EPA/ROD/R03-97/174
1997

EPA Superfund
Record of Decision:

ALLEGANY BALLISTICS LABORATORY (USNAVY)
EPA ID: WV0170023691
OU 03
MINERAL COUNTY, WV
05/29/1997

<IMG SRC 971740>

RECORD OF DECISION

SITE 1 OPERABLE UNIT 3, GROUNDWATER, SURFACE WATER, AND SEDIMENT

at the

ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA

APRIL 1997

TABLE OF CONTENTS

PAGE

1.0 DECLARATION

1.1 Site Name and Location 1
1.2 Statement of Basis and Purpose 1
1.3 Description of the Selected Remedy 1
1.4 Statutory Determinations 2

2.0 DECISION SUMMARY

2.1 Site Name, Location, and Description 4
2.2 Site History and Enforcement Activities 5
2.3 Scope and Role of Operable Unit 8
2.4 Summary of Site Characteristics 9
2.5 Summary of Site Risks 15
2.6 Description of Alternatives 18
2.7 Summary of Comparative Analysis of Alternatives 22
2.8 The Selected Remedy 25
2.9 Statutory Determinations ....: 29

3.0 RESPONSIVENESS SUMMARY

3.1 Background on Community Involvement 33

LIST OF FIGURES

1 Location Map
2 Plant Features
3 Site, 1 Waste Disposal Units
4 Approximate Area of Contaminated Groundwater

APPENDICES

A Toxicological Profiles for COCs at Site 1
B Applicable or Relevant and Appropriate Requirements
C Summary of Comments Received During Public Meeting and Responses

1.0 THE DECLARATION

1.1 SITE NAME AND LOCATION

Site 1 Groundwater, Surface Water and Sediments
Allegany Ballistics Laboratory
Rocket Center, West Virginia

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for site 1 (the "site") Groundwater, Surface Water and Sediments at the Allegany Ballistics Laboratory (ABL), Rocket Center, West Virginia. This determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980(CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

The Department of the Navy (DoN) has obtained concurrence from the State of West Virginia and the United States Environmental Protection Agency (USEPA), Region III with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

1.3 DESCRIPTION OF THE SELECTED REMEDY

The Navy will manage the remediation at Site 1 in two phases or operable Units (OUs). The remedial action selected in this Record of Decision (ROD) addresses contamination associated with groundwater, surface water and sediments in the North Branch Potomac River near Site 1 and is to be implemented as Operable Unit Three (OU 3).

Operable Unit Four (OU 4), defined as the contaminated surface and subsurface soils at Site 1, will undergo further evaluation and separate remediation alternatives will be studied.

The selected remedy for OU 3 is a site-wide groundwater extraction, with Dense Non-Aqueous Phase Liquids (DNAPLs) targeting and air stripping.

The major components of the selected remedy are:

- Construction of a groundwater treatment plant onsite for treatment of flow in the range of 175 gpm to 540 gpm.

- Extraction of groundwater across Site 1. Groundwater extraction will prevent flow of contaminated groundwater into the river thereby allowing contaminated surface water and sediments to undergo processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion. Extracted groundwater will be treated by the groundwater treatment plant and discharged to the North Branch Potomac River. A portion of the treated groundwater will be utilized by-the facility, on an as needed basis, for steam generation. The extraction well network would be periodically evaluated and modified as necessary in order to enhance recovery of contaminants and better control the dissolution of DNAPLs into groundwater.

- Establishment of an Operation and Maintenance (O&M) program for the groundwater treatment plant and extraction system. Deed notations and property use and access restrictions will be implemented to prevent future groundwater use.

- A sediment, surface water, and aquifer monitoring plan will be undertaken to monitor contaminant concentrations in the river and across Site 1. Human health risk from ingestion of fish will be reconsidered during this monitoring. In concurrence with State and EPA, wells that no longer produce contaminated groundwater concentrations above MCLs would be shut off, providing residual groundwater contaminant concentrations do not present unacceptable risk to human and ecological receptors in the river. This process would continue until a smaller zone of groundwater contamination is defined in the aquifer, likely corresponding to DNAPLs.

Implementation of the selected remedy will address the principal threats at the site by reducing the potential risk to human health and the environment associated with the discharge of groundwater to the North Branch Potomac River.

1.4 STATUTORY DETERMINATIONS

The selected remedy for OU 3 is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to this action (a waiver for cleanup of the DNAPL-zone under the Safe Drinking Water Act may be justified because of technical impractability from an engineering perspective), and is cost-effective.

This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

<IMG SRC 97174A>

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Allegany Ballistics Laboratory (ABL) is located at Rocket Center, in the north central panhandle of West Virginia, about 10 miles south of Cumberland, Maryland. ABL consists of two plants and several additional sites (Figure 1). Plant 1 occupies approximately 1,572 acres and is owned by the Navy and operated by Alliant Techsystems. Plant 2, a 56-acre area adjacent to Plant 1, is owned exclusively by Alliant Techsystems, and was not listed on the NPL. Plant 2 is located along the river on a floodplain separate from Plant 1. Plant 1 lies between the North Branch Potomac River to the north and west, and Knobly Mountain to the south and east. Several small towns and communities are located near Plant 1, including Pinto, Maryland,(1,500 feet to the northwest) and the community along McKenzie Road (750 feet north of Site 1) both located directly across the river from Site 1 (Figure 1). These Maryland communities include a total of approximately 30-40 residents, 15 of whom obtain all potable water from private residential wells. Other residents use a public water system. Short Gap, West Virginia, is located on the other side of Knobly Mountain, 5,000 feet to the southeast of Plant 1.

Site 1, shown in Figure 2, is approximately 11 acres and is situated on the northern edge of Plant 1. Site 1 is located on the alluvial plain above the North Branch Potomac River and has a range in elevation from 648 feet above mean sea level (msl) and 671 feet msl. A portion of Site 1 is located in the 100-year flood zone. Most of Site 1 is level, however there is lower topography and a man-made drainage in the western portion of the Site 1. The northern edge of Site 1 is moderately steep, sloping toward a lower-level terrace and the river.

The land use across the river from Site 1 is primarily agricultural. The land is used for growing corn and hay, and a dairy farm also exists at the eastern end of McKenzie road. In addition, an aeration basin treating wastewater from the unincorporated Maryland communities of Pinto, Bel Air, and Glen Oaks is located just west of Pinto and discharges to the river.

Limestone quarry and treatment works were formerly located to the northeast of Site 1 across the North Branch Potomac River. The operation has been abandoned for over 50 years.

To the northwest of Site 1, a former industrial operation was located on top of the bedrock terrace.

<IMG SRC 97174B>
<IMG SRC 97174C>

There are no ground water production wells currently active on the alluvial plain portion of Plant 1 at ABL. Several residences utilize ground water wells, within 1,000 feet of Site 1 across the river. Springs have been identified on Plant 1 approximately 2,000 feet to the south of Site 1.

The North Branch Potomac River is the closest major body of water.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 History of Site Activities

Plant operations at ABL included research, development and the production of solid propellant rocket motors. The formulation of the rocket fuels included the use of oxidizing and explosive materials. Processing the propellant and hardware equipment required the use of organic solvents.

Since 1959, Site 1 has been utilized for various types of waste burning and disposal activities. As shown in Figure 3, Site 1 contains inert (non-ordnance)open and ordnance burn areas, two landfills, a former drum storage area, and three solvent disposal pits. Within the fenced portion of Site 1, known as the ordnance burning ground, eight earthen pads were formerly used to burn ordnance material generated at the facility. Selected pads are currently used for burning, however all burning is now done on steel pans. Near the southwest corner of the ordnance burning ground, three unlined pits historically were used to dispose of used solvents, acids, and bases generated by plant operations.

Near the eastern end of Site 1, inert wastes (i.e., rags, paper, etc.), possibly contaminated as a result of plant operations, historically were burned and the ash buried. Burning and disposal activities at this area have ceased.

Waste not classified as ordnance or explosive contaminated, such as sanitary waste, was burned in the open burn area, located near the western end of Site 1. The ash from the open burning activities was landfilled, together with building material and other nonflammable debris, in the open burn area landfill along the bank of the North Branch Potomac River.

Prior to 1981, the former drum storage area was used to store 55-gallon drums containing used solvents generated during plant operations.

<IMG SRC 97174D>

In August 1981, reports of deteriorated drums releasing their contents to the surrounding ground surface resulted in a cleanup effort in which the spilled material from the drums was removed from the ground surface and contained in new drums. The drums were then disposed in accordance with RCRA regulations.

2.2.2 Previous Investigations

Five investigations have been conducted at ABL during which Site 1 has been either part or the focus of the investigation: (1) the Initial Assessment Study (IAS); (2) the Confirmation Study (CS); (3) the Remedial Investigation (RI); 4) the Focused RI; and (5) the Focused Feasibility Study (FFS). The IAS, completed in 1983 under the Navy Assessment and Control of Installation Pollutants Program (NACIP), identified nine sites at ABL for further investigation (Environmental Science and Engineering, January 1983). The IAS concluded that these sites did not pose an immediate threat. However, the IAS showed the need for a confirmation study at seven of the nine sites, including Site 1, to assess the potential impacts on human health and the environment by suspected contaminants.

Following the recommendations of the IAS and in accordance with the NACIP, the CS was initiated in June 1984 and completed in August 1987. The CS focused on identifying the existence, concentration, and extent of contamination at the sites recommended for further investigation in the IAS. As a result of the Superfund Amendments and Reauthorization Act (SARA) of October 1986, the Navy changed its NACIP terminology and scope under the Installation Restoration Program (IRP) to follow the rules, regulations, guidelines, and criteria established by the EPA for the Superfund program. For this reason, the results of the CS are documented in the Interim Remedial Investigation (Interim RV Report (Weston, October 1989). The Interim RI Report recommended further investigation at six of the seven sites, including Site 1.

Following the recommendations of the Interim RI Report and in accordance with the Navy's changed Installation Restoration Program URP) policy, CH2M HILL was contracted to conduct an RI following EPAs RI/FS format under CERCLA.

The RI, initiated in May 1992 and completed in October 1992 (final document dated January 1996), was conducted to define the nature and extent of contamination at a number of ABL sites, including Site 1. The RI investigation at Site 1 is discussed in detail in the Remedial Investigation of the Allegany Ballistics Laboratory, January 1996 (RI).

In order to expedite the RI/FS process at Site 1 by filling data gaps remaining after completion of the RI, the Atlantic Division of the Navy contracted CH2M HILL to conduct a Focused RI at Site 1 following EPA's RI/FS format under CERCLA. The Site 1 Focused RI further defined the nature and extent of contamination at and adjacent to Site 1 and included baseline risk assessments for human health and the environment. The Site 1 Focused RI and the risk assessments are discussed in detail in the Site 1 Focused RI Report.

Based on the results from the previous four investigations a Focused Feasibility Study (FFS) was undertaken for Site 1. The FFS was conducted to assess several alternatives to address groundwater, surface water and sediment contamination identified at Site 1.

2.2.3 Enforcement Actions

In August, 1981, the State of West Virginia issued ABL a consent order for the improper storage of hazardous wastes at the storage facility within Site 1. ABL fully complied with all terms of the order resulting in no further action.

Consent Order (CO) #CO-R6,13,25-95-8 was issued on November 10, 1995 by the State of West Virginia. It deals with open burning of propellant and explosive (P/E) wastes and P/E contaminated wastes. The Co compliance program required cessation of open burning of P/E contaminated wastes by May 31, 1996. It also delineated three primary requirements: compliance demonstration; waste minimization and emissions mitigation; and utilization of an open burning management plan. Compliance demonstration included construction of an incinerator if open burning of P/E contaminated wastes was not ceased, research on alternative technologies, determination of impact on human health and the environment, and relocation of the burn site if the impact were unacceptable.

