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PROPOSED REMEDIAL ACTION PLAN FOR OPERABLE UNIT 11 (OU 11) SITE 11 AND OPERABLE UNIT 8 (OU 8) SITE 12 NIROP ROCKET CENTER WV

2/1/2011

NAVFAC MID ATLANTIC

Proposed Remedial Action Plan

Sites 11 and 12: Operable Units No. 11 and 8

Allegany Ballistics Laboratory

West Virginia

February 2011

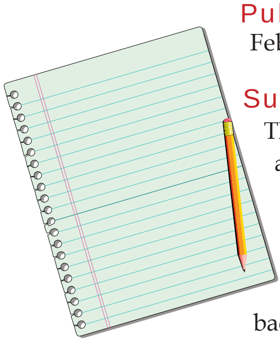
Introduction

This **Proposed Remedial Action Plan (PRAP)**, or Proposed Plan, identifies and describes the Preferred Remedial Alternative for Site 11 (Operable Unit 11), Former Production Well "F," and Site 12 (Operable Unit 8), Solid Waste Management Units (SWMUs) 52 and 37N, at Allegany Ballistics Laboratory (ABL), Rocket Center, West Virginia. Because of their close proximity, similarities, and hydrogeologic relationship, Sites 11 and 12 are addressed as one combined area in this Proposed Plan. The locations of ABL and Sites 11 and 12 are shown in Figure 1. A glossary of specialized terms used in this Proposed Plan is attached. Words listed in the glossary are indicated in **bold print** the first time they appear in this plan.

The previous investigations detailed in the **remedial investigation (RI)** reports at Sites 11 and 12 identified unacceptable risks to human health from: (1) exposure to contaminated **groundwater** at both sites, and (2) exposure to Site 11 surface and subsurface soil. However, **contaminants** in soil detected at Site 11 are attributable to site-specific background, so Site 11 soil requires no action. Based on these findings, this Proposed Plan recommends **focused enhanced anaerobic biodegradation, monitored natural attenuation (MNA)**, and **institutional controls (ICs)** for the groundwater and no further action for the surface and subsurface soil at both sites. This Proposed Plan provides the rationale for these recommendations, based on the investigative activities performed at Sites 11 and 12 to date and explains how the public can participate in the decision making process.

The U.S. Department of the Navy (Navy) and the U.S. Environmental Protection Agency Region III (EPA), in consultation with the West Virginia Department of the Environmental Protection (WVDEP), are issuing this document in accordance with the public participation requirements under Section 117(a) of the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**, as amended, and the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)** at Title 40 of the Code of Federal Regulations (CFR), Section 300.430(f)(2). This Proposed Plan summarizes information that can be found in greater detail in the RI reports, **Feasibility Study (FS)** report, and other documents contained in the **Administrative Record** files that are housed in the Public Repository.

Mark Your Calendar for the Public Comment Period



Public Comment Period

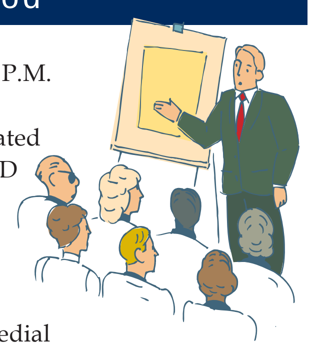
February 21, 2011 through April 7, 2011

Submit Written Comments

The Navy, EPA, and WVDEP will accept written comments on the Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the back page.

Attend the Public Meeting

March 8, 2011 from 6:30 P.M. to 7:30 P.M.



Location: LaVale Public Library, located at 815 National Highway, LaVale, MD

The public comment period will include a public meeting during which the Navy, EPA, and WVDEP will provide an overview of the site, previous investigation findings, remedial alternatives evaluated, and the Preferred Alternative, answer questions, and accept public comments.

Location of Information Repository

Fort Ashby Public Library
P.O. Box 74
Lincoln Street
Fort Ashby, West Virginia 26719

La Vale Public Library
815 National Highway
LaVale, Maryland 21502

The Navy and EPA, in consultation with WVDEP, will make a final decision on the remedy for Sites 11 and 12 after reviewing and considering all information submitted during the 45-day public **comment period** and may modify the Preferred Alternative, or select another remedial action, based on new information and/or public comments. Therefore, community involvement is critical in the decision making process, and the public is invited and encouraged to review and comment on this Proposed Plan. After the public comment period has ended and the comments and information submitted during that time have been reviewed and considered, the Navy and EPA, in consultation with WVDEP, will document the final remedy selection for Sites 11 and 12 in a **Record of Decision (ROD)**.

Site Description and Background

ABL is located in Rocket Center, West Virginia, in the northern part of Mineral County. The facility is situated along the North Branch Potomac River, separating Mineral County, West Virginia, from Allegany County, Maryland (Figure 1). Several small towns are located near the facility, including Short Gap, West Virginia, to the southeast and Pinto, Maryland, to the north.

Since 1943, ABL has been used primarily for research, development, production, and testing of solid propellants and motors for ammunition, rockets, and armaments. Currently, the facility is operated as a highly automated production facility for tactical propulsion systems and composite and metal structures.

The facility consists of two plants. Plant 1, owned by the Navy and operated by ATK Tactical Systems Company LLC (ATK) since 1995, occupies approximately 1,577 acres, of which only about 400 acres are within the developed floodplain of the North Branch Potomac River. Before 1995, the facility was leased and operated by Hercules Aerospace Company (Hercules). Sites 11 and 12 are adjacent to each other in the northwest portion of Plant 1 (Figure 1). The remaining acreage of Plant 1 is primarily forested and mountainous. In May 1994, Plant 1 was listed on the **National Priorities List (NPL)**. Plant 2, a 57-acre facility adjacent to Plant 1, is owned and operated by ATK; Plant 2 is not on the NPL.

Site 11

Site 11 consists of the former boiler house area at Building 215, former **diked** fuel oil storage area (which was composed of an oil pit and two aboveground storage tanks [ASTs]), and a former deep bedrock well, known as F-Well (Figure 2a). The original boiler house was built in the late 1950s. In 1961, F-Well was installed next to the boiler house to provide water to Plant 1. However, F-Well was never put into operation because attempts to use the well were unsuccessful. In 1962, the boiler house was renovated and expanded, covering F-Well with the larger building footprint. Two main sources of contamination at Site 11 have been identified: the former oil pit and former F-Well.

Environmental Investigation History

Several investigations and other activities were conducted at Site 11 between 1995 and 2007. A brief chronological description of each of these activities is provided below. More detailed descriptions can be found in the investigation-specific documents.

Boiler House Decommissioning

The boiler house was decommissioned in the late 1980s, which included removal of the boilers and two ASTs. In 1994, the AST pad and oil pit were removed and revealed the well casing for F-Well. Soil samples

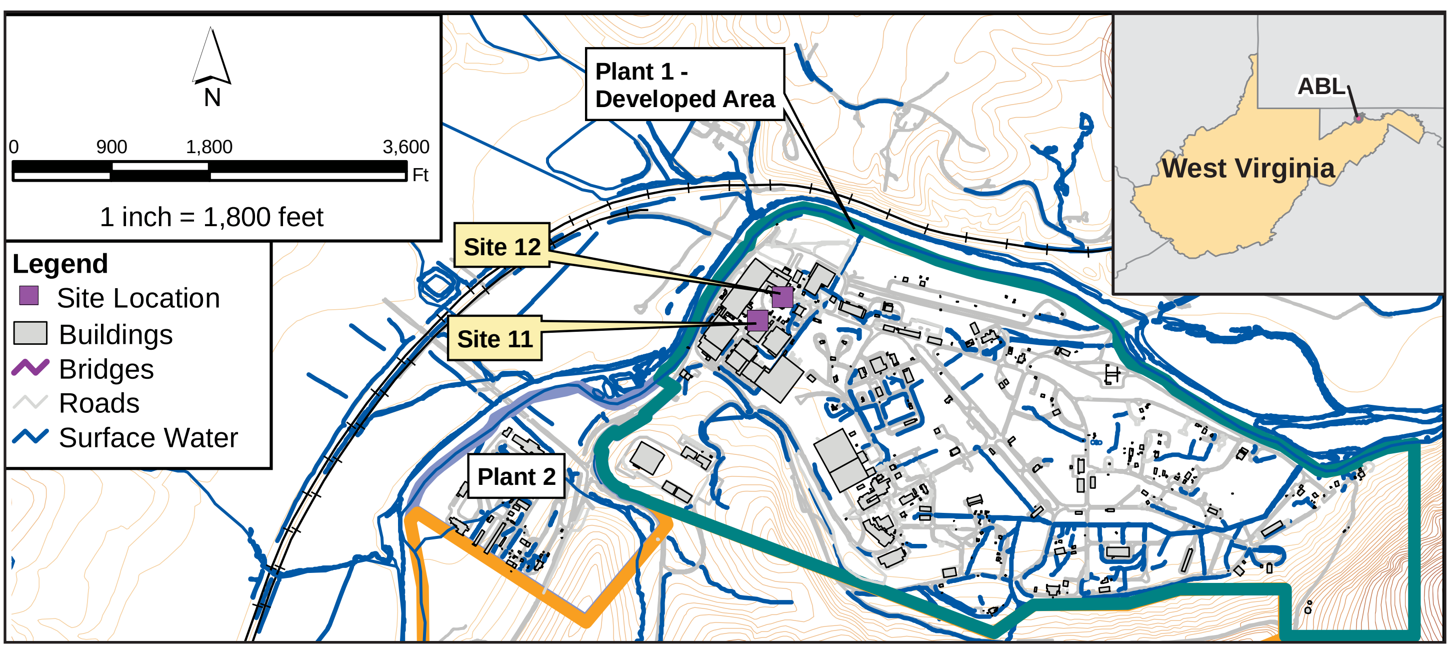


Figure 1. General Facility Setting and Location.

