Final

Remedial Investigation Report
Site 47—Mercuric Nitrate Disposal Area

Indian Head Division, Naval Surface Warfare Center
Indian Head, Maryland

Contract Task Order 066

December 2003

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Department of the Navy
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Prepared by

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Herndon, Virginia

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Indian Head Division
Indian Head, Maryland

Contract Task Order - 0066
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Executive Summary

Introduction

This report describes the work performed and the results of the remedial investigation (RI) conducted at Site 47 (Mercuric Nitrate Disposal Area) at the Indian Head Division, Naval Surface Warfare Center (IHDIV-NSWC) in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy as Contract Task Order (CTO) 0066 under U.S. Navy Contract N62470-95-D-6007.

Objectives and Scope of Work

The objectives of the RI were presented in the work plan (Brown & Root, 1997) and the Implementation Plan (CH2M HILL, 1998) as:

- Determine the geologic and hydrogeologic characteristics of the area underlying and surrounding the site.
- Characterize the nature, extent, and concentrations of site-related contaminants in concrete troughs, surface soil, sediment, and groundwater, and determine the rate of migration of site-related contaminants in the environment.
- Identify actual or potential human or environmental receptors and potential contaminant migration pathways.

Following implementation of the activities identified in the work plan and implementation plan, it was determined that additional investigation would be required in order to fully characterize the site. An additional objective was added to characterize the nature and extent of site-related contaminants in subsurface soil and in surface water.

Site Background

Site 47 (Mercuric Nitrate Disposal Area) is in the central portion of the facility. Mercuric nitrate was used in Building 856 as a catalyst in the production of the missile propellant hydrazinium nitroformate and was disposed of at a location near the building. An estimated 274 pounds of mercuric nitrate were disposed of at the site.

Recently, information provided by IHDIV-NSWC personnel indicated that carbon tetrachloride was used as a solvent in one of the processes in Building 856. Additional information indicated that a barium sulfate sludge may have been disposed of in an open pit on the east side of Building 856 between 1969 and 1974.

Conclusions and Recommendations

Surface Water and Sediment

Summary of Findings

Surface water samples contained very low concentrations of four organics, and no unusual detections of inorganics. Sediment samples contained elevated concentrations of semivolatile organic compounds (SVOCs), including several polynuclear aromatic hydrocarbons (PAHs). Lead and silver were detected at elevated concentrations in the sediment sample collected from industrial wastewater discharge manhole IW91. Nitroglycerin (NG) was detected in two sediment samples from the drainage swale near Building 856, and in the sediment sample collected from industrial wastewater discharge manhole IW91.

Human health risks calculated for surface water and sediment did not exceed the USEPA's target risk range.

Conclusions and Recommendations for Surface Water and Sediment

Sufficient data have been collected to characterize the nature and extent of contamination in surface water and sediment. No further sampling or evaluation is required for surface water and sediment, and no remedial action is warranted for these media.

Soil

Summary of Findings

Surface soil samples generally contained very low to undetectable concentrations of volatile organic compounds (VOCs). However, two samples collected downslope of Building 856 (east of Building 1794) during the site investigation contained elevated VOC concentrations, including tetrachloroethene. Metals concentrations displayed no significant spatial trends, but lead, silver, and mercury were detected at concentrations significantly exceeding the available background data for soil. NG and nitrocellulose were detected in one to three surface soil samples. PAHs (benzo(a)pyrene) and metals (arsenic and silver) were detected at sufficiently high concentrations in surface soil that they could serve as a continuing source of contaminant release to groundwater. However, the arsenic values are within the range of background results, and benzo(a)pyrene and silver SSL exceedances were few and widely scattered. Therefore, these are not considered to represent significant risks to groundwater quality.

Subsurface soil concentrations of VOCs and SVOCs were very low where they were detected at all. Metals were detected at concentrations exceeding background levels, but compounds detected most frequently were primarily low-risk compounds such as human nutrients.

The human health risk assessment concluded that for exposure to soil, future child residents and industrial workers would have noncarcinogenic hazards slightly above USEPA's target noncarcinogenic hazard level of 1.0. The risk drivers for the soil, through the ingestion route, are metals, although none of the individual constituents have hazard quotients above 1.0 and when separated by target organ/effect, all hazards are below 1.0. Additionally, the

noncarcinogenic hazards calculated using the central tendency assumptions are below USEPA's target level.

The results of the SERA indicated that site-related chemicals may impact the growth, survival and/or reproduction of the receptor species and receptor communities. As such, the results of the SERA are not sufficient to show that risks to ecological receptor populations at Site 47 are negligible.

Conclusions and Recommendations for Soil

Sufficient data were collected for surface and subsurface soil to characterize the nature and extent of contamination at the site. Potential human health risks identified due to exposure to metals insoil represent very low hazards, and there are no hazards to individual target organs, or based on central tendency assumptions. Therefore, no further evaluation is required and no remedial action is warranted.

Groundwater

Summary of Findings

The water table and the shallow water-bearing unit at the site are located in fine- to medium-grained silty sand overlying a hard, dense clay layer that appears to represent an areally extensive barrier to vertical groundwater flow. The thickness of the shallow water-bearing unit ranges from 1 to 24 feet, depending upon the surface elevation.

Groundwater originating at the site flows east-southeast discharging to the Site 8 Swale and the Site 12 Pond. Head measurements from wells near Building 856 indicate that a groundwater divide exists in this general area. The exact location of the divide shifts temporally, primarily depending on recharge conditions.

Chemicals detected in groundwater include high concentrations of chlorinated VOCs, including carbon tetrachloride and its breakdown products; tetrachloroethene and trichloroethene, and their breakdown products; and 1,2-dichloroethane.

The high concentrations of most VOCs around Building 856 suggest that this is the source area for these VOCs. Migration appears to be in the predominant flow direction of groundwater, which is toward the Site 12 Pond. According to the available data, few if any VOCs have reached the Site 12 Pond, or even the Site 8 Swale or other swales downgradient of the apparent source area.

It is likely that dense non-aqueous phase liquid (DNAPL) carbon tetrachloride is present in the subsurface, presumably derived from direct disposal to the former pits. As a DNAPL, this liquid would migrate downward through the subsurface under the influence of gravity. The downward movement would be temporarily arrested when the DNAPL reaches the hard, dense clay layer at depths ranging from 1 to 24 feet bgs at the site. The DNAPL then could move slowly down the slope of the top surface of the clay layer. Site data indicate that the layer generally slopes to the east, toward the Site 12 Pond. There are some irregularities in the top of this surface that could trap DNAPL in pools or redirect its migration in other directions. However, concentration data from wells in some of these possible traps, as well as other wells downgradient of Building 856, do not suggest the presence of DNAPL in these areas.

An evaluation of the potential distance traveled by groundwater over the years since contamination was first released at the site suggests strongly that dissolved VOCs are being degraded in the subsurface. Based on estimates of hydraulic conductivity from slug tests, the hydraulic gradients at Site 47, retardation coefficients for the organic contaminants, and an assumed initial release in 1943, groundwater contamination has had the potential to migrate greater than 3,300 feet from the source area. However, contamination from the Site 47 source area (Building 856 vicinity) has moved approximately 1,000 feet. This estimate, coupled with the presence of degradation products, indicates that subsurface degradation is occurring.

Risks and hazards associated with exposure to groundwater exceeded USEPA's target risks and hazards for all receptors. The main contributors to noncancer hazard indices are bromomethane, carbon tetrachloride, chloroform, chloromethane, 1,2-dichloroethane, tetrachloroethane, trichloroethene, arsenic, cyanide, vanadium, and iron. The main contributors to carcinogenic risks are VOCs and arsenic.

Conclusions and Recommendations for Groundwater

Sufficient data have been collected to characterize the nature and extent of VOC and metals contamination at Site 47. Based on the nature and extent of VOC and metals contamination at the site, and the elevated potential human health risk due to exposure to these compounds, a feasibility study is recommended for groundwater at Site 47.

VOC contamination detected south of the Site 8 Swale has not been fully delineated. However, because an RI/FS will be conducted at Site 8 beginning in 2004, it is appropriate to include any further evaluation of contamination in this area with that investigation.

The unusually elevated levels of cyanide detected in outlying wells north and west of the site need to be confirmed or eliminated through additional sampling.

One round of monitored natural attenuation (MNA) data was collected as a baseline for eventual evaluation of this remedial alternative during the feasibility study. These data will need to be supplemented with at least one additional round of data prior to the feasibility study to allow adequate evaluation of the MNA alternative.

The following specific actions are recommended prior to the FS:

- Install three additional monitoring wells to form a line along the direction of flow for MNA evaluation;
- Collect two additional rounds of MNA data from new and selected existing wells along the direction of flow, in addition to selected source area wells; and
- Resample monitoring wells IS47MW07, IS47MW08, and IS47MW09 to confirm previous elevated levels of cyanide.

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Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	bioaccumulation factor
bgs	below ground surface
BCF	bioconcentration factor
BERA	baseline ecological risk assessment
BIR	Background Soil Investigation Report
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CF	chloroform
CLEAN	Comprehensive Long-term Environmental Action, Navy
CLP	Contract Laboratory Program
CM	chloromethane
COPC	Chemical of Potential Concern
CS	Confirmation Study
CSF	carcinogenic slope factor
CT	carbon tetrachloride
CTO	Contract Task Order
DCA	1, 2 – dichloroethane
DL	detection limit
DNAPL	dense non-aqueous phase liquid
DQOs	data quality objectives
EC	effective concentration
EC	electric conductivity
EE/CA	Engineering Evaluation/Cost Analysis
EFACHES	Department of the Navy Engineering Field Activity, Chesapeake
ERA	Ecological Risk Assessment
FS	Feasibility Study
ft	feet
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HQ	hazard quotient
HRS	Hazard Ranking System
HSA	hollow-stem auger
IAS	Initial Assessment Study
ID	inner diameter

IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IHDIV-NSWC	Indian Head Division–Naval Surface Warfare Center
IR	Installation Restoration
IRIS	Integrated Risk Information System
LC	low concentration
LCS	laboratory control sample
LMS	linearized multistage
LNAPL	light non-aqueous phase liquid
LOAEL	lowest observed adverse effect level
MC	maximum concentration
MC	methylene chloride
MCL	maximum contaminant level
MDNR	Maryland Department of Natural Resources
MDE	Maryland Department of the Environment
µg/L	micrograms per liter
µm	micrometer (micron)
mg/L	milligrams per liter
MF	modifying factor
mg/kg	milligrams per kilogram
MILCON	Military Construction
MIP	membrane interface probe
MNA	monitored natural attenuation
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering Command
NCEA	National Center for Environmental Assessment
NEESA	Naval Energy and Environmental Support Activity
NG	nitroglycerin
NOAEL	no observed adverse effect level
NOS	Naval Ordnance Station
NPL	National Priorities List
NQ	nitroguanidine
NWI	National Wetlands Inventory
ORP	oxidation-reduction potential
PAH	polynuclear aromatic hydrocarbon
PCE	tetrachloroethene
PETN	pentaerythritol tetranitrate
PVC	polyvinyl chloride

QA	quality assurance
QC	quality control
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SERA	Screening-level Ecological Risk Assessment
SF	slope factor
SI	Site Inspection
SQL	standard quantitation limit
SSA	Site Screening Assessment
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCE	trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	total organic carbon
UCL	upper confidence limit
UF	uncertainty factor
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

SECTION 1

Introduction

This report describes the work performed and the results of the remedial investigation (RI) conducted at Site 47 (Mercuric Nitrate Disposal Area) at the Indian Head Division, Naval Surface Warfare Center (IHDIV-NSWC) in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy as Contract Task Order (CTO) 0066 under U.S. Navy Contract N62470-95-D-6007.

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- Characterize the nature, extent, and concentrations of site-related contaminants in concrete troughs, surface soil, sediment, and groundwater, and determine the rate of migration of site-related contaminants in the environment.
- Identify actual or potential human or environmental receptors and potential contaminant migration pathways.

Following implementation of the activities identified in the work plan and implementation plan, it was determined that additional investigation would be required in order to fully characterize the site. An additional objective was added to characterize the nature and extent of site-related contaminants in subsurface soil and in surface water.

1.2 Report Organization

The Site 47 RI report contains a summary of the data collected during the RI and previous investigations at the site, presents an interpretation of the data, and documents the nature and extent of contamination for affected media. Contaminant-migration pathways and transport mechanisms for affected media are evaluated. The report also presents an assessment of the human-health and environmental risks associated with current site conditions and recommendations for further activities at the site.

The report is divided into ten sections followed by the appendices:

- **Section 1 – Introduction:** Describes the objectives and scope of work of the RI, the organization of the report, a description of the Activity, a discussion of previous investigations, and presents a description and history of Site 47.
- **Section 2 –Activity Background:** Summarizes the physical characteristics of the facility.

- **Section 3 – Remedial Investigation Activities:** Provides details of the sampling and data-gathering methods used during the field activities. The sampling rationale and data-quality objectives (DQOs) as dictated by the intended use of the data are discussed in this section. The quality assurance (QA) and quality control (QC) protocols followed during the RI activities also are provided in this section.
- **Section 4 – Site Topography and Geology:** Summarizes the topographic and geologic features of Site 47.
- **Section 5 – Site Hydrogeology:** Discusses the hydrogeologic features of Site 47.
- **Section 6 – Nature and Extent of Contamination:** Describes the nature and extent of contamination found in soil, surface water, sediment, concrete, and groundwater from the past investigations and the RI activities.
- **Section 7 – Contaminant Fate and Transport:** Describes contaminant migration at the site in the context of the mobility and persistence of the contamination.
- **Section 8 - Human Health Risk Assessment:** Describes the effects of the contamination on human health.
- **Section 9 – Ecological Risk Assessment:** Describes the effects of the contamination on the environment.
- **Section 10 – Conclusions and Recommendations:** Summarizes the results of the RI and the risk posed to human health and the environment based on the nature, extent, fate, and transport of contaminants on the site.

The appendices contain the soil-boring and well-construction logs, well-location and well-elevation surveying data, the raw analytical data obtained during both the RI and previous investigations, the human-health and environmental risk assessment tables of calculations, and manifests for the handling and disposal of investigation-derived waste.

1.3 Activity Description

1.3.1 Introduction

IHDIV-NSWC is a military facility located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, District of Columbia (Figure 1-1). The facility consists of two tracts of land: the main installation on the Cornwallis Neck Peninsula and the Stump Neck Annex located across Mattawoman Creek (Figure 1-2).

The main installation contains approximately 2,500 acres and is bounded by the Potomac River to the northwest, west, and south; Mattawoman Creek to the south and east; and the town of Indian Head to the northeast (Figure 1-2). Included as part of the main installation are Marsh Island and Thoroughfare Island, which are located in Mattawoman Creek. Elevations range from sea level to approximately 125 feet (ft) above mean sea level (msl).

The Stump Neck Annex contains approximately 1,000 acres and is bounded by Mattawoman Creek on all sides except the southeast (Figure 1-2). Elevations range from sea level to approximately 10 ft above msl.

Both the main installation (Cornwallis Neck Peninsula) and the Stump Neck Annex are on the National Priorities List (NPL). The main installation and Stump Neck Annex are separated by Mattawoman Creek (noncontiguous), have separate United States Environmental Protection Agency (USEPA) identification numbers, and perform dissimilar operations. Investigation of the Stump Neck Annex is being conducted through the Resource Conservation and Recovery Act (RCRA) Corrective Action and the IR program. Site 47 is located on the main installation.

1.3.2 Current and Historical Uses of IHDIV-NSWC

IHDIV-NSWC was established in 1890 and is the Navy's oldest continuously operating ordnance station. At various times during its operation, IHDIV-NSWC has served as a gun and armor proving ground, a powder factory, a propellant plant, and a research facility. The U.S. Government purchased Stump Neck Annex in 1901. The property provided a safety buffer for the testing of larger naval guns that were tested by firing into the Potomac River, and at Stump Neck.

The Indian Head installation was enlarged by another 1,160 acres of adjacent land in 1918, during World War I. This expansion included the purchase of Hopewell Farm and Hog Island, which was then an islet in Mattawoman Creek and has since become attached to the Cornwallis Neck peninsula. When the Dahlgren Naval Proving Ground was established as a separate command in 1932, IHDIV-NSWC was redesignated the Naval Powder Factory (Parsons, 2000).

The production of gunpowder and development of new explosives during the onset of World War II resulted in the construction of several new facilities at Indian Head, as well as the construction of Route 210 as a Defense Access Road in 1943. Development and improvements at Indian Head continued throughout the 1950s and 1960s, and in 1966, IHDIV-NSWC was renamed the Naval Ordnance Station (NOS). Rum Point, an 80-acre promontory in Mattawoman Creek near Stump Neck, was also acquired in this year. Bullitt Neck was obtained in five small acquisitions between 1965 and 1966 in order to meet safety and security needs arising from explosive magazines at the Indian Head station (Parsons, 2000).

After the Vietnam conflict, the mission of IHDIV-NSWC shifted from primarily a production facility to a highly technical engineering support operation. In 1987, the NOS was established as a Center for Excellence to promote technological excellence in the following specialized fields: energetic chemicals; guns, rockets and missile propulsion; ordnance devices; explosives; safety and environmental protection; and simulators and training (Parsons, 2000). Current military land use includes operations and training; production; maintenance and utilities; research, development, testing and evaluation; explosive storage; supply and non-explosive storage; administration; community facilities and services; housing; and open space.

Forest stands comprise approximately 47 percent, or 1,603 acres, of IHDIV-NSWC and include pine, pine-hardwood, and hardwood forest cover types. Recreation areas at Indian Head include approximately 1,150 acres of designated hunting areas, approximately 2 miles of shoreline fishing areas, and 1.5 miles of nature trails.

1.3.3 Surrounding Land Uses

IHDIV-NSWC is generally surrounded by commercial, residential, and State Park land to the east and south of the main installation and Stump Neck Annex. The town of Indian Head is located just east of IHDIV-NSWC, where most residential developments are located. The Indian Head Highway (Route 210) extends eastward from the IHDIV-NSWC main gate, attracting businesses and providing access to residential areas off the main highway. The Potomac River borders the main installation to the north and west and Stump Neck to the west. Mason Neck National Wildlife Refuge is located across the Potomac River, north of the main installation. The Mattawoman Natural Environment Area is state-owned property located along the southern edge of Mattawoman Creek east of the main installation.

The Stump Neck Annex is bordered to the north by Mattawoman Creek, to the east by General Smallwood State Park and Sweden Point Marina, and to the south by Chicamuxen Creek, agricultural lands, and low-density residential development. The Chicamuxen Wildlife Management Area is located adjacent to and south of the Stump Neck Annex.

1.4 Previous Investigations

In June 1982, Naval Energy and Environment Support Activity (NEESA) conducted an Initial Assessment Study (IAS). Submitted in May of 1983 (Fred C. Hart Associates, 1983), the report evaluated the various sites at IHDIV-NSWC to determine if a potential threat to human health or the environment existed. The report identified five sites (Sites 5, 6, 8, 12, and 25) as exhibiting a potential threat. A Confirmation Study (CS) was conducted at three of these sites (Sites 5, 8, and 12) and was published in September 1985 by CH2M HILL. Removal actions subsequently were conducted at Sites 5 and 8. Site 12 has undergone further investigation by TetraTech NUS (TtNUS).

A Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted in 1988 (A.T. Kearney, Inc., 1988) and a supplemental Preliminary Assessment (PA) Report was prepared in January 1992 (NEESA, 1992). The report evaluated an additional 17 sites (Sites 39 to 55). All but two sites (Sites 51 and 52) were recommended for further work. As a follow-up to the supplemental PA, a Site Inspection (SI) was conducted on Sites 39 through 50, and at Sites 53, 54, and 55 in two phases. Phase I focused on Site 42, Olson Landfill. Phase II focused on the remainder of the sites. Based on the results of the SI, all of the sites were recommended for further study.

As required under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the USEPA applied the Hazard Ranking System (HRS) for IHDIV-NSWC. The Activity scored a 50, which is above the 28.5 cut-off score. Therefore, IHDIV-NSWC was proposed to the NPL on February 13, 1995, and was officially placed on the list on September 29, 1995.

1.5 Site 47 Overview

This section presents general information about Site 47. More detail on the site is provided in Section 2.7.

Site 47 (Mercuric Nitrate Disposal Area) is in the central portion of the facility (Figure 1-2). Overall site boundaries are shown in Figure 1-3. Mercuric nitrate was used in Building 856 as a catalyst in the production of the missile propellant hydrazinium nitroformate and was disposed of at a location near the southeast corner of the building (Figure 1-4). The disposal area consisted of about 24 square feet (4 feet by 6 feet) near the drainage ditch that begins near the southeast corner of the building (Figure 1-4). The disposal site was covered with limestone chips to provide neutralization for the spent catalyst (comprised of nitric acid) disposed of at the site. There is no evidence of the disposal area at present. Drainage in the ditch adjoining the former disposal location flows generally southward to the Site 8 Swale which discharges to the east into the Site 12 Pond (Figure 1-3).

Recently, information provided by IHDIV-NSWC personnel (personal communication, March 2000) indicated that carbon tetrachloride was used as a solvent in one of the processes in Building 856.

Several concrete troughs are located on the north side of Building 856 (Figure 1-4). At one time the troughs were lined with lead sheeting and carried process solutions from Building 856 to storage and treatment in Building 856A. The troughs are still present but the lead sheeting has been removed.

An industrial wastewater sewer is located in the vicinity of Building 856. An industrial wastewater discharge manhole (designated IW91; Figure 1-4) is located about 50 feet west of the building.

1.6 References

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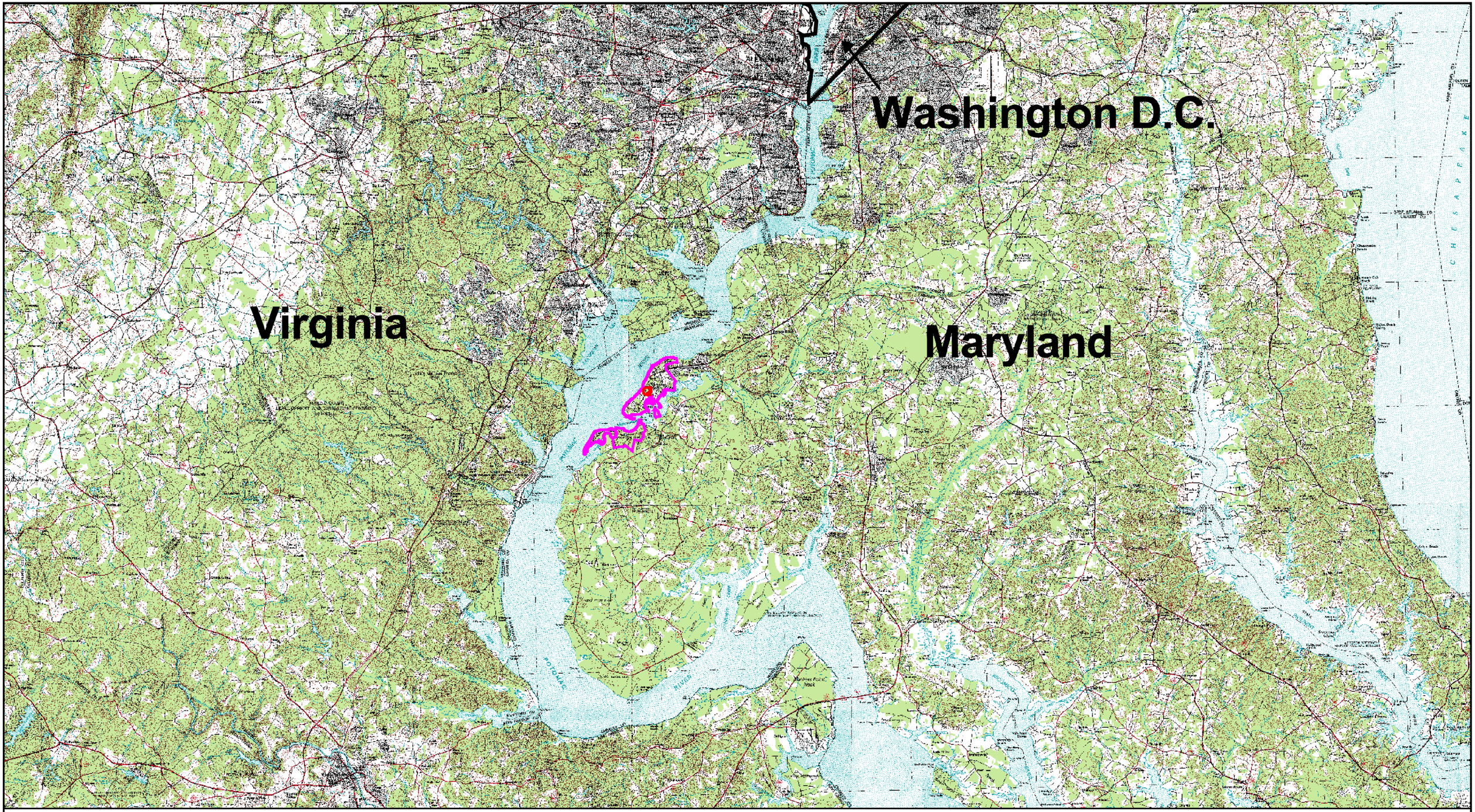

LEGEND

- Facility Boundary
- District of Columbia
- Water Bodies

N

0 25000 50000 Feet

Figure 1-1
Facility Location Map
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

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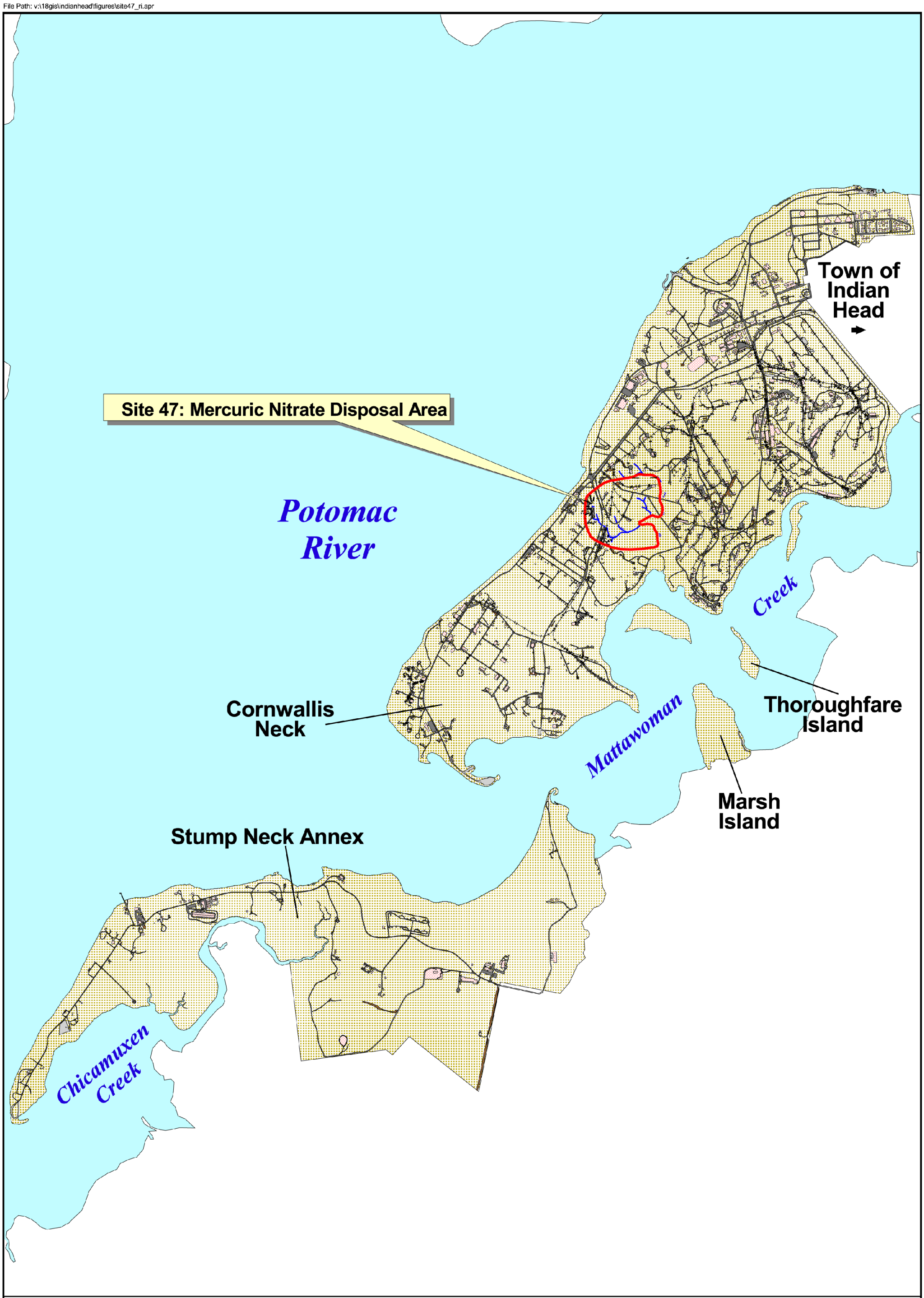

LEGEND

- IR Site Boundary
- Perennial Swale
- Intermittent Swale
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road

N

0 2500 5000 Feet

Figure 1-2
Base Map
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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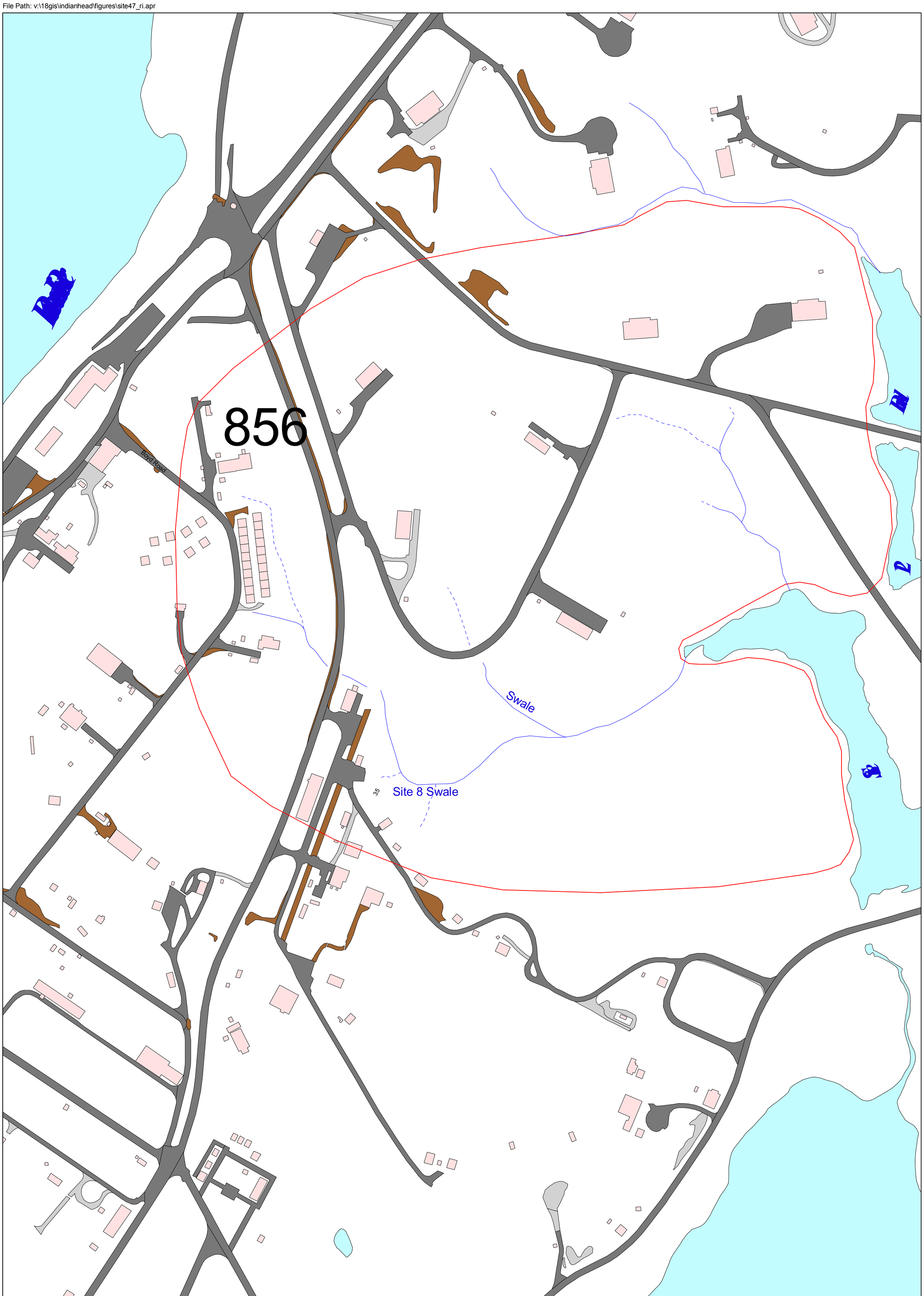

LEGEND

- IR Site Boundary
- Perennial Swale
- Intermittent Swale
- 5 Foot Elevation Contours
- 1 Foot Elevation Contours
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road
- 36.60 Elevation (feet above mean sea level)

N

100 0 100 200 300 Feet

Figure 1-3
Approximate Site 47 IR Boundary
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

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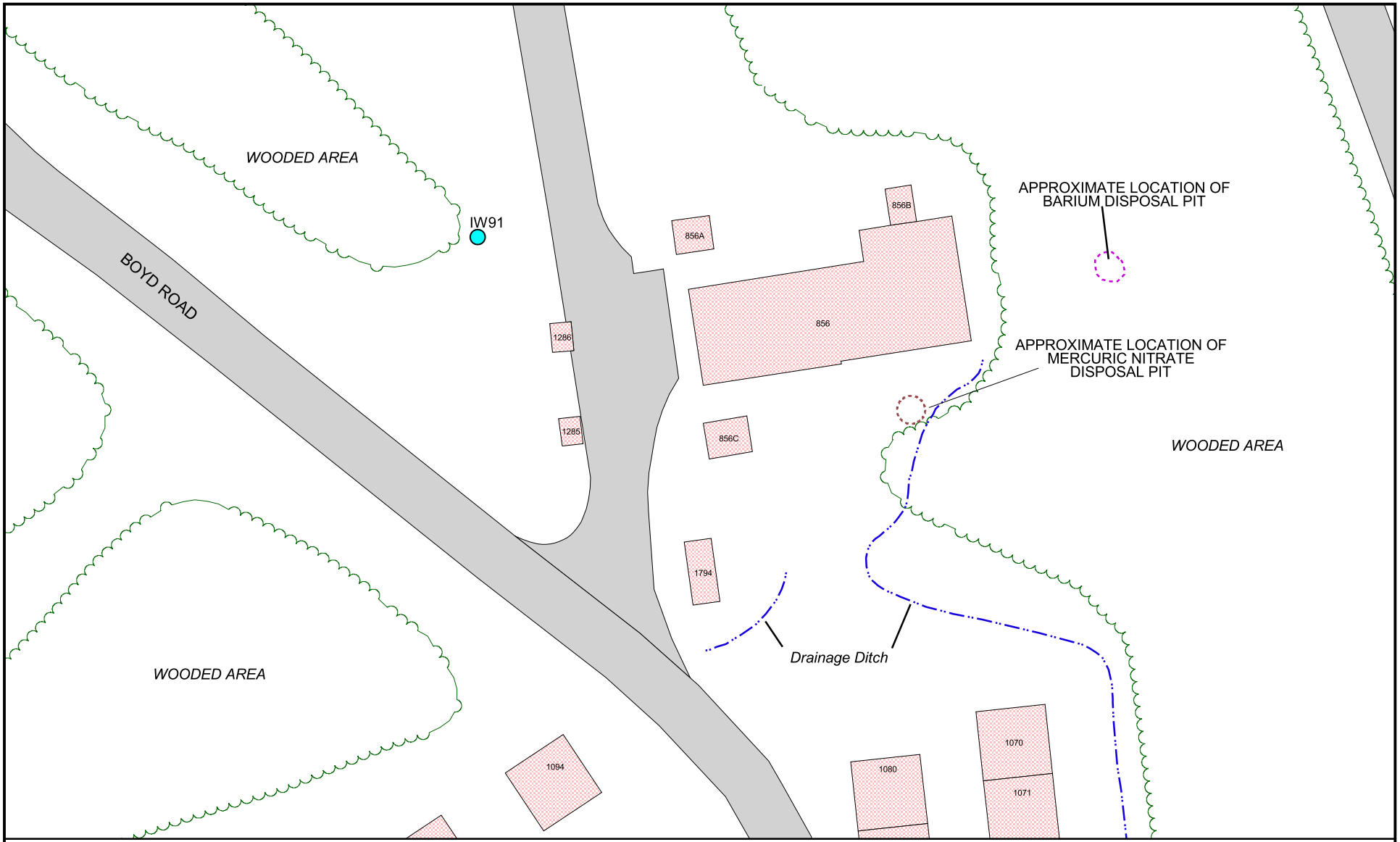

LEGEND

- Approximate Location of Mercuric Nitrate Disposal Pit
- Approximate Location of Barium Disposal Pit
- Drainage Ditch
- Buildings
- Tree Line
- Asphalt
- Industrial Wastewater Manhole

N

0 25 50 75 Feet

Figure 1-4
Site Features
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

SECTION 2

Activity Background

Section 2 contains a discussion of the physical characteristics of IHDIV-NSWC. Section 2.1 describes the topography and climate, Section 2.2 describes the soils, Section 2.3 describes the hydrology, Section 2.4 describes the geology, Section 2.5 describes the hydrogeology, and Section 2.6 describes the ecology. Site-specific information pertaining to the geology and hydrogeology of Site 47 can be found in Sections 4 and 5, respectively. Section 2.7 provides an overview of the history of Site 47.