This order is currently in force and all order requirements are being met.

No other enforcement actions have occurred at Site 1.

2.2.4 Highlights of Community Participation

In accordance with Sections 113 and 117 of CERCLA, 42 U.S.C. ºº9613 and 9617, the Navy held a public comment period from October 22, 1996 through December 9, 1996 for the proposed remedial action described in the Focused Feasibility Study for Site 1 and in the Proposed Plan.

These documents were available to the public in the Administrative Record and information repositories maintained at the Fort Ashby Public Library, Fort Ashby, West Virginia and at the La Vale Public Library, La Vale, Maryland. Public notice was provided in the Cumberland Times newspaper on October 18, 1996 and a Public Meeting was held in the Bel Air Elementary School on October 29, 1996. No written comments were received during the comment period and the comments and responses provided during the Public Meeting are presented in Appendix C.

2.3 SCOPE AND ROLE OF OPERABLE UNIT (OR RESPONSE ACTION) WITHIN SITE STRATEGY

The Navy has decided to manage the remediation of Site 1 in two phases or operable Units (OUs). An OU is defined by the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300.5)(NCP), as a discrete action which is an incremental step toward comprehensively mitigating site problems. The NCP (40 CFR 300.430 (a)(1)(ii)(A)) states "Sites should generally be remediated in operable units when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or completion of total site cleanup.

The principal threats posed by conditions at Site 1 result from potential exposures to contaminated soils, groundwater, and surface water and sediments. The remedial action identified in this ROD address contamination associated with Site 1 groundwater, surface water and sediments, as identified in the RI Report and the Focused RI Report.

The selected final remedial action (FRA) is to be implemented as Operable Unit Three (OU 3). The FRA consists of extracting groundwater across Site 1 thereby preventing flow of contaminated groundwater into the river. This action will allow contaminated surface water and sediments to undergo processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion.

In addition, institutional controls will be used to prevent future groundwater use.

The remedial action at OU 3 will help to contain the DNAPLs in the aquifer, reduce contaminant concentration in the groundwater, reduce the discharge of contaminated groundwater to surface water thereby reducing the principal threat from groundwater contamination.

The response actions for groundwater, surface-water, and sediment are expected to comply with the remedial action objectives identified in the FFS for these media which are:

- Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 1.

- Prevent or minimize offsite migration of contamination originating from Site 1.

Operable Unit Four (OU 4), defined as the contaminated soils at Site 1, will undergo further evaluation and remedial cleanup alternatives will be developed. The final remedy or remedies for OU 4 will be for surface and subsurface soils.

2.4 SUMMARY OF SITE CHARACTERISTICS

Site 1 is underlain by two distinct lithologies: (1) unconsolidated alluvial deposits of clay, silt, sand, and gravel; and (2) mainly calcareous shale and limestone of Silurian age.

Unconsolidated Aquifer

Drilling activities at Site 1 indicated that the unconsolidated deposits overlying bedrock generally consist of two distinct layers of material: (1) an upper, or surficial silty clay, considered floodplain deposits and (2) a deeper sand and gravel layer (alluvium), with variable but typically significant amounts of clay and silt.

The floodplain deposits have an average depth of approximately 12 feet below ground surface (bgs) and the alluvial materials have an average thickness of approximately 14.5 feet beneath Site 1.

The sand and gravel alluvium constitutes the shallow aquifer at Site 1. The approximate position of the water table is based on water-level measurements collected in November 1994 during the Focused RI. The alluvial deposits are believed to be saturated through their entire thickness except near the river, where the water table drops below the top of the alluvium. Water-level measurements collected in November 1994 from all Site 1 alluvial wells indicate the direction of groundwater flow in the alluvial aquifer at Site 1 is toward the river. This translates into a north-northeast flow direction in the central and eastern portions of Site 1 and a northwest flow direction in the western portion of the site. As discussed previously, the average elevation of the river surface (648 feet msl) is within the 640 to 652 feet msl elevation range of the alluvial aquifer adjacent to the river at Site 1.

This suggests that the river is the ultimate discharge zone for groundwater flowing laterally through the alluvium.

Hydraulic conductivities calculated from slug tests conducted in Site 1 alluvial monitoring wells and horizontal hydraulic gradients were used to approximate the average linear velocity of horizontal groundwater flow in the alluvial aquifer at Site 1. Assuming an effective alluvium porosity of 20 percent, the average linear velocity was estimated to be between 5 and 250 feet per year (ft/yr), depending on the amount of clay in the alluvium and on the relative steepness of the hydraulic gradient.

Bedrock Aquifer

Below the sand and gravel alluvium lies bedrock consisting of mainly calcareous shale and limestone of Silurian age. The average depth to bedrock at Site 1 is approximately 26.5 feet. Across the North Branch Potomac River from Site 1, no alluvium was encountered on the hill slopes and the top of the predominantly shale bedrock lies close to the ground surface.

During the RI and Focused RI, separate investigations were conducted to identify bedrock fracture sets and orientations in the vicinity of Plant 1 which may control local bedrock groundwater flow. During the RI, field measurement of 96 fracture planes identified two predominant orientations: (1) N26!E; and (2) N39!W. The former measurement was the most common measurement recorded and is approximately parallel to the structural trend of the Wills Mountain anticlinorium and the Appalachian folds in the region. The latter orientation is oblique to the Appalachian structural trend.

During the Focused RI, aerial photographs were also studied and it was found that a number of probable fracture traces adjacent to the plant display orientations that are similar to the predominant fracture orientations measured during the RI. It is assumed that fracture traces displaying these predominant orientations also exist beneath Site 1.

Because of the limited bedrock-fracture data, the areal extent of fracture sets or voids at Site 1 is unclear. The bedrock coring data collected from two monitoring wells (1GW9 and 1GW15) at Site 1 suggest that there are no voids and that the fracture sets observed are limited in areal extent.

The pattern or direction of groundwater flow in the bedrock aquifer is similar to that of the alluvial aquifer, with both aquifers locally discharging to the North Branch Potomac River. However, unlike the alluvial aquifer, lateral groundwater flow in the bedrock aquifer is confined mainly to partings along bedding planes and fractures.

Bedrock groundwater beneath the central and eastern portion of Site 1 generally flows northeast, approximately parallel to strike of N30!E, toward the North Branch of the Potomac River; groundwater beneath the western portion of the site is believed to flow in step-wise fashion northwest, approximately parallel to the strike of N39!W, toward the river.

Aquifer tests at Plant 1 and water-level data collected from the river and monitoring wells at Site 1 suggest varying degrees of hydraulic interconnection exist between the river and alluvium, the river and shallow bedrock, and the alluvium and shallow bedrock. In addition, water-level data collected from monitoring wells across the river from Site 1 suggest that bedrock groundwater from the western two thirds of the site clearly discharges to the river and does not flow-beneath the river.

These flow conditions are a result of the higher bedrock topography and related groundwater elevation heads that occur across the river in comparison to the bedrock on site. However, bedrock groundwater may migrate beneath the river from the eastern one third of the site. Water-level data from the bedrock wells on both sides of the river in this section of Site 1 are very similar, however the wells to the north have a slightly lower groundwater elevation head indicating potential flow in that direction. The wells across the river at this location have been sampled and no contaminants of concern detected at Site 1 were detected, so if groundwater does flow under the river Site 1 groundwater contamination has not reached that area. Similar to the alluvium, the river is most likely a discharge zone for shallow bedrock groundwater in the vicinity of Site 1.

Data collected from alluvial and shallow bedrock well pairs at Plant 1 indicate that the vertical component of hydraulic gradient is downward throughout the plant, including Site 1. This is not the case for the shallow and deep bedrock relationship in the north-central portion of Site 1. Here, the vertical component of hydraulic gradient was shown to be upward from the deep bedrock to the shallow bedrock.

Because the shallow bedrock was shown to be in hydraulic connection with the river, increases in head in the shallow bedrock resulting from recharge from the overlying alluvium can be dissipated through movement of shallow bedrock groundwater into the river. The deeper bedrock, likely recharged in the highlands to the southwest of the facility, may not be hydraulically connected to the river. Therefore, the heads at depth tend to increase in response to addition of groundwater in the recharge zone, which results in an upward vertical component of hydraulic gradient in the deep bedrock relative to shallow bedrock and alluvium along the rivet.

Sources of Contamination

Three former solvent disposal pits are located in the southwestern portion of the fenced area. These pits are considered the prime source of the ground water solvent contamination at Site 1. Two additional areas, identified as potential spill sites are possible sources for solvent contamination. These two area are located in the northeastern portion and the northwestern portion of the fenced area.

NATURE AND EXTENT OF CONTAMINATION

Based on site history, previous investigations and Site 1 Focused RI findings, contamination from prior land use practices at Site 1 has impacted surface soil, subsurface soil, sediment, surface water, and groundwater. A brief summary of the nature and extent of contamination follows. A complete list of the contaminants of concern detected in groundwater, surface water and sediment and their toxicological characteristics is presented in Appendix A. Due to site geology and the probability of dense, non-aqueous phase liquids (DNAPLs), an accurate estimate of the volume of contaminated groundwater plume cannot be made. However, Figure 4 provides an approximate areal extent of the contaminant plume. This summary focuses on the primary constituents associated with groundwater contamination, and is not intended to address all of the sampling, analytical, and evaluation results contained in previous investigative documents. A detailed discussion of contaminant nature and extent can be found in the Site 1 Focused RI Report.

Groundwater Contamination

During the course of the RI and Focused RI, groundwater samples were collected from all Site 1 monitoring wells and monitoring wells across the river from Site 1 for various analyses to determine the nature and extent of contamination. The analytical results are discussed in detail in the RI and the Focused RI, and are briefly summarized here.

Volatile Organic Compounds (VoCs)

Thirteen VOCs were detected in Site 1 groundwater during one or both investigations, but the six most prevalent (detected in six or more samples) VOCs were, in order of detection frequency: trichloroethene ME), total 1,2-dichloroethene (1,2-DCE), methylene chloride (MC), acetone, 1,1,1-trichloroethane (1,1,1-TCA), and tetrachloroethene (PCE).

<IMG SRC 97174E>

Vinyl chloride (VC) was also detected, but in only one groundwater sample, at a concentration of 41 micrograms per kilogram (ug/kg). Of the VOCs detected in Site 1 groundwater, TCE was the most prevalent and was detected at the highest concentrations. The highest concentrations of TCE ((up to 240,000 micrograms per liter(ug/l)] were found in a well cluster located hydraulically downgradient of the solvent disposal pits. Concentration at this level indicates the presence of DNAPLs. TCE was found in all alluvial wells and most bedrock wells adjacent to the river at Site 1.

Similar to TCE, MC, 1,2-DCE, and 1,1,1-TCA were detected at the highest concentrations (8,000 ug/l, 4,800 ug/l, and-7,700 ug/l, respectively) in the well cluster located hydraulically downgradient of the solvent disposal pits. PCE was detected in both alluvial and bedrock monitoring wells at concentrations as high as 800 ug/l and 12 ug/l, respectively.

Inorganics

The highest total concentrations of inorganics in the alluvial aquifer on Site 1 were detected in a well considered to be an upgradient or "background" well for the alluvial aquifer at Site 1.