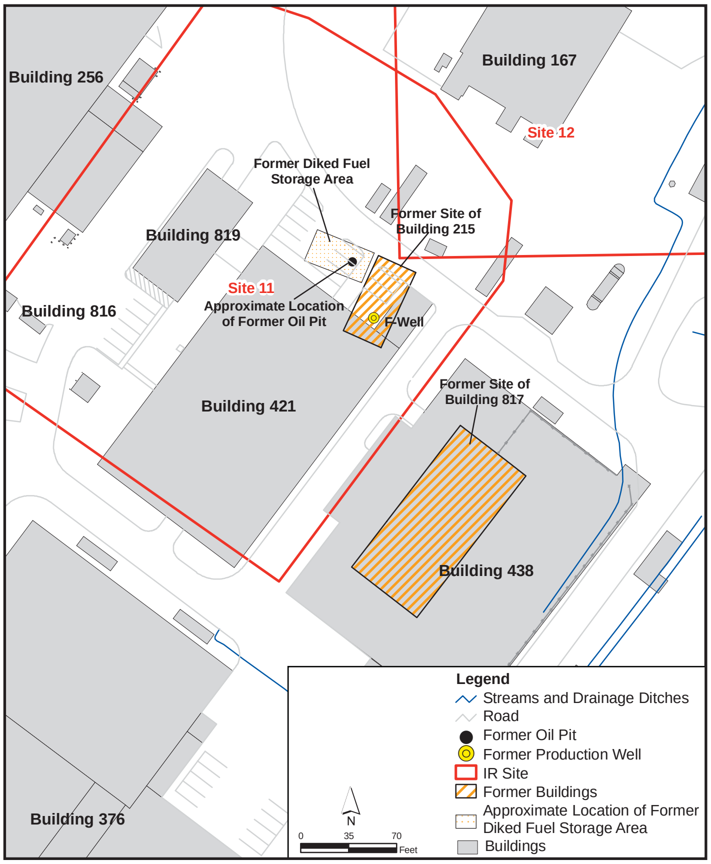


Figure 2a. Site 11 and Associated Features.

collected from the diked fuel storage area indicated the soil was contaminated with petroleum hydrocarbons. The soil within the fuel storage area was removed to meet soil cleanup requirements. Following these soil removal activities, Building 421 was constructed adjacent to F-Well and an asphalt parking lot was constructed around F-Well and over the former diked fuel storage area and oil pit.

Advanced Site Inspection

An advanced site inspection (ASI) was conducted in 1995 to characterize groundwater contamination associated with F-Well and potential soil and groundwater contamination associated with the oil pit (CH2M HILL, 1996). Several **volatile organic compounds (VOCs)** and **semi-volatile organic compounds (SVOCs)** were detected in soil above the **risk-based concentrations (RBCs)** in the vicinity of Site 11, mostly near the estimated location of the former oil pit. Several VOCs, including tetrachloroethene (PCE), trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), and vinyl chloride (VC), were detected in shallow **(alluvial)** groundwater.

In an effort to investigate the physical and chemical characteristics of F-Well, two downhole video camera surveys were undertaken down the well. A 1-foot-thick layer of **light non-aqueous phase liquid (LNAPL)** was observed at the groundwater's surface. The camera also encountered what is believed to have been a **dense non-aqueous phase liquid (DNAPL)** at 172 feet below ground surface.

Remedial Investigation

An RI was conducted at Site 11 from 1998 through 2001 to: (1) characterize the site, (2) evaluate the potential risk to human health from groundwater and soil, and (3) evaluate the potential ecological risk from soil and groundwater (CH2M HILL, 2005a). Between March and July 1999 several alluvial and bedrock monitoring wells were installed to assess the groundwater contamination. A human health risk assessment (HHRA) and an ecological risk assessment (ERA) were conducted as part of the RI. These will be discussed further in Section 5.

Downhole video inspection and overdrilling techniques also were used to further investigate F-Well during the RI. Any LNAPL or DNAPL in F-Well was removed by the overdrilling activities. Groundwater samples, collected from the most-significant water-bearing zones determined that VOCs were located in the shallow portion of bedrock aquifer, but not present below a depth of 158 feet below ground surface.

Several rounds of groundwater sampling were completed between 1999 and 2006. The results indicate that the source of the Site 11 groundwater contamination was likely the LNAPL and DNAPL in F-Well, which had been removed during overdrilling and pumping of F-Well. In general, the concentrations have decreased over time, likely due to the removal of contaminated soil during the boiler house decommissioning and the removal of NAPL from F-Well during the RI. The HHRA indicated that groundwater conditions pose an unacceptable risk to human health. The ERA indicated that site conditions do not pose an unacceptable risk to ecological receptors due to lack of habitat.

Feasibility Study

An FS was completed to address groundwater contamination at Site 11 (and Site 12). The FS evaluated five remedial alternatives, which involved a combination of active remedy, natural attenuation, and/or institutional controls (ICs) (CH2M HILL, 2010). Site 11 groundwater **contaminants of concern (COCs)** were identified as PCE, TCE, VC, antimony, arsenic, barium, chromium, iron, manganese, and thallium.

Site 12

Site 12 consists of the area surrounding Building 167 (Figure 2b). Building 167 activities primarily focus on the preparation of rocket casings. In the 1960s and 1970s, chlorinated solvents were used in the degreasing

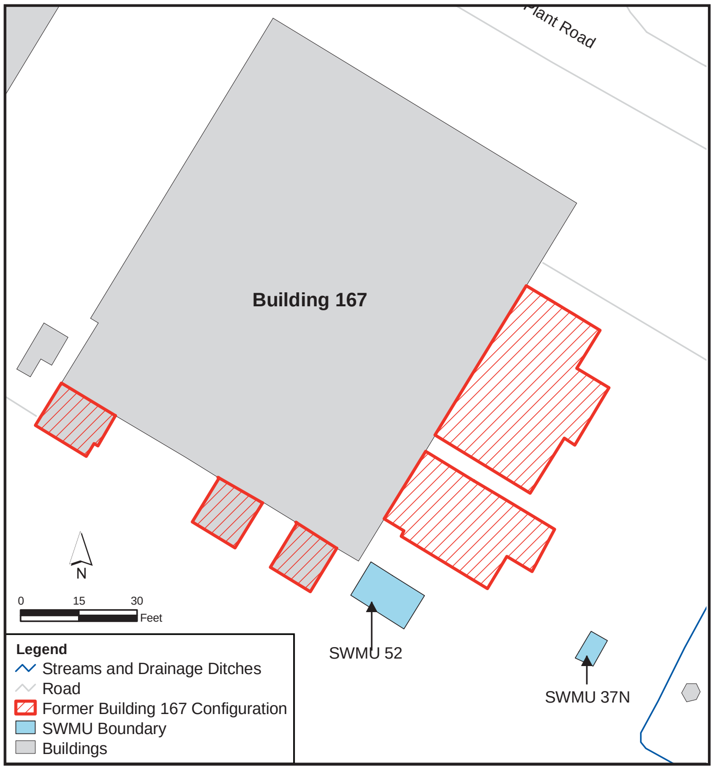


Figure 2b. Site 12 and Associated Features.

operations. The building housed a solvent recovery unit and two ASTs, which were used for storing and handling the chlorinated solvents.

Two main sources of contamination at Site 12 have been identified: the former unlined wastewater sump (SWMU 37N) and former **Alodine** treatment (plating) tank (SWMU 52). SWMU 37N was connected to a grated trench coming out of Building 167, which potentially received waste or product from Alodine treatment operations. SWMU 52 contained waste from the plating operations.

Environmental Investigation History

Phase II Resource Conservation and Recovery Act Facility Assessment

A Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted in 1993 to identify possible contamination sources (CH2M HILL, 2002a). Nine SWMUs (12, 14, 24S, 24T, 25B, 29F, 30, 37N, and 52) were identified in what is now known as Site 12. In 1995, the Alodine treatment tank (SWMU 52) was removed and it was decided that possible releases at Building 167 would be evaluated under the investigation of SWMU 52 and SWMU 37N.

Phase I and Phase II SWMU/AOC Investigations

The Phase I and Phase II SWMU/ Area of Concern (AOC) investigations were conducted between 1996 and 2000 to determine if the SWMUs required further investigation. During these investigations, SWMUs 37N and 52 were combined into AOC N. Based on soil and groundwater sampling results, it was concluded that contaminants detected in the soil and groundwater posed an unacceptable risk to human health and the environment. Consequently, AOC N was recommended for further investigation (CH2M HILL, 2001, CH2M HILL, 2005b).