2.1 Topography and Climate

IHDIV-NSWC is situated on a peninsula that separates Mattawoman Creek from the Potomac River. The terrain is characterized primarily by gently sloping hills and valleys. Elevations range from sea level along the perimeter of the peninsula to approximately 125 feet above mean sea level (MSL) at the bluffs located in the northeastern portion of the facility (Figure 2-1).

Climate is typical of the humid temperate continental climatic zone in which the facility lies. This zone has hot, humid summers and relatively mild winters. Because of its proximity to the Potomac River and its tributaries, IHDIV-NSWC experiences less extreme temperatures, higher precipitation, and higher humidity than inland areas. The average daily maximum temperature is 67.5°F and the average daily minimum temperature is 45°F. The warmest part of the year is in late July and the coldest is in late January and early February. The growing season is approximately 190 days, from mid-April through mid-October (U.S. Department of Agriculture (USDA), 1974).

2.2 Soils

The soils at IHDIV-NSWC consist of silty and sandy loams with minor amounts of gravel and tend to have low permeability and low shrink-swell potential. Four dominant soil associations are found at Indian Head (USDA, 1974):

- Beltsville-Gravelly Land-Bourne —Level to moderately sloping soils, moderately well-drained and loamy, and moderately deep. They also include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- Beltsville-Exum-Wickham—Level to moderately sloping, moderately well-drained and well-drained loamy soils. Soils within this association are moderately deep, and include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- Evesboro-Keyport-Elkton—Level to moderately sloping, excessively drained, sandy soils and moderately well-drained and poorly drained, level to gently sloping, loamy soils with clayey subsoil.

- Bibb-Tidal Marsh-Swamp—Level or nearly level, poorly drained soils, generally located on floodplains and in miscellaneous unclassified wetlands.

2.3 Hydrology

Major water bodies at Indian Head include the Potomac River, Mattawoman Creek, and Chicamuxen Creek. The Potomac River flows almost 400 miles from its headwaters in the Allegheny Mountains of West Virginia. Near Indian Head, the Potomac broadens and becomes saltier from the increasing influence of the Chesapeake Bay. Salinity ranges from 0.01 to 3.0 parts per thousand near IHDIV-NSWC, with the highest salinity values recorded during dry summer months. Mattawoman and Chicamuxen Creeks are tidal tributaries to the lower Potomac River. Chicamuxen Creek is more saline than Mattawoman Creek because it is more strongly influenced by the estuarine waters of the lower Potomac River.

The Potomac River bounds Cornwallis Neck to the north and northwest. Because of the peninsula's topography, most of the surface water drainage on Cornwallis Neck flows into Mattawoman Creek, which forms its southeastern boundary. The Stump Neck peninsula is bounded by Mattawoman Creek to the north, the Potomac River to the northwest, and partially by Chicamuxen Creek to the southeast.

2.4 Geology

The facility and the sites are in the Atlantic Coastal Plain physiographic province. The province consists of an eastward-thickening wedge of interbedded sand and clay units that were deposited in fluvial and marine environments. The deposits range in age from Cretaceous, consisting of the Potomac Group, to Quaternary, consisting of the Upper Lowland Deposits, and in thickness from 650 ft to 900 ft (Vroblesky and Fleck, 1991).

According to the geologic map provided by Hiortdahl (1997), the site is immediately underlain by Quaternary deposits. Hiortdahl (1997) provides a geologic cross section that indicates that the Quaternary deposits are approximately 100 ft thick in the vicinity of the site. They are of fluvial and estuarine origin as cut-and-fill deposits in paleochannels of the early Potomac River system. They generally consist of medium- to coarse-grained sand and gravel grading upward to silt and clay. Isolated cobbles and boulders may be found near the base of the deposits. The SI (Ensafe/Allen & Hoshall, 1994) reported that the soil profile from the ground surface to a depth of about 8 ft below ground surface (bgs) consists of well-sorted, medium-grained sand.

Vroblesky and Fleck (1991) reported that the Patapsco Formation, the uppermost unit of the Cretaceous Potomac Group, immediately underlies the Quaternary deposits in the vicinity of the site. The top of the Patapsco is about 45 ft below msl. The Patapsco is characterized by layers of fine- to medium-grained sand and silt separated by thick layers of clay. Typically, the deposits within the Patapsco Formation grade from coarse-grained at the bottom to finer-grained at the top. The Patapsco was not encountered during the RI drilling.

The Patapsco is immediately underlain by the tough, massive clay of the Arundel Formation, which is then underlain by the medium- to coarse-grained sand of the Patuxent

Formation. The Patuxent is subsequently underlain by gneissic, schistosic, and gabbroic bedrock. The depth to bedrock beneath Indian Head is approximately 650 to 900 ft bgs.

2.5 Hydrogeology

The water table is recharged by precipitation that infiltrates the ground surface. Some of the water that runs off the surface of the ground at the sites flows to drainage ditches. These ditches then drain toward the Potomac River or toward Mattawoman Creek. The Master Work Plan (Brown and Root Environmental, April 1997) reports that most natural drainage from the facility is to Mattawoman Creek.

Hiortdahl (1990) states that, although there are numerous localized water-bearing systems within the Lowland Deposits, these water-bearing units are not used as a potable water source by the facility or on the Indian Head Peninsula. The main aquifer is a series of units within the Potomac Group; the Patapsco unit is nearest the ground surface.

The facility is the largest user of groundwater in the area and withdraws an average of 1 to 2 million gallons per day. Most of the production wells are screened in the Patapsco Formation. A single production well, Well 16A, located near Building 1728, is screened in the Patuxent aquifer. This well currently is not used for drinking-water supply; however, as part of Military Construction (MILCON) Project P-160, due to begin in 2004, Well 16A will be used to supply potable water. MILCON Project P-160 titled Water Systems Improvement also include new well installation and well repairs (Jorgensen, 2002).

Eleven production wells are in use at the facility at present. Hiortdahl (1990) reports that pumping in the Potomac Group aquifers has produced a cone of depression in the potentiometric surface that extends approximately 6 miles to the northeast and southwest and 2 to 3 miles to the northwest and southeast.

2.6 Ecology

2.6.1 Terrestrial Systems

IHDIV-NSWC comprises approximately 2,000 acres of terrestrial ecological communities on Cornwallis Neck and about 1,000 acres on Stump Neck. Terrestrial habitats in these areas are classified as forested uplands, open uplands, and terrestrial cultural uplands. The forested areas on IHDIV-NSWC are dominated by oaks (*Quercus* spp.), hickories (*Carya* spp.), tulip trees (*Liriodendron tulipifera*), and pine (*Pinus* spp.). Flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), and American holly (*Ilex opaca*) are typical of the upland understory. The forests are heavily fragmented by buildings, roads, and other structures. Terrestrial cultural uplands consist of areas that have been created, maintained, or modified by human activities. These areas are characterized as either mowed grass/landscaped areas, wildlife food plots, or successional fields and roadsides.

2.6.2 Wetland Systems

National Wetland Inventory (NWI) maps identify approximately 290 acres of wetlands on IHDIV-NSWC. Of this acreage, tidal estuarine systems total 234 acres, forested wetlands total 42 acres, emergent marshes and shrub swamps total 5.5 acres, and lacustrine systems

make up the remaining acreage. There are also approximately 17 miles of riverine systems in this area.

At Indian Head, the tidal estuarine systems are associated with the Potomac River, Mattawoman Creek, and Chicamuxen Creek. Mattawoman Creek marshes are typically dominated by wild rice (*Zizania aquatica*), big cordgrass (*Spartina cynosuriodes*), cattail (*Typha* spp.), rose-mallow (*Hibiscus moscheutos*), tickseed sunflowers (*Bidens* spp.), pickerelweed (*Pontederia cordata*), and arrow arum (*Peltandra virginica*). Intertidal shoreline fringe marshes are extremely rare and are dominated by water willow (*Justica americana*) or American threesquare (*Scirpus pungens*). The broad expansive marsh of Chicamuxen Creek contains an extremely diverse flora. An informal survey of this marsh conducted in 1988 identified more than 80 species of plants (Maryland Department of Natural Resources, 1992).

2.6.3 Fauna

The diverse ecological communities at Indian Head support many wildlife species. Faunal inventories were conducted by Maryland Natural Heritage as part of the 1991–1992 rare, threatened, and endangered species survey. IHDIV-NSWC natural resources staff has conducted additional waterfowl and amphibian surveys. Currently, an estimated 15 species of damselflies, 26 of dragonflies, 48 of butterflies, 29 of mammals, 23 of reptiles, 20 of amphibians, and 119 of birds utilize the available habitat at IHDIV-NSWC (MDNR, 1992; Parsons, 2000).

2.6.4 Rare, Threatened, and Endangered Species

A survey of rare, threatened, and endangered species was conducted by the Maryland Natural Heritage Program in 1991–1992. The survey focused on areas with a high potential for supporting rare, threatened, and endangered species. Of the listed species, the bald eagle (*Haliaeetus leucocephalus*) is the only know federally listed threatened species identified on IHDIV-NSWC. The remainder of the species listed includes five state-listed endangered plants, two state-listed threatened plants, one state-listed endangered invertebrate, and 18 species of regional concern.

Three additional rare tree species were identified during the 1995 Urban Tree Inventory: the state-threatened eastern arborvitae (*Thuja occidentalis*), state-rare shingle oak (*Quercus imbricaria*), and potentially state-rare pussy willow (*Salix discolor*).

The 1991-1992 survey also identified 10 areas of ecological significance (totaling 614 acres) that have the potential to support the long-term protection of the rare, threatened, and endangered species. These protection areas are Bullitt Neck Point, Cornwallis Neck Marshes, Hog Island Cove, Thoroughfare Island, Chicamuxen Creek Marsh, Magnolia Seep, Porter Woods, Rum Point, Stump Neck Beaver Marsh, and West Stump Neck Shoreline.

2.7 Site History

Mercuric nitrate reportedly was disposed of at the site as a solution containing 1 ounce of mercuric nitrate dissolved in a 55-gallon drum of 98 percent nitric acid. The solution was disposed of over an approximately 8-year period, from 1957 and 1965. During three 8-hour daily shifts, 55-gallon drums of solution were disposed of 7 days per week and 6 months per

year. An estimated 274 pounds of mercuric nitrate were disposed of at the site (NEESA, 1988).

The floors and the drainage trenches that processed the wastewater to Buildings 856A, 856B and 856C were lined with leaded flooring. The lead that lined the trenches located outside of Building 856 (where the concrete samples were taken) was removed before the 1999 RI sampling. Free flowing mercury was found between the lead liner and the concrete. Also, washing down on the interior of the building was common practice in the past and the wastewater discharged to the ground outside around the building (the washing down operation was not always controlled to go to buildings 856A–856C). A removal action at the stream that passes by Building 790 was performed because of lead contaminated soil that came from the washing down of the interior of Building 790.

A site inspection was performed at the site in 1994 (E/A & H, 1994). Twelve samples of soil were collected in and around the former pit to determine if past mercury disposal contaminated soil at the site. Samples were obtained from shallow soil (i.e., from 0 to 1 foot bgs) and subsurface soil (i.e., from depths to 8 feet bgs.) Three of the samples were collected from the ditch at areas of apparent deposition. The samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and Target Analyte List (TAL) metals.

The VOCs tetrachloroethene (PCE), carbon tetrachloride, and chloroform were detected at concentrations that exceeded the action levels established for the SI. Concentrations of several SVOCs also exceeded risk-based criteria. Finally, cadmium, lead, mercury, and silver were detected at concentrations above background values, and silver was detected at concentrations above the action level identified for the SI. The analytical results obtained during the SI will be used in developing the nature and extent of contamination at the site for the RI, and are discussed in greater detail in Section 6, *Nature and Extent of Contamination*.

The soil borings did not encounter any evidence of the former mercuric nitrate disposal pit, such as deposits of limestone chips or elevated concentrations of mercury or other metals.

Based on conversations with Bob Farcomb, an employee of IHDIV-NSWC, it appears that a waste pit existed approximately 50 feet to the east of Building 856. Reportedly, once a month, beginning in 1969 and continuing until 1974, an employee working at Building 856 dug a pit approximately 6 feet long by 6 feet deep. A waste solution of water and barium sulfate generated from equipment cleaning at Building 856 would then be pumped into the pit. The pit was then backfilled using the soil removed from the pit until the following month. Mr. Farcomb estimated that a total of approximately 2,000 pounds of barium sulfate may have been disposed of in the pit before it was permanently abandoned.

It should be noted that although barium sulfate has relatively low solubility (approximately 2.5 milligrams per liter [mg/L]), the barium sulfate used at Building 856 reportedly was typically present as a solid, at a diameter of 1 micron or less. Often particles of this size will travel with groundwater without being dissolved; therefore, enhanced mobility of barium sulfate in groundwater may be expected at Site 47.

2.8 References

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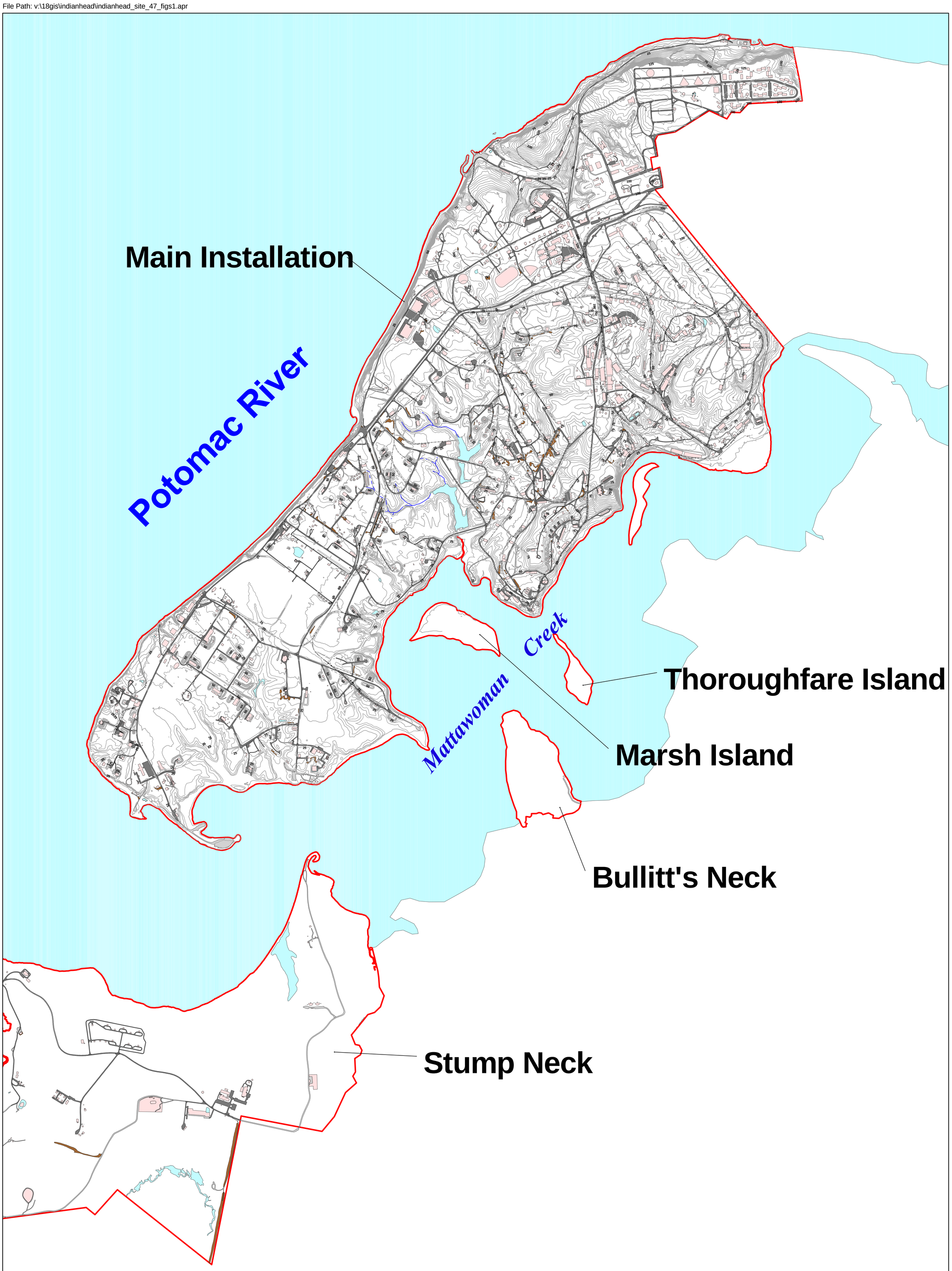

LEGEND

- Perennial Swale
- Intermittent Swale
- 5 Foot Elevation Contours
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road

25 = Elevation (feet above mean sea level)

N

700 0 700 1400 2100 Feet

Figure 2-1
Topography
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

SECTION 3

Remedial Investigation Activities

This section describes the scope and rationale for the field activities that were conducted during the RI at Site 47 at IHDIV-NSWC. A summary of the RI field activities that were conducted at the site is provided.

3.1 Chronology of Field Activities

RI field investigation activities have been conducted in several phases beginning in 1999 and ending in 2002. The following paragraphs summarize the chronology of field efforts. A detailed description of each type of activity is provided in the subsequent sections.

The initial RI was conducted at Site 47 between July 6 and 14, 1999, with follow-on work conducted on January 5, 2000. This work consisted of installing four monitoring wells, and sampling surface soil, sediment, groundwater, and concrete. In addition, a qualitative habitat assessment was performed on September 23, 1999.

An additional field investigation was conducted from March through April 2001. The objectives of this investigation were to (1) more fully define the distribution of contaminants in groundwater, the directions of groundwater flow, and the depth, continuity, and thickness of the underlying clay layer; and (2) define the nature and extent of contamination in soil, sediment, and surface water in the drainage ditch originating at Site 47 and extending to Caffee Road and in other drainage ditches on and near the site, and the nature and extent of potential contamination in soil at the reported chemical disposal area near Building 766. The objectives of the RI were met by the activities performed, as discussed in this chapter.

Further investigation was conducted from October through November 2001. The objectives of this investigation were to (1) more fully define the distribution of contaminants in groundwater in the vicinity of Site 47; (2) ensure that any dense non-aqueous phase liquid (DNAPL) that may exist at the site is not migrating from the source area along the subsurface topography of the identified clay layer; and (3) map the topography of the clay layer beyond Site 47. Due to low groundwater conditions the field investigation could not be completed, as discussed in this chapter.

A follow-up investigation was conducted at Site 47 between June and August 2002. The objectives of this investigation were to (1) more fully define the distribution of VOCs in groundwater in the vicinity of Site 47; (2) map the topography of the clay layer on the east side of Site 47; (3) determine whether or not VOCs derived from Site 47 pass beneath the downgradient surface water bodies; (4) provide data for the evaluation of monitored natural attenuation (MNA) as a remedial alternative at the site; and (5) investigate the reported barium sludge pit. The objectives of the RI were met by the activities performed, as discussed in this chapter.

The activities are described under sections specific to each type of environmental matrix investigated.

Table 3-1 lists the various parameters tested for each sample and analytical test methods used during the field investigation. Actual detection limits for each sample and compound are shown in the analytical result summary tables presented in Section 6 and Appendix J.

Note that monitoring wells GW01 through GW04 are now referred to as IS47MW01 through IS47MW04.

3.2 Installation of Monitoring Wells

Four shallow groundwater-monitoring wells (IS47MW01 through IS47MW04) were installed on July 6 through 8, 1999 at the locations defined in the work plan (Brown and Root, 1997). The well locations are shown in Figure 3-1. Well IS47MW01 was placed in what was expected to be the upgradient location and wells IS47MW02 through IS47MW04 were placed in what were expected to be downgradient locations.

The purpose of the wells was to monitor groundwater quality in the shallow water-bearing unit. All well boreholes were drilled to locate an underlying low-permeability clay or silt unit that may serve as the bottom of the shallow unit, and such a layer was encountered in three of the four boreholes. All wells were installed with screen bottoms near or at the top of the low-permeability unit, with the entire shallow unit being screened.

Six additional wells (IS47MW05 through IS47MW10) were installed on March 28 through March 30, 2001. Membrane Interface Probe/ Electric Conductivity (MIP/EC) and direct push sampling were used to better define the area of contamination and then determine the locations of the wells as shown on Figure 3-1 and 3-2.

The MIP-profiling approach was considered to be preferable to simply collecting direct-push groundwater samples because it provided continuous information rather than data from the limited interval of a sampler, thereby optimizing selection of the sample interval. Also, it ensured that the groundwater sample is collected from subsurface materials that are permeable enough to allow sufficient volume of groundwater to enter the sampler. A disadvantage to the approach is that its detection limit is around 100 parts per million (ppm); therefore, lower levels of contamination could be missed. MIP profiling is discussed in more detail in Section 3.3.

At the same time that the MIP data were collected, the EC of the soil was measured. The higher the voltage, the higher the clay content. The result of these measurements is a profile of the relative clay content at the site.

Five wells were installed in August 2002 (IS47MW11 through IS47MW15). These wells were placed based on the results of the June 2002 MIP/EC investigation to more fully define the distribution of contaminants in groundwater. The well locations are shown on Figure 3-1.

The monitoring-well installations involved:

- Drilling with 6 5/8-inch inner diameter (ID) hollow stem augers to the desired well depths

- Taking split-spoon samples every 5 feet with 2-inch ID, 2-foot-long split spoons
- Characterizing the soil types, delineating the depth to the water table, and looking for a shallow clay or silt layer which would define the bottom of the shallow water-bearing unit
- Constructing the well according to guidelines set out in the work plan; the wells were constructed with 2-inch-diameter polyvinyl chloride (PVC) risers and screens.
- Developing the wells by surging and pumping at least four well volumes of groundwater from each well.

All new monitoring wells were developed to remove fine-grained material that entered the well screens.

All material (primarily soil cuttings) generated during drilling of the well boreholes was placed in 55-gallon drums for characterization and proper disposal off the site. All groundwater extracted during well development also was containerized in 55-gallon drums for characterization and proper disposal off the site. Composite samples were taken, one for the solid investigation-derived waste (IDW) and one for the aqueous IDW, and then analyzed at an offsite laboratory by the Toxicity Characteristic Leaching Procedure (TCLP) and for ignitability, reactivity, and corrosivity. The aqueous IDW was determined to be hazardous and was disposed of at an offsite facility. The solid IDW was determined to be nonhazardous and was disposed of on the ground in the woods behind Building 856.

All wells were surveyed for vertical and horizontal datum. Elevation points surveyed were the top of the PVC well riser, the top of protective casing, and the top of the concrete pad.

Lithologic logs and well-construction diagrams were prepared for the new wells. Lithologic logs are provided in Appendix A and well-construction diagrams are provided in Appendix B, along with copies of the well-completion reports. Well-construction details are provided in Table 3-2.

3.3 In Situ Groundwater Sampling

Before direct-push groundwater sample locations were selected, a MIP was used to investigate the site. The MIP heats and volatilizes VOCs in the soil and groundwater. Samples of the volatilized gas are analyzed with an onsite flame ionization detector and an electron capture device for a measure of total VOCs. The analyses are performed continuously as the concentrations vary with depth, and the technology thereby identifies zones containing contamination.

An initial MIP/EC investigation was conducted at 11 locations (BH-01, BH-02, and MIP-01 through MIP-09, Figure 3-2) and 12 in-situ groundwater samples (IS47GW01 through IS47GW12, Figure 3-1) were collected from March 13 through March 15, 2001. Direct-push samples were collected at two depths at each selected location to ensure that the saturated thickness of the water-bearing unit was adequately tested. Samples were analyzed for VOCs and filtered TAL metals because historical information indicated these chemicals exceeded screening criteria in groundwater.

An additional MIP/EC investigation was conducted at 10 locations (MIP-10 through MIP-20, Figure 3-2) and 10 direct-push groundwater samples (RI47GW13 through RI47GW22) were taken from October 29 through November 2, 2001 (Figure 3-1). The locations focused on the area east and south of the original investigation because contamination appeared to be migrating in these directions. Samples were analyzed for low-concentration (LC) VOCs. Due to unusually low groundwater levels, no further direct-push groundwater samples were taken in 2001. In addition, one seep sample was collected (IS47SP01) at an unknown swale just north of the Site 8 Swale, as shown on Figure 3-1. The seep sample was collected through a stainless steel drive-point using a Teflon bailer.

MIP/EC investigation and direct-push groundwater sampling continued on June 12 through June 28, 2002. Eighteen MIP/EC probes were conducted (MIP-21 through MIP-39, Figure 3-2) and 19 direct-push groundwater samples (IS47GW23 through IS47GW43) (Figure 3-1). Again, the locations focused primarily on the area east of the original investigation, with some locations to the northeast and southeast to define extent in these directions. All samples, except for IS47GW43, were analyzed for VOCs. Sample IS47GW43 was not submitted for laboratory analysis because no VOCs were detected in sample IS47GW42. Samples collected in the vicinity of the reported barium pit also were analyzed for metals ('total', filtered using a 1-µm filter; and dissolved, filtered using a 0.45-µm filter). Several of these samples located further downgradient of the reported barium pit also were analyzed for metals in order to evaluate the potential downgradient extent of any detected barium plume.

3.4 Surface-Soil Sampling

Twelve surface soil samples (47SA01 through 47SA12) were collected around Building 856 between August 28 and September 4, 1992, at the locations shown on Figure 3-3. Surface soil samples were analyzed for TCL VOCs, SVOCs, and TAL Metals.

Twelve surface-soil samples (RI47SS01 through RI47SS12) were collected around Building 856 on July 13 and 14, 1999, at the locations shown in Figure 3-3. The purpose of the sampling was to supplement the results of surface-soil sampling performed during the SI and to determine if site-related constituents were transported away from Building 856. The locations, where overland flow appears to be concentrated, are ditches that run from the building. These ditches are mainly on the south side of Building 856. For the north side, samples were collected where pipes connected to the building may have discharged**.**

All surface-soil samples were collected from the top 12 inches of soil at each of the sample locations using a stainless-steel trowel. The samples were analyzed for TCL VOCs and SVOCs, TAL inorganics, and explosives (including nitroglycerin, nitroguanidine, and PETN).

The following describes the specific locations for each of the soil samples:

- **RI47SS01 –** Between the two easterly chutes on the north side of Building 856. In this area, a shallow ditch runs north–south, just west of location RI47SS01, and then turns westward toward location RI47SS11.

- **RI47SS02** – At the corner between the north side of Building 856 and the west side of Building 856B. Apparently wash down from the inside of Building 856 was brushed out onto the grass here.
- **RI47SS03** – Fifteen feet north of sample RI47SS02.
- **RI47SS04** – Approximately 45 feet west of sample RI47SS03.
- **RI47SS05 –** Four-and-one-half feet northeast of the door to Building 856C. Building 856C has a storage basin with a depth of about 6 feet bgs. This basin is used for collecting washdown water from Building 856.
- **RI47SS06 –** Just east of five plastic 55-gallon drums which lie on their sides on the east side of Building 856C.
- **RI47SS07 –** Just east of escape chute (the longer and most-easterly chute) on the south side of Building 856.
- **RI47SS08 –** On the opposite side of drive path from location RI47SD01. Point of sampling is situated on a gentle slope down from the drive path. The slope dips eastward into a north-south running ditch 8 feet away.
- **RI47SS09 –** North of the ditch oriented east to west and directly north of well IS47MW04, just on the curve of the slope that runs into the ditch.
- **RI47SS10** – On the east side of Building 856. A substantial pile of leaves was moved before sampling.
- **RI47SS11 –** In the ditch that runs in a southeast direction from Building 856A.
- **RI47SS12 –** Between two pipes running 4 feet up from the ground against the northern wall of Building C27. Sample point is closer to the more-eastern pipe.

Nine surface soil samples (IS47SS14 through IS47SS22) were collected on March 20, 2001. Five of the samples (IS47SS14 through IS47SS18) were located at the bottom of the drainage ditches on the southern and western sides of Site 47. The purpose of the sampling was to further determine the nature and extent of potential contamination in the drainage ditches at Site 47. Four of the samples (IS47SS19 through IS47SS22) were located within the area of reported disposal west of Building 766. The purpose of collecting these samples was to determine whether chemicals reportedly disposed of on the ground in the area have contaminated surrounding surface soil.

The following describes the specific locations for each of the soil samples:

- **IS47SS14** – In the drainage ditch just south of Building 1794.
- **IS47SS15 –** In the drainage ditch just southwest of Building 1285.
- **IS47SS16 –** In the upstream end of the main drainage ditch.
- **IS47SS17 –** In the upstream end of the main drainage ditch.
- **IS47SS18** – In the drainage ditch just south of the magazines.

- **IS47SS19 –** From reported chemical disposal area across Caffee Road from Building 766.

- **IS47SS20 –** From reported chemical disposal area across Caffee Road from Building 766.
- **IS47SS21 –** From reported chemical disposal area across Caffee Road from Building 766.
- **IS47SS22 –** From reported chemical disposal area across Caffee Road from Building 766.

All surface-soil samples were collected from the top 12 inches of soil at each of the sample locations using a stainless-steel trowel. The samples were analyzed for TCL VOCs and SVOCs, TAL inorganics, and LC PAHs. In addition, samples IS47SS14 - IS47SS18 were analyzed for perchlorate, and TOC, and samples IS47SS19 - IS47SS22 were analyzed for explosives, nitroglycerin, and TOC.

Figure 3-3 also includes the locations of samples collected during the SI performed by Brown and Root in 1992. Sampling at this time was limited to the south side of Building 856, in the vicinity of the former mercuric nitrate disposal area.

3.5 Subsurface-Soil Sampling

Four subsurface soil samples (IS47SB16 through IS47SB19) were collected on October 10, 2000 at the locations just south of Building 856 shown on Figure 3-4. Subsurface soil samples were collected from depths of 2 to 3 feet below ground surface. Samples were analyzed for TCL VOCs and SVOCs, and for TAL metals and cyanide.

Ten subsurface soil samples (IS47SB01 through IS47SB10) were collected between March 20 and March 30, 2001 at the locations described below and shown on Figure 3-4. Subsurface soil samples were collected from depths of 2 to 3 feet below ground surface. Samples IS47SB01 through IS47SB06 were analyzed for TOC and samples IS47SB07 through IS47SB10 were analyzed for TCL VOCs and SVOCs, TAL metals, explosives, perchlorate, and TOC.

- **IS47SB01 –** From borehole for monitoring well IS47MW05.
- **IS47SB02 –** From borehole for monitoring well IS47MW06.
- **IS47SB03 –** From borehole for monitoring well IS47MW07.
- **IS47SB04 –** From borehole for monitoring well IS47MW08.
- **IS47SB05 –** From borehole for BH-1.
- **IS47SB06 –** From borehole for monitoring well IS47MW10.
- **IS47SB07 –** From reported chemical disposal area across Caffee Road from Building 766.
- **IS47SB08 –** From reported chemical disposal area across Caffee Road from Building 766.
- **IS47SB09 –** From reported chemical disposal area across Caffee Road from Building 766.
- **IS47SB10 –** From reported chemical disposal area across Caffee Road from Building 766.

Five subsurface soil samples (IS47SB11 through IS47SB15) were collected on June 19 and 20, 2002 at the locations described below and shown on Figure 3-4. Samples were collected at 8 feet bgs at locations near the former barium pit. Samples were analyzed for TCL VOCs, and also for TAL metals to determine whether or not soil has been impacted by barium sulfate.

- **IS47SB11 –** East of Building 856 (at the former barium pit).
- **IS47SB12 –** East of Building 856 (at the former barium pit).
- **IS47SB13 –** East of Building 856 (at the former barium pit).
- **IS47SB14 –** East of Building 856 (at the former barium pit).
- **IS47SB15 –** East of Building 856 (at the former barium pit).

Lithologic logs of the soil borings are provided in Appendix A.

3.6 Surface Water Sampling

Two surface water samples (IS47SW01 and IS47SW02) were collected on March 19, 2001 from the downstream end of the main drainage ditch as shown on Figure 3-1. The samples were collected to determine the nature and extent of potential contamination in the surface water in the main drainage ditch. The samples were analyzed for TCL VOCs and SVOCs, TAL metals and cyanide, perchlorate, TOC, and hardness. Two surface water samples (IS47SW03 and IS47SW04) were collected on October 29, 2001 from the unnamed swales north of Building 1769 as shown on Figure 3-1. Samples were analyzed for TCL VOCs.

Two surface water samples (RI47SW03 and RI47SW04) were collected on October 29, 2001 from the unnamed swale east of Building 854 (Figure 1). The samples were analyzed for TCL VOCs.