However, the total concentrations of 12 inorganics were found to be higher in one or more Site 1 bedrock wells than in a well considered to be an upgradient or "background" well for the bedrock aquifer at Site 1. The 12 inorganics include; aluminum, arsenic, barium, chromium, cobalt, copper, iron, lead, mercury, nickel, vanadium and zinc.

Surface-Water and Sediment Contamination

Surface-water and sediment samples collected from the North Branch Potomac River upstream, downstream, and adjacent to Site 1 were analyzed for VOCs, SVOCs, and inorganics. Several of the surface-water and sediment sampling locations were located along areas with elevated levels of soil contamination detected in Site 1 soil.

The analytical results are discussed in detail in the RI and the Focused RI, and are briefly summarized here.

Surface-Water VOCs

TCE and 1,2-DCE (total) were the most prevalent VOCs detected in surface-water samples collected adjacent to and downstream of Site 1.

MC was also detected, but at relatively low concentrations, suggesting that it may have been the result of laboratory contamination. None of the aforementioned VOCs were detected in the upstream surface-water sample, suggesting that groundwater discharging to the river from Site 1 is the source of VOCs.

Surface-Water SVOCs

Bis(2-ethylhexyl)phthalate was the only SVOC detected, at an estimated concentration of 1 ug/l.

Surface-Water Inorganics

In general, inorganics concentrations in samples collected adjacent to and downstream of Site 1 were similar or lower than inorganics concentrations detected in the upstream sample.

Sediment VOCs

With the exception of acetone, which is believed to have been due to laboratory contamination, no VOCs were found in the upstream sample. The highest VOC concentrations were detected in the sediment samples collected adjacent to the groundwater well cluster hydraulically downgradient of the solvent disposal pits. In general, the VOC concentrations decrease in a downstream direction to non-detect within 1.5 miles of the eastern end of Site 1.

Sediment SVOCs

In general, similar SVOCs at similar concentrations were detected in sediment samples collected upstream, downstream, and adjacent to Site 1.

Sediment Inorganics

The inorganics data for the sediment samples collected during the RI and the Focused RI indicate that all inorganics concentrations were slightly higher in the upstream sediment sample than in the sediment samples collected adjacent to and downstream of Site 1.

Potential Routes of Contaminant Migration

Contaminated groundwater in the alluvial and bedrock aquifers at Site 1 is likely discharging to the North Branch Potomac River.

Consequently, contamination (primarily VOCs) has been detected in surface water and sediment samples collected hydraulically downgradient from the approximate area of the contaminant plume at Site 1 (Figure 4). VOC-contaminated groundwater in the bedrock aquifer could possibly flow to the north beneath the river at the eastern end of Site 1 as discussed above, however, no VOC-contamination has been detected in monitoring wells or residential wells along McKenzie Road.

2.5 SUMMARY OF SITE RISKS

The human health and ecological risks associated with exposure to contaminated media at Site 1 were evaluated in the Focused RI Report. The human health baseline risk assessment evaluated and assessed the potential health risks which might result under current and potential future land use scenarios.

Cancer risks are presented as a number indicating the potential for an increased chance of developing cancer if directly exposed to contaminants. As an example, EPA's acceptable risk range for cancer is 1×10^{-6} to 1×10^{-4}, which means there might be one additional chance in one million (1×10^{-6}) to one additional chance in ten thousand (1×10^{-4}) that a person would develop cancer if exposed to the contaminants at the site using EPA's recommended exposure scenario.

EPA's recommended exposure scenario for ingestion of contaminated groundwater for an adult resident assumes the individual consumes 1 liter/day for the first six years or their life and 2 liters/day for the following twenty-four years for 350 days/year. The risks evaluated for developing other health effects (using EPA's recommended exposure scenario) are expressed as a hazard index (HI). A hazard index of one or less indicates a very low potential to experience any adverse health effects based on EPA's recommended exposure scenario. An ecological evaluation was also performed and addressed the threats to ecological receptors. A summary of the human health and ecological risks associated with the site are summarized below.

2.5.1 Human Health Risks

Groundwater

There is no current exposure to contaminated groundwater because it is not used as a drinking water source at Site 1 or on Plant 1 at ABL.

Future exposure to groundwater was evaluated for a future resident obtaining all of their potable water from the most contaminated groundwater at Site 1. Future adult resident exposure pathways include inhalation of VOCs while showering and ingestion of groundwater. Future child resident exposure pathways include dermal contact while bathing and ingestion of groundwater.

Groundwater risks for potential future exposure scenarios were calculated assuming two different water supply sources: the most likely residential water supply source, and a reasonable maximum residential water supply source. The definition of these sources is provided in the Focused RI Report, and the associated risks for each source is described below.

For the reasonable maximum exposure, which includes use of groundwater from the alluvial aquifer and shallow bedrock, the HI for the child resident is 4,000 and the HI for the adult resident is 3,000. TCE contributed greater than 90 percent of the total HI. The lifetime exposure age-adjusted cancer risk, which included dermal exposure while bathing up to age 7 and inhalation of VOCs while showering for 24 years, and ingestion of groundwater is 1×10^{-1}. The risk from ingestion is 5×10^{-2}, with TCE contributing 65 percent.

The risk from inhalation of VOCs by an adult is 8×10^{-2}, mainly from vinyl chloride. The risk from dermal exposure to a child, 2×10^{-3}, is mainly caused by TCE.

For the most likely exposure, which includes use of groundwater from the shallow and deep bedrock, the HI for a child is 1,000, and the HI for an adult is 900. TCE contributed the majority of the hazard associated with inhalation, dermal contact, and ingestion. The lifetime exposure age-adjusted cancer risk, including dermal exposure while bathing for a child, inhalation of VOCs while showering for an adult and ingestion of groundwater is 7×10^{-2}. The lifetime risk from ingestion of groundwater for 30 years is 1×10^{-2}. The main contributor for the ingestion risk is TCE.

The risk from inhalation of VOCs by an adult is 5×10^{-2}. Vinyl chloride contributes approximately 83 percent of this risk. The risk to a child from dermal contact while bathing is 7×10^{-3}, with TCE contributing about 99 percent of the risk.

No human health risk assessment was performed for a future construction worker exposed to groundwater, however the risks would be much lower than the residential risk evaluated above.

Surface Water and Sediment

A quantitative human health risk evaluation of the surface water and sediment was not conducted during the base-line risk assessment. At the time of the evaluation, all of the contaminants in the surface water and sediment at Site 1 were eliminated during preliminary screening. However, after additional review several contaminants including iron, manganese, and antimony were determined to be of potential concern. Iron is an essential human nutrient. The other two inorganic contaminants will be re-evaluated during the development of discharge limits and during monitoring of the effectiveness of the preferred action. Human health risk from ingestion of fish was also not considered. This potential exposure pathway will also be reconsidered during the monitoring of the remedy performance.

2.5.2 Environmental Evaluation

Analytical data compiled from the Focused RI were analyzed using EPA Region III guidance for determining environmental effects quotients (EEQs). Data was reviewed for surface water, sediment, and soil. EEQs were determined by comparison with standard guidelines. EEQs greater than 1 indicate a potential for risk, greater than 10 represent potential moderate adverse effects, and greater than 100 represent a significant potential for adverse effects. The exposure assessment for surface water and sediment is presented below.

Surface Water

EEQs greater than 1.0 occurred for mercury, silver, copper, chromium, and aluminum at a "background" sampling location. EEQS over 40 were reported for silver in several site samples. EEQs for aluminum, lead, zinc, and mercury also exceeded a value of 1 for sampling locations potentially receiving site-related contaminants.

Sediment

EEQs for two SVOCs exceeded 1 at a "background" sampling location, but were based on values for non-detects. Most of the site EEQ values exceeding 1 were the result of using non-detect values (i.e., one half of the detection limit). Based on the analysis of EEQ values for surface water and sediments, there are relatively few contaminants of concern (COCs). The COCs include: antimony, cadmium, anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, TCE, and VC.

2.6 DESCRIPTION OF ALTERNATIVES

A detailed analysis of the possible remedial alternatives for Site 1 groundwater, surface water, and sediment is included in the Site 1 FFS report.

The detailed analysis was conducted in accordance with the TPA document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" and the National Oil Hazardous Substances Pollution Contingency Plan (NCP). A summary of the remedial alternatives which were developed to address contamination associated with Site 1 groundwater, surface water, and sediment is presented below.

GROUNDWATER ALTERNATIVE 1 - NO ACTION

Description: Under this alternative no further effort or resources would be expended at Site 1. Because contaminated media would be left at the site, a review of the site conditions would be required every 5 years. The review is specified in the NCP. Alternative 1 serves as the baseline against which the effectiveness of the other alternatives is judged.

Cost: There are no costs associated with this alternative.

Time to Implement: Implementation would be immediate.

GROUNDWATER ALTERNATIVE 2 - INSTITUTIONAL CONTROL ACTIONS

Description: The major components of this alternative include:

1. Locking up or abandoning existing wells onsite.

2. Filing of a groundwater use restriction on the site.

3. Deed notations along with property use and limited access restrictions that would prevent residential development and access to the land overlying groundwater contamination.

4. Groundwater, surface water, and sediment monitoring on a routine basis, quarterly to semi-annually, for a minimum of 5-years.

Cost: The estimated costs associated with this alternative are as follows:

Capital:	$50,000
Annual operation and maintenance:	$0
Net present worth (30-year):	$50,000

Costs associated with performing the 5-year site reviews are not included.

Time to Implement: Three to four months to implement.

GROUNDWATER ALTERNATIVE 3 - SITEWIDE GROUNDWATER EXTRACTION AND AIR STRIPPING

Description: The major components of this alternative include:

1. Construction of a groundwater treatment plant onsite. The treatment plant will be located outside the limits of the 100-year floodplain. The preliminary major process components are flow equalization, metals precipitation and clarification, gravity filtration, air stripping, and off-gas treatment by thermal oxidation.

2. Extraction of groundwater across Site 1, treatment by the groundwater treatment plant, and discharge to the North Branch Potomac River. A portion of the treated groundwater will be utilized by the facility, on an as needed basis, for steam generation.

3. During implementation of this alternative, an annual operation and maintenance (O&M) program will be established for the groundwater treatment plant. Deed notations and property use and access restrictions will be implemented to present future groundwater use.

4. Groundwater, surface water, and sediment monitoring on a timely basis, quarterly to semi-annually, for inclusion in the 5-year site reviews.

Groundwater extraction will occur across the length of Site 1 with the focus of preventing offsite migration of contaminants from the site to the river. This will prevent the continued contamination of surface water and sediment in the North Branch Potomac River.

Because the contaminant source (Site 1 groundwater) will be controlled, surface water and sediment contamination will be reduced through processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion in the river.

Based on preliminary groundwater modeling, the extraction flow race is estimated to range from 175 to 540 gpm, depending an the anisotropy exhibited by groundwater flow in the aquifer. The treatment plant flow rate will be revised based upon pump tests conducted on the extraction wells once they are installed and tested.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program.

The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

The State of Maryland has the right to review the discharge limitations imposed by West Virginia, and may impose more stringent limitations at their discretion. The treatment plant will be designed to comply with the final discharge limits once they are established.

Cost: The estimated costs associated with this alternative are listed below. Costs are given over the flow rate range of 175 gpm to 540 gpm.

Capital:	$3,600,00 to $7,500,000
Annual operation and maintenance:	$250,000 to $550,000
Net present worth (30-year):	$7,400,000 to $16,000,000

Time to Implement: Six to twelve months to implement.