Sump Investigation and Removal

As part of the investigation of SWMU 37N, the concrete and metal sump was excavated and removed in November 2000 (CH2M HILL, 2005c). Soil samples collected from the excavation indicated that a potentially unacceptable non-cancer risk from exposure to soil was present.

Phase III SWMU/AOC Investigation

The Phase III SWMU/AOC Investigation was conducted between 2002 and 2003 to define the nature and extent of VOCs and metals in alluvial groundwater and metals in soil in the southeastern portion of Site 12 (CH2M HILL, 2003). Soil sample results indicated that a non-time-critical removal action was warranted. The groundwater sample results identified two areas of TCE contamination and one area of methylene chloride (MC) contamination in the alluvial aquifer. One area of TCE contamination in groundwater was centered around Building 167; the second TCE area of groundwater contamination was centered beneath SWMU 37N. The results also identified the limits of an area of MC contamination in groundwater that coincided with the TCE area of contamination beneath SWMU 37N. Based on these findings, AOC N was designated as Site 12.

Site 12 CERCLA Soil Removal Action

Soil sample results at Site 12 indicated that the primary human health and ecological risks were associated with shallow soils (less than 2 feet deep) affected by VOCs, SVOCs, and metals near the locations of SWMUs 37N and SWMU 52 (CH2M HILL, 2004). An Engineering Evaluation and Cost Analysis presented remedial alternatives to address the contamination in shallow soils and recommended soil excavation as the preferred alternative (CH2M HILL, 2004).

The soil removal action at Site 12, pursuant to CERCLA, was completed in 2005. This action included the removal of approximately 237 tons of soil from the site (CH2M HILL, 2005d). Confirmatory sampling indicated that the cleanup goals were obtained and the soil no longer poses an unacceptable risk to human or ecological receptors. Based on these factors, no further action is required for Site 12 soil.

Remedial Investigation

RI fieldwork was conducted at Site 12 between 2003 and 2007 and a report was completed in 2008 to characterize groundwater and evaluate the potential risk to human health and the environment (CH2M HILL, 2008). The RI focused on groundwater because it had been concluded that the other **media** (i.e., soil) at Site 12 did not pose unacceptable risks.

Several alluvial and bedrock monitoring wells were installed during the investigation. Multiple studies were conducted to gain additional subsurface hydrogeologic information, including a downhole **geophysical survey**, a **packer test**, an **aquifer yield test**, and a **dye test**. The results of groundwater sampling conducted between 2003 and 2007 indicated that former wastewater sump (SWMU 37N) was the primary source of groundwater contamination at Site 12. In general, the concentrations of these COCs have decreased over time, likely due to the removal of the sump and contaminated soil. The HHRA indicated that groundwater conditions pose an unacceptable risk to human health. The ERA indicated that site conditions do not pose an unacceptable risk to ecological receptors due to lack of habitat.

Feasibility Study

An FS was completed to address groundwater contamination at Site 12 (and Site 11) and to evaluate remedial alternatives to address potential hazards associated with the groundwater (CH2M HILL, 2010). The FS evaluated five remedial alternatives, which involved a combination of active remedy, natural attenuation, and/or ICs. Site 12 groundwater COCs consist of 1,2-dibromo-3-chloropropane, MC, TCE, VC, bis(2-ethylhexyl)phthalate, arsenic, chromium, lead, manganese, and thallium.

Site Characteristics

Sites 11 and 12 have similar geologic and **hydrogeologic characteristics** because they are located adjacent to each other. Therefore, the geologic and hydrogeologic characteristics of both sites are discussed collectively.

Geology

ABL is located on the floodplain of the North Branch Potomac River and is flanked by Knobly Mountain to the south and east. The facility is immediately underlain by sediments that generally comprise an upper silt and clay layer underlain by coarser deposits of sand and gravel. Limestone is the dominant **lithology** beneath the western third of the facility, where Sites 11 and 12 are located. The geology of both sites is dominated by steep dipping to vertically folded bedrock overlain by various unconsolidated alluvial deposits from the North Branch Potomac River.

Alluvial thickness beneath Sites 11 and 12 varies from about 18 to 32 feet. The alluvium consists of three distinct types of deposits: (1) silty clay layer of approximately 4 to 11 feet thick (surficial layer); (2) sandy clay to coarse sand approximately 0.5 to 2 feet thick (intermittent layer); and (3) poorly sorted, heterogeneous sand, gravel, pebbles, and cobbles with variable but typically significant amounts of clay and silt (basal layer). The water table is generally 13 to 15 feet below ground surface. In addition, there is a localized area of fill material in the vicinity of the former fuel storage area at Site 11.

The lithology of the bedrock beneath Sites 11 and 12 was largely identified from observations of the structural geology of the large bedrock outcrop adjacent to the railroad tracks on the north side of the North Branch Potomac River at Pinto, Maryland. The Tonoloway Limestone and Wills Creek Formations can be projected directly under Sites 11 and 12. Locally, the Tonoloway Limestone Formation appears in the outcrop as 30- to 45-foot-thick massive limestone interbedded with thin calcareous shale. The Wills Creek Formation appears in the outcrop as a massive 30-foot-thick unit composed primarily of limestone with minor amounts of thin interbedded calcareous shale.

Hydrogeology

The groundwater at Sites 11 and 12 is divided into three units: alluvial aquifer, shallow bedrock aquifer, and deep bedrock aquifer. The bedrock aquifer has been divided into two segments, shallow and deep, because of the fracture zones at the sites. As with the remainder of the ABL facility the data indicate there is hydrogeologic connectivity between the alluvial and bedrock aquifers at Sites 11 and 12. The hydrogeologic characteristics of these aquifers are summarized below in Table 1.

Nature and Extent of Contamination

VOCs are the predominant COCs detected in groundwater at Sites 11 and 12. Elevated concentrations of metals that are also COCs at both sites are likely attributable to the

Table 1. Hydrogeologic Characteristics of Aquifers at Site 11 and 12.

	Alluvial Aquifer	Bedrock Aquifer
Groundwater elevation (feet above mean sea level)	Site 11: 650-655 Site 12: 651-667	Site 11: 650-656 Site 12: 656-670
Groundwater flow direction[1]	Site 11: West-Northwest, with local component to the southwest Site 12: North-Northwest	Site 11: West-Northwest Site 12: Northwest
Vertical flow gradient	Site 11: Predominantly upward from deep to shallow bedrock in the southeast portion of site; however, a downward component of flow is periodically observed. Site 12: Predominantly upward from bedrock to alluvial aquifer in the southeast corner of site. Overall, an upward flow from bedrock to the alluvial aquifer is noticeable in wells located farther to the east/southeast and a downward flow from the alluvial aquifer to bedrock in wells located farther to the west.	
Notes: [1]In general, groundwater flow is toward the river.		