Four surface water samples (IS47SW05 through IS47SW08) were collected on June 17 through June 20, 2002. Samples IS47SW05 and IS47SW06 were collected in the unnamed swale east of Site 47 and samples IS47SW07 and IS47SW08 were collected in the Site 8 Swale as shown on Figure 3-1. The samples were analyzed for LC VOCs.

Four surface water samples (IS47SW09 through IS47SW12) were proposed in the work plan. However, only three samples (IS47SW10 throughIS47SW12) could be collected on September 25, 2002. Sample IS47SW09 could not be collected because the swale was dry. Samples were collected from the Site 8 Swale and from the unnamed swale northeast of Site 47 as shown on Figure 3-1. Samples were analyzed for TCL VOCs.

3.7 Sediment Sampling

Five sediment samples were collected on July 14, 1999. One sample was collected from industrial wastewater discharge manhole IW91, located approximately 100 feet west of Building 856, to evaluate whether Building 856 constituents are being carried into the sewer line. The remaining samples were collected from various locations south of Site 47 to determine if surface-water runoff is carrying contaminants away from the building and into nearby drainage ditches.

All sediment samples were collected from the top 12 inches of soil at each of the sample locations (except in Manhole IW91) using a stainless-steel trowel. The samples were analyzed for TCL VOCs and SVOCs, TAL metals, explosives, nitroglycerin, nitroguanidine, PETN, cyanide, and TOC.

Each of the sample locations is described below and shown in Figure 3-3:

- **IS47IW91** - The location is a manhole that is approximately 15 feet deep and has pipes running east-west to and from the manhole. What looks to be a body of sediment 2 feet long by 1.5 feet wide by 1.5 inches thick had accumulated at the manhole bottom. This sewer-sediment sample was collected using a small coal shovel, which was decontaminated before use and attached to a 15-foot long, 1-inch diameter PVC pipe. Several scraping motions were made to collect soil. Once the pipe was raised to the surface, one person held the device while the other scraped the sediment into the respective jars for the various analyses.
- **RI47SD01** – The location is next to a pipe that was placed below a small bridge allowing vehicular access to Building 856. The pipe allows surface-water runoff from the ditch to continue below the driveway, which is situated just east of Boyd Road.
- **RI47SD02** – The location is at a sediment catchment at the bottom of the drainage ditch carrying runoff southward away from Building 856.
- **RI47SD03** – The location is about 30 feet downstream from location RI47SD02.
- **RI47SD04** – The location is about 68 feet downstream from location RI47SD03, where the drainage ditch turns to the south.

Two sediment samples (IS47SD05 and IS47SD06) were collected on March 20, 2001. Samples were collected at downstream locations in the main drainage ditch between Site 47 and Caffee Road (Figure 3-3) to help characterize potential contamination in these ditches that may have been transported during surface-runoff events and to also investigate the possibility that contamination has been contributed to the ditch from the reported chemical disposal area near Building 766. Sediment samples were collected from the top 12 inches of sediment at each of the sample locations using a stainless-steel trowel. Samples were analyzed for TCL VOCs and SVOCs, LC PAHs, TAL metals, explosives, perchlorate, TOC, and grain size.

All sediment samples were collected from the top 12 inches of soil at each of the sample locations using a stainless-steel trowel.

Each of the sample locations is described below:

- **IS47SD05 –** At the downstream end of the main drainage ditch between Site 47 and Caffee Road.
- **IS47SD06 –** At the downstream end of the main drainage ditch between Site 47 and Caffee Road.

3.8 Monitoring-Well Sampling and Water-Level Survey

Groundwater monitoring-well samples were collected on multiple occasions between 1999 and 2002. Before sampling each well, the well was purged to remove at least three well volumes of water. During purging, groundwater from each monitoring well was monitored for pH, specific conductance, oxidation-reduction potential (ORP), turbidity, dissolved oxygen, and temperature. After purging was complete, a final measurement of these parameters was recorded. Table 3-3 contains the values of the purge parameters. Before each round of groundwater sampling, a round of water-level measurements was collected from all Site 47 monitoring wells to provide data for a map of the water table in the shallow water-bearing unit. The sections below describe the chronology of monitoring-well sampling, and identify the parameters analyzed during each of the sampling events. Any issues or concerns noted during each sampling event also are described.

Two rounds of groundwater samples initially were collected from monitoring wells IS47GW01 through IS47GW04 at Site 47. The samples were collected on July 13, 1999, and on January 5, 2000. The ORP and pH meters were not operating properly during the July 1999 sampling event, so no values for these parameters were obtained.

Samples from each well were analyzed for low-concentration (LC) VOCs, TCL SVOCs, TAL total and dissolved metals, cyanide, explosives, nitroglycerin, nitroguanidine, and PETN.

After the initial sampling in July 1999, the Navy requested that the wells be resampled for perchlorate. This was performed on January 5, 2000; in results tables, perchlorate results are included with results from samples collected in July 1999.

Two subsequent rounds of groundwater samples were collected from monitoring wells IS47MW01 through IS47MW10. The first round of samples was collected on April 9 and 10, 2001, and the wells were resampled as described below on April 16, 2001.

On April 9 and 10, 2001, samples from wells IS47GW01 through IS47GW04 and IS47MW08 were analyzed for TCL VOCs, and wells IS47MW05 through IS47MW07, IS47MW09 and IS47MW10 were analyzed for LC VOCs. All samples were analyzed for TCL SVOCs, explosives, perchlorate, TOC and monitored natural attenuation (MNA) parameters. MNA parameters were collected to provide a baseline of data for future evaluation of MNA during the feasibility study as a potential remedial alternative.

Monitoring wells IS47MW01 through IS47MW10 were resampled for total and dissolved TAL metals, cyanide, manganese, and ferrous iron on April 16, 2001.

Groundwater samples were scheduled to be collected from monitoring wells IS47MW03, IS47MW04, and IS47MW11 through IS47MW13 as defined in the September 7, 2001 work plan (CH2M HILL, 2001). Due to the low groundwater levels, samples could not be taken from these monitoring wells.

Groundwater samples were collected from monitoring wells IS47MW03, IS47MW04, and IS47MW11 through IS47MW15 between September 25 and September 27, 2002. Samples from IS47MW03 and IS47MW04 were analyzed for TCL VOCs. Samples from wells IS47MW11 through IS47MW15 were analyzed for LC VOCs, as well as the MNA parameters sulfate, nitrate, chloride, ferrous iron, TOC, methane, ethane, and ethene.

3.9 Concrete Sampling

Two samples of concrete (RI47CO01 and RI47CO02) were taken near the northwest corner of Building 856A. Both samples were taken within concrete surface conduits emanating out from Building 856 and into Building 856A to assess the possibility that constituents leaving Building 856 via the concrete conduits had contaminated the conduits.

Samples were taken using a concrete corer. The corer was 2 inches in diameter, and drilling 3 to 4 inches into the concrete was enough to fill a single 4-ounce jar. The core samples were crushed into sand-sized grains using a hammer, and a plastic bag to contain the sample. Multiple cores were taken at each sample point to allow the filling of adequate 4-ounce jars for the respective analytical parameters. The parameters sampled were analyzed for TCL SVOCs, TAL inorganics, and explosives.

3.10 Ecological Inventory

On September 23, 1999, CH2M HILL staff conducted a qualitative habitat assessment at Site 47. The assessment comprised visiting the site and observing the topography, surface-drainage features, the presence or absence of surface water, and vegetation. The visit included the extent of the main drainage ditch at the site down to Caffee Road, about 300 feet south of the site. Observations made during the ecological inventory are discussed in Section 9.

3.11 References

CH2M HILL. 2001. *Interim Final Work Plan for Additional Remedial Investigation Activities Site 47,* Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland. February.

CH2M HILL. 2001. *Work Plan for Additional Remedial Investigation Activities Site 47,* Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland. September.

CH2M HILL. 2002. *Work Plan for Additional Remedial Investigation Activities Site 47,* Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland. May.

TABLE 3-1
Sample Parameters
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	Sample ID	Media	Analyses*															
			TCL VOC (OLM04)	LC VOC (OLM04)	TCL SVOC (OLM04)	LC PAH (SW 846 8310)	TAL Metals (ILM04)	Filtered Metals (ILM04)	Explosives (SW 846-8330)	Nitroglycerin (SW 846 8332)	Nitroguanidine (SW 846 8330)	Ammonium Perchlorate (314)	Cyanide (ILMO4)	TOC (415.1)	Sulfate, Nitrate, Chloride (300.0)	Methane, Ethane, Ethene (RSK 175)	Hardness (MCAWW 130.2)	PH
Direct-Push Groundwater Samples																		
IS47GW01	IS47GW010301	water		X				X										
IS47GW02	IS47GW220301	water		X				X										
IS47GW02	IS47GW020301	water		X				X										
IS47GW03	IS47GW030301	water		X				X										
IS47GW04	IS47GW040301	water		X				X										
IS47GW05	IS47GW050301	water		X				X										
IS47GW06	IS47GW060301	water		X				X										
IS47GW07	IS47GW070301	water		X				X										
IS47GW08	IS47GW080301	water		X				X										
IS47GW09	IS47GW090301	water		X				X										
IS47GW10	IS47GW100301	water		X				X										
IS47GW11	IS47GW110301	water		X				X										
IS47GW12	IS47GW120301	water		X				X										
IS47GW12	IS47GW320301	water		X				X										
IS47GW23	IS47GW230602	water		X														
IS47GW24	IS47GW240602	water		X														
IS47GW25	IS47GW250602	water		X			X	X										
IS47GW26	IS47GW260602	water		X			X	X										
IS47GW27	IS47GW270602	water		X			X	X										
IS47GW27	IS47GW270602P	water		X														
IS47GW28	IS47GW280602	water		X														
IS47GW29	IS47GW290602	water		X														
IS47GW30	IS47GW300602	water		X			X	X										
IS47GW31	IS47GW310602	water		X			X	X										
IS47GW32	IS47GW320602	water		X			X	X										
IS47GW33	IS47GW330602	water		X			X	X										
IS47GW33	IS47GW330602P	water		X			X	X										
IS47GW34	IS47GW340602	water		X			X	X										
IS47GW35	IS47GW350602	water		X			X	X										
IS47GW36	IS47GW360602	water		X			X	X										
IS47GW36	IS47GW360602P	water		X														
IS47GW37	IS47GW370602	water		X			X	X										
IS47GW38	IS47GW380602	water		X			X	X										
IS47GW39	IS47GW390602	water		X			X	X										
IS47GW40	IS47GW400602	water		X														
IS47GW41	IS47GW410602	water		X														
IS47GW42	IS47GW420602	water		X														
RI47GW13	RI47GW13	water		X														
RI47GW14	RI47GW14	water		X														
RI47GW15	RI47GW15	water		X														
RI47GW16	RI47GW16	water		X														
RI47GW17	RI47GW17	water		X														
RI47GW18	RI47GW18	water		X														
RI47GW19	RI47GW19	water		X														
RI47GW20	RI47GW20	water		X														
RI47GW21	RI47GW21	water		X														
RI47GW22	RI47GW22	water		X														
IS47SP01	IS47SP01	water	X															
Monitoring Well Samples																		
IS47MW01	IS47MW010401	water	X		X		X	X	X	X	X	X	X	X	X			
IS47MW02	IS47MW020401	water	X		X		X	X	X	X	X	X	X	X	X			
IS47MW03	IS47MW030401	water	X		X		X	X	X	X	X	X	X	X	X			
IS47MW03	IS47MW030902	water	X															
IS47MW04	IS47MW040401	water	X		X		X	X	X	X	X	X	X	X	X			

VOC-Volatile Organic Compound
SVOC-Semi-Volatile Organic Compound
TPH- Total petroleum Hydrocarbon

TAL-Target Analyte List
TCL-Target Compound List
TOC- Total organic carbon

TABLE 3-1
Sample Parameters
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	Sample ID	Media	Analyses*															
			TCL VOC (OLM04)	LC VOC (OLM04)	TCL SVOC (OLM04)	LC PAH (SW 846 8310)	TAL Metals (ILM04)	Filtered Metals (ILM04)	Explosives (SW 846-8330)	Nitroglycerin (SW 846 8332)	Nitroguanidine (SW 846 8330)	Ammonium Perchlorate (314)	Cyanide (ILMO4)	TOC (415.1)	Sulfate, Nitrate, Chloride (300.0)	Methane, Ethane, Ethene (RSK 175)	Hardness (MCAWW 130.2)	PH
IS47MW04	IS47MW040902	water	X															
IS47MW05	IS47MW050401	water		X	X		X	X	X	X	X	X	X	X	X			
IS47MW06	IS47MW060401	water		X	X		X	X	X	X	X	X	X	X	X			
IS47MW07	IS47MW070401	water		X	X		X	X	X	X	X	X	X	X	X			
IS47MW07	IS47MW410401	water		X	X		X	X	X	X	X	X	X	X	X			
IS47MW08	IS47MW080401	water	X		X		X	X	X	X	X	X	X	X	X			
IS47MW09	IS47MW090401	water		X	X		X	X	X	X	X	X	X	X	X			
IS47MW10	IS47MW100401	water		X	X		X	X	X	X	X	X	X	X	X			
IS47MW11	IS47MW110602	water		X														
IS47MW11	IS47MW110902	water		X											X	X		
IS47MW12	IS47MW120902	water		X											X	X		
IS47MW13	IS47MW130902	water		X											X	X		
IS47MW13	IS47MW130902P	water		X											X	X		
IS47MW14	IS47MW140902	water		X											X	X		
IS47MW15	IS47MW150902	water		X											X	X		
IS47MW01	RI47GW01	water		X	X		X	X	X	X	X	X						
IS47MW02	RI47GW02	water		X	X		X	X	X	X	X	X						
IS47MW03	RI47GW03	water		X	X		X	X	X	X	X	X						
IS47MW03	RI47GW99	water		X	X		X	X	X	X	X	X						
IS47MW04	RI47GW04	water		X	X		X	X	X	X	X	X						
Subsurface Soil Samples																		
IS47SB01	IS47SB010204	soil												X				
IS47SB02	IS47SB020203	soil												X				
IS47SB03	IS47SB030203	soil												X				
IS47SB04	IS47SB040506	soil												X				
IS47SB05	IS47SB050203	soil												X				
IS47SB06	IS47SB060203	soil												X				
IS47SB07	IS47SB070304	soil	X		X		X		X	X	X	X		X				
IS47SB08	IS47SB080304	soil	X		X		X		X	X	X	X		X				
IS47SB09	IS47SB090304	soil	X		X		X		X	X	X	X		X				
IS47SB10	IS47SB100304	soil	X		X		X		X	X	X	X		X				
IS47SB11	IS47SB110602	soil					X											
IS47SB12	IS47SB120602	soil					X											
IS47SB12	IS47SB120602P	soil					X											
IS47SB13	IS47SB130602	soil					X											
IS47SB14	IS47SB140602	soil					X											
IS47SB15	IS47SB150602	soil					X											
RI47SO13	IS47SB17	soil	X		X		X						X					
RI47SO14	IS47SB18	soil	X		X		X						X					
RI47SO15	IS47SB19	soil	X		X		X						X					
RI47SO16	IS47SB16	soil	X		X		X						X					
RI47SO16	IS47SB98	soil	X		X		X						X					
Surface Soil Samples																		
47SA01	47SA01	soil	X		X		X											
47SA01	47SA01D	soil	X		X		X											
47SA02	47SA02	soil	X		X		X											
47SA02	47SA02D	soil	X		X		X											
47SA03	47SA03	soil	X		X		X											
47SA04	47SA04	soil	X		X		X											
47SA05	47SA05	soil	X		X		X											
47SA06	47SA06	soil	X		X		X											
47SA07	47SA07	soil	X		X		X											
47SA08	47SA08	soil	X		X		X											
47SA09	47SA09	soil	X		X		X											
47SA10	47SA10	soil	X		X		X											

VOC-Volatile Organic Compound
SVOC-Semi-Volatile Organic Compound
TPH- Total petroleum Hydrocarbon

TAL-Target Analyte List
TCL-Target Compound List
TOC- Total organic carbon

TABLE 3-1
Sample Parameters
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

			Analyses*															
Station ID	**Sample ID**	**Media**	**TCL VOC (OLM04)**	**LC VOC (OLM04)**	**TCL SVOC (OLM04)**	**LC PAH (SW 846 8310)**	**TAL Metals (ILM04)**	**Filtered Metals (ILM04)**	**Explosives (SW 846-8330)**	**Nitroglycerin (SW 846 8332)**	**Nitroguanidine (SW 846 8330)**	**Ammonium Perchlorate (314)**	**Cyanide (ILMO4)**	**TOC (415.1)**	**Sulfate, Nitrate, Chloride (300.0)**	**Methane, Ethane, Ethene (RSK 175)**	**Hardness (MCAWW 130.2)**	**PH**
47SA11	47SA11	soil	X		X		X											
47SA12	47SA12	soil	X		X		X											
SS-01	RI47SS01	soil	X		X		X		X	X	X		X					X
SS-02	RI47SS02	soil	X		X		X		X	X	X		X					X
SS-03	RI47SS03	soil	X		X		X		X	X	X		X					X
SS-04	RI47SS04	soil	X		X		X		X	X	X		X					X
SS-05	RI47SS05	soil	X		X		X		X	X	X		X					X
SS-06	RI47SS06	soil	X		X		X		X	X	X		X					X
SS-07	RI47SS07	soil	X		X		X		X	X	X		X					X
SS-07	IS47SS99	soil	X		X		X		X	X	X		X					X
SS-08	RI47SS08	soil	X		X		X		X	X	X		X					X
SS-09	RI47SS09	soil	X		X		X		X	X	X		X					X
SS-10	RI47SS10	soil	X		X		X		X	X	X		X					X
SS-11	RI47SS11	soil	X		X		X		X	X	X		X					X
SS-12	RI47SS12	soil	X		X		X		X	X	X		X					X
IS47SS14	IS47SS14	soil	X		X	X	X					X		X				
IS47SS14	IS47SS14P	soil	X		X	X	X					X		X				
IS47SS15	IS47SS15	soil	X		X	X	X					X		X				
IS47SS16	IS47SS16	soil	X		X	X	X					X		X				
IS47SS17	IS47SS17	soil	X		X	X	X					X		X				
IS47SS18	IS47SS18	soil	X		X	X	X					X		X				
IS47SS19	IS47SS19	soil	X		X	X	X		X	X	X			X				
IS47SS20	IS47SS20	soil	X		X	X	X		X	X	X			X				
IS47SS20	IS47SS20P	soil	X		X	X	X		X	X	X			X				
IS47SS21	IS47SS21	soil	X		X	X	X		X	X	X			X				
IS47SS22	IS47SS22	soil	X		X	X	X		X	X	X			X				
Sediment Samples																		
SD-01	RI47SD01	sediment	X		X		X		X	X	X		X					X
SD-02	RI47SD02	sediment	X		X		X		X	X	X		X					X
SD-02	RI47SD99	sediment	X		X		X		X	X	X		X					X
SD-03	RI47SD03	sediment	X		X		X		X	X	X		X					X
SD-04	RI47SD04	sediment	X		X		X		X	X	X		X					X
IS47SD05	IS47SD05	sediment	X		X	X	X					X		X				
IS47SD06	IS47SD06	sediment	X		X	X	X					X		X				
Sewer Sediment Samples																		
IW-91	RI47IW91	sediment	X		X		X		X	X	X		X					X
Surface Water Samples																		
IS47SW01	IS47SW01	water	X		X		X		X			X		X				
IS47SW02	IS47SW02	water	X		X		X		X			X		X				
IS47SW02	IS47SW02P	water	X		X		X		X			X		X				
RI47SW03	RI47SW03	water	X															
RI47SW04	RI47SW04	water	X															
IS47SW05	IS47SW050602	water		X														
IS47SW06	IS47SW060602	water		X														
IS47SW07	IS47SW070602	water		X														
IS47SW07	IS47SW070602P	water		X														
IS47SW08	IS47SW080602	water		X														
IS47SW10	IS47SW100902	water		X														
IS47SW10	IS47SW100902P	water		X														
IS47SW11	IS47SW110902	water		X														
IS47SW12	IS47SW120902	water		X														
Concrete Samples																		
CO-01	RI47CO01	concrete			X		X		X	X	X		X					
CO-02	RI47CO02	concrete			X		X		X	X	X		X					

VOC-Volatile Organic Compound
SVOC-Semi-Volatile Organic Compound
TPH- Total petroleum Hydrocarbon

TAL-Target Analyte List
TCL-Target Compound List
TOC- Total organic carbon

TABLE 3-2
Monitoring Well Construction Details—Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

Well Designation	Elevation at Top of Casing (ft msl)	Elevation at Ground Surface (ft msl)	Bottom of Screen		Top of Screen	
			Depth (ft bgs)	Elevation (ft msl)	Depth (ft bgs)	Elevation (ft msl)
Site 47						
IS47MW01	48.77	45.88	24.0	21.88	14	31.88
IS47MW02	42.01	42.29	17.0	25.29	7	35.29
IS47MW03	47.09	44.82	18.0	26.82	8	36.82
IS47MW04	43.08	40.57	16.0	24.57	6	34.57
IS47MW05	40.38	37.50	13.0	24.50	3	34.50
IS47MW06	41.58	39.30	15.0	24.30	5	34.30
IS47MW07	43.20	39.80	17.0	22.80	7	32.80
IS47MW08	48.05	45.20	19.0	26.20	9	36.20
IS47MW09	50.38	47.80	26.0	21.80	16	31.80
IS47MW10	44.38	40.70	17.0	23.70	7	33.70
IS47MW11	39.06	36.90	12.0	24.90	7	29.90
IS47MW12	34.95	33.40	12.0	21.40	7	26.40
IS47MW13	38.37	35.20	18.0	17.20	8	27.20
IS47MW14	30.11	26.10	20.0	6.10	10	16.10
IS47MW15	40.14	37.30	15.0	22.30	5	32.30

Notes:

ft msl = feet above mean sea level

ft bgs = feet below ground surface

Elevation at Ground Surface is approximate

TABLE 3-3
Stabilized Parameters from Groundwater Sampling—Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

Well	pH	ORP (millivolts)	Conductivity (MicroSiemens/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	Temperature (°C)
July 1999 Sampling Event						
IS47MW01	NA	NA	0.133	22	2.00	16.6
IS47MW02	NA	NA	0.108	635	3.92	25.5
IS47MW03	NA	NA	1.14	23	2.54	20.7
IS47MW04	NA	NA	0.133	188	2.89	22.1
January 2000 Sampling Event						
IS47MW01	5.6	82	0.372	87	10.10	16.5
IS47MW02	6.61	127	0.31	150	7.00	14.7
IS47MW03	5.24	187	0.101	890	8.90	14.7
IS47MW04	4.94	112	0.302	47	4.10	13.1
April 2001 Sampling Event						
IS47MW01	5.39	170	0.298	456	0.00	14.34
IS47MW02	5.85	121	0.216	250	3.17	14.53
IS47MW03	4.59	323	0.051	95.9	7.76	15.85
IS47MW04	3.94	128	0.405	298	0.00	10.28
IS47MW05	5.38	-14	0.149	271	0.00	11.98
IS47MW06	4.97	265	0.265	999	3.88	12.01
IS47MW07	4.81	195	0.307	530	0.27	13.45
IS47MW08	6.25	333	0.170	999	8.87	14.28
IS47MW09	4.52	264	0.147	205	5.03	15.06
IS47MW10	5.45	865	0.313	431	5.97	12.68
September 2002 Sampling Event						
IS47MW03	3.09	415	0.519	106	0.89	21.04
IS47MW04	4.10	-21	0.375	0.3	0.48	23.49
IS47MW11	5.97	95	0.180	0	2.95	20.71
IS47MW12	6.01	62	0.348	999	5.26	22.72
IS47MW13	5.91	-66	0.163	0	0.72	20.80
IS47MW14	4.83	157	0.520	198	1.52	21.47
IS47MW15	5.33	21	0.209	0	0.31	21.22

NA - Not analyzed due to pH and ORP meters not operating properly

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LEGEND

- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Surface Water Sample Location
- Seep Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Building
- Asphalt
- Dirt
- Gravel

N

0 300 600 Feet

Figure 3-1
Monitoring Well, Direct Push Groundwater, Surface Water, and Seep Sample Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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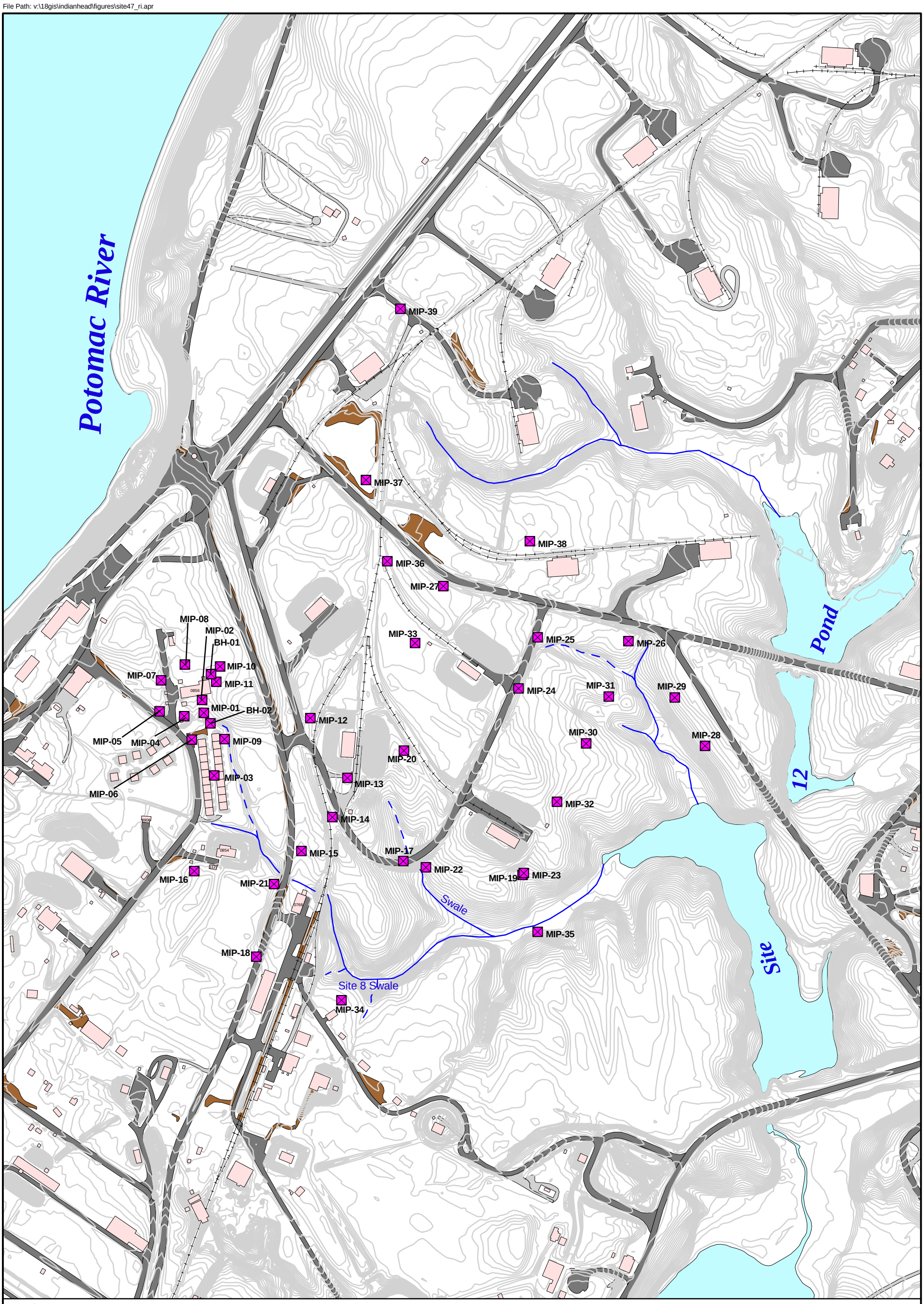

LEGEND

- MIP Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Building
- Asphalt
- Dirt
- Gravel

N

0 300 600 Feet

Figure 3-2
MIP Sample Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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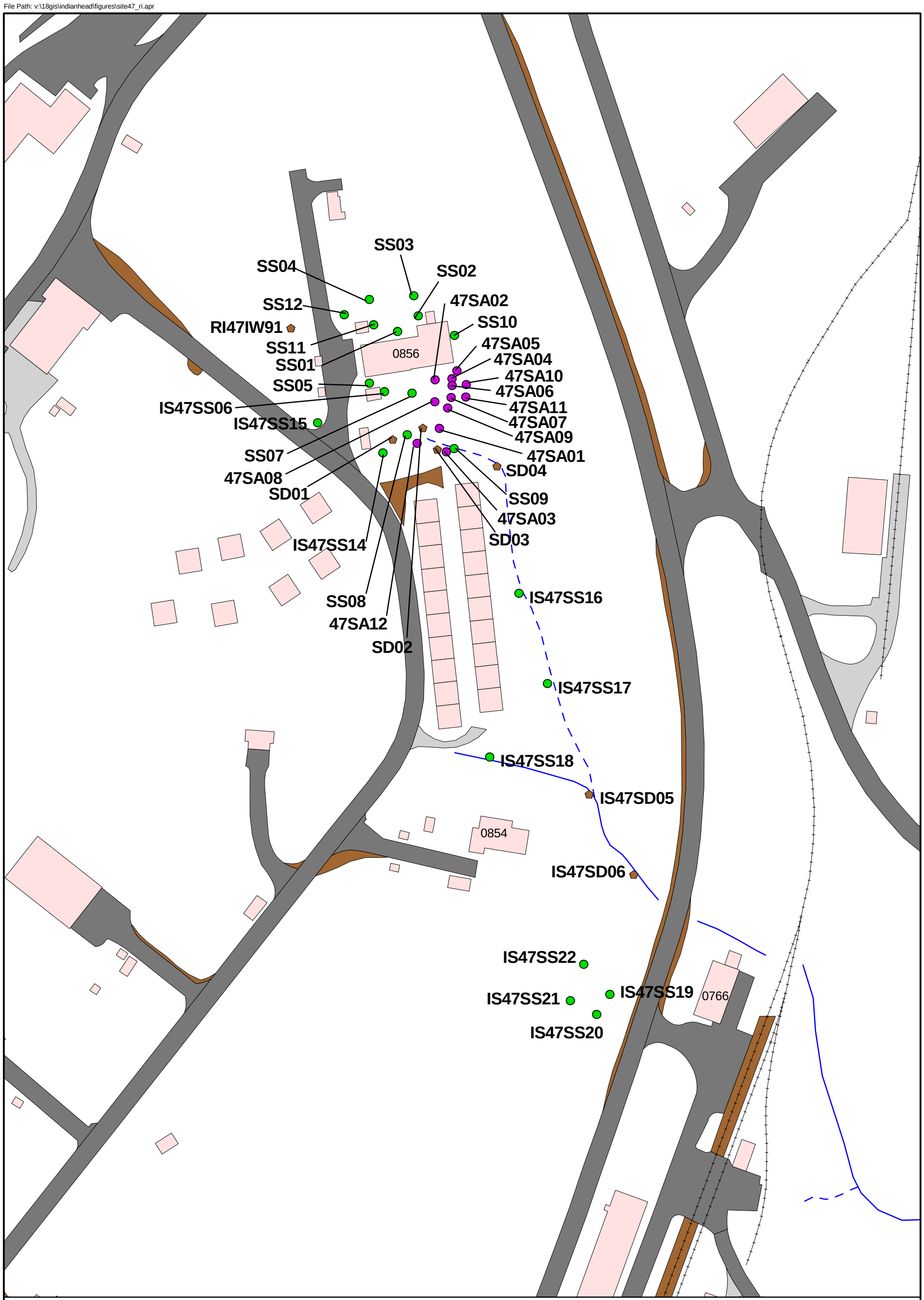

LEGEND

- Sediment Sample Location
- Surface Soil Sample Location
- 1992 Surface Soil Sample Location
- Perennial Swale
- Intermittent Swale
- Asphalt
- Dirt
- Gravel
- Railroad
- Building

N

0 100 200 Feet

Figure 3-3
Surface Soil and Sediment Sample Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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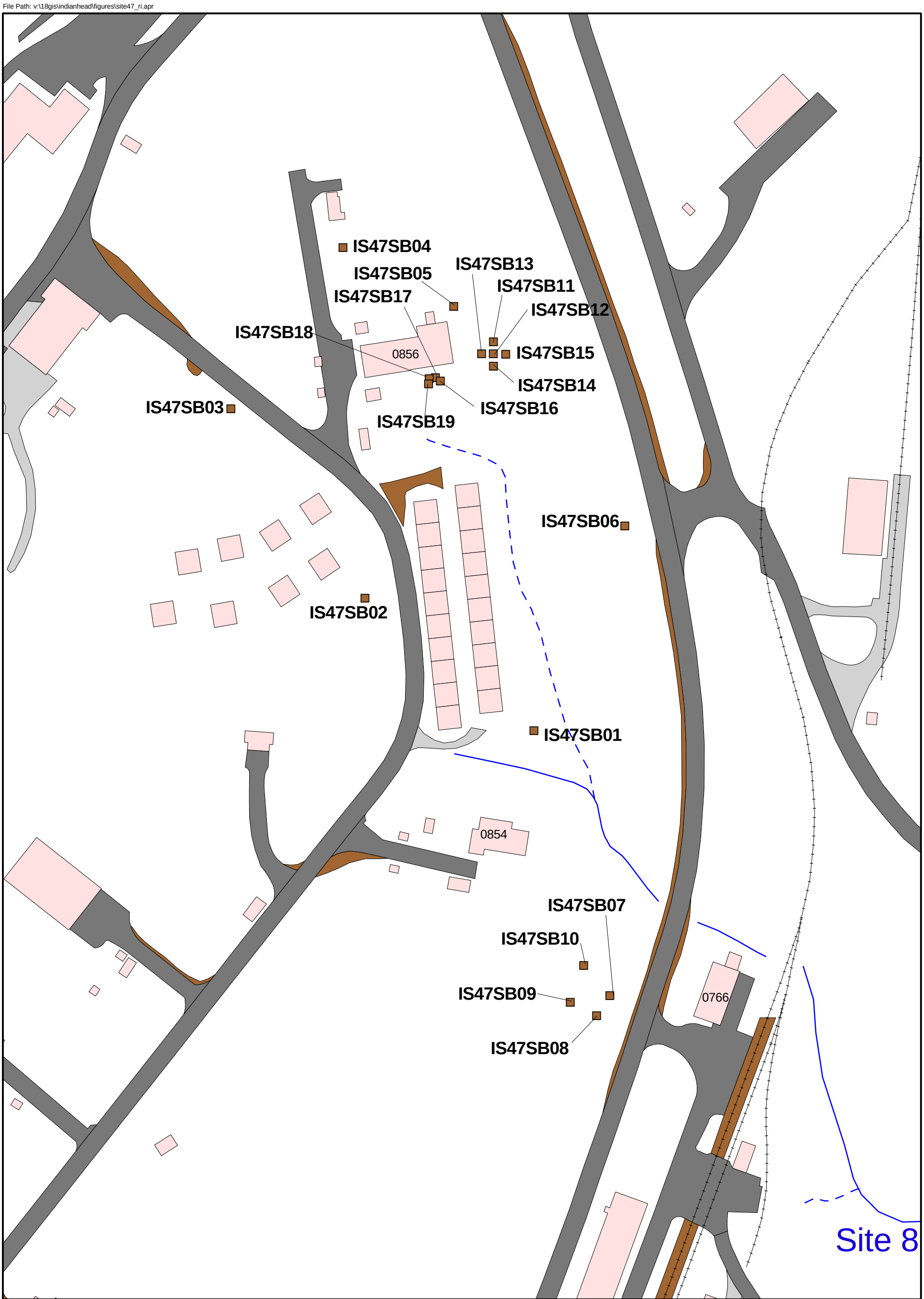

LEGEND
- Subsurface Soil Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Buildings
- Asphalt
- Dirt
- Gravel

N

0 100 200 Feet

Figure 3-4
Subsurface Soil Sample Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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SECTION 4

Site Topography and Geology

4.1 Topography

The topography of Site 47 is characterized as relatively flat in the area between the Potomac River and the Site 12 Pond. However, the valleys formed by the streams and swales that discharge to the Site 12 Pond and the valley surrounding the Site 12 Pond are prominent features. The drainage pattern is dendritic and the streams and swales are moderately incised. A typical elevation difference between the edge of the valley and the water surface is 25 feet with a slope of 1:6. The slope at the shoreline of the Potomac River is approximately twice as steep (Figure 4-1).