GROUNDWATER ALTERNATIVE 4 - SITEWIDE GROUNDWATER EXTRACTION, TARGETING DNAPLs, AND AIR STRIPPING

Description: This sitewide alternative is very similar to Alternative 3. The major components of this alternative include:

1. Construction of a groundwater treatment plant onsite for treatment of flow in the range of 175 gpm to 540 gpm. The treatment plant in this alternative is identical to that specified in Alternative 3.

   Therefore, the treatment plant will be designed to comply with the final discharge limits once they are established.

2. Extraction of groundwater across Site 1 preventing flow of contaminated groundwater into the river allowing contaminated surface water and sediments to undergo processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion. Extracted groundwater will be treated by the groundwater treatment plant and discharged to the North Branch Potomac River. A portion of the treated

groundwater will be utilized by the facility, on an as needed basis, for steam generation.

3. Establishment of an O&M program for the groundwater treatment plant and extraction system. Deed notations and property use and access restrictions will be implemented to prevent future groundwater use.

4. A sediment, surface water, and aquifer monitoring plan will be undertaken as well to monitor contaminant concentrations in the river and across Site 1. Human health risk from ingestion of fish will be reconsidered during this monitoring. In concurrence with State and EPA, wells that no longer produce contaminated groundwater concentrations above MCLs would be shut off, providing residual groundwater contaminant concentrations do not present unacceptable risk to human and ecological receptors in the river. This process would continue until a smaller zone of groundwater contamination is defined in the aquifer, likely corresponding to DNAPLs.

The extraction well network would be periodically evaluated and modified as necessary in order to enhance recovery of contaminants and better control the dissolution of DNAPLs into groundwater.

As with Alternative 3, the treatment plant will be designed to comply with the final discharge limits once they are established.

Cost: The estimated costs associated with this alternative are listed below. Costs are given over the flow rate range of 175 gpm to 540 gpm.

Capital:	$3,700,00 to $7,600,000
Annual operation and maintenance:	$250,000 to $550,000
Net present worth (30-year):	$7,500,000 to 16,100,000

Time to Implement: Six to twelve months to implement.

2.7 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives presented in Section 2.6 were evaluated in the FFS against nine criteria identified in the NCP.

2.7.1 THRESHOLD CRITERIA

Overall Protection of Human Health and the Environment

The Site 1 RAOs include:

- Preventing or minimizing exposure of potential onsite residents and construction workers to contaminated groundwater originating from Site 1.

- Preventing or minimizing migration of contamination from Site 1.

Alternative 1 does not achieve either RAO. Alternative 2 prevents exposure to contaminated groundwater through groundwater use restrictions, but off-site migration is not prevented and contaminated groundwater will continue to discharge to surface water and sediments. Alternatives 3 and 4 attain both RAOs.

However, because of the presence of DNAPLs, neither of these alternatives are expected to attain MCLs over the 30-year project life. Alternative 4 however, does have a containment plan for areas of groundwater that have DNAPLs.

Compliance with Applicable or Relevant and Appropriate Requirements

Groundwater chemical-specific ARARs (MCLs) would likely not be attained during the 30-year project life by any alternative. This is due to the probable existence of DNAPLs which may provide a continual source of contamination.

However, alternatives 3 and 4 are expected to achieve the MCLs in areas where DNAPLs do not exist. Alternative 4 will enhance contaminant removal by setting up containment of the area of groundwater contaminated with DNAPLs and better control the possible spread of dissolved DNAPLs. This will likely increase the volume of groundwater where MCLs are attained at Site 1.

All alternatives would comply with location-specific ARARs. Applicable ARAR focus on the presence of the 100-year floodplain of the North Branch Potomac River. All alternatives would comply with action-specific ARARs as well.

2.7.2 PRIMARY BALANCING CRITERIA

Long-term Effectiveness and Permanence

Alternatives 2 through 4 minimize the risk associated with groundwater contaminants remaining at Site 1. Alternative 2 provides the lowest degree of minimization by the use of deed and groundwater use restrictions. Alternative 2 does not prevent or minimize off-site migration of groundwater contaminants and consequently, surface water and sediment contamination would continue. Alternative 3 prevents off-site migration through groundwater extraction. Alternative 4 provides the most significant degree of risk minimization. The performance of the extraction well network in this alternative would be periodically evaluated and modified.

Wells that no longer produce contaminated groundwater concentrations above MCLs would be shut off, providing residual groundwater contaminant concentrations do not present unacceptable risk to human and ecological receptors in the river. Areas with sustained high concentrations of VOCs would be targeted enhancing contaminant removal, containment, and controlling dissolution of DNAPLs. Five year site reviews are required for each alternative.

Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

Alternatives 3 and 4 provide reductions in groundwater toxicity, mobility, and volume using a treatment plant. However, Alternative 4 enhances contaminant removal, establishes containment of the DNAPLs, and better controls the dissolution of DNAPLs into groundwater by targeting DNAPLs. These alternatives will prevent the discharge of contaminated groundwater to surface water and sediments, allowing contaminants in these media to undergo processes of volatilization, degradation, dilution, mixing, and sediment erosion or removal, effectively reducing the toxicity, mobility, and volume of contamination associated with surface water and sediments. Alternatives 1 and 2 provide no reduction in toxicity, mobility, or volume for groundwater, surface water, or sediments.

Short-Term Effectiveness

Alternatives 1 and 2 can be implemented most quickly, however they do not meet the remedial action objectives. Alternatives 3 and 4 can both be implemented in about the same amount of time, six to twelve months.

The no action alternative and alternative 2 involve no construction or site activities, and would therefore produce no disturbance to the surrounding community and environment. Alternatives 3 and 4, which require well installation and the construction of a groundwater treatment plant and a significant piping network, produce minimal to moderate disturbance to the community. All construction will take place at Site 1 on ABL property. The majority of the risk results from fugitive dust emissions which can be controlled.

Implementability

Alternatives 1 and 2 require no technical innovation. Alternatives 3 and 4 require the design and construction of an effective extraction well network and the construction of a complex treatment facility. Groundwater extraction in fractured bedrock is complicated.

Aquifer testing will be necessary to evaluate whether a well network is capable of capturing the contaminant plume. There are many specialty vendors to provide expertise in sizing the treatment plant components.

Jar testing is required to design the metals precipitation, and pH adjustment process, and to select the optimum polymer dosage for flocculation of the inorganics in the groundwater treatment plant.

Cost

The annual operating and maintenance (O&M) cost is estimated to be the same for alternatives 3 and 4. On a present worth basis, Alternative 4 is slightly more costly, at $7,500,000 at a proposed flow rate of 175 gallons per minute(gpm) and $16,100,000 at a flow rate of 540 gpm. The present worth of Alternative 3 is $7,400,000 at a flow rate of 175 gpm and $16,000,000 at a flow rate of 540 gpm. Alternative 2 is the least expensive alternative (excluding the No Action Alternative), with a present worth of $50,000.

2.7.3 MODIFYING CRITERIA

State Acceptance

The West Virginia Division of Environmental Protection on behalf of the State of West Virginia, has reviewed the information available for Site 1 OU 3 and has concurred with the selected remedy.

Community Acceptance

Community Acceptance summarizes the public's general response to the alternatives described in the Proposed Plan and the Focused Feasibility Study. No written comments were received during the forty-five day comment period, which began on October 22 and ended on December 9, 1996. The comments recorded at the Proposed Plan Public Meeting held October 29, 1996 and the responses are referenced in the Responsiveness Summary, Section 3.0 and included in Appendix B of the ROD.

2.8 THE SELECTED REMEDY

Alternative 4 - Sitewide Groundwater Extraction/Targeting DNAPLs, and Air Stripping, is the selected remedial alternative.

Based on available information and the current understanding of Site 1 conditions, Alternative 4 appears to provide the best balance with respect to the nine NCP evaluation criteria. In addition, the selected alternative is anticipated to meet the following statutory requirements:

- Protection of human health and the environment (groundwater, surface water, and sediment).
- Compliance with ARARs. While compliance with chemical-specific ARARs (MCLs) for groundwater will not likely occur for the entire site during the 30-year project life, it is estimated that a major portion of the aquifer will be remediated to MCLs in 30 years, with the remainder of the aquifer (DNAPL-zone) to be hydraulically-contained with continued groundwater extraction.
- Cost-effectiveness.
- Utilization of permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

The major components of the selected remedy include:

- Extraction of contaminated groundwater using an extraction well network to remove contaminated groundwater from both the alluvial and bedrock aquifers. Groundwater modeling and aquifer testing shall be used to design the extraction wells and the extraction network. The number and location of the extraction wells shall be specified during remedial design. The extraction system will be carefully monitored on a regular basis and its performance evaluated.

This evaluation may provide further information concerning the extent of the DNAPL-zone.

- An above ground treatment system. One or more of the treatment technologies - air stripping, granular activated carbon (GAC), chemical /UV oxidation - shall be used for treating aqueous contaminants in the extracted groundwater. Other technologies will also be used as needed in the treatment system for removal of dissolved inorganics and total suspended solids. The actual technologies and sequence of technologies used for the treatment system will be determined during remedial design. Final selection of these technologies will be based on additional, site information to be collected during remedial design.
- Discharge of the treated groundwater to North Branch Potomac River. Sampling shall be conducted before and after discharge to ensure that the discharge is not causing an exceedence of Ambient Water Quality Criteria. A portion of the treated groundwater will be utilized by the facility, on an as needed basis, for steam generation.
- Long-term groundwater monitoring will be performed, including quarterly sampling for 30 years. The groundwater monitoring plan will be developed during remedial design.

- Land-use restrictions to prohibit the on-site use of untreated groundwater.

The primary goals for the groundwater portion of this remedial action is for hydraulic containment of the likely DNAPL-zone and to restore the maximum areal extent of both the alluvial aquifer and the bedrock aquifer to its beneficial uses. At Site 1, the aquifers are potentially useable as a source of drinking water and the bedrock aquifer is currently used off-site for this purpose. Based on information obtained during the remedial investigation and on a careful analysis of all remedial alternatives, the Navy, WVDEP, and the EPA believe that the selected remedy will achieve these goals.

The selected remedy will include groundwater extraction for an estimated period of 30 years, during which the system's performance will be carefully monitored, and adjusted as warranted by the performance data collected during operation.

Refinement of the extraction system may be required, if the Navy, WVDEP, and the EPA determines that such measures will be necessary in order to restore the maximum areal extent of the aquifers in a reasonable timeframe, to provide a more efficient containment of the DNAPL-zone, or to significantly reduce the timeframe or long-term cost of attaining this objective.

Refinement of the extraction system may include any or all of following:

1) Adjusting the rate of extraction from some or all wells;

2) Discontinuing pumping at individual wells where cleanup goals have been attained:

3) Pulsed pumping of some or all extraction wells to eliminate flow stagnation areas, allow sorbed contaminants to partition into groundwater, or otherwise facilitate recovery of contaminants from the aquifers; and

4) installing additional groundwater extraction wells to facilitate or accelerate cleanup of the contaminant plume.

The primary goal for the surface water and sediment portion of this remedial action is to stop the migration and discharge of contaminated groundwater into the North Branch Potomac River and to allow processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion to clean the river. The selected remedy will achieve this goal.

The selected remedy addresses all contaminated media at Site 1, except contamination associated with surface and subsurface soil overlying the groundwater aquifers. As discussed previously, a separate FFS will be prepared which addresses soil contamination as operable Unit 4 at Site 1.

2.8.1 PERFORMANCE STANDARDS

The performance standards outlined below shall be used to evaluate the overall performance of the selected remedy.