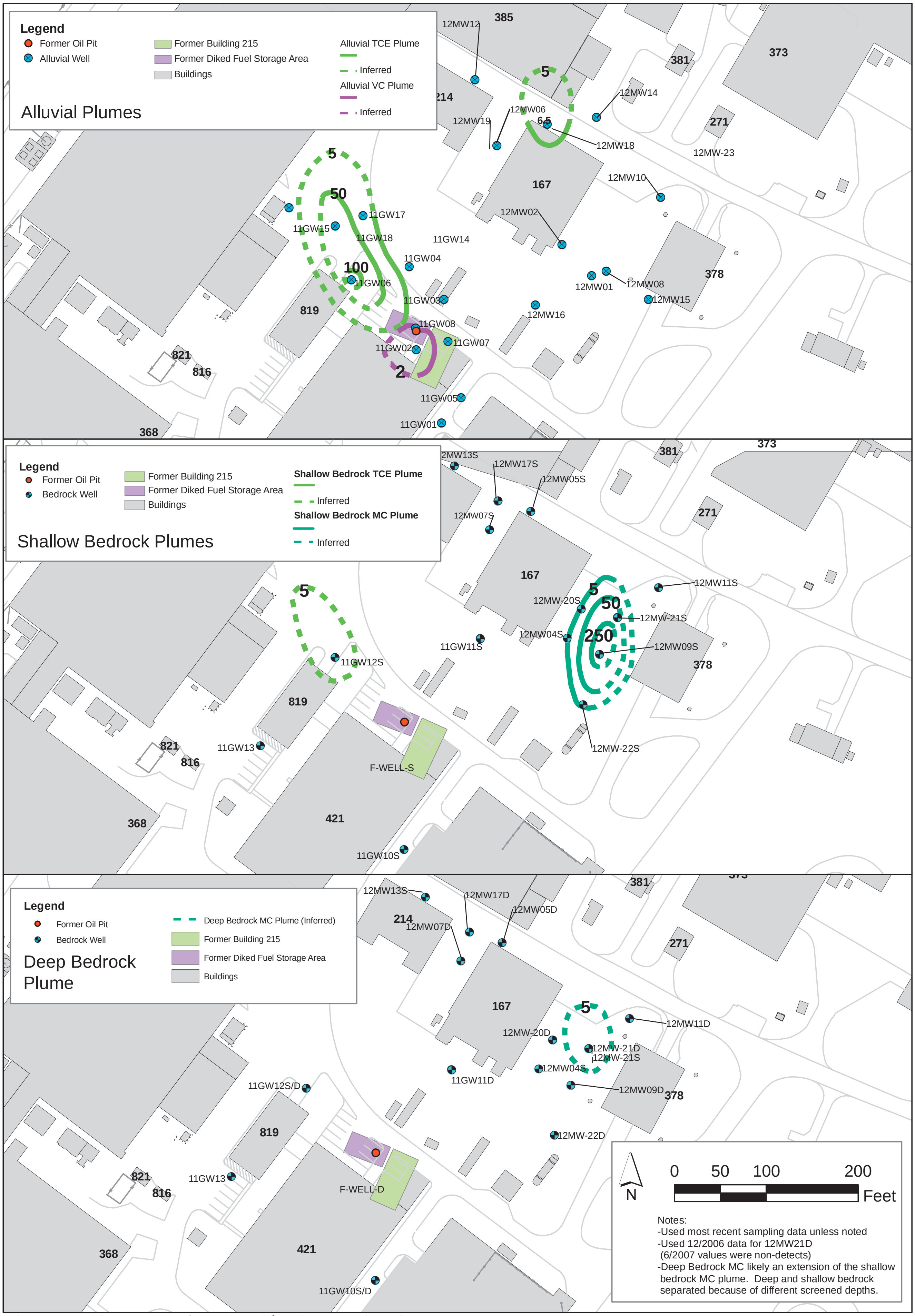


Figure 3. Sites 11 and 12 Aquifer Contamination

presence of VOCs, which create a reducing environment that can cause metals naturally present in the soil and rock to become dissolved in the groundwater. Figure 3 depicts the areas of groundwater in the alluvial and bedrock aquifers contaminated with TCE, MC, and VC above their respective **Maximum Contaminant Levels (MCLs).** MCLs are established by EPA regulation pursuant to the Safe Drinking Water Act; for TCE, MC, and VC, the MCLs are 5 micrograms per liter (µg/L), 5 µg/L, and 2 µg/L, respectively. Figure 3 shows the limits of the VOC plumes as concentric rings. The TCE plume at Site 11 and the MC plume at Site 12 are the predominant COCs at the Sites, exceeding their MCLs by factors of 20 and 50, respectively. The extent of contamination is summarized in Table 2.

A summary of site characteristics is provided in a conceptual site model for Site 11 (Figure 4) and Site 12 (Figure 5). The 3D visual representations describe the site geology and hydrology, contaminant sources, release mechanisms, migration, exposure **pathways** and routes, and receptors.

There are no ongoing releases to groundwater, nor are contaminants migrating offsite at detectable concentrations (CH2M HILL, 2010).

Scope and Role of the Proposed Remedial Action

This Proposed Plan addresses the evaluation and selection of the final remedial alternatives for Sites 11 and 12. It does not include or directly affect any other sites at the facility that fall under the CERCLA process. The purpose of the Proposed Plan is to summarize activities performed to date to investigate Sites 11 and 12 and provide a rationale for the proposed remedial action. In order to fully address the potential risks associated with exposure to contaminated groundwater at Sites 11 and 12, the Navy proposes focused enhanced anaerobic biodegradation, MNA, and ICs for contaminated groundwater. No action or no further action is warranted for other environmental media within Sites 11 and 12.

Summary of Site Risks

This section summarizes the results of the human health and ecological risk assessments conducted for Sites 11 and 12. These risk assessments evaluated the potential for chemicals at the sites to have an adverse effect on human and ecological receptors if no action is taken

Table 2. Extent of Contamination.

	COC	Historical Maximum Concentration (µg/L) (Date)	Sample Location	Most Recent Concentration (µg/L) (Date)	Site Remediation Goal (µg/L)
Site 11 Alluvial Groundwater	TCE	190 (11/00)	11GW06	60 (12/06)	5
	VC	13 (12/06)	11GW02	13 (12/06)	2
	Antimony	55 (5/04)	11GW13	55 (5/04)	6
	Barium	2,750 (7/98)	DP01	2,750 (7/98)	2,900
	Chromium	704 (07/98)	DP01	704 (07/98)	100
	Iron	1,420,000 (07/98)	DP01	1,420,000 (07/98)	5,400
	Manganese	23,500(07/98)	DP01	23,500(07/98)	270
	Thallium	14.2 (8/00)	11GW13	Not detected (5/04)	2
Site 11 Bedrock Groundwater	TCE	30 (2/01)	11GW12S	20 (12/06)	5
	Arsenic	92.2 (8/00)	11GW13	Not detected (5/04)	10
Site 12 Alluvial Groundwater	TCE	24 (9/03)	12MW18	8.8 (6/07)	5
	MC	2,900 (9/03)	12MW01	Not detected (12/06)	5
	VC	15 (7/00)	12MW02	Not detected (12/06)	2
	1,2-dibromo-3-chloropropane	3.8 (12/06)	12MW10	Not detected (6/07)	0.2
	Arsenic	16.3 (5/05)	12MW15	16.3 (5/05)	10
	Manganese	6,290 (7/00)	12MW2	5,140 (6/05)	270
	Thallium	6.2 (6/07)	12MW08	6.2 (6/07)	2
Site 12 Bedrock Groundwater	MC	4,400 (6/05)	12MW09S	540 (6/2007)	5
	TCE	8.9 (5/05)	12MW07S	3.8 (6/07)	5
	Arsenic	10.6 (6/07)	12MW09D	10.6 (6/07)	10
	Chromium	250 (6/07)	12MW09S	250 (6/07)	100
	Lead	18.5 (6/07)	12MW09D	18.5 (6/07)	15
	Manganese	738 (6/05)	12MW09S	719 (6/07)	270
	Thallium	6.2 (5/05)	12MW07D	Not detected (6/07)	2

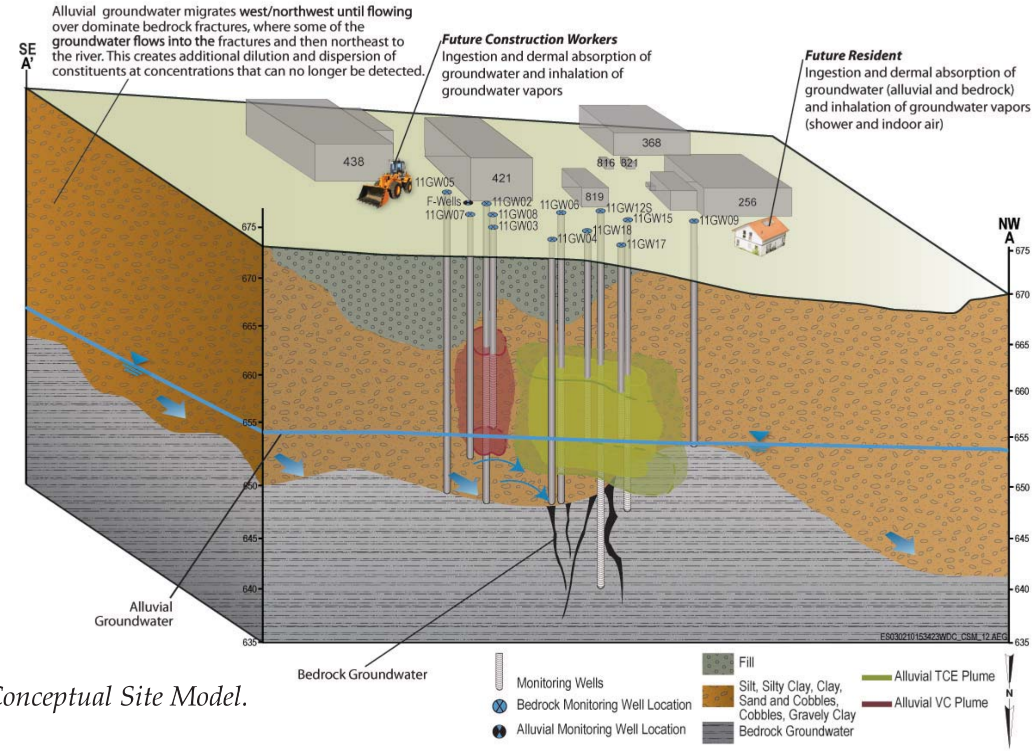


Figure 4. Site 11 Conceptual Site Model.