There are three surface water bodies near Site 47: the Potomac River to the west, the Site 12 Pond to the east, and Mattawoman Creek to the southeast. The Site 12 Pond was formerly connected to Mattawoman Creek and its water level fluctuated tidally. Drainage in the immediate vicinity of Building 856 follows a series of man-made drainage swales that discharge to the Site 8 Swale. Drainage swales are also present along the roads that traverse the site. These swales discharge to the Site 8 Swale as well as the other prominent streams and swales at the site.

Numerous man-made topographic features are present. The primary features are magazines used for explosive storage and the mounds built-up in front of the magazine doors in the event of an explosion. Some buildings used in the production of explosives have mounds that surround them, as well.

4.2 Geology

In order to obtain site-specific lithologic information, 17 hollow-stem auger (HSA) boreholes, 5 direct-push boreholes, and 41 electric conductivity (EC) logs were installed during the RI. Split-spoon samples were collected at 5-foot intervals during HSA drilling. Depths varied between 12 feet bgs (IS47MW12) and 27 feet bgs (IS47MW01). Continuous soil cores were collected from the direct-push soil borings. Each boring was installed to a total depth of 8 feet bgs. The EC logs were generated continuously during installation. Depths varied between 14 feet bgs and 43 feet bgs. Appendix A contains the HSA and direct-push boring logs and Appendix C presents the EC logs.

A review of the logs indicates that the shallow subsurface at site is characterized primarily by silty sand and underlain by a dense, gray clay. Both of these units are likely part of the Quaternary deposits discussed in Section 2.4.

The depth to the clay ranges between 1 and 24 feet bgs depending on surface elevation and location and slopes generally toward the southeast. In most instances the clay was only penetrated a few feet; however, at 6 locations, the clay was penetrated as much as 30 feet. At each location the thickness of the clay appears greater than 30 feet (i.e., the clay was not

fully penetrated at any of the locations). Figure 4-2 shows the locations the MIPs and borings used to obtain geologic data and the location of two geologic cross-sections (A-A′ and B-B′). Figure 4-3 presents cross-section A-A′, oriented approximately west-east through the site. Figure 4-4 shows cross-section B-B′, oriented approximately north-south through the site. Figure 4-5 presents a subsurface map of the clay layer.

As shown in Figures 4-3 and 4-4, a silt layer was encountered in the vicinity of Building 856. The silt layer was encountered in MIPs BH-1, BH-2, MIP-01, and MIP-02. Depth of the layer ranges between 8 and 16 feet bgs depending on elevation and location. The silt layer has only a limited areal extent and is, therefore, not a significant geologic feature at the site.

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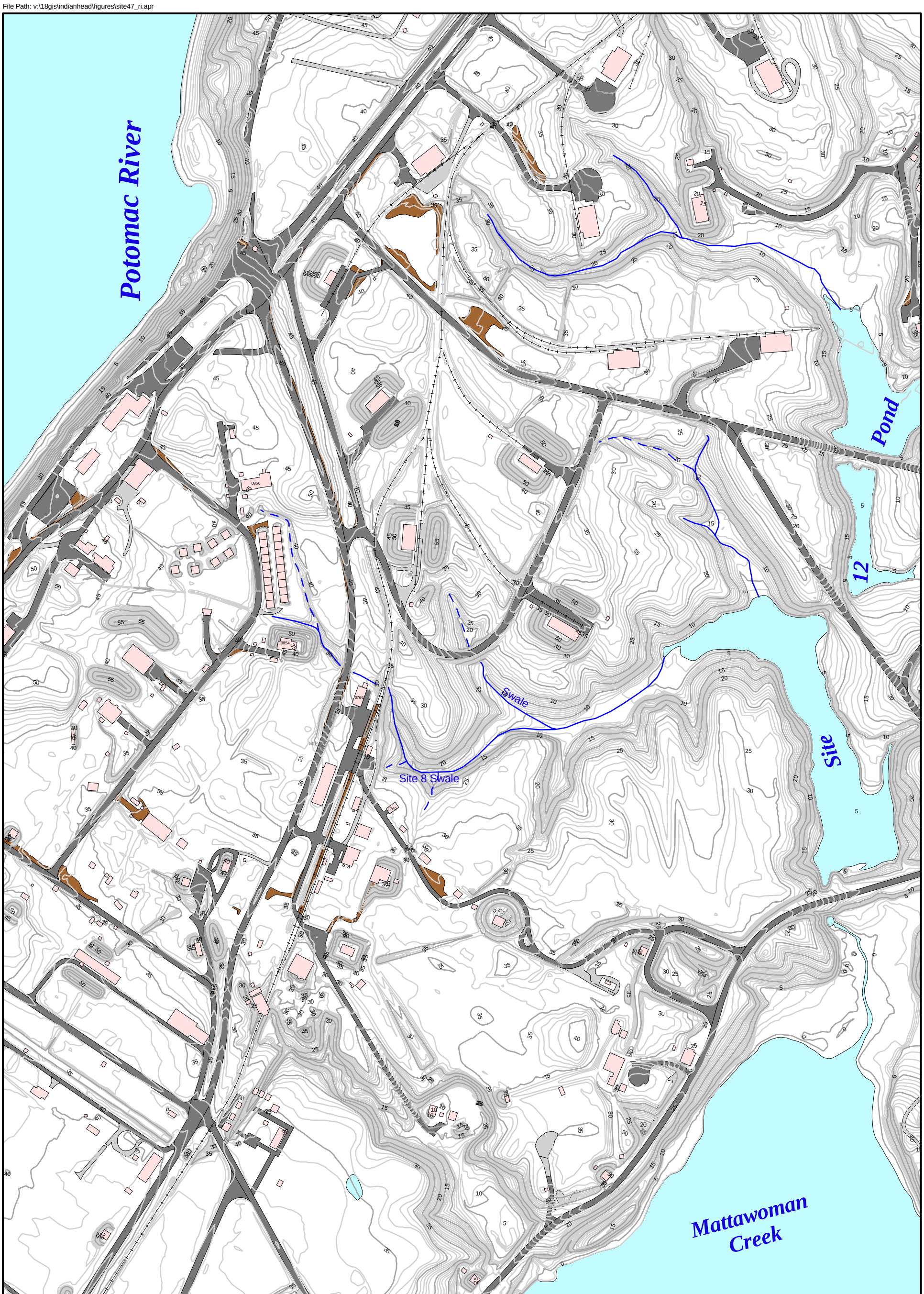

LEGEND

- Perennial Swale
- Intermittent Swale
- 5 Foot Elevation Contours
- 1 Foot Elevation Contours
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road
- 36 Elevation (feet above mean sea level)

N

0 300 600 Feet

Figure 4-1
Site Topography
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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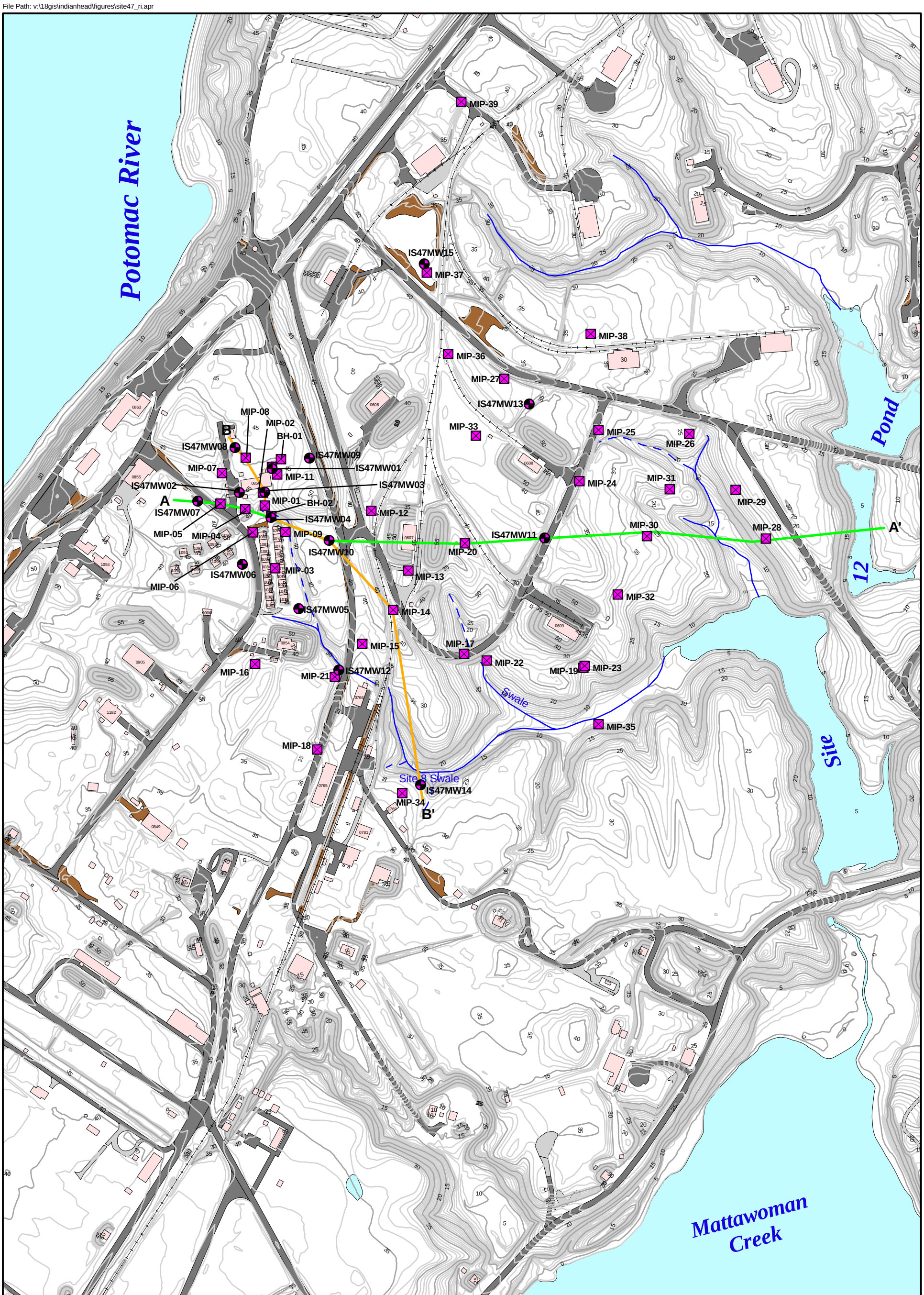

LEGEND

- Monitoring Well Locations
- MIP Locations
- Cross Section A - A'
- Cross Section B - B'
- Perennial Swale
- Intermittent Swale
- 5 Foot Elevation Contours
- 1 Foot Elevation Contours
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road
- 36 Elevation (feet above mean sea level)

N

0 300 600 Feet

Figure 4-2
Geologic Cross Section Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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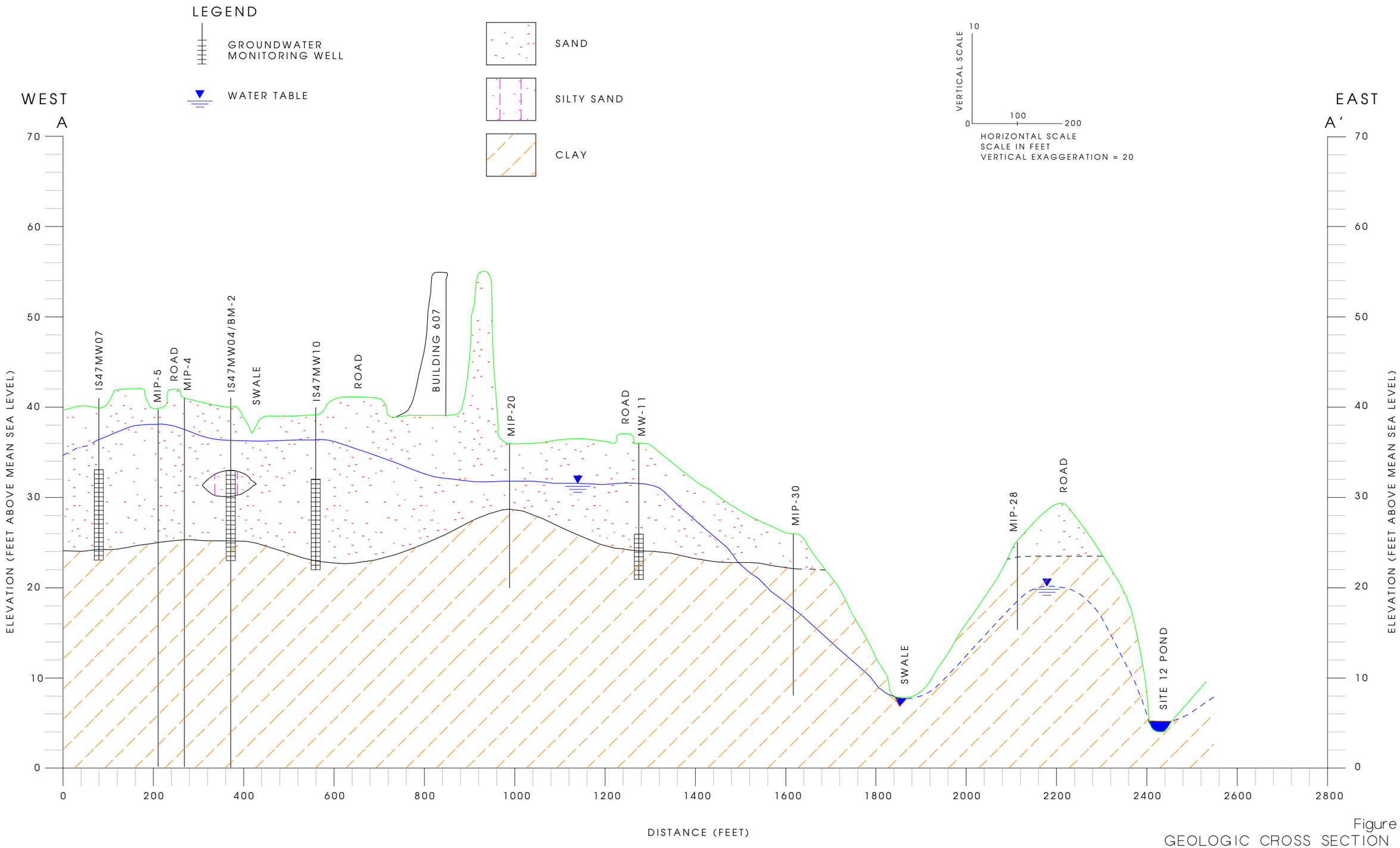

Figure 4-3
GEOLOGIC CROSS SECTION A-A'
SITE 47 REMEDIAL INVESTIGATION
IHDIV - NSWC
INDIAN HEAD, MARYLAND

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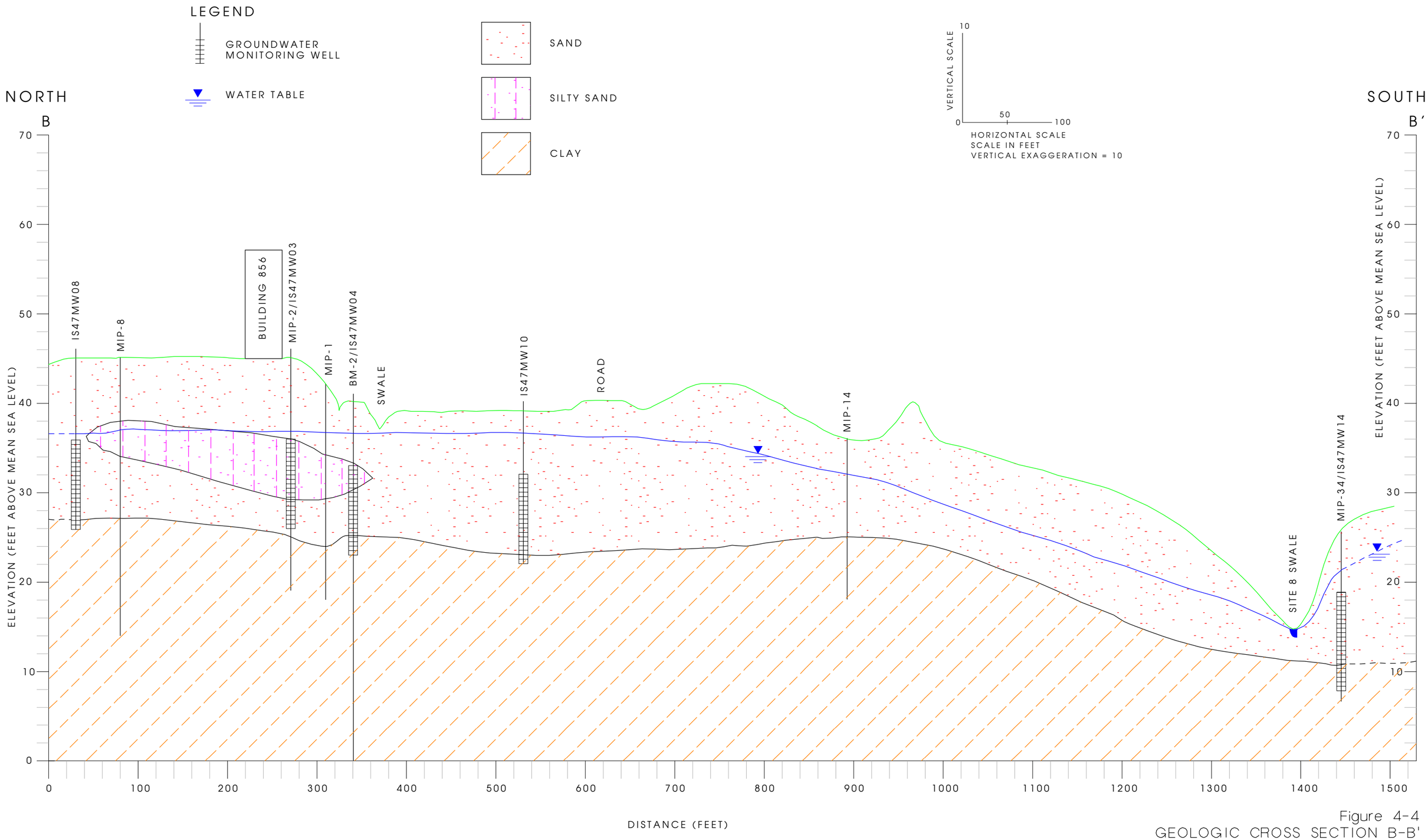

Figure 4-4
GEOLOGIC CROSS SECTION B-B'
SITE 47 REMEDIAL INVESTIGATION
IHDIV - NSWC
INDIAN HEAD, MARYLAND

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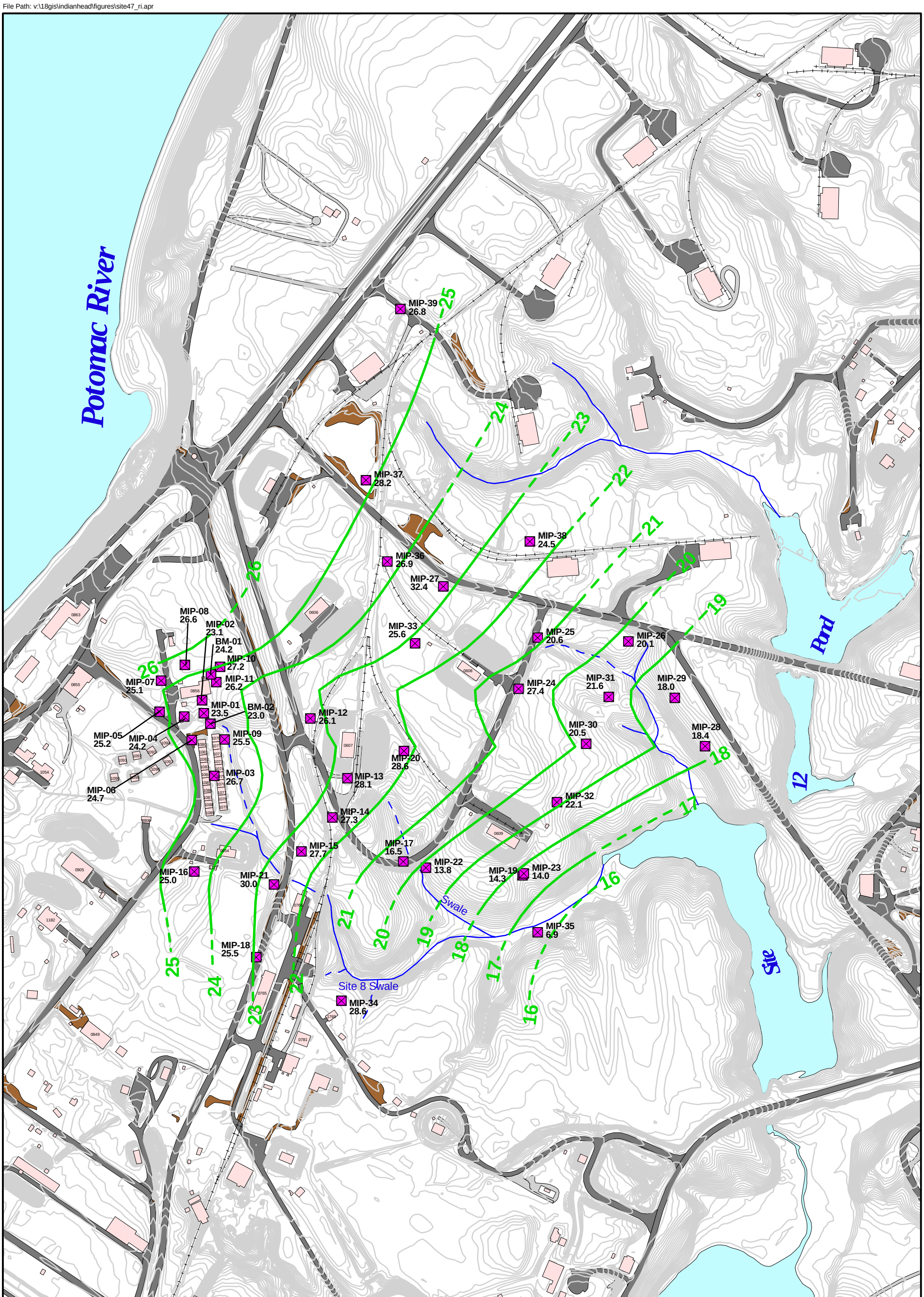

LEGEND

- Clay Elevation Contour, dashed where inferred
- MIP Sample Location
- Perennial Swale
- Intermittent Swale
- Buildings
- Asphalt
- Dirt
- Gravel
- 23 — Elevation of the top of the Clay Layer (feet above MSL)

N

0 300 600 Feet

Figure 4-5
Elevation of the Top of the Clay Layer
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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SECTION 5

Site Hydrogeology

5.1 Hydrogeology

As discussed in Section 4, the site appears to be immediately underlain by silty sand, which in turn is underlain by a clay layer of thickness greater than 30 feet. These are the two primary hydrostratigraphic units at the site. The silty sand acts as the primary water bearing unit and the underlying clay acts as a confining layer.

The water table was encountered at the site at elevations ranging from 21.67 feet above mean sea level (msl) in IS47MW14 to 37.48 feet above msl in IS47MW06 when measured on November 22, 2002 (Table 5-1). Figure 5-1 presents the water table map generated from the data collected on November 22, 2002 (the most complete round). The primary direction of groundwater flow across the site is to the southeast towards the Site 8 Swale. In areas north of Building 856, flow appears more easterly likely discharging directly to the Site 12 Pond. It should be noted, however, that similar hydraulic head values are observed in the monitoring wells near Building 856. Because the differences in head around this building are small, small head fluctuations observed in a given monitoring well may cause gradients to reverse. The fact that head values are similar and that small head differences can generate differences in water-table configurations near Building 856 suggests that the wells installed near Building 856 are on or near a groundwater divide. This is not surprising given that the Potomac River is approximately 800 feet to the west of Building 856.

Slug tests were performed in monitoring wells IS47MW01 through IS47MW10 to estimate the hydraulic conductivity of the silty sand. Conductivities ranged from 0.6-foot per day (feet/day) to 14.4 feet/day, with a geometric mean of 3.1 feet/day (Table 5-2; Appendix D). This is within the range of values reported by Domenico and Schwartz (1998) for fine- and medium-grained sand (0.05 foot/day to 140 feet/day).

Five shelby-tube samples were also collected from the underlying clay layer to estimate its hydraulic conductivity. Laboratory hydraulic conductivity testing was performed on these samples in accordance with ASTM D1587. Estimates ranged from 5.2×10^{-5} feet/day to 4.6×10^{-4} feet/day, with a geometric mean of 1.4×10^{-4} feet/day (Table 5-3; Appendix E). This is within the range of values reported by Domenico and Schwartz (1998) for clay (2.8×10^{-6} feet/day to 1.3×10^{-3} feet/day). These values reflect the low permeability of this unit and its role as a confining layer.

5.2 References

Domenico, P.A., and F.W. Schwartz. 1998. *Physical and Chemical Hydrogeology.* John Wiley & Sons, Inc. New York. 506 pp.

Table 5-1
Groundwater Elevations
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Monitoring Well	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation	Depth to Water	Groundwater Elevation
		07/13/1999		01/05/2000		04/09/2001		06/28/2001		01/31/2002		11/22/2002	
IS47MW01	48.77	13.91	34.86	12.05	36.72	11.19	37.58	12.38	36.39	14.15	34.62	12.41	36.36
IS47MW02	42.01	7.03	35.42	5.24	36.77	4.96	37.05	5.40	36.61	6.90	35.11	5.65	36.36
IS47MW03	47.09	12.11	34.98	9.74	37.35	9.06	38.03	9.99	37.10	12.10	34.99	10.28	36.81
IS47MW04	43.08	8.07	35.01	6.18	36.90	8.58	34.50	6.70	36.38	8.36	34.72	6.48	36.6
IS47MW05	40.38					4.95	35.43	5.49	34.89	6.35	34.03	5.10	35.28
IS47MW06	41.58					3.91	37.67	4.91	36.67	6.54	35.04	4.10	37.48
IS47MW07	43.20					5.24	37.96	6.62	36.58	8.47	34.73	6.45	36.75
IS47MW08	48.05					9.93	38.12	11.22	36.83	13.39	34.66	11.65	36.40
IS47MW09	50.38					12.65	37.73	13.98	36.40	15.78	34.60	14.08	36.30
IS47MW10	44.38					7.35	37.03	8.95	35.43	9.62	34.76	7.73	36.65
IS47MW11	39.06											7.52	31.54
IS47MW12	34.58											4.75	29.83
IS47MW13	38.52											4.76	33.76
IS47MW14	30.23											8.56	21.67
IS47MW15	40.14											4.62	35.52

Note: All Elevations are reported in feet above mean sea level.
All depths reported in feet.

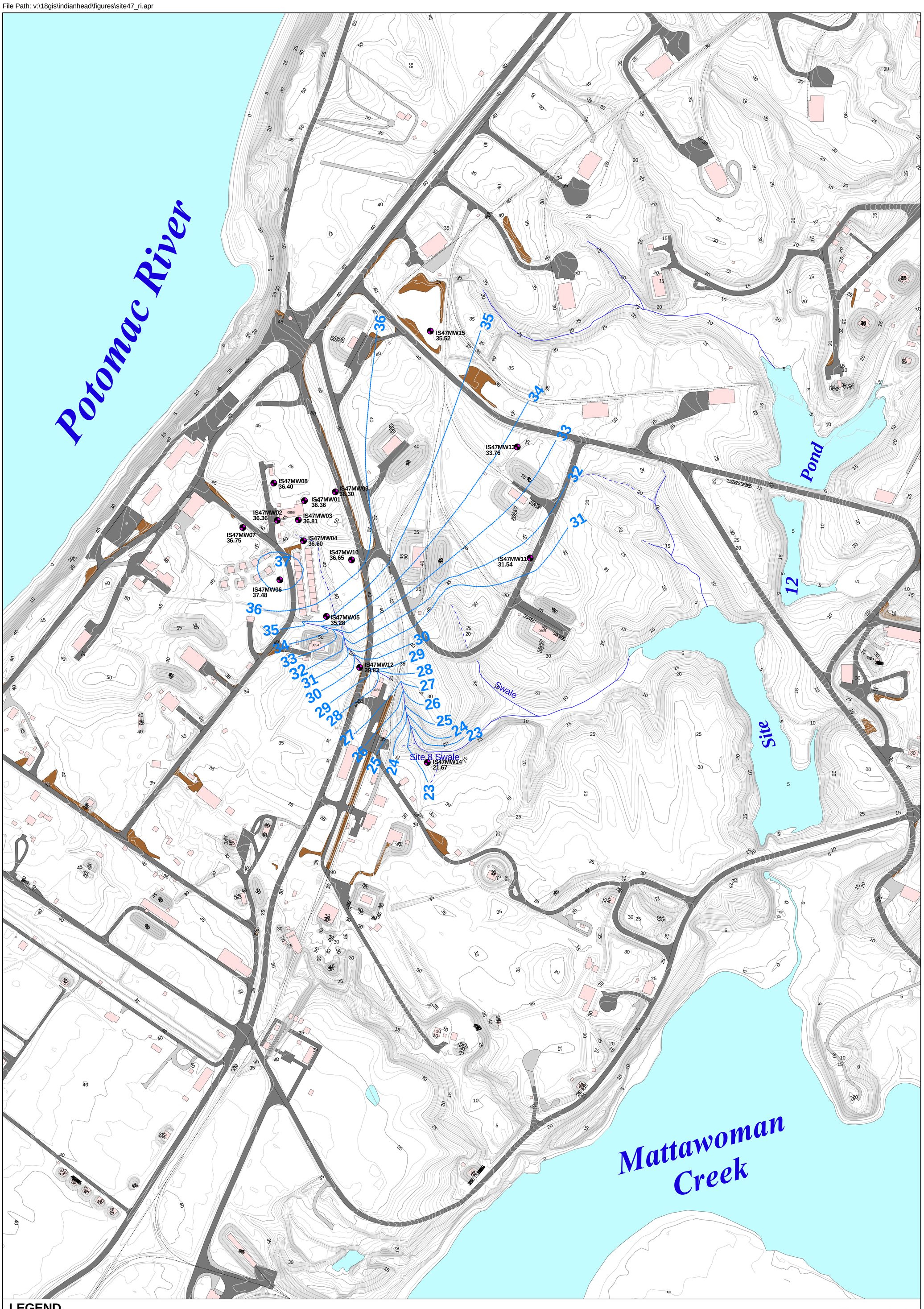
Table 5-2
Slug Test Results
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Monitoring Well	Hydraulic Conductivity (feet per day)
IS47MW01	4.3
IS47MW02	2.9
IS47MW03	5.8
IS47MW04	2.9
IS47MW05	4.3
IS47MW06	2.9
IS47MW07	2.9
IS47MW08	14.4
IS47MW09	0.6
IS47MW10	1.4
Geometric mean	**3.1**

Table 5-3
Vertical Hydraulic Conductivity Test Results from Shelby Tubes
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Boring	Depth (feet bgs)	Vertical Hydraulic Conductivity (feet per day)
IS47BH-1	18-20	1.8×10^{-4}
IS47MW06	14-16	1.3×10^{-4}
IS47MW07	18-20	4.6×10^{-4}
IS47MW08	20-22	8.4×10^{-5}
IS47MW09	26-28	1.4×10^{-4}
IS47MW10	18-20	5.2×10^{-5}
Geometric mean		**1.4×10^{-4}**

File Path: v:\18gis\indianhead\figures\site47_ri.apr



LEGEND

- Monitoring Well Locations
- Water Table Elevation Contours
- Perennial Swale
- Intermittent Swale
- 5 Foot Elevation Contours
- 1 Foot Elevation Contours
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road
- 36 Water Table Elevation (feet above mean sea level)

Figure 5-1
Water Table Contour Map
November 22, 2002
Site 47
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

SECTION 6

Nature and Extent of Contamination

6.1 Introduction

Section 6 summarizes the analytical data collected during SI and RI activities at Site 47 and evaluates the nature and extent of contamination at the site. Nature and extent are discussed according to media: surface soil, subsurface soil, *in situ* groundwater and groundwater from monitoring wells (combined), surface water, and sediment. The results obtained from sampling the concrete troughs near Building 856 also are discussed. The detected constituents observed in samples collected during the SI and RI activities are summarized in tables and presented in figures located at the end of this section. Tables in Appendix J present all constituents analyzed for all samples, whether the constituent was detected or not.

The discussion presented below focuses on the contaminants that are most prevalent at Site 47. Some contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants that are generally recognized to pose the greatest risks to human health and the environment.

The focus on this "short list" of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus the discussion. The baseline HHRA and ERA presented in Sections 8 and 9, respectively, formally screen and evaluate all chemicals analyzed for in the various media at Site 47 in accordance with established EPA Region III guidance.

In order to identify metals that may be of potential concern at Site 47, the data for inorganic analytes were compared to data presented in the *Background Soil Investigation Report* (BIR) prepared by Tetra Tech NUS (2002). The BIR was conducted to establish a facility-wide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites known to have been affected by facility operations. The facility-wide background statistics for each media are presented in Appendix F.

Sampling results for inorganic analytes in various media at Site 47 were compared to background concentrations as follows:

- Maximum detected concentrations for data collected during the investigation were compared to the upper confidence limits (UCLs) of the facility-wide background data as shown in Appendix G.
- Sampling means were compared to the background means.