A sufficient number of extraction wells shall be installed to achieve three remedial objectives for both aquifers: 1) minimizing further migration of contaminants from suspected subsurface DNAPL source areas to the surrounding groundwater; 2) minimizing further migration of the leading edge of the contaminant plume; and 3) capturing the Site 1 groundwater contaminant plume and preventing discharge of contaminated groundwater into the North Branch Potomac River along Site 1.

All extracted groundwater shall be treated to levels meeting the substantive requirements of the National Pollutant Discharge Elimination System (NPDES).

The Ambient Water Quality Criteria (AWQC) for water and organisms shall be considered further in the calculation of final discharge limits to be protective of human health and the environment.

All emissions from the air stripper shall be in compliance with the Clean Air Act and the requirements of the West Virginia Air Pollution Control Act.

Surface water and sediments in the North Branch Potomac River shall be monitored according to the substantive requirements outlined in the NPDES permit. Additionally, surface water and sediment will be sampled to monitor the contaminant concentrations in the river. This data will be used to evaluate the effectiveness of the extraction well network in reducing discharge to the river. A surface water and sediment monitoring plan, including the substantive requirements of the NPDES permit, will be developed during the remedial construction (action) phase.

A risk evaluation for fish ingestion shall be undertaken and reported before discharge of the treated groundwater begins.

Groundwater extraction shall be terminated after groundwater contaminant levels in the dissolved TCE plume at Site 1 are below the Maximum Contaminant Levels (MCLs) as defined in the Safe Drinking Water Act, providing residual groundwater contaminant concentrations do not present unacceptable risk to human and ecological receptors in the river. If the groundwater contaminant concentrations in the dissolved TCE plume at Site 1 reach background level of the contaminant, the wells can be shut off. The target level for total noncancer risk is represented by the hazard index (HI) of not more than 1 and for a total cancer risk within the range of 1 x 10 -6 to 1 x 10 -4. To this end, extraction wells and monitoring wells shall be sampled for at least 30-years.

The number and location of these monitoring and extraction wells shall be specified during the remedial design, and additional monitoring wells shall be installed, if required. The 0 & M plan for the groundwater treatment plant and extraction well network will be developed during the remedial construction (action) phase. If sampling confirms that MCLs or background levels have been attained at individual wells and remain at the required levels for three consecutive sampling periods, operations at those wells can be suspended. The sampling periods will be determined during remedial construction (action) phase and may vary during the life of the project. The sampling periods can not be changed unless the Navy, WVDEP, and the EPA agree on the change.

If subsequent monitoring shows the groundwater concentrations of any contaminant of concern in these wells to be above MCLs or background levels, pumping at those wells shall be restarted.

2.9 STATUTORY DETERMINATIONS

Remedial actions must meet the statutory requirements of Section 121 of CERCLA, 42 U.S.C. º9621 as discussed below.

Remedial actions undertaken at NPL sites must achieve adequate protection of human health and the environment, comply with applicable or relevant and appropriate requirements of both Federal and State laws and regulations, be cost effective, and utilize, to the maximum extent practicable, permanent solutions and alternative treatment or resource recovery technologies. Also, remedial alternatives that reduce the volume, toxicity, and/or mobility of hazardous waste as the principal element are preferred. The following discussion summarizes the statutory requirements that are met by this remedial alternative. Refer to the attached ARAR table for more information on specific ARARs mentioned below.

2.9.1 Protection of Human Health and the Environment

The selected remedial action will protect human health and the environment. The installation of extraction wells and the construction of a groundwater treatment plant will prevent continued discharge of contaminated groundwater to the river and will reduce contaminant concentrations in the aquifer.

However, due to the presence of DNAPLs, contaminant concentrations in the groundwater may not be remediated at or below MCLs across a portion of Site 1 in a reasonable time frame. The DNAPL-zone shall be hydraulically-contained with continued groundwater extraction.

A waiver for cleanup of the DNAPL-zone under the Safe Drinking Water Act and a variance for the West Virginia Groundwater Protection Act may be justified because of technical impractability from an engineering perspective and may be requested at a later time after more information about the DNAPL-zone is collected.

Processes, including volatilization, degradation, dilution, mixing, and sediment removal or erosion will reduce contaminant concentrations in the river and will eliminate the associated risk of exposure to human health and the environment.

Deed notations and property use and site access restrictions will prevent future use of untreated groundwater, therefore eliminating direct contact, ingestion and inhalation threats associated with groundwater contamination at the site.

2.9.2 Compliance with ARARs

The selected remedy will be constructed to meet all applicable or relevant and appropriate requirements (ARARs) whether chemical, action, or location specific with the following exception: Cleanup level MCLs, within the DNAPL-zone, may be waived and a State required variance secured due to technical impracticability from an engineering perspective.

Chemical-Specific ARARs - Attainment of ARARs for groundwater is accomplished through the use of extraction wells across Site 1 and treatment of extracted groundwater. In order to comply with chemical-specific ARARs, aquifer contaminant concentrations must be reduced to or below MCLs. This goal is complicated by the possible presence of DNAPLs providing a long-term source of continuing contamination.

This alternative will focus on remediation of the groundwater to MCLs and containment of the contaminants in the DNAPL-zone but, because of their presence, attaining MCLs for all of the site is unlikely. Complete aquifer restoration within the DNAPL-zone may be technically impracticable from an engineering perspective, and for this reason the ARAR in the DNAPL-zone may be waived according to CERCLA º121(d)(4)(c), 42 U.S.C. º9621(d)(4)(c) in addition, it may be necessary to secure a variance from the West Virginia Groundwater Protection Act according to West Virginia Code º22-12-5(d), º47 CSR 57.

Under this remedial action, extracted groundwater will be treated, then used for boiler make-up or discharged to the North Branch Potomac River.

Chemical-specific ARARs require contaminant concentrations in treated groundwater to be less than or equal to discharge limits established by the State of West Virginia and the federal government. The groundwater treatment system will be designed to meet these criteria.

Location-Specific ARARa - Site 1 is partially located within the 100-year floodplain of the river. According to 40 CFR 264.18(b), any facilities constructed in the floodplain of a river must be designed and constructed to avoid washout.

The groundwater treatment plant will be located an appropriate distance from the river, and outside the limits of the floodplain so that washout would not occur.

Discharge piping would be located in the floodplain, and therefore, would incorporate concrete collars at intervals to counteract buoyant forces acting on the pipe during flooding.

The Navy performed an ecological risk assessment as part of the Focused RI. A site survey was performed, and information was gathered concerning the presence of endangered or threatened species on Site 1. Correspondence with federal regulatory agencies indicated that, except for the occasional transient individuals, no federally listed or proposed endangered species are known to exist on Site 1. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will likely not be applicable to remediation activities occurring on Site 1.

The Wild and Scenic Rivers Act (16 USC 1271 et seq.) requires the avoidance of taking action that will have a direct adverse effect on a scenic river. Because construction activities along the river bank may impact river water quality, this ARAR is potentially applicable. Erosion and sediment controls will be incorporated into the remedial design in order to comply with this ARAR.

Action-Specific ARARs - The State of West Virginia Groundwater Protection Act regulations (47 CSR º58-4.7 to 4.7.4) require that pipelines which convey contaminants shall preferentially be installed above ground. Further, 47 CSR 58-4.4.1 requires that loading and unloading stations including but not limited to drums, trucks and railcars shall have spill prevention and control facilities and procedures as well as secondary containment, if appropriate or otherwise required. Spill containment and cleanup equipment shall be readily accessible,

All residuals from the groundwater treatment plant will be properly handled, characterized, and undergo proper disposal following federal and state regulations such as the Resource Conservation and Recovery Act (RCRA) (40 CFR 262.34, 40 CFR 262.171 to 173, 40 CFR 264.111, 174, 175, 176, and 177).

All emissions from the air stripper shall be in compliance with the Clean Air Act (40 C.F.R. 52 and 61, and CAA Sections 101 and 112) and the requirements of the West Virginia Air Pollution Control Act (45 CSR º7-4.2, 45 CSR º25-3.1 to 3.3, 45 CSR º25-4.1 to 4.3, and 45 CSR º30) and Maryland's Air Quality regulation (COMAR 26.11).

Post-closure use of the property would be restricted during 30-year project life because the aquifers will most likely remain contaminated. Section 121 of CERCLA, 42 U.S.C. º9621 as amended by SARA, requires a periodic review of remedial actions at least every five years for as long as contaminants which pose a threat to human health and the environment remain onsite.

2.9.3 Cost-Effectiveness

The selected remedy is the most cost effective alternative in meeting the RAOs. The "no action" and "institutional control" alternatives are less costly than the selected alternative, however these alternatives do not meet all of the RAOs. Although Alternatives 3 and 4 are approximately the same cost, the selected remedy, Alternative 4, provides for better control of DNAPLs.

2.9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable ("M.E.P.")

The selected remedial action utilizes permanent treatment technologies to the maximum extent practicable for this operable unit.

The selected remedy will greatly reduce contamination in surface water and sediment and dissolved contamination in the groundwater, providing a permanent solution in these contaminated areas. In addition, the groundwater extraction system will be modified as necessary to contain DNAPLs. Finally, a portion of the treated groundwater will be utilized by the facility for boiler make-up.

2.9.5 Preference for Treatment an a Principal Element

The statutory preference for treatment is satisfied by using aboveground treatment system to treat contaminated groundwater at Site 1.

2.9.6 Documentation of Significant Changes

The selected remedy is the same alternative identified as the recommended alternative in the Proposed Remedial Action Plan and that was presented to the public at the public meeting held October 29, 1996.

There were no significant changes to the recommended remedial action alternative presented in the Proposed Plan.

3.0 RESPONSIVENESS SUMMARY

The selected remedy for Site 1 OU 3 is the sitewide groundwater extraction, targeting DNAPLs, and air stripping. No written comments, concerns, or questions were received by the Navy, EPA, or the State of West Virginia during the public comment period from October 22, 1996 to December 9, 1996. A public meeting was held on October 29, 1996 to present the Proposed Plan for Site OU 3 and to answer any questions on the Proposed Plan and on the documents in the information repositories. Several questions were answered during the meeting. Based on the limited comments, the public appears to support the selected remedy. The transcript of the meeting is part of the administrative record for this Operable Unit. A summary of comments received during the Public Meeting is attached as Appendix C.

3.1 BACKGROUND ON COMMUNITY INVOLVEMENT

The Navy and ABL has had a comprehensive public involvement program for several years. Starting in 1993, a Technical Review Committee (TRC) would meet on average twice a year to discuss issues related to investigative activities at ABL.

The TRC was comprised of mostly governmental personnel, however a few private citizens attended the meetings.

In early 1996, the Navy converted the TRC into a Restoration Advisory Broad (RAB) and 8 - 10 community representatives joined. The RAB is co-chaired by a community member and has held meetings approximately every three months since.

The Focused Feasibility Study for Site 1 and the Proposed Plan were both discussed at the RAB meetings and a Site 1 tour was undertaken during a special RAB meeting.

Community relations activities for the final selected remedy include:

- The documents concerning the investigation and analysis at Site 1, as well as a copy of the Proposed Plan was placed in the information repository at Fort Ashby and La Vale Libraries.

- Copies of the documents, including the Proposed Plan were sent to the technical committee of the RAB.

- Newspaper announcements on the availability of the documents and the public comment period/meeting date was placed in the Cumberland Times on October 18, 1996.

- The Navy established a 45-day public comment period starting October 22, 1996 and ending December 9, 1996 to present the Proposed Plan.