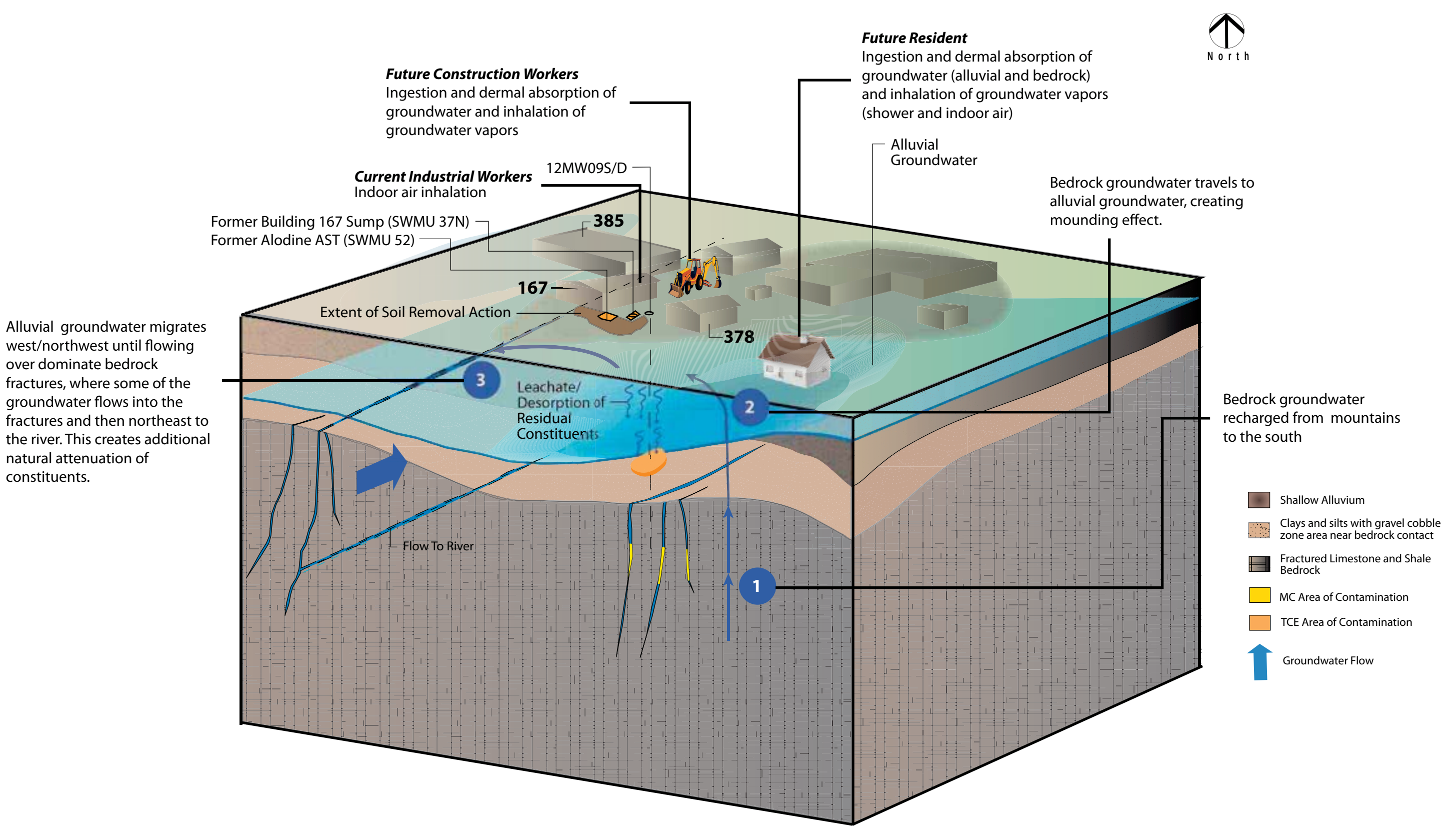


Figure 5. Site 12 Conceptual Site Model.

to clean up the sites. A detailed discussion of potential risks and the risk evaluation process can be found in the *Remedial Investigation Report for Site 11 – Production Well "F"* (CH2M HILL, 2005a) and *Remedial Investigation Report for Site 12 at Allegany Ballistics Laboratory* (CH2M HILL, 2008).

Human Health Risks

Human health risk assessments (HHRAs) were conducted to assess the potential human health impacts from the sites under current conditions, as well as to determine if any further actions are needed at the sites to be protective of human health. The HHRAs evaluated potential risks to people from coming into contact with contaminated media at Sites 11 and 12 under various current and possible future scenarios. Overall risks to people were evaluated based on a conservative estimate of the potential cancer-causing **(carcinogenic)** risks and other potential health effects not related to cancer. These risk evaluations were made in accordance with EPA guidance to ensure that conservative estimates of risk were calculated for current land use and the possible future land use scenarios.

Cancer risks are expressed as numbers reflecting the increased chance that a person will develop cancer if they are directly exposed (for example, through working, playing, or living at the site) to the contamination over a period of time. The acceptable cancer risk (CR) range under the NCP is 1×10^{-4} to 1×10^{-6}, which means there is one additional chance in ten thousand (1×10^{-4}) to one additional chance in one million (1×10^{-6}) that a person will develop cancer over a lifetime of exposure to the contamination (see "What is Human Health Risk and How is it Calculated?" text box).

Non-cancer risks are expressed as a **hazard quotient (HQ)**, which is the ratio of the existing (or possible) level of exposure to contamination to an acceptable level of exposure. The **hazard index (HI)** is the sum of the HQs for compounds that affect the receptor by the same pathway. Adverse health effects from exposure to site contaminants are not expected if the calculated HI is equal to or less than 1.

Based on the current site use, there are no potential receptors at the sites. The groundwater at Plant 1 is not used as a potable supply, so there is no current exposure to groundwater at Sites 11 and 12. In addition, the sites are almost entirely paved, so there is no current potential for contact with the groundwater or soil. The proposed future use of the site is expected to remain the same as the current use. The most likely future receptors would be industrial and construction workers. A future residential child and adult scenario was conservatively included in this evaluation. It was conservatively assumed that groundwater from the alluvial and bedrock aquifers at the sites may be used as a potable water supply in the future.

The Site 11 HHRA was conducted to assess the potential human health risks associated with the presence of site-related groundwater and soil contaminants. The Site 12 HHRA was conducted to assess the potential human health risks associated with the presence of site-related groundwater contaminants. Soil at Site 12 was not evaluated because soil contamination at the site had already been addressed through the removal actions, which achieved soil clean up goals (CH2M HILL, 2005d). In summary, the HHRAs evaluated the future land use exposure routes for Sites 11 and 12 as shown in Table 3.

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A human health risk assessment estimates "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. The Navy undertakes a four-step process to estimate baseline risk at a site:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, the Navy looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies help the Navy to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, the Navy considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a "reasonable maximum exposure" (RME) scenario that portrays the highest level of human exposure that reasonably could be expected to occur.

In Step 3, the Navy uses the information from Step 2, combined with information on the toxicity of each chemical, to assess potential health risks. The Navy considers two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a site is generally expressed as an upper-bound probability, for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, the Navy calculates a "hazard index (HI)." The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which adverse, non-cancer health effects are no longer predicted.

In Step 4, the Navy determines whether site risks are great enough to cause health problems for people at or near the site. The results of the three previous steps are combined, evaluated, and summarized. The Navy adds together the potential risks from the individual contaminants to determine the total risk resulting from the site.

Table 3. Future Land Use Exposure Routes for Human Health.

Receptor	Site 11	Site 12
Industrial Worker	**Soil:** • Incidental ingestion • Dermal contact • Inhalation of particulates and volatile emissions	Not Applicable
Construction Workers	**Soil:** • Incidental ingestion • Dermal contact • Inhalation of particulates and volatile emissions **Alluvial Groundwater:** • Dermal contact • Inhalation of volatiles	**Alluvial Groundwater:** • Dermal contact • Inhalation of volatiles
Onsite Residents (adult & child)	**Soil:** • Incidental ingestion • Dermal contact • Inhalation of particulates and volatile emissions **Alluvial and Bedrock Groundwater:** • Ingestion • Dermal contact (child only) • Inhalation of volatiles (adult only)	**Alluvial and Bedrock Groundwater:** • Ingestion • Dermal contact (child only) • Inhalation of volatiles (adult only)

Table 4. Human Health Risks for Potential Future Receptors.

Site 11 Risk Drivers			
Receptor	**Media**	**Compound/Vector(s)**	**Risk**
Noncarcinogenic Risk			
Industrial Worker	Soil	Not Applicable	No unacceptable risk
Construction Workers	Alluvial Aquifer	Manganese (Dermal Contact)	HQ = 8.2
Onsite Residents (adult)	Alluvial Aquifer	Iron (Ingestion)	HQ = 1.5
		Manganese (Ingestion)	HQ = 3.7
		Thallium (Ingestion)	HQ = 1.9
		Total HI = 8.7	
Onsite Residents (child)	Alluvial Aquifer	TCE (Ingestion)	HQ = 2.2
		Iron (Ingestion)	HQ = 4.1
		Manganese (Ingestion)	HQ = 10.1
		Thallium (Ingestion)	HQ = 5.2
		Total HI = 24	
	Bedrock Aquifer	Arsenic (Ingestion)	HQ = 1.6
		Total HI = 2.3	
Carcinogenic Risk			
Industrial Worker	Soil	Not Applicable	No unacceptable risk
Construction Workers	Soil	Not Applicable	No unacceptable risk
	Alluvial Aquifer	Not Applicable	No unacceptable risk
Onsite Residents (age adjusted)	Alluvial Aquifer	VC (Ingestion)	CR = 1.4×10^{-4}
		Total CR = 3.2×10^{-4}	
	Bedrock Aquifer	Arsenic (Ingestion)	CR = 1.4×10^{-4}
		Total CR = 1.8×10^{-4}	
MCL Exceedance for Groundwater			
Onsite Residents (adult & child)	Alluvial Aquifer	Antimony	Not Applicable
		Barium	
		Chromium	
	Bedrock Aquifer	TCE	Not Applicable

Table 4 (continued). Human Heath Risks for Potential Future Receptors.