Where an inorganic analyte exceeds background and is discussed for one medium (e.g., surface soil), the analyte may be discussed for another medium (e.g., subsurface soil) even if the concentrations in the second medium do not exceed background. This is to allow a more

complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

It should be noted that the groundwater background data set is based on unfiltered metals concentrations. Further, based on comparison of the groundwater data set to a subset reported as "nonturbid" in the BIR, four groundwater samples were excluded from the background data set due to elevated turbidity levels. The comparisons presented in this discussion are also based on unfiltered metals concentrations. Additionally, applying a similar rationale as that used in the BIR, the analytical data generated from *in situ* sampling are excluded from the discussion because of the turbidity associated with *in situ* samples.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a compound was detected in a sample and a corresponding duplicate also was collected, the higher of the two values was used; and (3) data points rejected by the data validator were excluded from the descriptive statistics.

Background surface water samples were not collected as part of the background investigation and, therefore, are unavailable for comparison.

6.2 Data Quality Assessment

The data quality was evaluated to assess the usability of the analytical results. The analytical data quality is dependent on laboratory performance, matrix interference, ambient laboratory and field conditions, and field sampling technique. Data quality is used to assess whether the project's data quality objectives were met. The data quality assessment comprised reviewing the results of the laboratory quality control (QC) review, the data validation reports, and the data validation qualifiers applied to the data.

6.2.1 Laboratory Quality Control Review

Prior to the release of the analytical results, the laboratory reviewed the sample and QC data to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the results were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Non-conforming results were identified and were discussed in the data package cover letter and associated case narrative.

6.2.2 Data Validation

Two groups of data, historical site 47 data (from the 1992 SI) and remedial investigation (RI) data were reviewed by an independent data validator following EPA Region III Modifications to the National Functional Guidelines for data validation of organic and inorganic results (1993b, 1994a). Areas of review included holding time compliance, surrogate recovery accuracy, matrix spiked sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, laboratory and field sample duplicate precision.

6.2.3 Data Quality Evaluation

CH2M HILL conducted the data quality evaluation, which consisted of reviewing the analytical data for systematic errors. An evaluation of the data quality is made based on the number of, severity of, and distribution of these data qualifiers. The data for Site 47 has been divided into two phases of the sampling that took place at the site. The most recent sampling corresponds to the site remedial investigation data, sampled from July 1999 through September 2002. Data from July of 1999 and October 2001 had already been archived; for these sampling rounds the data qualifiers were tallied, but the data validation reports were not reviewed. Furthermore, the direct-push groundwater samples were not validated, so the laboratory qualifiers were used to determine data quality. In addition to the RI data, a review of historical Site 47 data from the September and October 1992 SI was also conducted; these data are referred to as "Historic Site 47 Data" or "SI data."

The data evaluation showed that the majority of the analytical results were unqualified and acceptable as reported. The vast majority of the "J" qualifiers are present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J" qualified results are acceptable for use as reported.

The "J", "JB", "K", "L", "UJ", and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem and are considered usable by risk assessors when determining risk to human health and the environment.

The data evaluation showed that the sample results qualified with a "B", indicating blank contamination, are usable at their adjusted reporting limits. Analytes such as acetone and methylene chloride are common laboratory contaminants, and the qualified results should not, alone, be used to make project decisions. Less than 5% of the "Historic Site 47 Data" was "B" qualified, and less than 3 percent of the remedial investigation data was "B" qualified.

The "R" qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large environmental sampling effort. The results that are rejected should not be used to make project decisions. Less than 1% of the data for the "Historic Site 47 Data" and remedial investigation data was "R" qualified.

With the exception of the "R" qualified results (and with caution regarding the "B" qualified results), the remedial investigation data and the SI data for Site 47 are of sufficient quality to support risk and site assessment. A more detailed review of the Site 47 data quality is contained in Appendix J.

6.3 Surface Soil

Surface soil sampling activities conducted at Site 47 consisted of collecting 21 samples (RI47SS01 through RI47SS12 and IS47SS14 through IS47SS22) as part of the RI and collecting 12 samples (SA01 through SA12) as part of the SI. The results of surface soil sampling are presented in Table 6-1 and selected results are presented in Figure 6-1.

6.3.1 VOCs and SVOCs

VOCs were detected in 6 of the 21 RI surface soil samples (including one duplicate sample) and 6 of the SI samples. Most detected concentrations range between 1 µg/kg and 7 µg/kg. Three of the 21 RI samples (IS47SS01, IS47SS03, and IS47SS04) contained between 10 and 12 detections. These three are on the north side of Building 856. Because of the low concentrations in most of the RI samples, they are not discussed further in this section. The remainder of the discussion focuses on the two samples containing the most elevated concentrations of VOCs.

One of the SI samples, SA01, contained concentrations of chloroform, carbon tetrachloride, trichloroethene, and tetrachloroethene at concentrations of 68 µg/kg, 41 µg/kg, 32 µg/kg, and 3,100 µg/kg, respectively. A second sample, SA12, contained concentrations of chloroform, carbon tetrachloride, trichloroethene, and tetrachloroethene at concentrations of 180 µg/kg, 99 µg/kg, 39 µg/kg, and 140 µg/kg, respectively. The two samples are located in an area down-slope of Building 856, east of Building 1794 (Figure 6-1). The absence of such elevated concentrations of VOCs elsewhere on the site suggests that this is a localized area of contamination, perhaps due to waste disposal.

With the exception of SA09, one or more SVOCs were detected in each of the 33 SI and RI surface soil samples collected. Of the 33 samples with detections, 13 samples had 12 or more detections. Most of the highest SVOC concentrations in samples SA01, SA02, SA05, IS47SS01 through IS47SS08, IS47SS10, and IS47SS19 were detected in samples collected to the southwest of Building 856. The samples are scattered evenly around Building 856, with the exception of IS47SS19, which was collected west of Building 766.

6.3.2 Metals

With few exceptions, one or more of the surface soil samples contain one or more metals that exceed the background 95% UCL. Background soil data (obtained from Tetra Tech NUS, 2002) are presented in Appendix G. This discussion focuses on lead, mercury, and silver. These metals were chosen because of the magnitude of the exceedences, their recognized health concerns, and the historical use of mercury at the site.

Concentrations of lead, detected in all samples except SA03, ranged from 5.1 mg/kg to 1,310 mg/kg. The 95% UCL was exceeded in 18 of the samples and the sampling mean was 118 mg/kg, above the background mean of 18.7 mg/kg. It should be noted, however, that the mean is skewed by the sampling results of RI47SS02, RI47SS05, and RI47SS06. These three samples contain concentrations of lead at 982 mg/kg, 561 mg/kg, and 1,310 mg/kg, respectively (Figure 6-1).

Because the detections are so widespread, there does not appear to be a spatial trend in the data. The same is true of the three highest detections: RI47SS02 was collected north of Building 856 and RI47SS05 and RI47SS06 were collected south of the south east corner of Building 856 (Figure 6-1).

Mercury was detected in 26 of 33 samples. Concentrations ranged from 0.08 mg/kg to 47.4 mg/kg. However, excluding the results from samples 47SA08 (15.9 mg/kg) and RI47SS02 (47.4 mg/kg), the maximum detected concentration was 5.5 mg/kg.

Because the detections are so widespread, there does not appear to be a spatial trend in the data. Of note, the five surface soil samples collected furthest from Building 856 (IS47SS18 through IS47SS22) did not contain mercury at or above the laboratory detection limit. (Figure 6-1).

Silver was detected in 25 of 33 samples with concentrations ranging from 0.29 mg/kg to 474 mg/kg. Of those, three samples RI47SS05, RI47SS06, and IS47SS14 contained concentrations in the hundreds of milligrams per kilogram (259 mg/kg, 474 mg/kg, and 212 mg/kg, respectively).

As with lead and mercury, the detections are widespread, which limits spatial analysis of the data. Of note, the four highest detections were observed in samples collected on the south side of the building. Further, the three highest detections were observed in samples collected near the southeast corner of the building (Figure 6-1).

6.3.3 Explosives, Nitroglycerine, and Nitrocellulose

Explosives were analyzed in 16 of the 21 samples collected during the RI; they were not analyzed in samples collected during the SI. However, three explosive compounds (2,4-dinitrotoluene; 2,6-dinitrotoluene; and nitrobenzene) are included in the SVOC list, which was analyzed in samples collected during the SI. These compounds are reported along with the other explosive compounds for clarity. Only 2,6-dinitrotoluene was detected and only in one sample. This sample, 47SA12, contained a concentration of 250 µg/kg. Nitroglycerin (NG) was detected in three of the 16 samples analyzed for this parameter. Detections were observed in RI47SS02, RI47SS05, and RI47SS07 at concentrations of 19,000 µg/kg, 23,000 µg/kg, and 12,000 µg/kg, respectively. Nitrocellulose was detected in one of the 16 samples analyzed for this parameter. The sample, RI47SS06, contained nitrocellulose at a concentration of 58,600 µg/kg. Nitroguanidine was analyzed for in several RI samples but was not detected.

The samples containing detections of the above parameters were collected on the north, south and southeast sides of Building 856; therefore, no pattern is discernable. However, except for 47SA12, the samples were collected within 25 feet of the building (Figure 6-1).

6.4 Subsurface Soil

Subsurface soil sampling activities conducted within Site 47 consisted of collecting 19 samples (IS47SB01 through IS47SB19) plus two duplicate samples. The results of subsurface soil sampling are presented in Table 6-2 and selected results are presented in Figure 6-2.

6.4.1 VOCs and SVOCs

VOCs were detected in three subsurface soil samples out of the eight samples analyzed for VOCs. The highest concentrations, in both cases 12 µg/kg of methylene chloride, were detected in IS47SB08 and IS47SB10, respectively. The remaining sample, IS47SB18, contained PCE and TCE at very low concentrations. Sample IS47SB18 was collected south of the magazines between Buildings 854 and 856. VOCs are not discussed further in this section.

One or more SVOCs were detected in six of the eight samples analyzed for SVOCs. However, none of the samples contained more than seven SVOCs. The highest detection was di-n-butylphthalate at 570 µg/kg in sample IS47SB07.

6.4.2 Metals

Thirteen metals were detected at concentrations above their respective background 95% UCL. Of those, eight had means that exceeded the background mean. However, the exceedences were small and primarily associated with low risk compounds (e.g., calcium, magnesium, sodium, etc.) Of note, mercury was detected in four samples (IS47SB16 through IS47SB19, all in the reported location of mercuric nitrate disposal) at concentrations ranging from 0.17 mg/kg to 14 mg/kg.

6.5 Groundwater

Groundwater sampling activities conducted within Site 47 consisted of collecting 42 *in situ* groundwater samples (IS47GW01 through IS47GW12, RI47GW13 through RI47GW22, and IS47GW23 through IS47GW42 plus 5 duplicate samples) and sampling 15 monitoring wells (IS47MW01 through IS47MW15). It should be noted that, as discussed in Section 3, monitoring wells IS47MW01 and IS47MW02 were sampled twice, monitoring wells IS47MW03 and IS47MW04 were sampled three times, and monitoring wells IS47MW05 through IS47MW15 were sampled once. Further, *in situ* groundwater samples and monitoring well samples were collected over the course of approximately three years. Where possible, temporal trends will be discussed; however, the primary purpose of this discussion is to provide a composite 'picture' of contaminants in groundwater. This is to allow the greatest use of the data, which will aid the future development of the FS.

The results of *in situ* groundwater sampling are presented in Table 6-3. The results of monitoring-well sampling are presented in Table 6-4. It should be noted that in addition to the results presented below, monitoring wells IS47MW11 through IS47MW15 were sampled for monitored natural attenuation (MNA) parameters (methane, ethane, ethene, chloride, nitrate, nitrite, and sulfate). The parameters were collected to provide data for the evaluation of MNA as a remedial alternative (CH2M HILL, 2002). For this reason, results are not presented here but retained for evaluation during the FS.

6.5.1 VOCs and SVOCs

In the immediate vicinity of Building 856, very high concentrations of VOCs have been detected. The compounds detected at the highest concentrations are carbon tetrachloride (CT) and its breakdown products: chloroform (CF; i.e., trichloromethane), methylene chloride (MC; i.e., dichloromethane), and chloromethane (CM). Also of note are larger, lower-concentration plumes of PCE, TCE, and their breakdown products (*cis*-1,2-dichloroethene [*cis*-DCE] and vinyl chloride [VC]), and 1,2-dichloroethane (DCA). Numerous other VOCs have been detected in monitoring well and *in situ* groundwater samples collected at the site. The discussions presented below will focus on CT and its breakdown products; PCE, TCE and their products; and DCA.

The discussions will make use of plume maps generated from the sampling data. The following should be noted with respect to the maps:

- First, the maps are composites with respect to time. This is because the investigations occurred over the course of 3 years. In some cases there are multiple rounds of sampling and the observed concentrations of contaminants fluctuate with time (as is expected). Additionally, contaminants move and degrade in the subsurface, which suggests that, had a given sample been collected at another point in time, its concentration would have varied from the observed concentration within a small range. That being noted, evaluating the data as if it were collected at one fixed point in time allows for the most complete picture of VOC concentrations in groundwater. In all cases, the highest concentration measured at the location was used in the maps.
- Second, the data have been composited with respect to depth. In the immediate vicinity of Building 856, there are locations where two samples were collected at the same location but at different depths (e.g., *in situ* groundwater samples IS47GW04 and IS47GW05). In most instances, there are differences in concentrations between the shallow and the deep samples. However, for the purposes of this evaluation, the higher of any constituent is treated as the concentration representative of the entire saturated thickness of the water-bearing unit. This approach, while more conservative than presenting multiple plume maps that show the differences in concentrations with depth, is sufficient for the purposes of evaluating the nature and extent of contamination. If, during the FS, a finer evaluation of vertical contaminant distribution is needed, it will be conducted at that time.
- Third, in a very limited number of cases, reported concentrations were treated as biased low. This is because, at these locations, the observed concentration was lower than would be anticipated based on groundwater flow (i.e., the isoconcentration contour lines would have to assume unlikely shapes). In all cases where the concentration was treated as biased low, the modification was small. For example, a non-detect was treated as containing a concentration of between 1 and 9 µg/L. In no cases were detected concentrations treated as non-detect.
- Fourth, with respect to the plume map of CT, CF, MC, and CM, the concentrations of these constituents have been composited to generate one total value. This is because of the very high concentrations of the individual constituents and the relatively small area to which they are confined. For these reasons, presenting maps of the individual constituents would not add value to the present evaluation. As noted above, if, during the FS, a finer evaluation of individual contaminant distribution is needed, it will be conducted at that time.

6.5.1.1 Carbon Tetrachloride and Breakdown Products

As noted above, small concentrations of CT and CF were detected in two surface soil samples. However, the observed concentrations are not indicative of the primary source given their locations and concentrations.

Figure 6-3 presents the detected concentrations of CT, CF, MC, and CM. Figure 6-4 presents the composite plume map of CT, CF, MC, and CM. Observed concentrations are highest east of Building 856 at the approximate location of the reported barium pit. *In situ* groundwater samples collected in the vicinity of the pit (IS47GW31 and IS47GW39; not shown on Figure 6-3 to reduce the clutter in the figure) contained concentrations of CT at

110,000 µg/L and 250,000 µg/L, respectively and concentrations of CF at 56,000 µg/L and 91,000 µg/L, respectively. It is worthy of note that samples IS47GW31 and IS47GW39 were collected at the top of the clay and that shallow samples collected at the same locations (IS47GW30 and IS47GW38, respectively; also not shown on the figure) also contained CT and CF but at greatly reduced concentrations. These samples contained concentrations of CT at 11,000 µg/L and 2,300 µg/L, respectively, and concentrations of CF at 4,300 µg/L and 2,000 µg/L, respectively. Three shallow samples (IS47GW32, IS47GW34, and IS47GW36) contained concentrations of CT and CF at elevated concentrations relative to their deeper conterparts (IS47GW33, IS47GW35, and IS47GW37; none of these samples, near the reported barium pit, is shown on Figure 6-3).

The zone of very high concentrations (greater than 10,000 µg/L) extends south and west to include IS47MW03 and IS47MW04 (Figures 6-3 and 6-4). The samples collected from these wells contained varying concentrations of CT, CF, and CM. Samples collected from IS47MW03 contained CT at concentrations of 6,500 µg/L to 286,340 µg/L, CF at concentrations of 2,000 µg/L to 57,570 µg/L, and CM at concentrations varying between non-detect and 59,259 µg/L. The samples collected from IS47MW04 contained CT at concentrations of 6,483 µg/L to 34,000 µg/L, CF at concentrations of 6,063 µg/L to 23,000 µg/L, and CM at concentrations varying between non-detect and 1.1 µg/L. Outside this area, concentrations decrease rapidly with distance (Figure 6-4).

In situ sample IS47GW05, collected south of Building 856 (Figure 6-3), contained CT and CF, both at concentrations of 350 µg/L. Sample IS47GW06, also collected south of Building 856, contained CT, CF, and MC, at concentrations of 31 µg/L, 280 µg/L, and 120 µg/L, respectively. Samples IS47GW10 and IS47MW01, collected on the north side of the building, contained CT at concentrations of 4 µg/L and 0.6 µg/L, respectively. IS47GW10 contained CF at a concentration of 30 µg/L, as well. The sample collected from monitoring well IS47MW10 (located southeast of Building 856) contained CF at a concentration of 5.5 µg/L.

All of the detections discussed above appear related to a source east or south of Building 856. Two monitoring well samples and one *in situ* groundwater sample collected south of the Site 8 Swale (an apparent hydraulic divide) contained low concentrations of CT and/or CF. Monitoring well IS47MW12, installed south of the Site 8 Swale and east of Caffee Road, contained CF at a concentration of 8.1 µg/L but no CT. Monitoring well IS47MW14, installed south of the Site 8 Swale and behind Building 1769, contained CF at a concentration of 0.43 µg/L but no CT. *In situ* groundwater sample IS47GW40, installed near IS47MW14 but closer to Building 1769, contained CT at concentration of 15 µg/L and CF at concentration of 5 µg/L. The VOCs detected in the groundwater sample from IS47GW40 may be associated with a separate release in the vicinity of Building 1769. This monitoring well is located a considerable distance from the main footprint of the CT plume detected in the vicinity of Building 856, with lower concentrations detected at well IS47MW12 (8 µg/L) and an absence of detectable CT at IS47MW05. In addition, the presence of the perennial water in swale 8 likely refracts and partially captures flow from the Building 856 area. Finally, the contaminant signature in this sample contains VOCs not detected elsewhere at Site 47.

6.5.1.2 Tetrachloroethene, Trichloroethene, and their Breakdown Products

The following discussion will treat PCE and TCE as parent products and *cis*-DCE and VC as their breakdown products. While TCE may be a breakdown product of PCE, it is a common industrial solvent in its own right. Further, *cis*-DCE and VC are less common as industrial chemicals (although VC is widely used in some industries). Therefore, the most likely usage and disposal history of these five compounds has PCE and TCE being employed in various processes with the subsequent generation of *cis*-DCE and VC in the subsurface following disposal and degradation of the parent products. It should be noted that, without documentation pertaining to every process that has taken place at Building 856, this usage and disposal history cannot be confirmed.

As noted in Sections 6.2.1 and 6.3.1, low concentrations of PCE and TCE were detected in a limited number of surface and subsurface soil samples. To reiterate: one surface soil sample, SA01, contained PCE at a concentration of 3,100 μg/kg. The sample was collected approximately 70 feet south of Building 856, east of the intermittent drainage swale that discharges to the Site 8 Swale.

Figure 6-5 presents the detected concentrations of PCE, TCE, DCE, and VC. Figure 6-6 presents the composite plume map of PCE. The highest detection of PCE, 1,400 μg/L, was observed in the sample collected from IS47MW04 during the April 2001 sampling event. A similar concentration (1,300 μg/L) was observed in the same well during the September 2002 sampling event. This well is near, but upgradient of, the location of the soil sample discussed above. The leading edge of the plume is likely near RI47GW15 where PCE was detected at a concentration of 103 μg/L (Figure 6-5).

The size of the plume may suggest multiple source areas. Since the highest detection is located near the primary soil detection, this points to at least one source. If this is the only source, it is unlikely that PCE would reach IS47MW01 or IS47GW10 (located north of Building 856) from this location through the process of diffusion, which can move a contaminant against the flow of groundwater. Therefore, there may be a source of PCE north of Building 856. However, the groundwater-flow directions near the groundwater divide can vary greatly and may have contributed to these locations from the source near Building 856.

As shown in Figure 6-6, the shape of the plume appears to reflect groundwater flow. Higher concentrations are observed around IS47MW04 and the leading edge of the plume is moving to the southeast.

Figure 6-7 presents the composite plume map of TCE. The TCE plume is wider than that of PCE. Further, there are no detections above 1,000 μg/L (the highest detection is 270 μg/L at RI47GW15); however, the 100 μg/L isoconcentration line extends from as far north as IS47MW01 (168 μg/L), as far south as IS47GW03 (170 μg/L), and as far east as RI47GW15. Given the wide distribution of concentrations in the hundreds of micrograms per liter and the lack of any identified soil source, it appears that there may have been multiple sources of TCE. As with PCE, the plume appears to be a reflection of groundwater flow, although the TCE plume appears to be moving more directly to the east than does the PCE plume.

Figure 6-8 presents the composite plume map of DCE. High concentrations (greater than 1,000 μg/L) were observed in two samples (IS47MW03 and IS47GW08) collected just south

of Building 856. The plume appears relatively large, extending from as far north as IS47MW01 (15 μg/L), as far south as IS47MW05 (14 μg/L), and as far east as RI47GW20 (34 μg/L). Based on the shape of the plume, the primary source may have been a now-degraded release of PCE and/or TCE in the vicinity of Building 856. Further, different rates of degradation of the parent products appear to have produced a plume that extends east in the direction of groundwater flow but with a shape that is not a direct reflection of flow or of the distribution of the parent products.

Figure 6-9 presents the composite plume map of VC. VC was detected at relatively low concentrations (1 μg/L to 68 μg/L). As with DCE, the shape of the plume suggests the primary source may have been a now-degraded release of PCE and/or TCE in the vicinity of Building 856. The plume appears to extend to the south rather than to the east in the direction of groundwater flow. This may suggest that the shape of the plume is more dependant on the rate of degradation of the parent products than groundwater flow direction.

6.5.1.3 1,2-Dichloroethane

Figure 6-10 presents the DCA results and Figure 6-11 presents the composite plume map of DCA. DCA was the most widespread VOC detected in groundwater. The plume appears to have originated in the vicinity of Building 856. DCA is not a common industrial chemical; therefore, it is likely that it is a degradation product of 1,1,2-trichloroethane (TCA). TCA was detected in samples IS47GW31 and IS47GW34, collected at the approximate location of the former barium pit; concentrations there were 1 μg/L and 4 μg/L, respectively.

The highest concentration of DCA, 1,580 μg/L, was observed in *in situ* groundwater sample RI47GW15. The sample was collected approximately 500 feet southeast of Building 856, suggesting the center of the plume is moving towards the Site 8 Swale. However, DCA was detected as far north as IS47GW25 (7 μg/L). It is also possible, given the areal extent of the plume, that there were multiple sources of the parent product TCA.

6.5.2 Inorganics

This discussion focuses on the monitoring well samples. Although filtered metals were collected at several of the *in situ* groundwater sampling locations, their purpose was primarily as a screening tool. However, the results of *in situ* groundwater samples will be discussed with respect to specific metals identified from the monitoring well samples.

Thirteen metals were detected at concentrations above their respective background 95% UCL (see background concentrations in Appendix F). Of those, eight had means that exceeded the background mean. However, the exceedences were small and primarily associated with low risk compounds (e.g., calcium, magnesium, sodium, etc.) Of note, arsenic was detected in five samples (IS47MW01, IS47MW02, IS47MW04, IS47MW07, and IS47MW08) at concentrations ranging from 3 μg/L to 47.9 μg/L. No spatial trend is apparent in the data.

Also of note: cyanide was detected in five samples (IS47MW06 through IS47MW10) at concentrations ranging from 137 μg/L to 23,200 μg/L. Given the groundwater flow patterns at Site 47, no trend is discernable.

6.6 Surface Water

Surface water sampling activities conducted within Site 47 consisted of collecting 11 samples (IS47SW01, IS47SW02, RI47SW03, RI47SW04, IS47SW05 through IS47SW08, and IS47SW10 through IS47SW12). The results of surface water sampling are presented in Table 6-5.

6.6.1 VOCs and SVOCs

VOCs were analyzed in all 11 samples. Detections were observed in IS47SW10 and IS47SW12. The samples contained concentrations of acetone, a common lab contaminant, at concentrations of 3.4 µg/L (in the duplicate sample) and 3.1 µg/L, respectively. Surface water sample IS47SW12 contained 0.1 µg/L of bromodichloromethane, as well.

SVOCs were analyzed in surface water samples IS47SW01 and IS47SW02 only. Both samples contained bis(2-ethylhexyl)phthalate. Concentrations were 1.4 µg/L and 2.3 µg/L, respectively.

The only other organic compound detected in surface water was di-n-butyl phthalate, which was detected in each of the two samples analyzed for SVOCs at an estimated concentration of 2.5 µg/L.

6.6.2 Metals

Metals were analyzed in surface water samples IS47SW01 and IS47SW02 only. None of the observed concentrations warrant further discussion.

6.7 Sediment

Sediment sampling activities conducted within Site 47 consisted of collecting 6 samples (RI47SD01 through RI47SD04 and IS47SD05 and IS47SD06). The results are presented in Table 6-6 and selected results are presented in Figure 6-1.

6.7.1 VOCs and SVOCs

VOCs were analyzed for in all samples. TCE was detected in the duplicate sample of RI47SD02 at a concentration of 2 µg/kg. This was the only VOC detection in sediment.

SVOCs were also analyzed in all samples. The samples RI47SD01 through RI47SD04, which were collected in the drainage swale near Building 856, contained high concentrations of several SVOCs. The following discussion focuses on benzo(a)pyrene (BAP), benzo(a)anthracene (BAA), benzo(b)fluoranthene (BBF), benzo(k)fluoranthene (BKF), and pyrene due to their recognized health effects.

The highest concentration of these compounds were observed in sediment sample RI47SD02. BAP was detected at a concentration of 1,900 µg/kg, BAA at a concentration of 2,200 µg/kg, BBF at a concentration of 4,600 µg/kg, BKF at a concentration of 1,200 µg/kg, and pyrene at a concentration of 3,200 µg/kg. Concentrations of these constituents were generally in the high tens to low hundreds of micrograms per kilogram range in samples RI47SD01, RI47SD03, and RI47SD04. Sediment sample IS47SD05 contained only three SVOCs: acetophenone, di-n-butylphthalate, and phenanthrene, at concentrations of 170

µg/kg, 420 µg/kg, and 120 µg/kg, respectively. Sediment sample IS47SD06 contained only four SVOCs: acetophenone, chrysene, di-n-butylphthalate, and pyrene, at concentrations of 87 µg/kg, 330 µg/kg, 560 µg/kg, and 350 µg/kg, respectively.

6.7.2 Metals

Numerous metals were detected in sediment samples. Of note, most metals were detected at their highest concentrations at RI47SD01. This includes aluminum, iron, lead, and silver at concentrations of 22,800 mg/kg, 36,000 mg/kg, 289 mg/kg, and 814 mg/kg. Concentrations generally decrease with increasing distance from RI47SD01. However, sample IS47SD05, collected at a distance of approximately 450 feet from RI47SD01, contained aluminum at 10,800 mg/kg, arsenic at 10 mg/kg, cobalt at 36.7 mg/kg, and iron at 24,900 mg/kg.

6.7.3 Explosives

Sediment samples RI47SD01 through RI47SD04 were analyzed for explosives, NQ, and NG, while sediment samples RI47SD05 and RI47SD06 were analyzed for perchlorate only. Samples RI47SD02 (duplicate sample) and RI47SD03 were found to contain NG. Concentrations were 9,300 µg/kg and 9,100 µg/kg, respectively. No other explosives were detected.

6.8 Concrete

The analytical results for the concrete analyses are provided in Table 6-7. Several metals were detected but only lead was detected at concentrations of any note. The concentrations of lead ranged from 1,220 mg/kg to 2,110 mg/kg, which may represent a disposal problem if the concrete is removed and disposed of. In that event, the concentrations can be evaluated in terms of the disposal requirements of the destination disposal facility.

6.9 Sewer Sediment

The analytical results for industrial wastewater discharge sediment sample RI47IW91 are provided in Table 6-8. Of note, the sample contained NG at a concentration of 3,700,000 µg/kg. According to facility personnel, the pipe that passes through this manhole is no longer in service but that when it was it discharged to the shore of the Potomac River. Outfall sampling was attempted but due to the age of the pipe and shoreline erosion, the outfall could not be located.

6.10 References

Tetra Tech NUS. February 2002. *Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland*.

CH2M HILL. May 2002. *Work Plan for Additional Remedial Investigation Activities, Site 47, Indian Head Division-NSWC* .

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,1-Dichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,1-Dichloroethene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,2-Dichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,2-Dichloroethene (total)	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,2-Dichloropropane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Acetone	NA	13 U	5 U	3 U	14 B	9 U	6 U	3,600 U	2 U	5 J	11 U
Bromodichloromethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Carbon disulfide	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	1 J	2 J
Carbon tetrachloride	NA	41	11 U	5 J	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chlorobenzene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chloroform	NA	68	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Tetrachloroethene	NA	3,100	6 J	2 J	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Trichloroethene	NA	32	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Vinyl chloride	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Semi-volatile Organic Compounds (UG/KG)											
2,6-Dinitrotoluene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2-Methylnaphthalene	430 U	440 U	350 U	350 U	430 U	340 U	20 J	340 U	350 U	350 U	350 U
Acenaphthene	54 J	51 J	30 J	350 U	430 U	340 U	52 J	340 U	350 U	350 U	350 U
Acenaphthylene	150 J	180 J	26 J	31 J	430 U	340 U	100 J	340 U	350 U	350 U	350 U
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	410 J	430 J	100 J	73 J	430 U	340 U	240 J	340 U	350 U	350 U	350 U
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	610	570	290 J	170 J	430 U	22 J	660	19 J	350 U	23 J	350 U
Benzo(a)pyrene	570	560	230 J	150 J	430 U	340 U	540	340 U	350 U	19 J	350 U
Benzo(b)fluoranthene	1,000	1,200	420	250 J	430 U	24 J	850	19 J	20 J	32 J	350 U
Benzo(g,h,i)perylene	220 J	210 J	120 J	100 J	430 U	340 U	170 J	340 U	350 U	19 J	350 U
Benzo(k)fluoranthene	1,100	900	260 J	320 J	430 U	28 J	470	26 J	19 J	53 J	350 U
Carbazole	59 J	88 J	75 J	36 J	430 U	340 U	88 J	340 U	350 U	350 U	350 U

NA - Not analyzed
B - Not detected above associated blank
J - Estimated
K - Biased high
L - Biased low

R - Unreliable
U - Not detected
UL - Not detected, biased low
UJ - Not detected, biased high
Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Chrysene	680	600	390	250 J	38 J	27 J	820	28 J	22 J	35 J	350 U
Di-n-butylphthalate	430 U	440 U	59 U	59 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Dibenz(a,h)anthracene	200 J	220 J	92 J	70 J	430 U	340 U	120 J	340 U	350 U	350 U	350 U
Dibenzofuran	43 J	35 J	20 J	350 U	430 U	340 U	32 J	340 U	350 U	350 U	350 U
Diethylphthalate	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Dimethyl phthalate	430 U	440 U	350 U	22 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Fluoranthene	1,000	860	570	300 J	37 J	43 J	1,200	31 J	28 J	41 J	350 U
Fluorene	120 J	95 J	36 J	24 J	430 U	340 U	94 J	340 U	350 U	350 U	350 U
Indeno(1,2,3-cd)pyrene	420 J	470	170 J	120 J	430 U	340 U	240 J	340 U	350 U	22 J	350 U
Naphthalene	430 U	440 U	350 U	350 U	430 U	340 U	19 J	340 U	350 U	350 U	350 U
Pentachlorophenol	71 J	86 J	840 U	840 U	1,000 U	830 U	150 J	830 U	850 U	840 U	850 U
Phenanthrene	780	600	400	200 J	430 U	20 J	820	340 U	350 U	350 U	350 U
Pyrene	880	700	480	250 J	26 J	40 J	1,100	30 J	29 J	37 J	350 U
bis(2-Ethylhexyl)phthalate	34 U	440 U	120 U	94 U	84 U	340 U	67 U	340 U	350 U	350 U	350 U
Explosives (UG/KG)											
Nitrocellulose	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)											
Aluminum	2,450 J	1,600 J	2,710	2,770	1,040	2,700	1,990	2,740	2,420	2,950	2,080
Antimony	6.7 UJ	6.7 UJ	5.3 U	5.3 U	606 U	5.2 U	5.3 U	5.2 U	5.3 U	5.2 U	5.3 U
Arsenic	0.8 UJ	0.81 UJ	1.5 B	2.4	0.79 U	2.3	1.8 B	1.9 B	2.4	1.7 B	1.6 B
Barium	11.1 B	9.3 B	21.3 B	21.5 B	4.7 B	17.3 B	18.7 B	18.9 B	17.2 B	17.9 B	14.7 B
Beryllium	0.27 U	0.27 U	0.21 U	0.21 U	0.26 U	0.25 B	0.21 U	0.23 B	0.23 B	0.21 U	0.21 U
Cadmium	1.3 U	1.3 U	4.3	4.6	1.3 U	1 U	1.1 U	1 U	1.1	1 U	1.1 U
Calcium	495 B	298 B	350 B	362 B	74.1 B	274 B	317 B	255 B	619 B	231 B	199 B
Chromium	9.1	7	2.6	13.4	2.9	7.8	11.8	7.3	6.9	6.9	5.2
Cobalt	4 U	4 U	2.5 B	3.6 B	3.9 B	5.9 B	4.6 B	6.8 B	5.3 B	5.9 B	5 B
Copper	13.8	9.8	9.5	6.7	2.6 U	4.8 B	14.9	4.7 B	3.6 B	3.7 B	3.4 B
Cyanide	1.7 U	1.4 U	1.3 U	1.3 U	1.6 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Iron	5,150 J	3,550 J	6,790	7,150	1,170	7,960	8,110	6,990	6,460	5,590	4,970
Lead	61.4 J	52.4 J	22.3 J	30.2 J	3.7 U	9.1 J	48.5 J	8.9 J	12.3 J	12.3 J	13.1 J

NA - Not analyzed
B - Not detected above associated blank
J - Estimated
K - Biased high
L - Biased low

R - Unreliable
U - Not detected
UL - Not detected, biased low
UJ - Not detected, biased high
Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Magnesium	408 B	307 B	286 B	282 B	141 B	278 B	321 B	277 B	372 B	243 B	212 B
Manganese	49.4	18.1	59.3 J	72.7 J	4.7 J	98.2 J	146 J	161 J	164 J	136 J	141 J
Mercury	2.7 J	2.1 J	0.34	3.8	0.36	0.09 U	0.54	1.6	0.4	15.9	0.11
Nickel	5 B	4 U	3.2 U	3.4 J	3.9 U	3.1 U	3.8 U	4.1 U	3.2 U	3.1 UJ	3.2 UJ
Potassium	247 U	247 U	194 U	241 B	241 U	192 U	193 U	193 U	196 U	193 U	195 U
Silver	65.3 J	28.9 J	11.4 J	9.5 J	1.3 UJ	1 UJ	15.5 J	1.9 J	1.1 UJ	3.4	13.4
Sodium	12.1 U	12.1 U	32.9 B	37.7 B	33.5 B	25.6 B	25.6 B	22.2 B	24.6 B	22.2 B	21 B
Vanadium	14.2	10.6 B	9.2 B	9.5 B	3.5 B	11.4	13.5	9.7 B	8.9 B	8.5 B	6.7 B
Zinc	85.5 J	58.8 J	40.5 J	40.3 J	4.1 UJ	10.7 J	51.3 J	13 UJ	14.8 J	8.2 J	9.7 UJ
Wet Chemistry (MG/KG)											
% Solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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J - Estimated
K - Biased high
L - Biased low