- A Public Meeting was held October 29, 1996 to answer any questions concerning the Site 1 OU 3 Proposed Plan. Approximately 30 people, including Federal, State and 1ocal government representatives attended the meeting. A summary of comments received during the Public Meeting is attached as Appendix C.

APPENDIX A

TOXICOLOGICAL PROFILES FOR COCs AT SITE 1
(Source: Region III TOX PROFILES)

VOLATILE ORGANIC COMPOUNDS VOCs

CHLOROFORM

Chloroform has a molecular weight of 119.38, and exists at room temperature as a clear, colorless liquid with a boiling point of 61.7 C. It is widely used in industry as a solvent, feedstock, and sterilizing agent, and is found in all chlorinated public water supplies (because it is a by-product of the chlorination process). Chloroform is soluble in water, acetone, and non-polar solvents, and volatilizes readily from solution. It is readily taken into the body by inhalation, ingestion, and dermal or eye contact.

Chloroform is a Class B2 carcinogen, because it causes increases in kidney tumors in rats, and in liver tumors in mice. There is also suggestive evidence from epidemiological studies that exposure to chloroform and other trihalomethanes is associated with an increased incidence of bladder tumors in humans. Other toxic effects of chloroform include central nervous system depression; eye, skin, and gastrointestinal irritation; and damage to the liver, heart, and kidney.

1,1-DICHLOROETHANE

Dichloroethane (1,1-) is a colorless liquid with a chloroform-like odor. It is used as a solvent and cleaning and degreasing agent as well as in organic synthesis as an intermediate. Exposure to 1,1-dichloroethane may occur through inhalation, ingestion, eye and skin contact. Direct contact to 1,1-dichloroethane may cause skin irritation. Oral exposure to 1,1-dichloroethane has been shown to cause mammary gland, liver and kidney tumors in rats and mice. Therefore, the EPA has classified 1,1-dichloroethane as a Group C possible human carcinogen.

1,2-DICHLOROETHANE

1,2-Dichloroethane (1,2-DCA) is used in synthetics (nylon, rayon, rubber, plastics) industries. It can be used as a solvent, fumigant, and degreaser. It may be used in the photographic, adhesive, water softening, cosmetic, and pharmaceutical industries (Sittig, 1985).

Prolonged dermal contact with 1,2-DCA can cause irritation and dermatitis. Symptoms of inhalation exposure can include CNS effects such as dizziness and depression of respiration, as well as nausea.

EPA has classified 1,2-DCA as a Group 32 probable human carcinogen. 1,2-DCA has also been shown to alkylate DNA.

1,1-DICHLOROETHENE

1,1-Dichloroethene (1,1-DCE), formerly known as vinylidene chloride, is used in the manufacture of 1,1,1-trichloroethane and in polymers. Polymer applications include mortars, concretes, and fabrics (Sittig, 1985).

1,1-DCE is an irritant that can also affect the liver. Inhalation of high concentrations of 1,1-DCE has resulted in CNS depression, as well as liver and kidney damage. 1,1-DCE is highly volatile and is readily absorbed by the respiratory and GI tracts. EPA has classified 1,1-DCE as a Group C possible human carcinogen. 1,1-DCE has been shown to alkylate DNA.

1,2-DICLOROETHENE

1,2-Dichloroethene (1,2-DCE) is used as a solvent for waxes, resins, and acetylcellulose. It is also used in the rubber extraction, refrigeration, and pharmaceuticals industry (Sittig, 1985).

1,2-DCE can irritate the skin and mucous membranes. Via the inhalation route, dizziness, nausea, and vomiting and CNS depression may occur (Sittig, 1985). The lungs, liver, and kidneys may be affected.

1,2-DCE is not classified as a carcinogen by EPA.

METHYLENE CHLORIDE (DICHLOROMETHANE)

Methylene chloride, also known as dichloromethane, is a volatile solvent and common laboratory contaminant. Like many volatile solvents, methylene chloride can affect the nervous system, especially after inhalation exposure. Potential effects include dizziness, numbness, eye and skin irritation, and cardiac effects.

Methylene chloride is classified by the EPA as a Group B2 (probable human) carcinogen via the oral and inhalation routes of exposure.

TETRACHLOROETHENE

Tetrachloroethene (PCE), also known as perchloroethylene, is a commonly used solvent in the dry cleaning, degreasing, and textile industries. It is also used as an intermediate in the manufacture of organic chemicals (Sittig, 1985).

Irritation of the skin can occur after dermal exposure. High-level inhalation exposure can cause respiratory and eye irritation. Other effects include CNS depression and liver damage (Sax, 1989).

EPA ECAO classifies PCE as a Group B2 probable human carcinogen, although this is not considered Agency-wide consensus at this time.

TOLUENE

Toluene is a clear, colorless, noncorrosive liquid with a sweet, pungent, benzenelike odor. Toluene may be encountered in the manufactures of benzene. It is used as a chemical feed for toluene diisocyanate, phenol, benzyl and benzoyl derivatives, benzoic acid, toluene sulfonates, nitrotoluenes, vinyltoluenes, and saccharin. As a solvent, toluene is used for paints and coatings. It is also used as a component of automobile and aviation fuels.

Toluene has been shown to be embryotoxic in experimental animals. Chronic inhalation exposures to high levels of toluene produce central nervous system depression and narcosis in humans. Chronic exposure to toluene at high concentrations by mammals may produce cerebellar degeneration and an irreversible encephalopathy. Co-administration of toluene along with benzene or styrene has been shown to suppress the metabolism of benzene or styrene in rats. In humans toluene may cause irritation to the eyes, respiratory tract, and skin. Acute exposure to toluene causes central nervous system depression, the symptoms of which include headache, dizziness, fatigue, muscular weakness, drowsiness, loss of coordination with staggering gait, skin paresthesia, collapse, and coma.

1,1,1-TRICHLOROETHANE

1,1,1-Trichloroethane is a colorless, nonflammable liquid with an odor similar to chloroform. In recent years it has been used as a substitute for carbon tetrachloride. In liquid form it is used as a degreaser and for cold cleaning, dip-cleaning, and bucket cleaning of metals. 1,1,1-trichloroethane is a solvent used in dry-cleaning, vapor degreasing, and as a propellant.

1,1,1-Trichloroethane is irritating to the eyes on contact with either liquid or vapor phases. This effect is usually first noted in acute exposures. Mild conjunctivitis may develop but recovery is usually rapid. The solvent's defatting properties may produce a dry, scaly dermatitis upon repeated contact with the skin. Acute exposures may lead to dizziness, drowsiness, increased reaction time, loss of coordination, unconsciousness, and death. Inhalation exposure to high concentrations of 1,1,1-trichloroethane depress the central nervous system; affect cardiovascular function; and damage the lungs, liver, and kidneys in animals and humans. Mucous membranes may also be irritated by exposure to this solvent.

TRICHLOROETHENE

Trichloroethene (TCE) has been used as a solvent in degreasing operations associated with both metal-using industries and dry cleaning. TCE has been used as an intermediate in the production of pesticides, waxes, gums, resins, paints, varnishes, and trichloroacetic acid (Sittig, 1985).

TCE toxicity can include dermatitis, CNS depression, anesthesia, and effects on the liver, kidneys, and heart. TCE is a volatile compound, and inhalation exposure may be significant.

The carcinogenicity of TCE is currently under review.

VINYL CHLORIDE

Vinyl chloride is a volatile organic compound used in the manufacture of polyvinyl chloride and other resins. It is also used as a chemical intermediate and a solvent (Sittig, 1985). Vinyl chloride can be found environmentally as a breakdown product of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,2-dichloroethene.

Vinyl chloride can cause skin irritation and CNS depression. Chronic exposure may cause hepatic damage (Doull, 1986). Vinyl chloride is classified by EPA as a Group A (known) human carcinogen, and has been specifically associated with hemangiosarcoma of the liver.

INORGANICS

BARIUM

Barium is an extremely reactive silver white metal produced by the reduction of barium oxide. It may ignite spontaneously in air in the presence of moisture. Barium is insoluble in water but most of the barium compounds are soluble in water. Barium has many uses. It is used for removal of residual gas in vacuum tubes and in metal alloys (e.g., nickel and lead). It is used in the manufacture of lithopone (a white pigment in paints); in synthetic rubber vulcanization; in x-ray diagnostic work; in glassmaking; and in electronics industries. Long-term oral exposure to soluble barium salts may increased blood pressure. Short-term exposure may cause prolonged stimulant action on muscle. Occupation-inhalation exposure to barium may result in Baritosis, a non-cancerous lung disease. There are no reports of carcinogenicity associated with exposure to barium.

MANGANESE

Manganese is used in the manufacture of dry cell batteries, paints, dyes, and in the chemical and glass and ceramics industries. Manganese is an essential nutrient in food; the average human intake is reported to be approximately 10 mg/day (Sittig, 1985).

Previous reports of neurotoxicity from manganese were generally reported from high-level occupational exposure to dust and fumes. More recent studies have focused on exposures to drinking water, with subtle neurologic effects being reported after chronic consumption of high concentrations of manganese in water (Sittig, 1985; USEPA, 1993).

Manganese is not classified as a carcinogen by EPA.

TOXICOLOGICAL PROFILES FOR CONTAMINANTS FOR FUTURE CONSIDERATION

INORGANICS

ANTIMONY

Antimony is a soft metal insoluble in water and organic solvents. It is widely used in the production of alloys. Short-term oral exposure to antimony has been shown to cause burning stomach pains, colic, nausea and vomiting in humans. Long-term occupational inhalation exposure is associated with heart disease in both humans and laboratory animals, and decreased longevity and altered cholesterol levels in rats. Antimony has not been tested for carcinogenicity.

ARSENIC

Arsenic has been used by the agricultural, pigment, glass, and metal smelting industries. Arsenic is a ubiquitous metalloid element. Acute ingestion of arsenic can be associated with damage to mucous membranes including irritation, vesicle formation, and sloughing. Arsenic can also be associated with sensory loss in the peripheral nervous system and anemia. Liver injury is characteristic of chronic exposure. Effects of arsenic on the skin can include hyperpigmentation, hyperkeratosis, and skin cancer.
(Casarett & Doull, 1986)

EPA classifies arsenic in drinking water as a Group A known oral human carcinogen.

CHROMIUM

Chromium is a heavy metal that generally exists in either a trivalent or hexavalent oxidation state. Hexavalent chromium is soluble and mobile in ground water and surface water. Trivalent chromium is in the reduced form and is generally found absorbed to soil; and therefore, it is less mobile. Hexavalent chromium is used in chrome plating, copper stripping, aluminum anodizing, as a catalyst, in organic synthesis and photography. Exposure to chromium compounds can occur through ingestion, inhalation and skin contact.

Hexavalent chromium may have a direct corrosive effect on the skin and may cause upper respiratory tract irritation. Short term exposure to dust or mist of hexavalent chromium may cause upper respiratory distress, headache, fever, and loss of weight. Long term occupational inhalation exposure to dust and fumes of hexavalent chromium has been shown to cause lung cancer in humans, especially those in the chromate-producing industry. In addition, a number of salts of hexavalent chromium are carcinogenic in rats. The EPA has classified hexavalent chromium as a Group A human carcinogen. Trivalent chromium is an essential nutrient and has low toxicity; however, at high levels, it may cause skin irritation.

LEAD

Lead has been used as a gasoline additive (tetraethyl lead) and in paint pigments, batteries, X-ray shielding, and plumbing, and has been associated with smelting and plating industries.