Site 12 Risk Drivers			
Receptor	**Media**	**Compound/Vector(s)**	**Risk**
Noncarcinogenic Risk			
Industrial Worker	Soil	Not Applicable	Not Evaluated
Construction Workers	Alluvial Aquifer	Not Applicable	No Acceptable Risk
Onsite Residents (adult)	Alluvial Aquifer	Manganese (Ingestion, Dermal Contact, Inhalation)	HQ = 3.9
		Thallium (Ingestion, Dermal Contact, Inhalation)	HQ = 2.4
		Total HI = 8.8	
	Bedrock Aquifer	Thallium (Dermal Contact, Inhalation)	HQ = 2.3
		Total HI = 5.6	
Onsite Residents (child)	Alluvial Aquifer	1,2-dibromo-3-chloropropane (Ingestion, Dermal Contact)	HQ = 1.3
		Arsenic (Ingestion, Dermal Contact)	HQ = 1.0
		Manganese (Ingestion, Dermal Contact)	HQ = 9.4
		Thallium (Ingestion, Dermal Contact)	HQ = 5.7
		Total HI = 20	
	Bedrock Aquifer	bis(2-ethylhexylphthalate (Dermal Contact)	HQ = 1
		Arsenic (Dermal Contact)	HQ = 1.1
		Chromium (Dermal Contact)	HQ = 1.2
		Manganese (Dermal Contact)	HQ = 1.6
		Thallium (Dermal Contact)	HQ = 5.5
		Total HI = 13	
Carcinogenic Risk			
Industrial Worker	Soil	Not Applicable	Not Evaluated
Construction Workers	Alluvial Aquifer	Not Applicable	No unacceptable risk
Onsite Residents (lifetime)	Alluvial Aquifer	1,1,2,2-tetrachloroethane (Ingestion, Dermal Contact, Inhalation)	CR = 1.3×10^{-5}
		1,1,2-trichloroethane (Ingestion, Dermal Contact, Inhalation)	CR = 4.3×10^{-6}
		1,2-dibromo-3-chloropropane (Ingestion, Dermal Contact, Inhalation)	CR = 3.2×10^{-4}
		1,4-dichlorobenzene (Ingestion, Dermal Contact, Inhalation)	CR = 1.4×10^{-6}
		Benzene (Ingestion, Dermal Contact, Inhalation)	CR = 1.8×10^{-6}
		PCE (Ingestion, Dermal Contact, Inhalation)	CR = 1.9×10^{-6}
		VC (Ingestion, Dermal Contact, Inhalation)	CR = 1.2×10^{-4}
		Arsenic (Ingestion, Dermal Contact)	CR = 1.1×10^{-4}
		Total CR = 6.0 x 10-4	

Table 4 (continued). Human Heath Risks for Potential Future Receptors.

Site 12 Risk Drivers (continued)			
Receptor	**Media**	**Compound/Vector(s)**	**Risk**
Carcinogenic Risk			
	Bedrock Aquifer	Arsenic (Ingestion)	CR = 1.1 x 10-4
		MC (Ingestion, Dermal Contact, Inhalation)	CR = 4.6 x 10-5
		PCE (Ingestion, Dermal Contact, Inhalation)	CR = 1.8 x 10-5
		bis(2-ethylhexyl)phthalate (Ingestion, Dermal Contact)	CR = 6.7 x 10-5
		Total CR = 2.4 x 10-4	
MCL Exceedance for Groundwater			
Onsite Residents (adult & child)	Alluvial Aquifer	MC	Not Applicable
		TCE	
	Bedrock Aquifer	TCE	Not Applicable
		Lead	
Notes: Cancer and non-cancer risk are taken from the HHRA for each site. The presented values are from the reasonable maximum exposure (RME) exposure scenario.			

The results of the HHRA for the potential future receptors are shown below. Unacceptable risk levels were present for the receptors listed in Table 4.

Based on the **receptors** at risk, the COCs at these sites are:

- Site 11 alluvial groundwater: TCE, VC, antimony, barium, chromium, iron, manganese, and thallium.
- Site 11 bedrock groundwater: TCE and arsenic.
- Site 12 alluvial groundwater: MC, TCE, VC, 1,2-dibromo-3-chloropropane, arsenic, manganese, and thallium.
- Site 12 bedrock groundwater: MC, TCE, arsenic, chromium, lead, manganese, and thallium.

Ecological Risks

Ecological risk assessments (ERAs) were conducted to identify potential risks to ecological receptors because of exposure to Sites 11 and 12 media. A risk to plants and animals at the sites requires a source of contamination and a pathway for exposure to the contaminants (see "What is Ecological Risk and How is it Calculated?" text box). The ERAs concluded that the sites pose negligible risks to ecological receptors (CH2M HILL, 2005a; CH2M HILL, 2008). Based on the site configuration (i.e., mostly asphalt-covered, industrial area, no surface water or sediment present), there are no complete and significant exposure pathways for ecological receptors at Sites 11 and 12.

Remedial Action Objectives

It is the Navy's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in this Proposed Plan, is necessary to protect public health and welfare from existing groundwater contamination. Because no action or no further action is required by CERCLA or the NCP for any other environmental media at Sites 11 and 12, the following site-specific **Remedial Action Objectives (RAOs)** were developed for groundwater:

- Prevent human exposure to groundwater containing COCs above **site remediation goals (SRGs)**
- Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer(s) to beneficial use

To achieve these RAOs, SRGs were developed for each COC. The SRGs were developed primarily by using the federal groundwater MCLs. If there was no MCL available, the SRG was identified by the risk-based preliminary remediation goal developed in the FS.

The evaluation performed during the FS resulted in the following COCs being targeted for **direct remediation:**

- Site 11 alluvial aquifer: TCE and VC
- Site 11 bedrock aquifer: TCE
- Site 12 alluvial aquifer: TCE
- Site 12 bedrock aquifer: MC

The evaluation did not eliminate COCs, but rather served as a means to identify which COCs in groundwater are to be targeted for direct remediation (VOCs) versus those that will be indirectly remediated (mainly metals). The VOCs were selected for direct remediation because their concentrations cannot be reduced by indirect remediation within an acceptable timeframe; however, metals in groundwater were selected for indirect remediation because their elevated concentrations are correlated with the localized reducing conditions in groundwater resulting from the site setting and the presence of VOCs. Once the concentrations of VOCs diminish, the concentrations of these metals are expected to decrease. Regardless of whether a COC is targeted for direct or indirect remediation, all COCs will be monitored during and after remediation and the monitoring data analyzed for trends in contaminant levels over time, especially as part of the 5-year review process until site conditions allow for unlimited use and unrestricted exposure. Table 5 below shows the SRG for each COC retained and targeted for direct remediation in the groundwater. The SRGs for TCE, VC, and MC are based on their respective MCLs for drinking water.

Table 5. SRGs for the COCs Retained and Targeted for Direct Remediation.

Contaminants Targeted for Direct Remediation	Site Remediation Goal (µg/L)
Site 11	
TCE	5
VC	2
Site 12	
TCE	5
MC	5

WHAT IS ECOLOGICAL RISK AND HOW IS IT CALCULATED?

An ecological risk assessment evaluates the potential adverse effects that human activities have on the plants and animals that make up ecosystems. The ecological risk assessment process follows a phased approach similar to that of the human health risk assessment. The risk assessment results are used to help determine what measures, if any, are necessary to protect plants and animals.

Ecological risk assessment includes three steps:

Step 1: Problem Formulation

The problem formulation includes:

- Identifying area(s) and environmental media (e.g., surface water, soil, sediment) in which site-related constituents may be present
- Evaluating potential transport pathways (i.e., movement) of constituents in these areas/media
- Consideration of site-specific habitat information for identification of ecological receptors
- Identifying exposure pathways and routes for these receptors

Step 2: Risk Analysis

In the risk analysis, potential exposures to plants and animals are estimated and the concentrations of chemicals at which an effect may occur are evaluated.

Step 3: Risk Characterization

The risk characterization uses all of the information identified in the first two steps to estimate the risk to plants and animals. This step also includes an evaluation of the uncertainties (potential degree of error) associated with the predicted risk evaluation and their effects on the conclusions that have been made.

Summary of Remedial Alternatives

Alternative 1 – No Action

This alternative is required by the NCP as a baseline. Under this alternative, no remediation or action would be performed.

Alternative 2 – MNA, and ICs

Alternative 2 relies on MNA to achieve the SRGs at Sites 11 and 12. This alternative consists of the following:

- MNA to address the residual dissolved area of contamination in groundwater
  - Implementation of long-term groundwater monitoring plan for an estimated 36 years, or until SRGs are met.
- ICs to ensure that receptors are not exposed to site conditions that could pose an unacceptable risk.
  - ICs include excavation restrictions and groundwater use restrictions. These restrictions will be enforced through a land use control plan that will include a map of the affected area. The facility GIS mapping system will also identify the affected area. These restrictions are intended to prevent the potable use of groundwater and to ensure that adequate worker protection is used if excavation activities encounter groundwater in the affected area. This plan will be on file at the facility and referenced prior to commencing construction activities. The restrictions would remain in place until groundwater monitoring determines that the SRGs have been met.