R - Unreliable
U - Not detected
UL - Not detected, biased low
UJ - Not detected, biased high
Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA10		47SA11		47SA12		IS47SS14				IS47SS15		IS47SS16		IS47SS17		IS47SS18	
Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																		
Volatile Organic Compounds (UG/KG)																		
1,1,1-Trichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
1,1-Dichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
1,1-Dichloroethene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
1,2-Dichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
1,2-Dichloroethene (total)	11	U	11	U	7	J	NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
Acetone	2	U	11	U	64	U	19	U	19	U	14	U	13	U	17	U	14	U
Bromodichloromethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
Carbon disulfide	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
Carbon tetrachloride	11	U	11	U	99		19	U	19	U	14	U	13	U	17	U	14	U
Chlorobenzene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
Chloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
Chloroform	11	U	11	U	180		19	U	19	U	14	U	13	U	17	U	14	U
Tetrachloroethene	11	U	11	U	140		19	U	19	U	14	U	13	U	17	U	14	U
Trichloroethene	11	U	11	U	39		19	U	19	U	14	U	29		17	U	14	U
Vinyl chloride	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U
Semi-volatile Organic Compounds (UG/KG)																		
2,6-Dinitrotoluene	350	U	350	U	250	J	620	U	610	U	460	U	450	U	740	U	630	U
2-Methylnaphthalene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U
Acenaphthene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U
Acenaphthylene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U
Acetophenone	NA		NA		NA		120	J	81	J	95	J	70	J	91	J	630	U
Anthracene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U
Benzaldehyde	NA		NA		NA		98	J	99	J	95	J	97	J	740	U	630	U
Benzo(a)anthracene	53	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U
Benzo(a)pyrene	44	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U
Benzo(b)fluoranthene	69	J	19	J	20	J	31	U	30	U	23	U	23	U	37	U	31	U
Benzo(g,h,i)perylene	27	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U
Benzo(k)fluoranthene	71	J	22	J	35	J	31	U	30	U	23	U	23	U	37	U	31	U
Carbazole	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U

NA - Not analyzed
B - Not detected above associated blank
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K - Biased high
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Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA10	47SA11	47SA12	IS47SS14		IS47SS15	IS47SS16	IS47SS17	IS47SS18
Sample ID	47SA10	47SA11	47SA12	IS47SS14	IS47SS14P	IS47SS15	IS47SS16	IS47SS17	IS47SS18
Sample Date	08/28/92	08/28/92	08/31/92	03/20/01	03/20/01	03/20/01	03/20/01	03/20/01	03/20/01
Chemical Name									
Chrysene	80 J	350 U	23 J	31 U	30 U	23 U	23 U	37 U	31 U
Di-n-butylphthalate	350 U	350 U	390 U	340 J	160 J	270 J	130 J	180 J	140 J
Dibenz(a,h)anthracene	19 J	350 U	390 U	31 U	30 U	23 U	23 U	37 U	31 U
Dibenzofuran	350 U	350 U	390 U	620 U	610 U	460 U	450 U	740 U	630 U
Diethylphthalate	350 U	350 U	390 U	620 U	470 J	460 U	520	740 U	630 U
Dimethyl phthalate	350 U	350 U	390 U	620 U	610 U	460 U	450 U	740 U	630 U
Fluoranthene	100 J	30 J	29 J	31 U	30 U	23 U	23 U	37 U	31 U
Fluorene	350 U	350 R	390 R	31 U	30 U	23 U	23 U	37 U	31 U
Indeno(1,2,3-cd)pyrene	39 J	350 U	390 U	31 U	30 U	23 U	23 U	37 U	31 U
Naphthalene	350 U	350 U	390 U	31 U	30 U	23 U	23 U	37 U	31 U
Pentachlorophenol	850 U	850 U	940 U	1,500 U	1,500 U	1,100 U	1,100 U	1,900 U	1,600 U
Phenanthrene	45 J	350 U	390 U	31 U	460	23 U	23 U	5,700	72
Pyrene	93 J	22 J	21 J	31 U	30 U	23 U	23 U	37 U	31 U
bis(2-Ethylhexyl)phthalate	350 U	350 U	390 U	620 U	140 J	3,300	780	740 U	630 U
Explosives (UG/KG)									
Nitrocellulose	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)									
Aluminum	1,840	2,670	1,500	14,100	10,500	2,330	3,640	5,780	3,860
Antimony	5.4 U	5.3 U	5.9 U	2.8 U	2.6 U	2 U	2 U	3.3 U	2.8 U
Arsenic	2.6	2.6	0.7 U	5.9	5.2	1.2 U	1.6 J	2.8 J	5.8
Barium	12.3 B	25.1 B	7.9 B	90.1	74.9	18.4 J	12.5 J	41.9 J	30.4 J
Beryllium	0.21 U	0.21 U	0.23 U	0.65 J	0.55 J	0.17 J	0.14 J	1.3 J	0.4 J
Cadmium	1.1 U	1.1 U	1.2 U	0.86 J	1 J	0.13 U	0.14 U	0.8 J	0.48 J
Calcium	172 B	1,340	133 B	4,500	4,250	603 J	488 J	673 J	1,220 J
Chromium	5.8	6.3	3.2	31.1	24.1	5.7	7	18.9	10
Cobalt	5.5 B	5.7 B	3.5 U	9.6 J	7.8 J	1.6 J	2 J	7 J	6.7 J
Copper	3	3.7 B	2.3 U	37.7	31.5	6.8	3.4 J	11 J	11.1
Cyanide	1.3 U	1.3 U	1.4 U	NA	NA	NA	NA	NA	NA
Iron	4,960	6,440	858	25,400	18,000	4,440	1,940	2,640	9,890
Lead	15.2 J	9.3 J	5.1 J	109	96.6	34.3	14.1	25.1	21.6

NA - Not analyzed
B - Not detected above associated blank
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TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA10	47SA11	47SA12	IS47SS14		IS47SS15	IS47SS16	IS47SS17	IS47SS18
Sample ID	47SA10	47SA11	47SA12	IS47SS14	IS47SS14P	IS47SS15	IS47SS16	IS47SS17	IS47SS18
Sample Date	08/28/92	08/28/92	08/31/92	03/20/01	03/20/01	03/20/01	03/20/01	03/20/01	03/20/01
Chemical Name									
Magnesium	170 B	581 B	123 B	2,510	1,860	483 J	262 J	399 J	700 J
Manganese	156 J	232 J	3.8 J	312	281	119	7.2	15.1	193
Mercury	0.1	0.97	0.22	2	1.6	0.19	0.45	3.3	0.19 U
Nickel	3.2 UJ	3.2 U	3.5 U	29.6	21.2	4.6 J	3.7 J	9.9 J	6 J
Potassium	197 U	196 U	215 U	779 J	683 J	210 J	227 J	259 J	299 J
Silver	2.9	1.1 UJ	3.9 J	212	110	0.43 U	3.5	33.3	0.59 U
Sodium	25.4 B	25.5 B	48 B	200 J	165 J	208 J	78.1 U	128 U	162 J
Vanadium	7.6 B	9.5 B	2.7	54.2	44.3	14.9	8.2 J	23	23.6
Zinc	7.4 UJ	9.3 UJ	8.3 UJ	263	238	34.5	12.4	42.9	114
Wet Chemistry (MG/KG)									
% Solids	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	57,000	5,900	3,400	9,600	49,000	21,000
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed
B - Not detected above associated blank
J - Estimated
K - Biased high
L - Biased low

R - Unreliable
U - Not detected
UL - Not detected, biased low
UJ - Not detected, biased high
Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SS19		IS47SS20		IS47SS20		IS47SS21		IS47SS22		SS-01		SS-02		SS-03		SS-04	
Sample ID	IS47SS19		IS47SS20		IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04	
Sample Date	03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																		
Volatile Organic Compounds (UG/KG)																		
1,1,1-Trichloroethane	12	U	11	U	11	U	17	U	17	U	1	L	1	L	1	L	2	L
1,1-Dichloroethane	12	U	11	U	11	U	17	U	17	UJ	2	L	1	L	2	L	2	L
1,1-Dichloroethene	12	U	11	U	11	U	17	U	17	UJ	1	L	11	UL	1	L	2	L
1,2-Dichloroethane	12	U	11	U	11	U	17	U	17	UJ	1	L	11	UL	1	L	1	L
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		3	L	2	L	3	L	3	L
1,2-Dichloropropane	12	U	11	U	11	U	17	U	17	U	1	L	11	UL	1	L	2	L
Acetone	12	U	11	U	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL
Bromodichloromethane	12	U	11	U	11	U	17	U	17	U	11	UL	11	UL	11	UL	1	L
Carbon disulfide	12	U	11	U	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL
Carbon tetrachloride	12	U	11	U	11	U	17	U	17	U	1	L	11	UL	1	L	2	L
Chlorobenzene	12	U	11	U	11	U	17	U	17	UJ	1	L	11	UL	1	L	2	L
Chloroethane	12	U	11	U	11	U	17	U	17	UJ	11	UL	1	L	1	L	2	L
Chloroform	12	U	11	U	11	U	17	U	17	UJ	4	B	3	B	4	B	4	B
Tetrachloroethene	12	U	11	U	11	U	17	U	17	UJ	2	B	2	B	2	B	3	B
Trichloroethene	12	U	11	U	11	U	17	U	17	U	1	L	11	UL	1	L	2	L
Vinyl chloride	12	U	11	U	11	U	17	U	17	UJ	1	L	1	L	1	L	2	L
Semi-volatile Organic Compounds (UG/KG)																		
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA	
2-Methylnaphthalene	390	U	360	U	370	U	580	U	570	U	350	U	360	U	120	J	400	U
Acenaphthene	1,900		18	U	19	U	64		29	U	350	U	360	U	480		400	U
Acenaphthylene	19		18	U	19	U	56		29	U	350	U	360	U	350	U	400	U
Acetophenone	74	J	71	J	59	J	99	J	120	J	NA		NA		NA		NA	
Anthracene	19		18	U	19	U	29	U	29	U	49	J	59	J	750		61	J
Benzaldehyde	180	J	94	J	370	U	580	U	570	U	NA		NA		NA		NA	
Benzo(a)anthracene	2,000		18	U	19	U	29	U	170	K	280	J	350	J	1,800		180	J
Benzo(a)pyrene	1,600		18	U	19	U	29	U	29	U	190	J	280	J	950		110	J
Benzo(b)fluoranthene	1,500		18	U	19	U	29	U	29	U	400		620		2,300		270	J
Benzo(g,h,i)perylene	19		18	U	19	U	29	U	29	U	150	J	240	J	510		92	J
Benzo(k)fluoranthene	1,000		18	U	19	U	29	U	29	U	94	J	190	J	790		61	J
Carbazole	390	U	360	U	370	U	580	U	570	U	45	J	67	J	450		43	J

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Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SS19	IS47SS20		IS47SS21	IS47SS22	SS-01	SS-02	SS-03	SS-04
Sample ID	IS47SS19	IS47SS20	IS47SS20P	IS47SS21	IS47SS22	RI47SS01	RI47SS02	RI47SS03	RI47SS04
Sample Date	03/20/01	03/20/01	03/20/01	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name									
Chrysene	3,100	18 U	19 U	29 U	29 U	300 J	360 J	1,600	190 J
Di-n-butylphthalate	160 J	100 J	220 J	430 J	420 J	350 U	360 U	350 U	45 J
Dibenz(a,h)anthracene	19	18 U	19 U	29 U	29 U	350 U	360 U	180 J	400 U
Dibenzofuran	390 U	360 U	370 U	580 U	570 U	350 U	360 U	350	400 U
Diethylphthalate	390 U	41 J	370 U	580 U	570 U	350 U	360 U	350 U	400 U
Dimethyl phthalate	390 U	360 U	370 U	580 U	570 U	350 U	360 U	350 U	400 U
Fluoranthene	2,200	320	170	67	29 U	650	660	2,300	420
Fluorene	4,500	18 U	19 U	73	29 U	350 U	360 U	530	46 J
Indeno(1,2,3-cd)pyrene	19	18 U	19 U	29 U	29 U	140 J	200 J	500	88 J
Naphthalene	19	18 U	19 U	29 U	56 K	350 U	360 U	110 J	400 U
Pentachlorophenol	970 R	910 U	930 U	1,500 U	1,400 U	890 U	910 U	880 U	1,000 U
Phenanthrene	33,000	140	130	550	29 U	400	370	2,400	360 J
Pyrene	3,500	29	19 U	180	29 U	490	630	2,200	300 J
bis(2-Ethylhexyl)phthalate	390 U	67 J	370 U	580 U	570 U	41 B	320 B	350 U	400 U
Explosives (UG/KG)									
Nitrocellulose	2,900 R	2,720 U	2,790 U	4,350 U	4,340 U	38,100 U	34,600 U	35,600 U	40,300 U
Nitroglycerin	58,000 U	54,000 U	56,000 U	88,000 U	86,000 U	5,200 U	19,000	5,300 U	6,000 U
Total Metals (MG/KG)									
Aluminum	2,890	2,330	1,970	3,760	2,840	4,620	4,150	3,130	5,010
Antimony	1.7 U	1.6 U	1.7 U	3 J	3.7 J	0.4 UL	0.61 L	0.42 UL	0.45 UL
Arsenic	8.3	14.8	16.2	4.1	3.4 J	1.7 J	2.7	2.6	3
Barium	11.6 J	8.9 J	8.3 J	14.7 J	25.6 J	24.2 J	60.5	20.3 J	21.3 J
Beryllium	0.15 J	0.13 J	0.12 J	0.22 J	0.26 J	0.25 J	0.41 J	0.21 J	0.28 J
Cadmium	0.12 U	0.11 U	0.11 U	0.17 U	0.23 J	0.15 J	3.6	0.46 J	0.07 J
Calcium	238 J	229 J	254 J	740 J	719 J	690 B	6,000	451 B	274 B
Chromium	7.1	6.2	5.1	9.2	4.8	11	26.6	9.5	10.5
Cobalt	3.2 J	2 J	1.8 J	4.1 J	4.8 J	4.5 J	5.9 J	5.2 J	6.5 J
Copper	4.5 J	3.6 J	3.9 B	11.3	12.2	9.1	57.1	9.4	7.3
Cyanide	NA	NA	NA	NA	NA	0.19 U	0.21 U	0.22 U	0.22 U
Iron	7,330	7,140	5,640	12,800	5,880	10,100	12,600	9,470	10,500
Lead	26.5	14.8	13.5	37.6	52.4	35.3 K	982 K	51.4 K	7.5 K

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TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SS19	IS47SS20		IS47SS21	IS47SS22	SS-01	SS-02	SS-03	SS-04
Sample ID	IS47SS19	IS47SS20	IS47SS20P	IS47SS21	IS47SS22	RI47SS01	RI47SS02	RI47SS03	RI47SS04
Sample Date	03/20/01	03/20/01	03/20/01	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name									
Magnesium	325 J	265 J	232 J	428 J	313 J	589 J	2,030	403 J	486 J
Manganese	113	85.7	70.7	134	113	180	418	244	212
Mercury	0.12 U	0.1 U	0.11 U	0.16 U	0.17 U	0.51	47.4	0.2	0.14
Nickel	3.3 J	2.3 J	1.9 J	5.9 J	7.7 J	7 B	20.4	5.6 B	5.3 B
Potassium	206 J	138 J	117 J	255 J	275 J	407 J	255 J	285 J	411 J
Silver	0.37 U	0.34 U	0.35 U	0.55 U	0.55 U	3.3	40.3	2.9	0.29 J
Sodium	66.9 U	61.7 U	63.4 U	99.7 U	99.4 U	29.7 U	196 J	36.6 J	33.3 U
Vanadium	19.1	17.4	13.4	27.6	16.3 J	16.3	17.8	14.1	16
Zinc	23.4	15	12	23.3	32.1	42.9 B	762	26.7 B	20.6 B
Wet Chemistry (MG/KG)									
% Solids	NA	NA	NA	NA	NA	93.6	92.1	94.6	82.7
Total organic carbon (TOC)	24,000	9,800	13,000	64,000	88,000	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	7.2	7.62	7.03	5.79

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TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	SS-05		SS-06		SS-07				SS-08		SS-09		SS-10		SS-11		SS-12	
Sample ID	RI47SS05		RI47SS06		RI47SS07		RI47SS99		RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																		
Volatile Organic Compounds (UG/KG)																		
1,1,1-Trichloroethane	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
1,1-Dichloroethane	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
1,1-Dichloroethene	11	U	11	U	11	U	11	U	11	U	11	U	11	UL	12	U	11	U
1,2-Dichloroethane	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
1,2-Dichloroethene (total)	11	U	11	U	11	U	11	U	11	U	11	U	2	L	12	U	11	U
1,2-Dichloropropane	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
Acetone	11	U	11	U	11	U	11	U	11	U	11	U	11	UL	12	U	11	U
Bromodichloromethane	11	U	11	U	11	U	11	U	11	U	11	U	11	UL	12	U	11	U
Carbon disulfide	11	U	11	U	11	U	11	U	11	U	11	U	11	UL	12	U	11	U
Carbon tetrachloride	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
Chlorobenzene	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
Chloroethane	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
Chloroform	2	B	2	B	2	B	2	B	2	B	2	B	4	B	3	B	2	B
Tetrachloroethene	11	U	11	U	11	U	11	U	11	U	11	U	2	B	12	U	11	U
Trichloroethene	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
Vinyl chloride	11	U	11	U	11	U	11	U	11	U	11	U	1	L	12	U	11	U
Semi-volatile Organic Compounds (UG/KG)																		
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA	
2-Methylnaphthalene	380	U	370	U	350	U	350	U	350	U	360	U	370	U	390	U	370	U
Acenaphthene	380	U	98	J	350	U	350	U	38	J	360	U	120	J	390	U	370	U
Acenaphthylene	380	U	370	U	350	U	350	U	350	U	360	U	370	U	390	U	370	U
Acetophenone	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Anthracene	380	U	100	J	350	U	350	U	49	J	360	U	230	J	390	U	370	U
Benzaldehyde	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Benzo(a)anthracene	130	J	460		160	J	77	J	240	J	69	J	750		130	J	74	J
Benzo(a)pyrene	170	J	320	J	120	J	51	J	210	J	55	J	580		90	J	47	J
Benzo(b)fluoranthene	320	J	640		280	J	89	J	360		84	J	1,000		190	J	130	J
Benzo(g,h,i)perylene	120	J	210	J	69	J	350	U	130	J	360	U	390		80	J	41	J
Benzo(k)fluoranthene	100	J	290	J	88	J	45	J	130	J	360	U	310	J	66	J	370	U
Carbazole	380	U	110	J	350	U	350	U	45	J	360	U	170	J	390	U	370	U

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Shading indicates detection

TABLE 6-1
Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	SS-05		SS-06		SS-07				SS-08		SS-09		SS-10		SS-11		SS-12	
Sample ID	RI47SS05		RI47SS06		RI47SS07		RI47SS99		RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																		
Chrysene	150	J	450		190	J	84	J	240	J	66	J	780		140	J	84	J
Di-n-butylphthalate	110	J	120	J	37	J	350	U	350	U	59	J	370	U	390	U	370	U
Dibenz(a,h)anthracene	380	U	63	J	350	U	350	U	350	U	360	U	96	J	390	U	370	U
Dibenzofuran	380	U	53	J	350	U	350	U	350	U	360	U	82	J	390	U	370	U
Diethylphthalate	380	U	82	J	350	U	350	U	350	U	360	U	370	U	390	U	370	U
Dimethyl phthalate	380	U	370	U	100	J	350	U	350	U	360	U	370	U	390	U	370	U
Fluoranthene	160	J	880		310	J	130	J	490		170	J	1,200		260	J	190	J
Fluorene	380	U	68	J	350	U	350	U	350	U	360	U	140	J	390	U	370	U
Indeno(1,2,3-cd)pyrene	130	J	220	J	84	J	350	U	130	J	360	U	350	J	390	U	39	J
Naphthalene	380	U	43	J	350	U	350	U	350	U	360	U	44	J	390	U	370	U
Pentachlorophenol	950	U	930	U	890	U	880	U	880	U	910	U	940	U	970	U	930	U
Phenanthrene	90	J	750		180	J	84	J	250	J	100	J	1,100		100	J	100	J
Pyrene	130	J	640		260	J	120	J	370		110	J	1,200		220	J	120	J
bis(2-Ethylhexyl)phthalate	110	B	200	B	350	U	350	U	350	U	360	U	370	U	390	U	370	U
Explosives (UG/KG)																		
Nitrocellulose	37,000	U	58,600		35,600	U	36,300	U	36,400	U	37,400	U	38,400	U	40,800	U	39,400	U
Nitroglycerin	23,000		5,400	U	12,000		5,000	U	5,100	U	5,300	U	5,500	U	5,800	U	5,400	U
Total Metals (MG/KG)																		
Aluminum	3,020		3,090		3,570		1,520		3,220		6,140		7,390		4,130		3,300	
Antimony	0.47	UL	0.42	L	0.39	UL	0.41	UL	0.4	UL	0.41	UL	0.59	L	0.52	L	0.42	UL
Arsenic	1.7	J	1.6	J	2.1		0.68	J	0.49	U	0.71	J	3.9		2.2		1.6	J
Barium	44.6		22.2	J	21.7	J	15.9	J	17.4	J	22.9	J	36.4	J	21.8	J	14.9	J
Beryllium	0.19	J	0.16	J	0.18	J	0.07	J	0.08	J	0.11	J	0.31	J	0.22	J	0.17	J
Cadmium	1.6		0.57	J	0.22	J	0.19	J	0.12	J	0.07	J	1.1		0.09	J	0.1	J
Calcium	919	B	588	B	295	J	228	B	577	B	123	B	1,090		399	B	892	B
Chromium	11.8		12.1		12.1		5.1		5.5		7.3		32.5		9.7		8.6	
Cobalt	3.4	J	2.5	J	2.3	J	1.3	J	0.92	J	1.3	J	4	J	3.8	J	2.5	J
Copper	13.3		10.9		7.8		5		4.1	J	4	J	21.3		6.4		5.6	
Cyanide	0.3		0.34		0.28		0.28		0.26		0.28		0.22	U	0.24	U	0.25	U
Iron	7,750		7,320		9,110		3,740		3,600		4,180		19,500		8,290		7,590	
Lead	561	K	1,310	K	94.3	K	41.3	K	12.1	K	8.9	K	89.2	K	13.5	K	19.5	K

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Detected Compounds in Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	SS-05	SS-06	SS-07		SS-08	SS-09	SS-10	SS-11	SS-12
Sample ID	RI47SS05	RI47SS06	RI47SS07	RI47SS99	RI47SS08	RI47SS09	RI47SS10	RI47SS11	RI47SS12
Sample Date	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name									
Magnesium	502 J	486 J	376 J	154 J	293 J	356 J	770 J	489 J	682 J
Manganese	152	118	79.6	60.2	39.2	40.9	265	138	100
Mercury	0.94	5.5	3.7	1.4	0.5 B	0.2	0.99	0.08	0.65
Nickel	6.6 J	7.7	6 B	4.5 B	5.3 J	5.8 B	11.4	6 J	8.9
Potassium	299 J	318 J	271 J	137 J	217 J	350 J	378 J	347 J	266 J
Silver	259	474	22.3	8	4.3	1.2 J	5.9	0.39 J	1.2 J
Sodium	49.3 J	30.4 U	37.5 J	36.1 J	52.7 J	30 U	70.8 J	27.9 U	32.5 J
Vanadium	15.2	13.8	14.8	8.4 J	9.5	13.2	24.2	14.7	13.3
Zinc	235	96.8	102	58.4 B	12.9 B	12.5 B	255	19.9 B	21.7 B
Wet Chemistry (MG/KG)									
% Solids	88.5	89.9	93.6	95.4	95	91.7	89.3	85.6	90.4
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	7.02	6.1	5.53	5.38	5.68	4.81	7.1	5.86	7.67

NA - Not analyzed
B - Not detected above associated blank
J - Estimated
K - Biased high
L - Biased low

R - Unreliable
U - Not detected
UL - Not detected, biased low
UJ - Not detected, biased high
Shading indicates detection

TABLE 6-2
Detected Compounds in Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01	IS47SB02	IS47SB03	IS47SB04	IS47SB05	IS47SB06	IS47SB07	IS47SB08
Sample ID	IS47SB010204	IS47SB020203	IS47SB030203	IS47SB040506	IS47SB050203	IS47SB060203	IS47SB070304	IS47SB080304
Sample Date	03/28/01	03/30/01	03/29/01	03/29/01	03/29/01	03/30/01	03/20/01	03/20/01
Chemical Name								
Volatile Organic Compounds (UG/KG)								
Methylene chloride	NA	NA	NA	NA	NA	NA	12 U	12
Tetrachloroethene	NA	NA	NA	NA	NA	NA	12 U	12 U
Trichloroethene	NA	NA	NA	NA	NA	NA	12 U	12 U
Semi-volatile Organic Compounds (UG/KG)								
Acetophenone	NA	NA	NA	NA	NA	NA	78 J	50 J
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	390 U	390 U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	390 U	390 U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	390 U	390 U
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	67 J	390 U
Chrysene	NA	NA	NA	NA	NA	NA	390 U	390 U
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	570	210 J
Diethylphthalate	NA	NA	NA	NA	NA	NA	78 J	190 J
Fluoranthene	NA	NA	NA	NA	NA	NA	390 U	390 U
Phenanthrene	NA	NA	NA	NA	NA	NA	390 U	390 U
Pyrene	NA	NA	NA	NA	NA	NA	390 U	390 U
Total Metals (MG/KG)								
Aluminum	NA	NA	NA	NA	NA	NA	2,540	2,620
Antimony	NA	NA	NA	NA	NA	NA	1.7 U	1.7 U
Arsenic	NA	NA	NA	NA	NA	NA	2.1 J	2.7
Barium	NA	NA	NA	NA	NA	NA	13.6 J	10.3 J
Beryllium	NA	NA	NA	NA	NA	NA	0.31 J	0.29 J
Calcium	NA	NA	NA	NA	NA	NA	177 J	130 J
Chromium	NA	NA	NA	NA	NA	NA	9.8	12.9
Cobalt	NA	NA	NA	NA	NA	NA	7.2 J	3.6 J
Copper	NA	NA	NA	NA	NA	NA	6.6	6.2
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	8,640	12,900
Lead	NA	NA	NA	NA	NA	NA	7.2	7.8
Magnesium	NA	NA	NA	NA	NA	NA	523 J	457 J
Manganese	NA	NA	NA	NA	NA	NA	73.6	43.2

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

TABLE 6-2
Detected Compounds in Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01	IS47SB02	IS47SB03	IS47SB04	IS47SB05	IS47SB06	IS47SB07	IS47SB08
Sample ID	IS47SB010204	IS47SB020203	IS47SB030203	IS47SB040506	IS47SB050203	IS47SB060203	IS47SB070304	IS47SB080304
Sample Date	03/28/01	03/30/01	03/29/01	03/29/01	03/29/01	03/30/01	03/20/01	03/20/01
Chemical Name								
Mercury	NA	NA	NA	NA	NA	NA	0.12 U	0.11 U
Nickel	NA	NA	NA	NA	NA	NA	3.1 J	2.6 J
Potassium	NA	NA	NA	NA	NA	NA	378 J	356 J
Silver	NA	NA	NA	NA	NA	NA	0.37 U	0.36 U
Sodium	NA	NA	NA	NA	NA	NA	66.2 U	65.4 U
Vanadium	NA	NA	NA	NA	NA	NA	16.8	25
Zinc	NA	NA	NA	NA	NA	NA	12.8	13.9
Wet Chemistry (MG/KG)								
% Moisture	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	7.4	1.8	3.4	2.1	2.9	1.5	840	740

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

TABLE 6-2
Detected Compounds in Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12		IS47SB12		IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
Methylene chloride	12	U	12		NA		NA		NA		NA		NA		NA	
Tetrachloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Trichloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Semi-volatile Organic Compounds (UG/KG)																
Acetophenone	58	J	45	J	NA		NA		NA		NA		NA		NA	
Benzo(a)anthracene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(b)fluoranthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(k)fluoranthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Butylbenzylphthalate	410	U	390	U	NA		NA		NA		NA		NA		NA	
Chrysene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Di-n-butylphthalate	150	J	360	J	NA		NA		NA		NA		NA		NA	
Diethylphthalate	55	J	390	U	NA		NA		NA		NA		NA		NA	
Fluoranthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Phenanthrene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Pyrene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Total Metals (MG/KG)																
Aluminum	2,380		2,180		1,970		2,200		2,170		2,110		6,840		2,050	
Antimony	1.8	U	1.8	U	0.43	B	0.41	B	0.38	B	0.62	B	0.54	B	0.37	B
Arsenic	1.2	J	3		1.5	J	1.7	J	1.7	J	1.9	J	5		1.3	J
Barium	14.8	J	18.2	J	11.7	J	10.6	J	13.3	J	12.3	J	77.5		13.9	J
Beryllium	0.19	J	0.32	J	0.23	B	0.23	B	0.23	B	0.23	B	0.41	B	0.24	B
Calcium	267	J	237	J	16	B	23.4	L	14.3	B	27.9	L	95,200		50.9	L
Chromium	9.8		11.4		5.6		6.3		6.8		6		14.7		7.2	
Cobalt	2.4	J	12.1		5.4	J	5.2	J	4.5	J	5.7	J	6.1	J	8.1	J
Copper	6.4		6.7		4.1	J	4.2	J	4.1	J	3.7	J	19.7		3.7	J
Cyanide	NA		NA		NA		NA		NA		NA		NA		NA	
Iron	4,620		3,290		7,590		7,720		8,320		7,320		16,300		7,620	
Lead	6.7		7.4		3.4		3.1		3		3.3		12.8		3.6	
Magnesium	551	J	557	J	309	J	346	L	341	J	304	J	34,400		371	J
Manganese	58		43.3		207	L	196		174	L	229	L	502	L	244	L

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

TABLE 6-2
Detected Compounds in Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12		IS47SB12		IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
Mercury	0.12	U	0.1	U	0.049	U	0.057	U	0.048	U	0.053	U	0.04	U	0.04	U
Nickel	3.1	J	6.5	J	4.2	J	4.6	J	4.1	J	4.7	J	20.4		3.8	J
Potassium	381	J	360	J	180	J	193	J	189	J	171	J	1,630		181	J
Silver	0.39	U	0.37	U	0.14	U	0.16	U	0.14	U	0.15	U	0.15	U	0.15	U
Sodium	70.6	U	67.7	U	48.8	J	81.6	J	38.3	J	68.4	J	358	J	69	J
Vanadium	18.6		21.1		9.3	J	9.7	J	10.5		9.1	J	18.5		10.4	J
Zinc	11.4		20.2		7.4		8.8		8.4		9.9		50		7.1	
Wet Chemistry (MG/KG)																
% Moisture	NA		NA		NA		NA		NA		NA		NA		NA	
Total organic carbon (TOC)	2,300		2,100		NA		NA		NA		NA		NA		NA	

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

TABLE 6-2
Detected Compounds in Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
Methylene chloride	2.7	B	2.8	B	3.2	B	1.9	B	1.5	B
Tetrachloroethene	11	U	2.3	J	11	U	11	U	10	U
Trichloroethene	11	U	1.5	J	11	U	11	U	10	U
Semi-volatile Organic Compounds (UG/KG)										
Acetophenone	200	B	91	B	69	B	76	B	52	B
Benzo(a)anthracene	350	U	100	J	350	U	350	U	350	U
Benzo(b)fluoranthene	350	U	130	J	350	U	350	U	350	U
Benzo(k)fluoranthene	350	U	55	J	350	U	350	U	350	U
Butylbenzylphthalate	350	U	350	U	350	U	350	U	350	U
Chrysene	350	U	120	J	350	U	350	U	350	U
Di-n-butylphthalate	350	U	350	U	350	U	350	U	350	U
Diethylphthalate	350	U	350	U	350	U	350	U	350	U
Fluoranthene	350	U	150	J	350	U	350	U	350	U
Phenanthrene	350	U	84	J	350	U	350	U	350	U
Pyrene	350	U	48	J	350	U	350	U	76	J
Total Metals (MG/KG)										
Aluminum	2,150		3,010		2,930		4,600		4,760	
Antimony	0.66	U	0.93	K	0.66	U	0.65	U	0.65	U
Arsenic	2.1	K	3	K	1.5	K	3.3	K	3.1	K
Barium	15	J	26.5		19	J	24.6	J	25.5	J
Beryllium	0.12	B	0.075	B	0.15	B	0.22	B	0.22	B
Calcium	205	B	385	J	102	B	117	B	109	B
Chromium	11.6		16.1		8.5		10.1		10.3	
Cobalt	1.7	J	2.6		2.6	J	5.4	J	5.6	J
Copper	4.7	J	8.1		3.2	J	5.7		6	
Cyanide	0.085	J	0.19	J	0.069	J	0.53	U	0.52	U
Iron	7,670		9,390		6,790		10,400		10,400	
Lead	10	K	13.8	K	6.7	K	6.9	K	6.9	K
Magnesium	191	B	482	J	267	J	421	J	417	J
Manganese	45.4	B	79.3	J	65		97.6		90.4	

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

TABLE 6-2
Detected Compounds in Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
Mercury	1		2.6		0.17		11		14	
Nickel	2.6	K	4.5	K	2.8	K	4.7	K	4.6	K
Potassium	182	B	218	B	165	B	250	B	247	B
Silver	6.4		13.5		1.2	J	0.81	J	0.87	J
Sodium	52	U	51.5	U	51.7	U	51.3	U	51.1	U
Vanadium	12		13.7		10.9		16		16.2	
Zinc	13.2	J	22.4	J	10.3	J	16.2	J	15.8	J
Wet Chemistry (MG/KG)										
% Moisture	6.2		5.3		5.6		4.9		4.5	
Total organic carbon (TOC)	NA		NA		NA		NA		NA	