The target organs for lead exposure include the nervous system, hematopoietic system, kidneys, and reproductive system. Symptoms of severe toxicity may include anemia, encephalopathy and peripheral neuropathy. Recently, an association between low-level lead exposure and impaired neurological development in children has been suggested.

EPA considers lead to be a Group B2 probable human carcinogen via the oral route, but no Agency-wide consensus has been reached concerning a cancer slope factor.

MERCURY

Mercury is a silver-white, heavy liquid metal that is slightly volatile at ambient temperatures. Mercury can occur in the environment in either the organic (usually methyl) or inorganic (metallic) form. Mercury compounds are used as preservatives, disinfectants, fungicides, and germicides. Additionally, mercury is used in the plating, dyeing, textile and pharmaceutical industries. In humans, prenatal exposure to methylmercury has been associated with brain damage. Other major target organs for organic mercury compounds in humans are the central and peripheral nervous systems and the kidney. In animals, toxic effects also occur in the liver, heart, gonads, pancreas, and gastrointestinal tract.

Experimental studies involving laboratory animals indicate that both organic and inorganic forms of mercury are toxic to embryos.

NICKEL

Nickel is a white, hard, ferromagnetic metal that is a naturally-occurring element in the earth's crust and is stable in the atmosphere at ambient temperatures. Nickel forms alloys with a variety of metals, including copper, manganese, zinc, chromium and iron. Elemental nickel is used in electroplating and casting operations, magnetic tapes, surgical and dental instruments, nickel-cadmium batteries, and colored ceramics. Occupational exposure to nickel compounds has been associated with an increased incidence of nasal cavity and lung cancers. For this reason, nickel refinery dust has been classified by the EPA as a Group A - Human Carcinogen via the inhalation route of exposure. The most common reaction to nickel exposure is skin sensitization. Nickel and its compounds also irritate the conjunctiva of the eye and the mucous membranes of the upper respiratory tract.

SILVER

Silver is a white metal. Alloys of silver (e.g., copper, aluminum, cadmium, lead or antimony) are used in the manufacture of silverware, jewelry, coins, automobiles bearings and grid in storage batteries, in photographic films, in mirrors, as a bactericide for sterilizing water, fruit juices, etc. Some silver compounds are also of medical importance as antiseptics or astringents. Exposure to silver can occur through inhalation of fumes or dust, ingestion of solutions or dust, eye and skin contact. Eye and skin contact with metallic silver may produce local permanent discoloration of the skin similar to tattooing. This process is refer to as argyria. Argyria is characterized by a dark, slate-grey color pigmentation of the skin.

Generalized argyria can also develop through exposure to silver oxides or salts through ingestion and inhalation of dust. Silver is not classifiable as to carcinogenicity.

THALLIUM

Thallium is a byproduct of iron, cadmium, and zinc refining. It has been used in alloys, optical lenses, jewelry, semiconductors, and dyes and pigments. Thallium, compounds have been used as pesticides. (Casarett and Doull, 1986)

Thallium, toxicity can result in hair loss, gastrointestinal irritation, paralysis, nephritis, and liver necrosis. Thallium, is one of the more toxic metals, with an estimated lethal dose in humans of 8 to 12 mg/kg. (Casarett and Doull, 1986)

ZINC

Zinc is a bluish-white metal that is stable in dry air, but becomes covered with a white coating on exposure to moist air. Zinc is present in abundance in the earth's crust. Zinc chloride is used as a wood preservative, in dry battery cells, in oil refining operations, and in the manufacture of dyes, activated carbon, deodorants and disinfecting solutions. Zinc chromate and zinc oxide are used primarily as pigments. Exposure to zinc compounds can cause skin sensitization, irritation of the nose and throat, fever, and fatigue.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

ARAR or TBC	Regulation	Classification	Requirement Synopsis
I LOCATION SPECIFIC			
Endangered Species Act of 1978	16 USC 1531 50 C.F.R. Part 402	Applicable	Act requires federal agencies to ensure that any action authorized by any agency is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.
The Archaeological and Historical Preservation Act of 1974	16 U.S.C 469	Potentially Applicable	Requires actions to avoid potential loss or destruction of significant scientific, historical, or archaeological data. Construction on previously undisturbed land would require an archaeological survey of the area.
Rivers and Harbors Act of 1890	33 USC 403	Applicable	The North Branch Potomac River is classified as a navigable river. Permits required for structures or work in or affecting navigable waters.
Migratory Bird Area	16 USC Section 703	Applicable	Protects almost all species of native birds in the U.S. from unregulated "take" which can include poisoning at hazardous waste sites Migratory birds are encountered near the river at Site 1.
Wild and Scenic Rivers Act	16 USC 1271 et seq. And section 7(a)	Potentially Applicable	Avoid taking or assisting, in action that will have direct adverse effect on scenic rivers. Construction activities near the North Branch Potomac River may have an adverse effect on the river.
Fish and Wildlife Coordination Act, Section 662	16 USC 662	Potentially Applicable	Action taken should protect fish of wildlife. Response actions (treated discharge) will be protective of human health and the environment.
Resource Conservation and Recovery Act	40 C.F.R. 264.18(b)	Potentially Applicable or Relevant and Appropriate to removal and treatment activities.	Site 1 is located in a 100-year floodplain. Applicable to hazardous waste facilities constructed within 100-year floodplain. Relevant to construction of facilities for management of materials similar to hazardous waste. Facility must be designed, constructed, operated, and maintained to avoid washout.
Groundwater Protection Act	47 CSR 58-4.10	Relevant and Appropriate	Facility or activity design must adequately address the issues arising from locating in karst, wetlands, faults, subsidences, delineated wellhead protection areas determined vulnerable.

Executive Order 11988, Protection of Floodplains	40 C.F.R. 6, Appendix A, excluding sections 6(a)(2). 6(a)(4). 6(a)(6); 40 C.F.R. 6.302	Potentially Applicable	Facilities or activities located within the floodplain must comply with this order. Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.
Executive Order 11990, Protection of Wetlands	40 C.F.R. 6, Appendix A	Applicable	Action to minimize the destruction, loss, or degradation of wetlands
Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act	40 C.F.R. Part 6 Appendix A	Applicable	This is EPA's policy for carrying out the provisions of Executive Order 11990 (Protection of Wetlands). No activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. If there is no other practicable alternative, impacts must be mitigated.
Endangered and Threatened Fish Species	COMAR 09.02.12/ 08.03.08	Applicable	Actions will be performed to conserve endangered fish species and the habitats they depend on.
Construction on Nontidal Waters and Floodplains	COMAR 08.05.03	Applicable	Any remedial action that alters the waterway or floodplain in the State of Maryland will follow these regulations.
Nontidal Wetlands	COMAR 08.05.04/ 08.05.07	To Be Considered	Protect the nontidal wetlands of the State of Maryland.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

II ACTION SPECIFIC

AIR

Clean Air Act	CAA Section 101 and 40 C.F.R. 52	Relevant and Appropriate	File an Air Pollution Emission Notice (APEN) with the State to include estimation of emission rates for the pollution expected. Design system to provide an odor-free operation.
Clean Air Act	40 C.F.R. 52	Applicable	Predict total emission of volatile organic compounds (VOCs) to demonstrate allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).
Clean Air Act	40 C.F.R. 60 Subpart WWW and CC	To Be Considered	New Source Performance Standard (NSPS): deals with non-methane organic compounds.
Clean Air Act	40 C.F.R. 61	Relevant and Appropriate	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulation.
Clean Air Act	CAA Section 112(D)	Relevant and Appropriate	Emission Standards for new stationary sources.
Clean Air Act	CAA Section 118	Applicable	Control of pollution from Federal Facilities.
Air Pollution Control Act	°45CSR7-4 2	Applicable	Allowable mineral acids stack gas concentration.
Air Pollution Control Act	°45CSR25-3.2	Relevant and Appropriate	Adopts by reference Table 25-A of the Code of Federal Regulations
Air Pollution Control Act and the Hazardous Waste Management Act	°45CSR25-4.3	Relevant and Appropriate	Facility design, construction, maintain, and operate in a manner to minimize hazardous waste constituents to the air.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

Air Pollution Control Act	º45CSR27-3.1 thru º45-27-3.5	Applicable	Best Available Technology requirements for the discharge of emissions of toxic air pollutants.
Air Pollution Control Act	º45CSR27-4.1 thru 4.2	Applicable	Best Available Technology requirements for Fugitive Emissions of Toxic Air Pollutants.
Air Pollution Control Act	º45CSR30	Applicable	Requirements for the air quality permitting system.
Air Quality	COMAR 26.11	To Be Considered	Ambient air quality standards, general emissions standards, and restrictions for air emissions from construction activities, vents, and treatment technologies.
WATER			
Criteria for Classification of Solid Waste Disposal Facilities and Practices	49C.F.R. 257.3-3(a)	Potentially Applicable	A facility shall not cause a discharge of pollutants into the waters of the U.S. that is in violation of the substantive requirements of the NPDES under CWA Section 402, as amended.
Criteria for Classification of Solid Waste Disposal Facilities and Practices	49 C,F.R 257.3-3(a)	Potentially Applicable	A facility or practice shall not cause nonpoint source pollution of the waters of the U.S. that violates applicable legal substantive requirements implementing an areawide or Statewide water quality management plan approved by the Administrator under CWA Section 208, as amended
Criteria for Classification of Solid Waste Disposal Facilities and Practices	49 C.F.R. 257.34 and Appendix I	Potentially Applicable	A facility or practice shall not contaminate an underground drinking water source beyond the solid wage boundary or a court- or State-established alternative.
Clean Water Act	40 C.F.R. 403	Applicable	Pretreatment Standards. Control the introduction of pollutants into POTWs.
Clean Water Act	40 C.F.R. 121	Relevant and Appropriate	Contaminated groundwater will be cleaned up to MCLs, except in the DNAPL-zone which will be exempt because it is technically impracticable based on engineering concerns.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

Clean Water Act	40 C.F.R. 122.44(a)	Applicable	Best Available Technology (BAT). Use BAT to control toxic and nonconventional pollutants. Use best conventional pollutant control technology (BCT) to control conventional pollutants.
Clean Water Act	40 C.F.R. 122.41(i), (j)	Applicable	Monitoring Requirements. Discharge must be monitored to assure compliance. Comply with additional substantive requirements
Clean Water Act	40 C. F. R. 125.100	Applicable	Best Management Practices. Develop and implement a Best Management Practice program to prevent the release of toxic constituents to surface waters.
Groundwater Protection Act	º46CSR12-3.1 thru 3.3 plus Appendix A, º47CSR58-1 to º47CSR58-12	Relevant and Appropriate	This establishes the minimum standards of water purity and quality for groundwater located in the state.
Groundwater Protection Act	º46CSR 12-3.3	Applicable	Constituents in groundwater shall not cause a violation of the standards found at 46 CSR in any surface water.
Groundwater Protection Act	º47CSR58-4 2	Relevant and Appropriate	Subsurface bores of all types shall be constructed, operated and closed in a manner which protects groundwater.
Groundwater Protection Act	º47CSR58-43-2	Relevant and Appropriate	New areas used for storage shall be designed, constructed and operated to prevent release of contaminants.
Groundwater Protection Act	º47CSR58-4.4.1	Relevant and Appropriate	Loading and unloading stations including but not limited to drums, trucks and railcars shall have spill prevention and control facilities and procedures as well as secondary containment
Groundwater Protection Act	º47CSR58-4.5.2	Relevant and Appropriate	New impoundments shall be designed and operated to prevent contamination of groundwater.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