Alternative 3 – Enhanced Anaerobic Biodegradation, MNA, ICs

Alternative 3 involves the same components as those described in Alternative 2. In addition enhanced anaerobic biodegradation (EAB) via injection of electron donor substrate material would be implemented within the Site 11 alluvial aquifer where the TCE concentration is greater than or equal to 30 µg/L and within the Site 12 shallow bedrock aquifer where the MC concentration is greater than or equal to 50 µg/L. The contamination limits for injection were determined by the estimated remediation timeframes from the SourceDK modeling program. With this model, the maximum timeframe to achieve the SRGs is projected to be 18 years. It was also

Summary of the Estimated Cost of Alternatives

Table 6. Comparison of the Estimated Cost for Each Alternative.

Estimated Cost	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
2009 Capital Cost	$0	$150,000	$1.39 million	$167,000	$1.77 million
Lifetime Operation and Maintenance (O&M) Cost	$0	$1.52 million	$650,000	$1.18 million	$616,000
Lifetime Present-Worth O&M Cost	$0	$974,000	$532,000	$808,000	$496,000
Total Present Worth	Not Applicable (N/A)	$1.12 million	$1.92 million	$975,000	$2.26 million
Projected Maximum Time-frame to Achieve RAOs	N/A	36 years	18 years	18-36 years	18 years

assumed that one round of substrate injection would take place in approximately 38 nested well pairs across the treatment area.

Alternative 4 – Focused Enhanced Anaerobic Biodegradation, MNA, ICs

Alternative 4 involves the same components as those described in Alternative 2. In addition, Focused EAB would be conducted via injection of electron donor substrate material within the Sites 11 and 12 alluvial and shallow bedrock aquifers specifically where the **hot spots** of TCE and MC are located. This type of injection would be conducted in six existing monitoring wells near the current TCE and MC hot spots. The projected timeframe to achieve the RAOs is expected to be between that of Alternatives 2 and 3; however, the maximum timeframe of 36 years was used to calculate a conservative cost estimate.

Alternative 5 – *In Situ* Chemical Oxidation, MNA, ICs

Alternative 5 involves the same design components as those described in Alternative 3, except *in situ* chemical oxidation (ISCO) would be used as the active treatment component instead of EAB. ISCO would be implemented via injection of a chemical oxidant material, such as activated persulfate. The projected maximum timeframe to achieve SRGs is the same as Alternative 3, 18 years.

Evaluation of Remedial Alternatives

The NCP at 40 CFR 300.430 (e)(9) requires comparing the remedial alternatives based on **nine evaluation criteria** to determine the relative performance of the alternatives and provide a means to identify their advantages and disadvantages. The criteria are:

1. Overall protection of human health and the environment
2. Compliance with **Applicable or Relevant and Appropriate Requirements (ARARs)**
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, and volume

Table 7. Comparative Analysis of Remedial Alternatives.

Criteria	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Overall Protectiveness of Human Health and the Environment	○	●	●	●	●
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	○	●	●	●	●
Long-Term Effectiveness and Permanence	○	◉	●	●	●
Reduction of Toxicity, Mobility or Volume Through Treatment	◉	●	●	●	●
Short-Term Effectiveness	○	○	◉	◉	●
Implementability	●	●	●	●	●
Cost[1]	$0	$1.12 million	$1.92 million	$975,000	$2.26 million
State/Support Agency Acceptance	○	○	●	●	●
Community Acceptance	To Be Determined	To Be Determined	To Be Determined	To Be Determined	To Be Determined

Ranking: ● Well satisfies criterion ◉ Moderately satisfies criterion ○ Poorly satisfies criterion

Alternative 1 – No Action
Alternative 2 – Source Zone Removal, MNA, ICs
Alternative 3 – Source Zone Removal, EAB, MNA, and ICs
Alternative 4 – Source Zone Removal, Focused Enhanced Anaerobic Biodegradation, MNA, and ICs
Alternative 5 – Source Zone Removal, ISCO, MNA, ICs

[1] – Cost is the total present worth value; Cost accuracy ranges from -30% to +50%.

5. Short-term effectiveness

6. Implementability

7. Cost

8. State acceptance

9. Community acceptance

The remedial alternatives for the sites were evaluated in terms of effectiveness (both long- and short-term), implementability, and cost. The level of effectiveness was assessed based on criteria such as protection of public health; protection of workers during implementation; protection of the environment; compliance with ARARs; level of treatment and containment expected; and residual effect concerns. Effectiveness encompasses the first five NCP criteria. The level of implementability was assessed based on criteria such as construction and operation considerations; demonstration of performance/useful life; adaptability to environmental conditions; contribution to remedial performance; completion in an acceptable timeframe; availability of equipment, personnel, and services; and the ability to impose ICs. Implementability encompasses the sixth NCP criteria. Cost was evaluated on three variables: total capital cost, lifetime O&M and total present worth. Cost encompasses the seventh NCP criteria.

The remedial alternatives were analyzed and compared in detail in the FS based on criteria 1 through 7. Criteria 8 and 9 will be evaluated after receipt of the public's comments on this Proposed Plan during the 45-day comment period. Table 6 compares the estimated cost and timeframe for each of the alternatives. Table 7 summarizes how each alternative satisfies each criterion and how it compares to the other alternatives.

Preferred Remedial Alternative

The Navy and EPA, with the support of the WVDEP, are proposing to implement Alternative 4, focused enhanced anaerobic biodegradation, MNA, and ICs for groundwater. Alternative 4 is expected to be protective of human health and the environment, and will comply with the ARARs, which are primarily MCLs.

Of the alternatives evaluated, Alternative 4 provides the best balance of the seven NCP criteria. It is recognized that the estimated timeframe for Alternative 4 to reach the RAOs may be up to 15 years longer than that for Alternatives 3 and 5. However, the benefit of potentially reducing the timeframe by 15 years does not outweigh the additional total present worth cost (approximately $945,000 or more) required to do so. This is because the actual risk to human health and the environment by the presence of the contamination (approximately 0.67 lbs of VOCs) for an additional 15 years is negligible and can be readily controlled. If these controls are determined to be ineffective in the future, the remedy can be altered. Additionally, of the viable options, Alternative 4 has the best sustainability, the lowest cost, and the highest cost-benefit or risk-reward characteristics. The alternatives that are more aggressive than Alternative 4 have limitations that could lead to significant cost growth if multiple rounds of treatment are required. In addition, the more aggressive alternatives may cause an increase in the mobility and concentrations of metal COCs and other metals whose concentrations are currently within acceptable levels. Finally, although not quantified, there is a greater risk to humans for Alternatives 3 and 5 than to those involved with Alternative 4 based on workers transporting, managing, and injecting the associated quantities of EAB/ISCO materials.

Alternative 4 meets all the effectiveness criteria because it will be protective of human health and the environment during and after implementation. This alternative will provide a high level of implementability based on the criteria for technical feasibility. Also, the alternative was chosen because it had the lowest estimated total present worth of the viable alternatives.

The components of Alternative 4 are:

- Focused enhanced anaerobic biodegradation of contaminated groundwater by introduction of a substrate via a gravity-fed or pressure pumping system into selected monitoring wells.
- Long-term groundwater monitoring to evaluate the effectiveness of the remedial action and MNA for the residual dissolved area of contamination. Long-term monitoring will be conducted for an estimated 36 years, or until the SRGs are met. The monitoring requirements, frequency, and duration will be detailed in the long-term monitoring plan to be submitted after the ROD is signed.
- ICs to ensure that receptors are not exposed to site conditions that could pose an unacceptable risk. ICs include excavation restrictions and groundwater use restrictions. These restrictions will be enforced through a land use control plan that will include a map of the affected area. The facility GIS mapping system will also identify the affected area. These restrictions are intended to prevent the potable use of groundwater and to ensure that adequate worker protection is used if excavation activities encounter groundwater in the affected area. This plan will be on file at the facility and referenced prior to commencing construction activities. The restrictions would remain in place until groundwater monitoring determines that the SRGs have been met.

- Conducting 5-year reviews to ensure that sites remain protective of human health and the environment until conditions allow for unlimited use and unrestricted exposure.

Based on the site conditions as investigated in the RI and the analysis of alternatives in the FS, the Navy believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): (1) to be protective of human health and the environment; (2) to comply with ARARs; (3) to be cost effective; (4) to utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) to satisfy the preference for treatment as a principal element.

Community Participation

The Navy and EPA provide information regarding the cleanup of ABL sites to the public through **public meetings**, the Administrative Record File for each site, the **Information Repository**, and announcements published in the newspaper. The Administrative Record for the sites can be accessed at the following internet address:

https://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_hq_pp/navfac_env_pp/env_restoration_installations/lant/midlant/abl

The Navy and EPA encourage the public to gain a more comprehensive understanding of the sites and the CERCLA activities that have been conducted at the sites.