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW01		IS47GW02		IS47GW02		IS47GW03		IS47GW04		IS47GW05		IS47GW06		IS47GW07		IS47GW08	
Sample ID	IS47GW010301		IS47GW220301		IS47GW020301		IS47GW030301		IS47GW040301		IS47GW050301		IS47GW060301		IS47GW070301		IS47GW080301	
Sample Date	03/13/01		03/13/01		03/13/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01	
Chemical Name																		
Volatile Organic Compounds (UG/L)																		
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	9.6	J	10	U	10	U	10	U	4.7	J	10	U	8.3	J
1,2-Dichloroethane	310	D	240	D	82		21		10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	2,000	UD	10	U	10	U	41		74		10	U	10	U
Carbon tetrachloride	400	D	550	D	9,000	D	10	U	10	U	350	D	31		10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroform	410	D	590	D	16,000	D	10	U	10	U	350	D	280	D	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	10	U	10	U	2,000	UD	10	U	10	U	10	U	120		10	U	10	U
Naphthalene	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Tetrachloroethene	10	U	10	U	77		110		34		82		160		10	U	29	
Toluene	10	U	10	U	22		11		6.4	J	10	U	72		10	U	10	U
Trichloroethene	4.3	J	3.3	J	11		170		57		190		80		8.1	J	10	U
Vinyl chloride	10	U	10	U	10	U	18		23		10	U	10	U	14		68	
cis-1,2-Dichloroethene	10	U	10	U	10	U	140		140		36		86		89		2,300	D
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
m- and p-Xylene	10	U	10	U	10	U	6.5	J	10	U	10	U	10	U	10	U	10	U
o-Xylene	10	U	10	U	10	U	2.8	J	10	U	10	U	10	U	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	33	
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Total Metals (UG/L)																		
Aluminum	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Arsenic	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Barium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Beryllium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Cadmium	NA		NA		NA		NA		NA		NA		NA		NA		NA	

NA - Not analyzed
B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW01		IS47GW02		IS47GW02		IS47GW03		IS47GW04		IS47GW05		IS47GW06		IS47GW07		IS47GW08	
Sample ID	IS47GW010301		IS47GW220301		IS47GW020301		IS47GW030301		IS47GW040301		IS47GW050301		IS47GW060301		IS47GW070301		IS47GW080301	
Sample Date	03/13/01		03/13/01		03/13/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01	
Chemical Name																		
Calcium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Cobalt	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Copper	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Iron	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Magnesium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Manganese	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Mercury	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Nickel	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Potassium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Selenium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Sodium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Thallium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Vanadium	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Dissolved Metals (UG/L)																		
Aluminum	46.7	B	72.1	B	8.2	U	1,070	E	218	E	96.9	BE	253	E	51.5	BE	83.7	BE
Arsenic	7.4	B	15.8		4.5	U	4.5	U	4.5	U	17.5		6.3	B	4.5	U	4.5	U
Barium	63	B	210		0.3	U	81	B	53.6	B	67.5	B	67.1	B	48.1	B	12.5	B
Beryllium	0.1	U	0.56	B	0.1	U	0.1	U	0.1	U	0.4	B	0.65	B	0.1	U	0.1	B
Cadmium	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Calcium	4,310	B	9,000		3.1	U	5,020		3,710	B	5,980		5,600		4,590	B	5,630	
Cobalt	3.5	B	105		1.1	U	5.2	B	1.1	U	40.3	B	26.7	B	1.1	B	4.7	B
Iron	14,700		23,500		20.6	U	31,200		19,500		11,200		23,900		20,500		1,440	
Lead	1.5	U	1.7	B	1.5	U	6		3.4		1.5	U	3		3.6		1.5	U
Magnesium	3,560	B	7,180		5.5	U	4,850	B	3,470	B	2,540	B	1,400	B	2,080	B	1,090	B
Manganese	430		382		0.3	U	830		563		171		246		496		47.4	
Mercury	0.2	U	0.2	U	0.2	U	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN
Nickel	2.5		48.5		1.6	U	1.6	U	3.1	B	15	B	20.4	B	1.6	U	1.8	B
Potassium	3,090	BE	3,500	BE	22.3	UE	3,480	BE	2,060	BE	1,740	BE	979	BE	1,490	BE	1,010	BE
Selenium	4.8	U	4.8	U	4.8	U	4.8	U	4.8	U	4.8	U	32		4.8	U	19.7	
Sodium	22,000		17,600		289	U	15,900		14,600		4,980	B	6,080		16,700		12,800	
Thallium	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.7	B
Vanadium	1.9	B	3.5	B	0.8	B	5.9	B	2.8	B	7.4	B	12.7	B	2	B	2.6	B
Zinc	11.7	B	106		5.9	B	14.3	B	55.1		42.8		38.2		10.5	B	7.8	B

NA - Not analyzed
B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW09		IS47GW10		IS47GW11		IS47GW12		IS47GW12		IS47GW23		IS47GW24		IS47GW25		IS47GW26	
Sample ID	IS47GW090301		IS47GW100301		IS47GW110301		IS47GW120301		IS47GW320301		IS47GW230602		IS47GW240602		IS47GW250602		IS47GW260602	
Sample Date	03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		06/17/02		06/18/02		06/19/02		06/19/02	
Chemical Name																		
Volatile Organic Compounds (UG/L)																		
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
1,2-Dichloroethane	10	U	10	U	140		20		16		3	U	3	U	7		3	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U	NA		NA		NA		NA	
Carbon tetrachloride	10	U	4	J	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Chloroethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Chloroform	10	U	30		10	U	10	U	10	U	2	U	2	U	2	U	2	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Methylene chloride	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Naphthalene	NA		NA		NA		NA		NA		3	U	2		3	U	3	U
Tetrachloroethene	10	U	38		10	U	10	U	10	U	2	U	2	U	2	U	2	U
Toluene	8.1	J	10		8.1	J	13		5.7	J	2	U	2	U	2	U	2	U
Trichloroethene	10	U	4.6	J	6.7	J	6.7	J	5.2	J	2	U	2	U	2	U	2	U
Vinyl chloride	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
cis-1,2-Dichloroethene	10	U	12		10	U	15		9.5	J	2	U	2	U	2	U	2	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
m- and p-Xylene	10	U	10	U	10	U	10	U	10	U	4	U	4	U	4	U	4	U
o-Xylene	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	2	U	2	U	2	U	2	U
Total Metals (UG/L)																		
Aluminum	NA		NA		NA		NA		NA		NA		NA		216	B	58.7	B
Arsenic	NA		NA		NA		NA		NA		NA		NA		4.2	U	4.2	U
Barium	NA		NA		NA		NA		NA		NA		NA		95.2	J	146	J
Beryllium	NA		NA		NA		NA		NA		NA		NA		0.37	B	0.4	B
Cadmium	NA		NA		NA		NA		NA		NA		NA		0.3	U	0.3	U

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B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW09		IS47GW10		IS47GW11		IS47GW12				IS47GW23		IS47GW24		IS47GW25		IS47GW26	
Sample ID	IS47GW090301		IS47GW100301		IS47GW110301		IS47GW120301		IS47GW320301		IS47GW230602		IS47GW240602		IS47GW250602		IS47GW260602	
Sample Date	03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		06/17/02		06/18/02		06/19/02		06/19/02	
Chemical Name																		
Calcium	NA		NA		NA		NA		NA		NA		NA		5,370		28,500	
Cobalt	NA		NA		NA		NA		NA		NA		NA		1.2	B	1.1	B
Copper	NA		NA		NA		NA		NA		NA		NA		1	L	0.7	UL
Iron	NA		NA		NA		NA		NA		NA		NA		45,900		37,900	
Magnesium	NA		NA		NA		NA		NA		NA		NA		3,230	J	5,910	
Manganese	NA		NA		NA		NA		NA		NA		NA		1,680		1,390	
Mercury	NA		NA		NA		NA		NA		NA		NA		0.46		0.12	J
Nickel	NA		NA		NA		NA		NA		NA		NA		1.2	B	1.6	B
Potassium	NA		NA		NA		NA		NA		NA		NA		1,070	J	5,660	J
Selenium	NA		NA		NA		NA		NA		NA		NA		2.2	J	2.2	U
Sodium	NA		NA		NA		NA		NA		NA		NA		8,750	B	18,200	B
Thallium	NA		NA		NA		NA		NA		NA		NA		4.4	J	3.7	J
Vanadium	NA		NA		NA		NA		NA		NA		NA		1.5	B	0.5	U
Zinc	NA		NA		NA		NA		NA		NA		NA		19.2	L	22.4	
Dissolved Metals (UG/L)																		
Aluminum	316	E	8.2	UE	8.2	UE	196	BE	94.9	BE	NA		NA		56.5	B	59.3	B
Arsenic	4.5	U	4.5	U	5.4	B	4.5	U	4.5	U	NA		NA		4.2	U	4.2	U
Barium	41	B	6	B	78.3	B	48	B	48	B	NA		NA		97.1	J	161	J
Beryllium	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	NA		NA		0.76	B	0.73	B
Cadmium	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA		0.3	U	0.3	U
Calcium	3,530	B	2,090	B	5,710		3,160	B	3,090	B	NA		NA		5,400		28,800	
Cobalt	1.2	B	2.6	B	1.1	U	1.4	B	1.1	U	NA		NA		1.1	B	2.1	B
Iron	20,400		1,180		22,000		22,800		22,300		NA		NA		45,000		41,300	
Lead	5.1		1.5	U	3.8		2.3	B	3.1		NA		NA		1.3	U	1.3	U
Magnesium	2,620	B	687	B	5,030		2,790	B	2,740	B	NA		NA		3,220	J	6,410	
Manganese	476		44.2		867		688		671		NA		NA		1,650		1,470	
Mercury	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN	NA		NA		0.1	U	0.1	U
Nickel	1.6	U	1.6	U	2.5	B	1.6	U	1.6	U	NA		NA		2.9	B	5.3	B
Potassium	2,010	BE	1,200	BE	3,770	BE	2,260	BE	2,140	BE	NA		NA		1,170	B	7,030	J
Selenium	4.8	U	4.8	U	4.8	U	4.8	U	4.8	U	NA		NA		2.2	U	2.2	U
Sodium	18,900		2,220	B	16,100		14,800		14,700		NA		NA		9,030	B	22,500	B
Thallium	5.2	U	7.6	B	5.2	U	5.2	U	5.2	U	NA		NA		7.2	L	6.4	L
Vanadium	2.4	B	2.8	B	1.7	B	1.8	B	1.7	B	NA		NA		0.9	B	0.75	B
Zinc	11.2	B	7.8	B	11.9	B	12.2	B	11	B	NA		NA		24.6	B	63.6	B

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D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW27		IS47GW28	IS47GW29	IS47GW30	IS47GW31	IS47GW32	IS47GW33	
Sample ID	IS47GW270602	IS47GW270602P	IS47GW280602	IS47GW290602	IS47GW300602	IS47GW310602	IS47GW320602	IS47GW330602	IS47GW330602P
Sample Date	06/19/02	06/19/02	06/18/02	06/18/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02
Chemical Name									
Volatile Organic Compounds (UG/L)									
1,1,1-Trichloroethane	2 U	2 U	2 U	2 U	2	12	2 U	2 U	NA
1,1,2-Trichloroethane	2 U	2 U	2 U	2 U	2 U	1 J	2 U	2 U	NA
1,1-Dichloroethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA
1,1-Dichloroethene	2 U	2 U	2 U	2 U	2 U	4	2 U	2 U	NA
1,2-Dichloroethane	27	24	3 U	3 U	1 J	8	3 U	19	NA
Bromodichloromethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	2 U	2 U	2 U	1 J	11,000 D	110,000 D	14,000 D	12	NA
Chloroethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA
Chloroform	2 U	2 U	2 U	2 U	4,300 D	56,000 D	6,100 D	2 U	NA
Chloromethane	2 U	2 U	2 U	2 U	2 U	3	2	2 U	NA
Dibromochloromethane	2 U	2 U	2 U	2 U	2 U	3	2 U	2 U	NA
Dichlorodifluoromethane(Freon-12)	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA
Methylene chloride	2 U	2 U	2 U	2 U	4	31	2	2 U	NA
Naphthalene	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	NA
Tetrachloroethene	2 U	2 U	2 U	2 U	21	3	30	2 U	NA
Toluene	2 U	2 U	2 U	2 U	2 U	52 E	2 U	2 U	NA
Trichloroethene	2 U	2 U	2 U	2 U	2 U	16	2 U	18	NA
Vinyl chloride	2 U	2 U	2 U	2 U	2 U	1 J	2 U	1 J	NA
cis-1,2-Dichloroethene	2 U	2 U	2 U	2 U	2 U	8	2 U	1 J	NA
cis-1,3-Dichloropropene	2 U	2 U	2 U	2 U	2 U	1 J	2 U	2 U	NA
m- and p-Xylene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	NA
o-Xylene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA
trans-1,2-Dichloroethene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	NA
trans-1,3-Dichloropropene	2 U	2 U	2 U	2 U	2 U	2	2 U	2 U	NA
Total Metals (UG/L)									
Aluminum	270 B	NA	NA	NA	90.5 B	5,140	152 B	63.9 B	166 B
Arsenic	4.2 U	NA	NA	NA	4.2 U	36.5	4.2 U	4.2 U	4.2 U
Barium	124 J	NA	NA	NA	8.2 B	196 J	4.3 B	104 J	101 J
Beryllium	0.65 B	NA	NA	NA	0.58 B	13.4	0.63 B	0.64 B	0.69 B
Cadmium	0.3 U	NA	NA	NA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U

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E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW27		IS47GW28	IS47GW29	IS47GW30	IS47GW31	IS47GW32	IS47GW33	
Sample ID	IS47GW270602	IS47GW270602P	IS47GW280602	IS47GW290602	IS47GW300602	IS47GW310602	IS47GW320602	IS47GW330602	IS47GW330602P
Sample Date	06/19/02	06/19/02	06/18/02	06/18/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02
Chemical Name									
Calcium	4,240 J	NA	NA	NA	932 J	8,550	1,420 J	3,600 J	3,470 J
Cobalt	2 B	NA	NA	NA	3.2 B	428	8.9 J	0.6 U	0.78 B
Copper	0.7 UL	NA	NA	NA	0.7 UL	0.7 UL	0.7 UL	0.7 UL	0.7 UL
Iron	31,100	NA	NA	NA	398	62,600	619	19,700	19,000
Magnesium	4,260 J	NA	NA	NA	420 J	13,700	1,080 J	3,900 J	3,720 J
Manganese	1,400	NA	NA	NA	19.1 B	602	76.3 B	548	537
Mercury	0.1 J	NA	NA	NA	0.1 J	0.12 J	0.11 B	0.1 J	0.11 J
Nickel	9.1 B	NA	NA	NA	4.9 B	264	10.2 B	2 B	2 B
Potassium	1,610 J	NA	NA	NA	488 J	4,030 J	810 J	6,410 J	6,140 J
Selenium	2.7 J	NA	NA	NA	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Sodium	16,000 B	NA	NA	NA	22,100 B	39,700	26,300 B	23,500 B	22,800 B
Thallium	5.2 J	NA	NA	NA	3.3 U	8 J	3.3 U	3.5 J	3.3 U
Vanadium	2.6 B	NA	NA	NA	0.5 U	115	0.73 B	0.77 B	1.8 B
Zinc	13.3 L	NA	NA	NA	9.9 L	522	19.9 L	6.1 L	16.9 L
Dissolved Metals (UG/L)									
Aluminum	58.6 B	NA	NA	NA	64.9 B	4,880	82.3 B	39 B	30 B
Arsenic	5.5 J	NA	NA	NA	4.2 U	37.7	4.2 U	4.2 U	4.2 U
Barium	138 J	NA	NA	NA	7.7 B	207	3.7 B	99 J	98.9 J
Beryllium	0.74 B	NA	NA	NA	0.69 B	13.5	0.68 B	0.54 B	0.37 B
Cadmium	0.3 U	NA	NA	NA	0.3 U	0.3 U	0.3 B	0.3 U	0.3 U
Calcium	5,120	NA	NA	NA	683 J	8,730	1,410 J	3,450 J	3,420 J
Cobalt	1.8 B	NA	NA	NA	2.4 B	440	8.9 J	0.6 U	0.62 B
Iron	37,600	NA	NA	NA	1,250 B	65,100	555 B	19,200	18,500
Lead	1.3 U	NA	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Magnesium	5,290	NA	NA	NA	273 B	14,200	1,060 J	3,810 J	3,710 J
Manganese	1,660	NA	NA	NA	32.8 B	634	76.8 B	557	546
Mercury	0.1 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	10.3 B	NA	NA	NA	6.3 B	272	8.8 B	1.3 B	1.5 B
Potassium	2,410 J	NA	NA	NA	741 B	4,440 J	839 B	6,320 J	6,240 J
Selenium	2.5 J	NA	NA	NA	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Sodium	18,900 B	NA	NA	NA	21,600 B	40,800	24,600 B	23,900 B	24,000 B
Thallium	6 L	NA	NA	NA	3.3 UL	9.1 L	3.3 UL	4.4 L	3.3 UL
Vanadium	1.3 B	NA	NA	NA	0.5 U	114	0.5 U	0.5 U	0.54 B
Zinc	13.3 B	NA	NA	NA	13.1 B	566	20.6 B	10.6 B	19.2 B

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L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW34		IS47GW35		IS47GW36		IS47GW36		IS47GW37		IS47GW38		IS47GW39		IS47GW40		IS47GW41	
Sample ID	IS47GW340602		IS47GW350602		IS47GW360602		IS47GW360602P		IS47GW370602		IS47GW380602		IS47GW390602		IS47GW400602		IS47GW410602	
Sample Date	06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02		06/20/02		06/20/02		06/26/02	
Chemical Name																		
Volatile Organic Compounds (UG/L)																		
1,1,1-Trichloroethane	3		2	U	3		2	U	2	U	2	U	2	U	2	U	2	U
1,1,2-Trichloroethane	4		2	U	2	U	2	U	2	U	2	U	2		2	U	2	U
1,1-Dichloroethane	2	U	5	DJ	2	U	2	U	2		2	U	2	U	2	U	2	U
1,1-Dichloroethene	2	U	6	D	2	U	2	U	3		2	U	14		2	U	2	U
1,2-Dichloroethane	3	U	7	DJ	3	U	3	U	3	U	3	U	3	U	3	U	25	
Bromodichloromethane	2	U	2	U	2	U	2	U	2	U	2	U	1	J	2	U	2	U
Carbon disulfide	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Carbon tetrachloride	18,000	D	3		8,000	D	930	E	2,400	D	2,300	D	250,000	DE	15		2	U
Chloroethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloroform	4,800	D	15	D	7,700	D	620	E	8,100	D	2,000	D	91,000	DE	5		2	U
Chloromethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Dibromochloromethane	64	E	8	DJ	2	U	2	U	2	U	9		2	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	2	U	2	U	2	U	2	U	2	U	2	U	8		2	U	2	U
Methylene chloride	3		2	U	10		9		18		2		2,000	DJ	2	U	2	U
Naphthalene	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
Tetrachloroethene	69	E	9	DJ	100	D	57	E	16		10		20		2	U	2	U
Toluene	2	U	2	U	6		7		4		2	U	49		2	U	3	
Trichloroethene	2	U	170	D	2		2	U	47		2	U	2	U	2	U	2	U
Vinyl chloride	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
cis-1,2-Dichloroethene	2	U	39		2	U	2	U	23		2	U	21		2	U	2	U
cis-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
m- and p-Xylene	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U
o-Xylene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	2	U	1	J	2	U	2	U	2	U	2	U	2	U	2	U	2	U
trans-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Total Metals (UG/L)																		
Aluminum	116	B	129	B	157	B	NA		109	B	116	B	16,400		NA		NA	
Arsenic	4.2	U	5.7	J	4.2	U	NA		8.4	J	4.2	U	15.1		NA		NA	
Barium	6.6	B	193	J	11.7	B	NA		228		5	B	170	J	NA		NA	
Beryllium	0.78	B	0.6	B	1	B	NA		2.3	B	0.82	B	15		NA		NA	
Cadmium	0.3	U	0.3	U	0.81	B	NA		0.3	U	0.3	U	2.8	J	NA		NA	

NA - Not analyzed
B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW34	IS47GW35	IS47GW36		IS47GW37	IS47GW38	IS47GW39	IS47GW40	IS47GW41
Sample ID	IS47GW340602	IS47GW350602	IS47GW360602	IS47GW360602P	IS47GW370602	IS47GW380602	IS47GW390602	IS47GW400602	IS47GW410602
Sample Date	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/20/02	06/20/02	06/20/02	06/26/02
Chemical Name									
Calcium	2,140 J	8,280	3,080 J	NA	13,300	1,410 J	7,770	NA	NA
Cobalt	10.5 J	32.3 J	24.5 J	NA	288	14.3 J	279	NA	NA
Copper	0.7 UL	1.3 L	0.7 UL	NA	0.7 UL	0.7 UL	0.7 UL	NA	NA
Iron	517	20,200	5,980	NA	53,700	674	76,600	NA	NA
Magnesium	1,380 J	9,450	2,410 J	NA	15,600	1,600 J	16,100	NA	NA
Manganese	79 B	400	184	NA	731	172	697	NA	NA
Mercury	0.11	0.1 U	0.11 J	NA	0.1 J	0.11 J	0.11 J	NA	NA
Nickel	8 B	25.6 J	19.9 J	NA	126	8.7 B	245	NA	NA
Potassium	835 J	8,990 J	1,790 J	NA	9,210 J	890 J	4,360 J	NA	NA
Selenium	2.2 U	2.2 U	2.2 U	NA	2.3 J	2.2 U	2.2 U	NA	NA
Sodium	17,900 B	51,200	39,400	NA	50,700	8,990 B	38,200	NA	NA
Thallium	3.3 U	4.3 J	3.3 U	NA	6.7 J	3.3 U	14	NA	NA
Vanadium	0.5 U	2.4 B	0.56 B	NA	1.6 B	0.5 U	332	NA	NA
Zinc	24.8	31.5	72.7	NA	119	21.1 L	522	NA	NA
Dissolved Metals (UG/L)									
Aluminum	59 B	67.6 B	96.4 B	NA	81.5 B	49.1 B	17,900	NA	NA
Arsenic	4.2 U	4.2 U	4.2 U	NA	9.1 J	4.2 U	15	NA	NA
Barium	5.6 B	178 J	11.6 B	NA	215	4.3 B	185 J	NA	NA
Beryllium	0.26 B	1.1 B	0.4 B	NA	1.7 B	0.2 U	14.9	NA	NA
Cadmium	0.3 U	0.3 U	0.79 B	NA	0.3 U	0.3 U	3.2 J	NA	NA
Calcium	2,240 J	7,440	2,980 J	NA	13,100	1,370 J	8,100	NA	NA
Cobalt	11 J	27.2 J	24.2 J	NA	297	14.2 J	292	NA	NA
Iron	565 B	18,600	5,780	NA	53,200	705 B	80,400	NA	NA
Lead	1.3 U	1.3 U	1.3 U	NA	1.3 U	1.3 U	3.8 B	NA	NA
Magnesium	1,450 J	8,730	2,350 J	NA	15,300	1,530 J	17,000	NA	NA
Manganese	88.4 B	366	194	NA	745	172	760	NA	NA
Mercury	0.1 J	0.1 U	0.1 U	NA	0.1 U	0.12 J	0.1 U	NA	NA
Nickel	8.1 B	16.8 J	19.7 J	NA	120	9 B	277	NA	NA
Potassium	852 B	8,890 J	1,780 J	NA	8,800 J	1,030 B	4,460 J	NA	NA
Selenium	2.2 U	2.2 U	2.3 J	NA	2.2 U	2.2 U	2.2 U	NA	NA
Sodium	16,200 B	46,200	33,900	NA	53,000	9,730 B	41,900	NA	NA
Thallium	3.3 UL	4.4 L	3.5 L	NA	5.8 L	3.3 UL	10.6 L	NA	NA
Vanadium	0.5 U	1.8 B	0.5 U	NA	1.2 B	0.5 U	350	NA	NA
Zinc	28.9 B	28.4 B	74 B	NA	132	18.9 B	572	NA	NA

NA - Not analyzed
B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW42		RI47GW13		RI47GW14		RI47GW15		RI47GW16		RI47GW17		RI47GW18		RI47GW19		RI47GW20		RI47GW21		RI47GW22		RI47SP01	
Sample ID	IS47GW420602		RI47GW13		RI47GW14		RI47GW15		RI47GW16		RI47GW17		RI47GW18		RI47GW19		RI47GW20		RI47GW21		RI47GW22		RI47SP01	
Sample Date	06/28/02		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01	
Chemical Name																								
Volatile Organic Compounds (UG/L)																								
1,1,1-Trichloroethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1,2-Trichloroethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethene	2	U	2	U	1	J	2	J	2	J	2	U	2	U	2	U	1	J	2	U	2	U	2	U
1,2-Dichloroethane	3	U	17		124	D	1,580	D	1,290	D	11		650	D	96	D	120	D	3	U	3	U	3	U
Bromodichloromethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Carbon disulfide	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Carbon tetrachloride	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloroethane	2	U	2	U	2	U	2		2	J	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloroform	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloromethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Dibromochloromethane	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Methylene chloride	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Naphthalene	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3		3	U	3	U	3	U	3	U
Tetrachloroethene	2	U	2	U	2	U	103	D	81	D	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Toluene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Trichloroethene	2	U	7		75	D	270	D	200	D	2	U	2	U	2	U	34		2	U	2	U	2	U
Vinyl chloride	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
cis-1,2-Dichloroethene	2	U	2	U	32		40		34		2	U	2		1	J	34		2	U	2	U	2	U
cis-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
m- and p-Xylene	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U
o-Xylene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	2	U	2	U	1	J	4		3		2	U	2	U	2	U	1	J	2	U	2	U	2	U
trans-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Total Metals (UG/L)																								
Aluminum	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Arsenic	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Barium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Beryllium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Cadmium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

NA - Not analyzed
B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range

J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-3
Detected Compounds in Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW42	RI47GW13	RI47GW14	RI47GW15	RI47GW16	RI47GW17	RI47GW18	RI47GW19	RI47GW20	RI47GW21	RI47GW22	RI47SP01
Sample ID	IS47GW420602	RI47GW13	RI47GW14	RI47GW15	RI47GW16	RI47GW17	RI47GW18	RI47GW19	RI47GW20	RI47GW21	RI47GW22	RI47SP01
Sample Date	06/28/02	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01
Chemical Name												
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)												
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed
B - Analyte found in the associated blank and the sample
D - Spike diluted out
E - Concentration exceeds calibration range
J - Reported value is estimated
L - Reported value biased low
U - Analyte not detected

TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04			IS47MW05
Sample ID	IS47MW010401	RI47GW01	IS47MW020401	RI47GW02	IS47MW030401	IS47MW030902	RI47GW03	RI47GW99	IS47MW040401	IS47MW040902	RI47GW04	IS47MW050401
Sample Date	04/10/01	07/13/99	04/10/01	07/13/99	04/10/01	09/26/02	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/09/01
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	0.7 J	6,300 U	1 U	1 U	1 U	3,300 U	6.3	1 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	6,300 U	1.2	1.1	3	3,300 U	0.5 J	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	3.9 J	NA	NA	6,300 U	NA	NA	NA	3,300 U	NA	NA
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	6,300 U	3.4	3.4	1 U	3,300 U	0.3 J	1 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	1 U	6,300 U	168 J	1 U	0.9 J	3,300 U	1.2	1 U
1,1-Dichloroethene	1.3	1.9	1 U	1 U	1 U	6,300 U	743 J	1 U	3.9	3,300 U	3.3	1 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 U	6,300 U	6.6	1 U	1 R	3,300 U	1 U	1 R
1,2-Dichloroethane	2.2	6.7	1.5	1 U	1 U	6,300 U	716 J	1 U	53	3,300 U	1 U	1 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	6,300 U	1.3	1 U	1 U	3,300 U	1 U	1 U
2-Butanone	5 U	5 R	5 U	5 R	5 U	6,300 U	5 R	5 R	5 R	3,300 U	5 R	5 R
2-Hexanone	5 U	5 U	5 U	5 U	5 U	6,300 U	2.1 J	5 U	5 U	3,300 U	5 UJ	5 U
4-Methyl-2-pentanone	5 U	5 U	5 U	5 U	5 U	6,300 U	10.8	5 U	5 U	3,300 U	5 UJ	5 U
Acetone	5 U	5 R	5 U	5 R	5 U	6,300 U	6,064 L	5 R	5 R	3,300 U	13.5 L	5 R
Bromochloromethane	1 U	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	1 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	6,300 U	4.3	1 U	1 U	3,300 U	0.9 J	1 U
Bromomethane	1 U	1 U	1 U	1 U	1 U	6,300 U	937 J	1 U	1 U	3,300 U	1 U	1 U
Carbon disulfide	1 U	0.5 B	1 U	0.6 B	1.1	2,200 J	6,620 L	1 U	2,900	2,800 J	777	1 U
Carbon tetrachloride	1 U	0.6 J	3.6	87.5 L	6,500	100,000	286,340 L	270,710 L	34,000	28,000	6,483 L	1 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	6,300 U	26.2 J	1 U	1 U	3,300 U	1 U	1 U
Chloroform	1 U	9.9 B	2.4	20.8 B	2,000	39,000	57,570 L	1 U	23,000	23,000	6,063 L	1 U
Chloromethane	1 U	1 U	1 U	1 U	1 U	6,300 U	59,259 J	1 U	1.1	3,300 U	1 U	1 U
Cyclohexane	NA	NA	NA	NA	NA	6,300 U	NA	NA	NA	3,300 U	NA	NA
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	6,300 U	86.6 J	1 U	1 U	3,300 U	1 U	1 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	6,300 U	NA	NA	NA	3,300 U	NA	NA
Methylene chloride	2 U	1 B	2 U	0.9 B	2 U	4,500 B	1,660 B	2 U	42 R	2,400 B	259 B	1.5 J
Tetrachloroethene	2.1	2.8	1.3	2.9	5.2	6,300 U	116 J	116 J	1,400	1,300 J	290 L	1 U
Toluene	1 U	1 U	1 U	1 U	1 U	1,100 B	233 J	237 J	25	540 B	26.8 R	1 U
Trichloroethene	130	168 L	4.1	1 J	1 U	6,300 U	0.4 J	1 U	120	3,300 U	339	2.6
Vinyl chloride	1 U	1 U	2	1 U	1 U	6,300 U	28.2 J	1 U	1 U	3,300 U	1 U	0.8 J
Xylene, total	1 U	1 U	1 U	1 U	1 U	6,300 U	0.3 J	1 U	1 U	3,300 U	1 U	1 U
cis-1,2-Dichloroethene	15	15	13	0.7 J	1 U	6,300 U	1,452 J	1 U	12	3,300 U	12.4	14
trans-1,2-Dichloroethene	1 U	0.6 J	1 U	1 U	1 U	6,300 U	382 J	1 U	1.6	3,300 U	1.7	1 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	6,300 U	4.8	1 U	1 U	3,300 U	1 U	1 U
Semi-volatile Organic Compounds (UG/L)												
2-Methylnaphthalene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	10 U
Acenaphthene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	10 U
Anthracene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	10 U
Benzaldehyde	10 U	NA	10 U	NA	10 U	NA	NA	NA	1.9 J	NA	NA	10 U
Di-n-butylphthalate	10 U	11 U	10 U	11 U	10 U	NA	3 B	2 B	10 U	NA	8 B	10 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate

TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04			IS47MW05
Sample ID	IS47MW010401	RI47GW01	IS47MW020401	RI47GW02	IS47MW030401	IS47MW030902	RI47GW03	RI47GW99	IS47MW040401	IS47MW040902	RI47GW04	IS47MW050401
Sample Date	04/10/01	07/13/99	04/10/01	07/13/99	04/10/01	09/26/02	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/09/01
Chemical Name												
Diethylphthalate	10 U	11 U	10 U	11 U	10 U	NA	2 J	2 J	10 U	NA	11 U	10 U
Dimethyl phthalate	10 U	11 U	10 U	11 U	10 U	NA	3 J	3 J	10 U	NA	11 U	10 U
Fluoranthene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	10 U
Fluorene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	10 U
Hexachloroethane	10 U	11 U	10 U	11 U	10 U	NA	58	54	10 U	NA	11 U	10 U
Naphthalene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	10 U
Pentachlorophenol	25 U	27 U	25 U	27 U	25 U	NA	4 J	3 J	25 U	NA	29 U	25 U
Phenanthrene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	1.1 J
Phenol	10 U	11 U	10 U	11 U	10 U	NA	13	12	10 U	NA	21	10 U
Pyrene	10 U	11 U	10 U	11 U	10 U	NA	11 U	11 U	10 U	NA	11 U	1.3 J
bis(2-Ethylhexyl)phthalate	10 U	11 U	10 U	11 U	10 U	NA	1 B	11 U	10 U	NA	6 B	1.7 J
Explosives (UG/L)												
Nitroguanidine	100 U	5 U	140 U	5 U	240 U	NA	37.4	25.3	140 U	NA	5 U	100 U
Total Metals (UG/L)												
Aluminum	94.5 B	122 B	1,890	1,100	288	NA	27,100	25,400	559	NA	2,660	77.6 J
Arsenic	32.9	10.9	4.5 J	3.7 B	2.5 U	NA	108	100	47.9	NA	104	2.5 U
Barium	239 J	176 J	109 J	55.9 J	3.5 J	NA	335	312	102 J	NA	163 J	46.6 J
Beryllium	0.34 B	0.1 U	0.35 B	0.28 J	0.1 U	NA	14.5	13.8	1.2 B	NA	4.1 J	0.68 J
Cadmium	0.4 U	0.41 J	0.64 J	0.66 J	1.6 J	NA	5.6	5.3	0.48 J	NA	0.69 J	0.6 J
Calcium	6,490	5,560	20,500	36,400	6,220	NA	7,630	7,140	2,990 J	NA	3,570 J	5,200
Chromium	0.8 U	1.1 U	5.1 J	13.2	0.8 U	NA	14.9	14.3	0.8 U	NA	28.4	0.8 U
Cobalt	15.3 J	11.1 J	15.7 J	6.6 B	2.3 J	NA	282	267	50.4	NA	100	3.4 J
Copper	1.4 J	4.1 B	7.2 J	12.5 J	1.9 J	NA	38.9	34.6	0.8 U	NA	5.3 B	0.8 U
Cyanide	10 U	NA	10 U	NA	10 U	NA	NA	NA	10 U	NA	NA	10 U
Iron	12,300	6,310	4,280	1,070	548	NA	99,300	94,300	16,700	NA	36,000	12,400
Lead	2.5 U	1 U	6.5	12.7	2.5 U	NA	35	33.8	2.5 U	NA	8.3	2.5 U
Magnesium	8,000	5,670	7,630	10,300	1,180 J	NA	17,300	16,400	2,530 J	NA	4,140 J	2,600 J
Manganese	252	364	206	45.5	25.3	NA	869	823	168	NA	350	315
Mercury	0.2 R	0.1 U	0.29 L	0.28	0.2 L	NA	0.1 U	0.1 U	0.2 R	NA	0.1 U	0.2 R
Nickel	2.1 J	3.9 J	10.7 J	8.4 J	5.1 J	NA	249	234	33.9 J	NA	86.3	1.7 U
Potassium	4,900 J	5,070	3,420 J	3,470 J	1,050 J	NA	3,160 J	2,910 J	1,470 J	NA	2,660 J	1,170 J
Sodium	55,800 J	40,300	21,700 J	16,300	3,270 J	NA	51,100	47,700	32,200	NA	30,200	15,300
Thallium	3.9 U	3.2 U	5.6 J	3.2 U	3.9 U	NA	3.6 J	3.2 U	6.5 J	NA	3.2 U	6 J
Vanadium	34.9 U	1.2 J	34.9 U	15.3 J	34.9 U	NA	326	309	34.9 U	NA	67.1	34.9 U
Zinc	85.9 J	38	49.3 J	26.2 B	70.7 J	NA	655	619	120 J	NA	201	36.7 J
Dissolved Metals (UG/L)												
Aluminum	124 B	38.2 U	5,190	118 J	317	NA	27,000	26,800	915	NA	1,390	49.1 J
Antimony	5.8 J	2.7 U	4.9 U	2.7 U	4.9 U	NA	2.7 U	2.7 U	4.9 U	NA	2.7 U	4.9 U
Arsenic	28.5	11.9	12.1	3.7 J	3.7 U	NA	105	106	53.7	NA	103	3.7 U
Barium	218	167 J	185 J	33.4 J	4.8 J	NA	331	330	105 J	NA	152 J	51.6 J
Beryllium	0.28 B	0.1 U	1.2 B	0.1 U	0.1 U	NA	14.4	14.5	1.4 B	NA	3.7 J	0.1 B