Groundwater Protection Act	º47CSR58-4.7 to 4.7.4	Relevant and Appropriate	Pipelines conveying contaminants shall preferentially be installed above ground. Ditches conveying contaminants must have appropriate liners Pumps and related equipment must be installed to prevent or contain any leaks or spills.
Groundwater Protection Act	º47CSR58-4.8	Relevant and Appropriate	Requirements for secondary containment for sumps and above ground tanks.
Groundwater Protection Act	º47CSR58-4.9.4 to 4.9.7	Applicable	Groundwater monitoring stations shall be located and constructed in a manner that allows accurate determination of groundwater quality and levels, and prevents contamination of groundwater through the finished well hole or casing. All groundwater monitoring stations shall be accurately located utilizing latitude and longitude by surveying, or other acceptable means, and coordinates shall be included with all data collected.
Groundwater Protection Act	º47CSR58-8.13	Applicable	Adequate groundwater monitoring shall be conducted to demonstrate control and containment of the substance. The director shall specify which parameters should be monitored in a remedial operation Groundwater monitoring must continue until results assure adequate remedial action was taken.
Groundwater Protection Act	º47CSR58-8 1 2 to 8 1 3	Relevant and Appropriate	Clean up actions shall not rely primarily on dilution and dispersion if active remedial measures are technically and economically feasible
Groundwater Protection Act	º47CSR58-4.10	Relevant and Appropriate	Facility or activity design must adequately address the issues arising from locating in Karst, wetlands, faults, subsidence, delineated wellhead protection areas determined vulnerable.
Groundwater Protection Act	º47CSR59-4.1 to 4.7	Relevant and Appropriate	Monitoring well Drillers certification.
Groundwater Protection Act	º47CSR 60-1 to 23	Applicable	Monitoring well design Standards.
Groundwater Protection Act	º47CSR60-5 to 18 and º47CSR60-20 to 22	Relevant and Appropriate	Requirements and procedures governing the installation and development and/or redevelopment and reconditioning of temporary or permanent monitoring well(s), piezometer(s), recovery well(s), well(s), and boreholes.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

Groundwater Protection Act	°47CSR60-19	Relevant and Appropriate	Abandonment requirements and procedures for temporary or permanent monitoring well(s), piezometer(s), recovery well(s), well(s), and boreholes.
Water Pollution Control Act	°46 CSR 1-1 to 9	Relevant and Appropriate	Rules establishing the requirements governing the discharge or deposit of sewage, industrial wastes and other wastes into the waters of the State and establishing water quality standards for the waters of the State standing or flowing over the surface of the State.
Water Pollution Control Act	°47CSR10	Applicable	Requirements for NPDES
Water Appropriation or Use	COMAR 08.05.02	Applicable	Report monitoring well data for inclusion in Maryland database
Hearing Procedures for Waterway Obstruction, Waterway Construction, and Water Appropriation and Use Permits	COMAR 08.05.06	Applicable	Requirements for public information/notification of the use of State of Maryland water resources.
Well Construction	COMAR 26.04.04	Relevant and Appropriate	Follow specifications for well construction and abandonment for wells in Maryland.
Board of Well Drillers	COMAR 26.05 11	Applicable (wells in Maryland)	Licensing requirements for persons drilling and installing wells in Maryland.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

Water Quality Discharge Limits Permits	COMAR 26.08.02/ 26.08.03/ 26.08.04	Applicable	Discharge of treated groundwater will meet State NPDES limits. There is an agreement between West Virginia and Maryland that the West Virginia NPDES limits could apply to discharges from the West Virginia shore.
Miscellaneous			
Public Health Laws of West Virginia	º64CSR42-4.3.3.20 to 4.3.3 20.2.3	Relevant and Appropriate	Abandonment criteria for test wells and groundwater sources.
Division of Environmental Protection	º38CSR11	Relevant and Appropriate	Requirements for spill prevention
Erosion and Sediment Control, Stormwater Management	COMAR 26.09.01/ 26.09.02	To Be Considered	Any land clearing, grading, other earth disturbances require an erosion and sediment control plan.
Resource Conservation and Recovery Act	40 CFR 262.10 (a), 262.11	Applicable	Waste generator shall determine if that waste is hazardous waste.
Resource Conservation and Recovery Act	40 CFR 262.34	Potentially Applicable	Generator may accumulate hazardous waste onsite for 90 days or less or must comply with requirements for operating a storage facility. Accumulation of hazardous waste onsite for longer than 90 days would subject to the substantive RCRA requirements for storage facilities.
Resource Conservation and Recovery Act	40 CFR 262.171, 172, 173	Potentially Applicable	Containers of RCRA hazardous waste must be: - Maintained in good condition. - Compatible with hazardous waste to be stored. - Closed during storage except to add or remove waste.
Resource Conservation and Recovery Act	40 CFR 264.111	Potentially Applicable or Relevant and Appropriate	General performance standard requires elimination of need for further maintenance and control: elimination of postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products. May be relevant to active management of wastes which are sufficiently similar to hazardous wastes.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

Resource Conservation and Recovery Act	40 CFR 264.174	Potentially Applicable	Inspect Container storage areas weekly for deterioration.
Resource Conservation and Recovery Act	40 CFR 264.175(a) and (b)	Potentially Applicable	Place containers on a sloped, crackfree base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.
Resource Conservation and Recovery Act	40 C.F.R. 264.176	Potentially Applicable	Keep containers of ignitable or reactive waste at least 50 feet from the facility property line.
Resource Conservation and Recovery Act	40 C.F.R. 264.177	Potentially Applicable	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.
Resource Conservation and Recovery Act	40 C.F.R. 264.178	Potentially Applicable	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.
Resource Conservation and Recovery Act	40 C.F.R. 268.40	Potentially Applicable	Movement and disposal of hazardous waste to new location and placement in or on land will trigger land disposal restrictions for the hazardous waste. Attain land disposal treatment standards before disposing of hazardous waste.
Resource Conservation and Recovery Act	40 C.F.R. 264.251 (except 251(j), 251(e)(11))	Potentially Applicable	Waste put into waste pile subject to land ban regulations.
U.S. Department of Transportation	49 C.F.R. 171.2(f)	Potentially Applicable	No person shall represent that a container or package is safe unless it meets the requirements of 49 USC 1802, et seq. Or represent that a hazardous material is present in a package or motor vehicle if it is not.

APPENDIX B
Applicable or Relevant and Appropriate Requirements
Site 1 Groundwater, Surface Water, and Sediments
Allegany Ballistics Laboratory, West Virginia

U.S. Department of Transportation	49 C.F.R. 171.2(g)	Potentially Applicable	No person shall unlawfully alter or deface labels, placards, or descriptions, packages, containers, or motor vehicles used for transportation of hazardous materials.
U.S. Department of Transportation	49 C.F.R. 171.300	Potentially Applicable	Each person who offers hazardous material for transportation or each carrier that transports it shall mark each package, container, and vehicle in the manner required.
U.S. Department of Transportation	49 C.F.R. 171.301	Potentially Applicable	Each person offering non-bulk hazardous materials for transportation shall mark the proper shipping name and identification number (technical name) and consignee's name and address.
U.S. Department of Transportation	49 C.F.R. 171.302	Potentially Applicable	Hazardous materials for transportation in bulk packages must be labeled with proper identification (ID) number, specified in 49 CFR 172 101 table, with required size of print. Packages must remain marked until cleaned or refilled with material requiring other marking.
U.S. Department of Transportation	49 C.F.R. 171.303	Potentially Applicable	No package marked with a proper shipping name or ID number may be offered for transport or transported unless the package contains the identified hazardous material or its residue.
U.S. Department of Transportation	49 C.F.R. 171.304	Potentially Applicable	The marking must be durable, in English, in contrasting colors, unobscured, and away from other markings.
U.S. Department of Transportation	49 C.F.R. 171.400	Potentially Applicable	Labeling of hazardous material packages shall be as specified in the list.
U.S. Department of Transportation	49 C.F.R. 171.312	Potentially Applicable	Non-bulk combination packages containing liquid hazardous materials must be packed with closures upward, and marked with arrows pointing upward.
U.S. Department of Transportation	49 C.F.R. 171.504	Potentially Applicable	Each bulk packaging or transport vehicle containing any quantity of hazardous material must be placarded on each side and each end with the type of placards listed in Tables 1 and 2 of 49 CFR 172.504.

APPENDIX C

SUMMARY OF COMMENTS RECEIVED DURING PUBLIC MEETING AND RESPONSES

The following represents the Department of the Navy's responses to all the comments received on the subject Proposed Plan. No written comments were received from any party by the Navy, WVDEP, or the EPA. Consequently, the following is based on remarks made or questions posed that were recorded and transcribed during the public meeting held October 29, 1996 at the Bel Air Elementary School. Because the transcript of the meeting was made from a recording, some minor editorial liberties were taken for clarification to a comment or response. A complete copy of the transcript is included in the Administrative Record which can be found in the information repositories located at:

Fort Ashby Public Library
Box 74, Lincoln Street
Fort Ashby, West Virginia 26719
Contact: Jean Howser
304/298-4493

La Vale Public Library
815 National Highway
La Vale, Maryland 21502
Contact: Sondra Ritchie
301/729-0855

Question 1: Do you (the Navy) ever analyze these materials? You call them DNAPLs (dense, non-aqueous phase liquids)?

Response: Yes. During the investigations, we collected soil and water samples for chemical analysis. The analyses provide the concentrations of the contaminants. Very high concentrations are strong evidence there is a contaminant source that will continue to dissolve over time. DNAPL presence is further deduced through research of the contaminants, their concentrations and their distribution.

Question 2: Are the extraction wells going to be on both the north and south side of the solvent disposal pits?

Response: The extraction wells will be situated to the north of the solvent disposal pits, between them and the North Branch Potomac River. Groundwater modeling predicts this is the optimum location to achieve our remediation goals.

Question 3: This proposed plan now presented is for the Site 1 groundwater. Is there to be a separate plan for the soil and the surface water?

Response: This Site 1 proposed plan addresses groundwater, surface water and sediment. By containing and treating the groundwater, we effectively remediate the surface water and sediment by not allowing the contaminants to move into the River. This will allow any contamination currently present in the sediment and the surface water to naturally attenuate or degrade. Regarding Site 1 soil, the Navy will develop an additional Site 1 soil focused Feasibility Study that will lead to a proposed plan.

Question 4: Would the "plan" chosen for the soil affect how the proposed plan for the water will work? Should they be done at the same time?

Response: The eventual "plan for the soil should not affect the proposed plan for the groundwater. The "plan" that will address soil contamination, limited to the upper eight to ten feet, will have to take into consideration the groundwater treatment technology in place.

Question 5: Is there any possibility of the air being contaminated in any of these sites and posing a risk to the residents?

Response: Volatile organic compounds that are "stripped" from the groundwater will be captured and not released. Various monitoring stations will be established to ensure our treatment system is effective and the applicable requirements are being met. The monitoring plan will undergo review from the State of West Virginia and the EPA.

Question 6: Who pays for the cost of the clean up?

Response: We do, the taxpayers. The Navy is heading it up but it comes out of our pockets. (Ed: The work is paid for out of the Navy's budget.)

Question 7: Have soil samples been taken as planned on the Maryland side of the Potomac?

Response: The question refers to a requirement in a consent order for the facility to collect soil samples in connection with open burning. Although not part of the Navy's Installation Restoration Program, specifics will be made known to you by Allegany Ballistics Lab.

This constitutes the extent of the comments and responses on the Proposed Remedial Action Plan for Site 1 Groundwater, Surface Water and Sediments at the Allegany Ballistics Laboratory.