The public comment period provides the public time to review and comment on the information provided in this Proposed Plan. The 45-day public comment period for this Proposed Plan is February 21, 2011 through April 7, 2011. The public meeting will be held on March 8, 2011, from 6:30 P.M. to 7:30 P.M. at the LaVale Public Library, located at 815 National Highway, LaVale, Maryland. The location of the Administrative Record and Information Repository are provided on page 1 of this Proposed Plan.

A transcript of the public meeting will be included in the Administrative Record file. All comments received during the public meeting and comment period will be summarized, and responses will be provided, in the **Responsiveness Summary** section of the ROD. The ROD is the document that will present the selected remedy, and it also will be included in the Administrative Record file.

Written comments can be submitted via mail, e-mail, or fax and should be sent to the following addressee:

For further information, please contact:

Mr. Thomas Kreidel
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9742 Maryland Avenue
Norfolk, VA 23511
Phone: 757-341-1410
Email: Thomas.kreidel@navy.mil

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Glossary of Terms

This glossary defines in non-technical language the more commonly used environmental terms appearing in this Proposed Remedial Action Plan. The definitions do not constitute the Navy's, EPA's, or WVDEP's official use of terms and phrases for regulatory purposes, and nothing in this glossary should be construed to alter or supplant any other federal or state document. Official terminology may be found in the laws and related regulations as published in such sources as the Congressional Record, Federal Register, and elsewhere.

Administrative Record: A record made available to the public that includes all information considered and relied on in selecting a remedy for a site.

Alluvial: Sand, silt, clay, gravel, or other matter deposited by flowing water, as in a riverbed, floodplain, delta, or alluvial fan. Alluvium is generally considered a young deposit in terms of geologic time.

Alodine: is a microscopic thin film commonly applied to aluminum to provide an excellent surface prep for paint, aid in corrosion resistance, and impose desired electrical resistance characteristics.

Applicable or Relevant and Appropriate Requirements (ARARs): A comprehensive set of state and federal laws and regulations that are relevant to guiding the selection of remediation at a CERCLA (see below) site. "Applicable requirements" are standards and other environmental protection requirements of federal or state law dealing with a hazardous substance, pollutant, or contaminant and its remedial action. "Relevant and appropriate requirements" are standards and environmental protection criteria of federal or state law that, although not "applicable" to a hazardous substance or remedial action, address situations sufficiently similar to those at the CERCLA site that their use is suitable.

Aquifer: A fully saturated, underground soil or rock formation that is capable of transmitting a usable quantity of water.

Aquifer yield test: An aquifer test (or a pumping test) is conducted to evaluate an aquifer by constant pumping, and observing the aquifer's "response" (drawdown) in observation wells.

Background: Area not affected by facility or site activities.

Carcinogenic: Causing cancer.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA provides the authority and procedures for responding to releases of hazardous substances, pollutants, and contaminants from inactive hazardous waste disposal sites.

Comment period: A time for the public to review and comment on various documents and actions taken, either by the Navy, EPA, or WVDEP.

Contaminant: Any substance or matter that, at a high enough concentration, could have an adverse effect on human health or the environment.

Contaminants of concern (COCs): Chemicals that are site-related and pose a potential risk to human health or the environment.

Dense non-aqueous phase liquid (DNAPL): Liquid that is denser than water and does not dissolve or mix easily in water.

Diked: A wall, barrier or obstruction used to enclose an area.

Direct remediation: Direct remediation pertains to COCs that are specifically targeted for remediation. The technology being implemented with the Selected Remedy has been developed to reduce and/or eliminate specific groups of chemical compounds (for example, the degradation of VOCs using EAB technology). In addition to the direct remediation, indirect remediation may occur to other chemicals that are not necessarily directly targeted. This occurs as a secondary reaction in response to the primary reaction.

Dye test: A dye test is performed to determine ground water flow.

Ecological risk assessment (ERA): An evaluation of the potential risks posed to plants and animals from exposure to existing levels of contamination.

Feasibility Study (FS): An analysis of the appropriateness, and cost of cleanup alternatives for a site.

Focused enhanced anaerobic biodegradation: Increasing the natural Micro-organisms ability to destroy contamination.

Geophysical Survey: Collection of geophysical data for based subsurface mapping.

Groundwater: Water beneath the ground surface that fills pore spaces between materials such as sand, soil, or gravel.

Hazard index (HI): The sum of the hazard quotients for compounds that affect a receptor through a specific pathway. An HI of 1 means that the amount to which a receptor is exposed is equivalent to the amount not expected to cause adverse health effects.

Hazard quotient (HQ): The ratio of the daily intake of chemicals from onsite exposure divided by the reference dose for those chemicals. The reference dose is the daily intake of a chemical not expected to cause adverse health effects.

Hot spot: An area of contamination within groundwater that contains the highest concentrations of contaminants.

Human health risk assessment (HHRA): An evaluation of the potential health risks posed to people from exposure to existing levels of contamination.

Hydrogeologic characteristics: Characteristics of the Earth's geology that deal with the distribution and movement of groundwater in soil and aquifers.

Information Repository: A file containing information, technical reports, and reference documents regarding a National Priorities List (NPL) site. This file is usually maintained in a place with easy public access, such as a public library.

Institutional control (IC): An administrative action imposed on a property to limit or prevent property owners or other people from coming into contact with contamination on the property.

Light non-aqueous phase liquid (LNAPL): Liquids that are sparingly soluble in water and less dense than water.

Lithology: The study of rocks; the character of a rock formation.

Maximum Contaminant Level (MCL): The regulatory level used to evaluate potential risk posed by a certain chemical in groundwater set forth by the EPA.

Media: One of the major categories of material found in the environment, e.g., surface water, ground water, soil, or air.

Monitored natural attenuation: Monitoring of subsurface conditions to ensure that natural processes are in place to clean up pollution in soil and groundwater.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The procedures for preparing and responding to discharges of hazardous substances, pollutants, or contaminants.

National Priorities List (NPL): The EPA's list of the most serious hazardous waste sites identified for possible long-term remedial response.

Nine evaluation criteria: Criteria used by EPA to evaluate remediation alternatives and select a preferred alternative.

Packer test: Test that isolates specific sections of a bedrock borehole so that water-quality samples can be collected and aquifer tests can be conducted.

Pathway: Describes how a chemical moves through the environment (migration pathway) or comes into contact with a person, plant, or animal (exposure parthway).

Proposed Remedial Action Plan (PRAP): A public participation document that summarizes the preferred cleanup strategy for the public.

Public meeting: The meeting where the lead agency presents and discusses the Proposed Remedial Action Plan, and accepts questions from the community members.

Receptor: Human, or plant or animal that may be exposed to site contaminants.

Record of Decision (ROD): A document that explains which cleanup alternative(s) will be used at an NPL site. The ROD explains the remedy selection process and is issued by the lead agency following the public comment period.

Remedial Investigation (RI): An in-depth study to gather data needed to evaluate the nature and extent of contamination at a site.

Remedial Action Objectives (RAOs): Describe what the proposed site cleanup is expected to accomplish. These objectives serve as the basis for the remedial alternatives.

Responsiveness Summary: A summary of public comments received during a comment period and the responses to these comments. The responsiveness summary is an important part of the ROD, highlighting community concerns for decision makers.

Risk-based concentration (RBC): Screening levels for chemicals that are protective of human health, used to identify contaminants of potential concern.

Risk driver: Compounds which pose the greatest risk to people or the environment, as determined by a risk assessment.

Semivolatile organic compound (SVOC): Compound that has a boiling point higher than water and that may vaporize when exposed to temperatures above room temperatures.

Site remediation goals (SRGs): The concentration levels of constituents that when met are protective of human health and the environment.

Volatile organic compounds (VOCs): Naturally occurring or manmade chemicals containing carbon that evaporate more quickly than SVOCs.

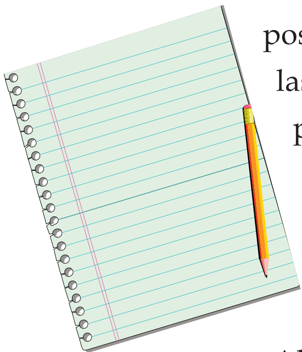
Please print or type your comments for Sites 11 & 12 here

Mark Your Calendar for the Public Comment Period

Public Comment Period

February 21, 2011 through April 7, 2011

Submit Written Comments



Written comments must be postmarked no later than the last day of the public comment period, which is April 7, 2011. Based on the public comments or on any new information obtained, the Navy may modify the Preferred Alternative. The insert page of this Proposed Plan may be used to provide comments, although the use of the form is not required. If the form is used to submit comments, please fold page, seal, add postage where indicated, and mail to addressee as provided.

Attend the Public Meeting

March 8, 2011 from 6:30 P.M. to 7:30 P.M.

Location: at the LaVale Public Library, located at 815 National Highway, LaVale, MD

The public comment period will include a public meeting during which the Navy, EPA, and WVDEP will provide an overview of the site, previous investigation findings, remedial alternatives evaluated and the Preferred Alternative; answer questions; and accept public comments on the Proposed Plan.

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Place stamp here

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