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R - Unreliable result

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TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04			IS47MW05
Sample ID	IS47MW010401	RI47GW01	IS47MW020401	RI47GW02	IS47MW030401	IS47MW030902	RI47GW03	RI47GW99	IS47MW040401	IS47MW040902	RI47GW04	IS47MW050401
Sample Date	04/10/01	07/13/99	04/10/01	07/13/99	04/10/01	09/26/02	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/09/01
Chemical Name												
Cadmium	0.4 U	0.44 J	0.4 U	0.3 U	0.4 U	NA	5.7	5.7	0.4 U	NA	0.7 J	0.4 U
Calcium	6,470	5,470	23,100	36,300	6,790	NA	8,200	7,530	3,050 J	NA	3,450 J	6,290
Chromium	0.9 J	1.1 U	22.5	4.5 J	1.1 J	NA	15.2	14.4	1.2 J	NA	2.1 J	0.7 U
Cobalt	16.2 J	11.1 B	28.4 J	3.5 B	3.6 J	NA	279	283	61.5	NA	95.6	6.1 J
Copper	3.4 J	3 B	31.8	3.3 B	0.7 U	NA	38.2	37.4	0.97 J	NA	2.9 B	0.7 U
Iron	8,490	6,400	9,680	39.2 J	516	NA	98,400	99,200	19,400	NA	34,500	13,000
Lead	2 U	1 U	34.6	1.4 J	2 U	NA	34.4	34.9	2 U	NA	5.5	2 U
Magnesium	8,050	5,470	8,560	10,200	1,320 J	NA	17,100	17,300	2,930 J	NA	3,920 J	3,220 J
Manganese	258	375	245	30.1	24.6	NA	868	870	192	NA	352	412
Nickel	2.2 J	3.7 J	19.8 J	5.4 J	5.2 J	NA	244	246	42.6	NA	72.8	2 U
Potassium	5,270	4,950 J	4,240 J	3,660 J	1,390 J	NA	3,100 J	3,080 J	1,860 J	NA	2,440 J	1,520 J
Sodium	54,500	39,400	23,100	16,300	4,110 J	NA	50,600	50,700	37,300	NA	29,900	18,500
Thallium	2.3 U	3.2 U	2.3 U	3.2 U	3 J	NA	3.2 U	3.2 U	3.5 J	NA	3.7 J	2.3 U
Vanadium	1 U	0.6 U	63.8	4.3 J	2.2 J	NA	324	327	13.7 J	NA	55.3	1.9 J
Zinc	86.8	40.5	79.3	10.8 B	48.2	NA	673	653	117	NA	180	23.4
Wet Chemistry (MG/L)												
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	44	NA	23	NA	0.2 U	NA	NA	NA	86	NA	NA	0.2 U
Nitrate	8.9	NA	0.2 U	NA	0.2 U	NA	NA	NA	8.9	NA	NA	3.5
Nitrite	0.2 U	NA	0.2 U	NA	0.2 U	NA	NA	NA	0.2 U	NA	NA	0.2 U
Sulfate	0.2 U	NA	0.2 U	NA	1.9	NA	NA	NA	0.2 U	NA	NA	9.6
Total organic carbon (TOC)	1.9	NA	2.5	NA	1.2	NA	NA	NA	2.4	NA	NA	4.4

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TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW06		IS47MW07		IS47MW07		IS47MW08		IS47MW09		IS47MW10		IS47MW11		IS47MW11		IS47MW12	
Sample ID	IS47MW060401		IS47MW070401		IS47MW410401		IS47MW080401		IS47MW090401		IS47MW100401		IS47MW110602		IS47MW110902		IS47MW120902	
Sample Date	04/09/01		04/09/01		04/09/01		04/10/01		04/09/01		04/09/01		06/28/02		09/26/02		09/25/02	
Chemical Name																		
Volatile Organic Compounds (UG/L)																		
1,1,1-Trichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
1,1,2,2-Tetrachloroethane	1	U	1	U	1	U	1	U	1	U	1	U	NA		0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
1,1,2-Trichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
1,1-Dichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
1,1-Dichloroethene	1	U	1	U	1	U	1	U	1	U	0.9	J	2	U	0.5	U	0.5	U
1,2-Dibromo-3-chloropropane	1	R	1	R	1	R	1	U	1	R	1	R	NA		0.5	R	0.5	R
1,2-Dichloroethane	1	U	1	U	1	U	1	U	1	U	23		3	U	0.5	U	0.5	U
1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
2-Butanone	5	R	5	R	5	R	5	U	5	R	5	R	NA		5	R	1.8	J
2-Hexanone	5	U	5	U	5	U	5	U	5	U	5	U	NA		5	U	0.82	J
4-Methyl-2-pentanone	5	U	5	U	5	U	5	U	5	U	5	U	NA		5	U	1.1	B
Acetone	5	R	5	R	5	R	5	U	5	R	5	R	NA		2.3	J	12	J
Bromochloromethane	1	U	1	U	1	U	1	U	1	U	1	U	NA		0.5	U	0.18	J
Bromodichloromethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.7	
Bromomethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
Carbon disulfide	1	U	1	U	1	U	1	U	1	U	1	U	NA		0.5	U	0.11	J
Carbon tetrachloride	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
Chloroethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
Chloroform	1	U	1	U	1	U	1	U	1	U	5.5	J	2	U	0.5	U	8.1	
Chloromethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.2	B	0.17	B
Cyclohexane	NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
Dibromochloromethane	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
Ethane	NA		NA		NA		NA		NA		NA		NA		0.07	J	2	U
Ethene	NA		NA		NA		NA		NA		NA		NA		2	U	2	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		NA		NA		NA		0.5	U	0.11	B
Methylene chloride	2	U	2	U	2	U	2	U	2	U	2	U	2	U	0.58	B	0.97	B
Tetrachloroethene	1	U	1	U	1	U	1	U	1	U	160		2	U	0.5	U	0.5	U
Toluene	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.19	B	0.53	B
Trichloroethene	1	U	1	U	1	U	1	U	1.1		150		2	U	0.5	U	0.26	J
Vinyl chloride	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
Xylene, total	1	U	1	U	1	U	1	U	1	J	1	U	NA		0.5	U	0.21	B
cis-1,2-Dichloroethene	1	U	1	U	1	U	1	U	1	U	5.3		2	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	1	U	1	U	1	U	1	U	1	U	0.7	J	2	U	0.5	U	0.5	U
trans-1,3-Dichloropropene	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U
Semi-volatile Organic Compounds (UG/L)																		
2-Methylnaphthalene	10	U	1.5	J	2.2	J	10	U	10	U	10	U	NA		NA		NA	
Acenaphthene	10	U	1.3	J	10	U	10	U	10	U	10	U	NA		NA		NA	
Anthracene	10	U	1.2	J	10	U	10	U	10	U	10	U	NA		NA		NA	
Benzaldehyde	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA		NA	
Di-n-butylphthalate	3.7	J	10	U	10	U	10	U	10	U	10	U	NA		NA		NA	

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TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW06		IS47MW07		IS47MW08	IS47MW09	IS47MW10	IS47MW11		IS47MW12
Sample ID	IS47MW060401		IS47MW070401	IS47MW410401	IS47MW080401	IS47MW090401	IS47MW100401	IS47MW110602	IS47MW110902	IS47MW120902
Sample Date	04/09/01		04/09/01	04/09/01	04/10/01	04/09/01	04/09/01	06/28/02	09/26/02	09/25/02
Chemical Name										
Diethylphthalate	10	U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA
Dimethyl phthalate	10	U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA
Fluoranthene	10	U	1.4 J	10 U	10 U	10 U	10 U	NA	NA	NA
Fluorene	10	U	1.4 J	10 U	10 U	10 U	10 U	NA	NA	NA
Hexachloroethane	10	U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA
Naphthalene	2.5	J	2.9 J	5.5 J	10 U	10 U	10 U	NA	NA	NA
Pentachlorophenol	25	U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA
Phenanthrene	10	U	4.3 J	1.9 J	10 U	10 U	10 U	NA	NA	NA
Phenol	10	U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA
Pyrene	10	U	1.9 J	10 U	10 U	10 U	10 U	NA	NA	NA
bis(2-Ethylhexyl)phthalate	1.3	J	5.1 J	1.2 J	10 U	10 U	10 U	NA	NA	NA
Explosives (UG/L)										
Nitroguanidine	80	U	240 U	60 U	80 U	80 U	100 U	NA	NA	NA
Total Metals (UG/L)										
Aluminum	6,740		1,040	1,260	2,680	399	271	NA	NA	NA
Arsenic	2.5	U	2.5 U	3.1 J	3 J	2.5 U	2.5 U	NA	NA	NA
Barium	346	J	96 J	88 J	16.7 J	69 J	46.5 J	NA	NA	NA
Beryllium	1.2	B	0.57 J	1 J	0.25 J	0.92 J	0.72 J	NA	NA	NA
Cadmium	1.6	J	1 J	1.2 J	0.4 U	0.52 J	0.4 U	NA	NA	NA
Calcium	12,500		10,700	9,390	6,740	3,640 J	2,570 J	NA	NA	NA
Chromium	13.5		1.5 J	3.7 J	7 J	0.8 U	0.8 U	NA	NA	NA
Cobalt	50.5		25.7 J	23.2 J	3 J	40.9 J	8.9 J	NA	NA	NA
Copper	14.5	J	3.8 J	2.9 J	5.1 J	0.8 U	0.8 U	NA	NA	NA
Cyanide	211		23,200	137	438	1,757	177	NA	NA	NA
Iron	4,940		1,380	1,690	2,880	1,230	5,980	NA	NA	NA
Lead	8.1		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NA	NA	NA
Magnesium	4,950	J	1,990 J	1,770 J	2,280 J	1,750 J	2,210 J	NA	NA	NA
Manganese	125		129	112	25	316	337	NA	NA	NA
Mercury	0.2	R	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	NA	NA	NA
Nickel	36	J	12.9 J	12.7 J	3.3 J	18.9 J	3.1 J	NA	NA	NA
Potassium	3,550	J	1,290 J	1,230 J	1,320 J	836 J	1,590 J	NA	NA	NA
Sodium	102,000	J	42,700 J	39,800 J	22,100 J	20,500	50,500 J	NA	NA	NA
Thallium	3.9	U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	NA	NA	NA
Vanadium	34.9	U	34.9 U	34.9 U	34.9 U	34.9 U	34.9 U	NA	NA	NA
Zinc	94.8		60.6 J	58.3 J	30.6 J	87.7	92.1 J	NA	NA	NA
Dissolved Metals (UG/L)										
Aluminum	3,850		146 J	430	3,890	663	218	NA	NA	NA
Antimony	10	J	4.9 U	5.3 J	6 J	4.9 U	4.9 U	NA	NA	NA
Arsenic	3.7	U	3.7 U	3.7 U	7.2 J	3.7 U	3.7 U	NA	NA	NA
Barium	266		80 J	80.9 J	20.9 J	72.1 J	40.9 J	NA	NA	NA
Beryllium	0.98	J	0.34 J	0.4 J	0.2 J	0.4 J	0.16 J	NA	NA	NA

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TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW06	IS47MW07		IS47MW08	IS47MW09	IS47MW10	IS47MW11		IS47MW12
Sample ID	IS47MW060401	IS47MW070401	IS47MW410401	IS47MW080401	IS47MW090401	IS47MW100401	IS47MW110602	IS47MW110902	IS47MW120902
Sample Date	04/09/01	04/09/01	04/09/01	04/10/01	04/09/01	04/09/01	06/28/02	09/26/02	09/25/02
Chemical Name									
Cadmium	1.3 J	1.6 J	0.98 J	0.4 U	0.4 U	0.4 U	NA	NA	NA
Calcium	10,800	10,300	11,200	7,700	4,100 J	2,790 J	NA	NA	NA
Chromium	13.7	0.7 U	4.4 J	11	1.1 J	0.7 U	NA	NA	NA
Cobalt	45.7 J	25.6 J	27.4 J	5.1 J	48.9 J	14.4 J	NA	NA	NA
Copper	16.8 J	0.84 J	79.9	6.8 J	0.7 U	0.7 U	NA	NA	NA
Iron	4,110	205	661	3,820	1,320	3,560	NA	NA	NA
Lead	7.9	2 U	2 U	2 U	2 U	2 U	NA	NA	NA
Magnesium	4,190 J	1,840 J	2,020 J	2,680 J	2,070 J	2,270 J	NA	NA	NA
Manganese	117	123	133	28.2	377	383	NA	NA	NA
Nickel	34.6 J	10.8 J	75.5	5.4 J	20.8 J	3.7 J	NA	NA	NA
Potassium	2,590 J	1,230 J	1,430 J	1,910 J	1,180 J	1,560 J	NA	NA	NA
Sodium	78,600	41,400	45,300	26,600	24,100	59,900	NA	NA	NA
Thallium	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	NA	NA	NA
Vanadium	25.2 J	1.1 J	1.3 J	15.2 J	2.2 J	1 U	NA	NA	NA
Zinc	134	43.1	63.7	42	82.8	85.1	NA	NA	NA
Wet Chemistry (MG/L)									
Carbon	NA	NA	NA	NA	NA	NA	NA	5 U	37.0
Chloride	42	44	86	0.2 U	11	29	NA	43.6	51.6
Nitrate	8.5	8.1	9.2	0.2 U	1.8	4.4	NA	0.05 U	0.05 U
Nitrite	0.2 U	0.2 U	0.2 U	0.2 U	9.9	35	NA	NA	NA
Sulfate	0.2 U	13	0.2 U	0.2 U	0.2 U	2.6	NA	5 U	74.1
Total organic carbon (TOC)	8.2	2.7	4.2	1.6	3.3	3.3	NA	NA	NA

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TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW13				IS47MW14		IS47MW15	
Sample ID	IS47MW130902		IS47MW130902P		IS47MW140902		IS47MW150902	
Sample Date	09/26/02		09/26/02		09/25/02		09/26/02	
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-Tetrachloroethane	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethane	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	0.5	U	0.5	U	0.1	J	0.5	U
1,2-Dibromo-3-chloropropane	0.5	R	0.5	R	0.5	U	0.5	R
1,2-Dichloroethane	3.5		3.6		0.5	U	0.5	U
1,2-Dichloropropane	0.5	U	0.5	U	0.5	U	0.5	U
2-Butanone	2.1	J	1.9	J	5	R	5	R
2-Hexanone	5	U	5	U	5	U	5	U
4-Methyl-2-pentanone	5	U	5	U	5	U	5	U
Acetone	2.3	J	2.7	J	3.5	J	2.4	J
Bromochloromethane	0.5	U	0.5	U	0.5	U	0.5	U
Bromodichloromethane	0.5	U	0.5	U	0.5	U	0.5	U
Bromomethane	0.5	U	0.5	U	0.5	U	0.5	U
Carbon disulfide	0.5	U	0.5	U	0.5	U	0.5	U
Carbon tetrachloride	0.5	U	0.5	U	0.5	U	0.5	U
Chloroethane	0.36	J	0.38	J	0.5	U	0.5	U
Chloroform	0.24	B	0.24	B	0.43	J	0.5	U
Chloromethane	0.13	B	0.15	B	0.21	B	0.11	B
Cyclohexane	0.5	U	0.5	U	0.1	J	0.5	U
Dibromochloromethane	0.5	U	0.5	U	0.5	U	0.5	U
Ethane	2	U	0.7	J	2	U	0.04	J
Ethene	2	U	0.9	J	0.06	J	2	U
Methyl-tert-butyl ether (MTBE)	0.5	U	0.5	U	0.5	U	2.1	
Methylene chloride	0.74	B	0.67	B	0.65	B	0.71	B
Tetrachloroethene	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	4.5	B	4.2	B	0.21	B	0.26	B
Trichloroethene	0.5	U	0.5	U	1.2		0.5	U
Vinyl chloride	0.5	U	0.5	U	0.5	U	0.5	U
Xylene, total	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-Dichloroethene	0.5	U	0.5	U	0.16	J	0.5	U
trans-1,2-Dichloroethene	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,3-Dichloropropene	0.5	U	0.5	U	0.5	U	0.5	U
Semi-volatile Organic Compounds (UG/L)								
2-Methylnaphthalene	NA		NA		NA		NA	
Acenaphthene	NA		NA		NA		NA	
Anthracene	NA		NA		NA		NA	
Benzaldehyde	NA		NA		NA		NA	
Di-n-butylphthalate	NA		NA		NA		NA	

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate

TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW13		IS47MW14	IS47MW15
Sample ID	IS47MW130902	IS47MW130902P	IS47MW140902	IS47MW150902
Sample Date	09/26/02	09/26/02	09/25/02	09/26/02
Chemical Name				
Diethylphthalate	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA
Phenol	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA
Explosives (UG/L)				
Nitroguanidine	NA	NA	NA	NA
Total Metals (UG/L)				
Aluminum	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Barium	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA
Iron	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Mercury	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Potassium	NA	NA	NA	NA
Sodium	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Zinc	NA	NA	NA	NA
Dissolved Metals (UG/L)				
Aluminum	NA	NA	NA	NA
Antimony	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Barium	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate

TABLE 6-4
Detected Compounds in Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW13		IS47MW14	IS47MW15
Sample ID	IS47MW130902	IS47MW130902P	IS47MW140902	IS47MW150902
Sample Date	09/26/02	09/26/02	09/25/02	09/26/02
Chemical Name				
Cadmium	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Iron	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Potassium	NA	NA	NA	NA
Sodium	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Zinc	NA	NA	NA	NA
Wet Chemistry (MG/L)				
Carbon	5 U	5 U	5 U	17.0
Chloride	25.8	25.6	208	55.1
Nitrate	0.05 U	0.05 U	0.15	0.05 U
Nitrite	NA	NA	NA	NA
Sulfate	9.46	9.24	15.7	13.6
Total organic carbon (TOC)	NA	NA	NA	NA

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate

TABLE 6-5
Detected Compounds in Site 47 Surface Water Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SW01		IS47SW02		IS47SW02		IS47SW05		IS47SW06		IS47SW07		IS47SW07		IS47SW08
Sample ID	IS47SW01		IS47SW02		IS47SW02P		IS47SW050602		IS47SW060602		IS47SW070602		IS47SW070602P		IS47SW080602
Sample Date	03/19/01		03/19/01		03/19/01		06/17/02		06/17/02		06/20/02		06/20/02		06/20/02
Chemical Name															
Volatile Organic Compounds (UG/L)															
Acetone	10	UJ	10	UJ	10	UJ	NA		NA		NA		NA		NA
Bromodichloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2
Semivolatile Organic Compounds (UG/L)															
Di-n-butylphthalate	2.5	J	2.5	J	1.2	J	NA		NA		NA		NA		NA
bis(2-Ethylhexyl)phthalate	1.4	J	2.3	J	10	U	NA		NA		NA		NA		NA
Explosives (UG/L)															
No Detections															
Total Metals (UG/L)															
Aluminum	333		226		131	J	NA		NA		NA		NA		NA
Arsenic	4.5	U	5.2	J	4.5	U	NA		NA		NA		NA		NA
Barium	43.9	J	21.6	J	17.9	J	NA		NA		NA		NA		NA
Beryllium	0.23	J	0.1	U	0.1	U	NA		NA		NA		NA		NA
Calcium	7,280		5,620		4,780	J	NA		NA		NA		NA		NA
Chromium	0.88	J	0.5	U	0.5	U	NA		NA		NA		NA		NA
Cobalt	14.2	J	3.8	J	3	J	NA		NA		NA		NA		NA
Copper	1.2	U	5	J	2.8	J	NA		NA		NA		NA		NA
Iron	2,860	J	2,960	J	2,460	J	NA		NA		NA		NA		NA
Magnesium	2,650	J	1,890	J	1,610	J	NA		NA		NA		NA		NA
Manganese	259		222		186		NA		NA		NA		NA		NA
Nickel	6.8	J	3.6	J	3	J	NA		NA		NA		NA		NA
Potassium	1,520	J	2,940	J	2,390	J	NA		NA		NA		NA		NA
Sodium	23,300	J	58,600	J	48,600	J	NA		NA		NA		NA		NA
Zinc	53.6	J	123	J	50.1	J	NA		NA		NA		NA		NA
Wet Chemistry (MG/L)															
Total organic carbon (TOC)	3.2		11		2.9		NA		NA		NA		NA		NA

NA - Not analyzed
B - Blank contamination
J - Estimated
R - Unusable

U - Undetected
UL - Not detected, quantitation limit is probably higher

TABLE 6-5
Detected Compounds in Site 47 Surface Water Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID		IS47SW10				IS47SW11		IS47SW12		RI47SW03		RI47SW04	
Sample ID		IS47SW100902		IS47SW100902P		IS47SW110902		IS47SW120902		RI47SW03		RI47SW04	
Sample Date		09/25/02		09/25/02		09/25/02		09/25/02		10/29/01		10/29/01	
Chemical Name													
Volatile Organic Compounds (UG/L)													
Acetone		3.1	J	3.4	J	5	R	3.1	J	NA		NA	
Bromodichloromethane	U	0.5	U	0.5	U	0.5	U	0.1	J	2	U	2	U
Semivolatile Organic Compounds (UG/L)													
Di-n-butylphthalate		NA		NA		NA		NA		NA		NA	
bis(2-Ethylhexyl)phthalate		NA		NA		NA		NA		NA		NA	
Explosives (UG/L)													
No Detections													
Total Metals (UG/L)													
Aluminum		NA		NA		NA		NA		NA		NA	
Arsenic		NA		NA		NA		NA		NA		NA	
Barium		NA		NA		NA		NA		NA		NA	
Beryllium		NA		NA		NA		NA		NA		NA	
Calcium		NA		NA		NA		NA		NA		NA	
Chromium		NA		NA		NA		NA		NA		NA	
Cobalt		NA		NA		NA		NA		NA		NA	
Copper		NA		NA		NA		NA		NA		NA	
Iron		NA		NA		NA		NA		NA		NA	
Magnesium		NA		NA		NA		NA		NA		NA	
Manganese		NA		NA		NA		NA		NA		NA	
Nickel		NA		NA		NA		NA		NA		NA	
Potassium		NA		NA		NA		NA		NA		NA	
Sodium		NA		NA		NA		NA		NA		NA	
Zinc		NA		NA		NA		NA		NA		NA	
Wet Chemistry (MG/L)													
Total organic carbon (TOC)		NA		NA		NA		NA		NA		NA	

NA - Not analyzed
B - Blank contamination
J - Estimated
R - Unusable

U - Undetected
UL - Not detected, quantitation limit is probably higher

TABLE 6-6
Detected Compounds in Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05		IS47SD06		SD-01		SD-02				SD-03		SD-04	
Sample ID	IS47SD05		IS47SD06		RI47SD01		RI47SD02		RI47SD99		RI47SD03		RI47SD04	
Sample Date	03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
Trichloroethene	17	U	13	U	14	U	12	U	2	J	11	U	11	U
Semi-volatile Organic Compounds (UG/KG)														
Acenaphthene	76	U	34	UL	470	U	76	J	360	U	370	U	370	U
Acenaphthylene	76	U	34	UL	470	U	40	J	360	U	370	U	370	U
Acetophenone	170	J	87	J	NA		NA		NA		NA		NA	
Anthracene	76	U	34	UL	470	U	450		180	J	370	U	370	U
Benzo(a)anthracene	76	U	34	UL	290	J	2,200		1,200		69	J	110	J
Benzo(a)pyrene	76	U	34	UL	280	J	1,900		1,000		57	J	89	J
Benzo(b)fluoranthene	76	U	34	UL	670		4,600		2,100		130	J	140	J
Benzo(g,h,i)perylene	76	U	34	UL	340	J	2,800		1,400		39	J	51	J
Benzo(k)fluoranthene	76	U	34	UL	170	J	1,200		780		45	J	69	J
Carbazole	1,500	U	680	U	470	U	67	J	37	J	370	U	370	U
Chrysene	76	U	330		320	J	2,100		1,100		86	J	110	J
Di-n-butylphthalate	420	J	560	J	73	J	390	U	360	U	96	J	63	J
Dibenz(a,h)anthracene	76	U	34	UL	470	U	850		350	J	370	U	370	U
Dibenzofuran	1,500	U	680	U	470	U	59	J	360	U	370	U	370	U
Fluoranthene	76	U	34	UL	510		1,400		1,200		140	J	230	J
Fluorene	76	U	34	UL	470	U	140	J	59	J	370	U	370	U
Hexachlorobutadiene	1,500	U	680	U	710		350	J	71	J	370	U	370	U
Hexachloroethane	1,500	U	680	U	470	U	48	J	360	U	370	U	370	U
Indeno(1,2,3-cd)pyrene	76	U	34	UL	290	J	2,600		1,100		43	J	67	J
Pentachlorophenol	3,800	U	1,700	U	1,200	U	180	J	910	U	920	U	920	U
Phenanthrene	120		34	UL	200	J	1,300		660		78	J	170	J
Pyrene	76	U	350		590		3,200		1,800		110	J	180	J
Explosives (UG/KG)														
Nitroglycerin	NA		NA		6,300	U	5,700	U	9,300		9,100		5,200	U
Total Metals (MG/KG)														
Aluminum	10,800		720		22,800		4,010		1,490		1,200		2,300	
Antimony	6.5	U	3	U	0.59	U	1.1	J	0.69	J	0.41	U	0.45	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
N - Tentative identification, consider present
U - Analyte not detected
UL - Not detected, quantitation limit is probably higher

TABLE 6-6
Detected Compounds in Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
Arsenic	10	2.3 J	7.4	0.99 J	0.48 U	0.5 U	0.55 U
Barium	96.3 J	7.7 J	91.7	13.9 J	6.1 J	5.4 B	9.7 J
Beryllium	3.5 J	0.12 J	0.57 J	0.1 J	0.03 J	0.03 J	0.07 J
Cadmium	3 J	0.2 U	1 J	0.63 J	0.18 J	0.07 J	0.1 J
Calcium	1,880 J	302 J	2,680	402 B	147 B	71.7 J	91.7 J
Chromium	21.5	2.6 J	40.7	14.3	4.1	3.3	5.4
Cobalt	36.7 J	4.1 J	5.6 J	1.2 J	0.56 J	0.56 J	1.7 J
Copper	34.5	5.1 J	113	33.4	3.9 J	1.9 J	3.2 J
Cyanide	NA	NA	0.29 U	0.29	0.3	0.34	0.31
Iron	24,900	2,290	36,000	5,150	1,410	1,150	2,170
Lead	55.4	22.3	289 N	74.9	13.7 N	3.5 B	7.1
Magnesium	1,040 J	158 J	1,830	479 J	241 J	171 J	276 J
Manganese	143	10.6	119	20.4	7.3	5.2	11.9
Mercury	0.74	0.2 U	2.9	3.8	1.2	0.35	0.21
Nickel	27.1 J	2.6 J	22.1	6.1 B	2.3 B	1.5 B	2.8 B
Potassium	441 J	93.1 J	1,370	254 J	206 J	172 J	245 J
Silver	21.4	0.64 U	814	40.5	10.4	4.9	3.6
Sodium	292 J	116 U	275 J	35.1 U	29.1 U	30 U	33.3 U
Vanadium	50.7	5.5 J	55.1	16.6	5.2 J	3.1 J	5.9 J
Zinc	287	45	372	43.9 B	15.7 B	7.6 B	14.4 B
Wet Chemistry (MG/KG)							
% Solids	NA	NA	70.7	85	92.3	90.9	91.3
Total organic carbon (TOC)	91,000	1,900	NA	NA	NA	NA	NA
pH	NA	NA	5.45	5.78	5.6	5.19	4.86

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
N - Tentative identification, consider present
U - Analyte not detected

UL - Not detected, quantitation limit is probably higher

TABLE 6-7
Detected Compounds in Site 47 Concrete Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	CO-01		CO-02	
Sample ID	RI47CO01		RI47CO02	
Sample Date	07/08/99		07/08/99	
Chemical Name				
Semi-volatile Organic Compounds (UG/KG)				
1,2,4-Trichlorobenzene	350	U	360	U
Total Metals (MG/KG)				
Antimony	0.55	UL	0.54	J
Arsenic	1.8	J	2.1	
Barium	53.3		59.2	
Beryllium	0.15	J	0.16	J
Cadmium	0.25	J	0.48	J
Calcium	66,800		66,500	
Chromium	5.6		6	
Cobalt	1.9	J	1.5	J
Copper	4.9	J	14.2	
Lead	2,110		1,220	
Magnesium	1,140		1,370	
Manganese	36.3		40.3	
Mercury	0.21		4.4	
Nickel	3.3	J	3.2	J
Potassium	294	J	385	J
Selenium	0.53	U	0.52	U
Sodium	67.5	J	83.8	J
Zinc	19.6	J	63.2	J

NA - Not analyzed
J - Reported value is estimated
U - Analyte not detected
UL - Not detected, quantitation limit is probably higher

TABLE 6-8
Detected Compounds in Site 47 Sewer Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IW-91	
Sample ID	RI47IW91	
Sample Date	07/14/99	
Chemical Name		
Semi-volatile Organic Compounds (UG/KG)		
1,2,4-Trichlorobenzene	550	U
Benzo(b)fluoranthene	90	J
Benzo(g,h,i)perylene	550	U
Fluoranthene	86	J
Fluorene	550	U
bis(2-Chloroethoxy)methane	550	U
Explosives (UG/KG)		
Nitroglycerin	3,700,000	
Total Metals (MG/KG)		
Antimony	0.95	J
Arsenic	8.8	
Barium	318	
Beryllium	0.89	J
Cadmium	2.7	
Calcium	4,780	
Chromium	43.6	
Cobalt	17.7	
Copper	109	
Cyanide	0.37	U
Iron	38,900	
Lead	5,760	J
Magnesium	3,290	
Manganese	1,300	
Mercury	80.2	
Nickel	30.5	
Potassium	8,760	
Selenium	0.74	U
Silver	406	
Sodium	1,410	
Zinc	582	
Wet Chemistry (MG/KG)		
pH	9.6	

NA - Not analyzed
J - Reported value is estimated
N - Tentative identification, consider present

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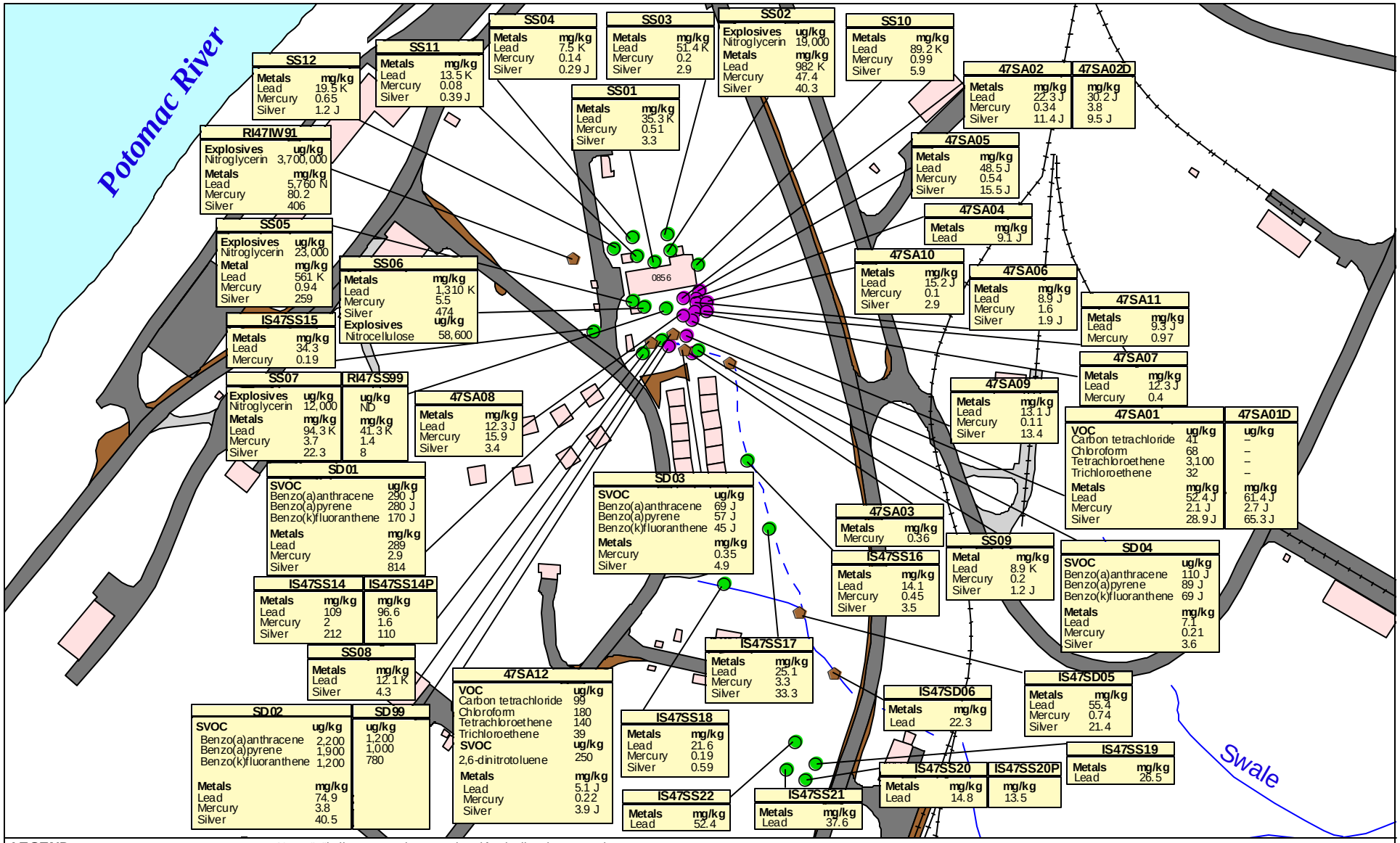

LEGEND

- Sediment Sample Location
- Surface Soil Sample Location
- 1992 Surface Soil Sample Location
- Perennial Swale
- Intermittent Swale
- Asphalt
- Dirt
- Gravel
- Railroad
- Building

Note: "--"indicates sample not analyzed for the listed compound.
Validation flags are explained in Tables 6-1, 6-6, and 6-7.

N

0 100 200 Feet

Figure 6-1
Selected Results in Surface Soil and Sediment Sample Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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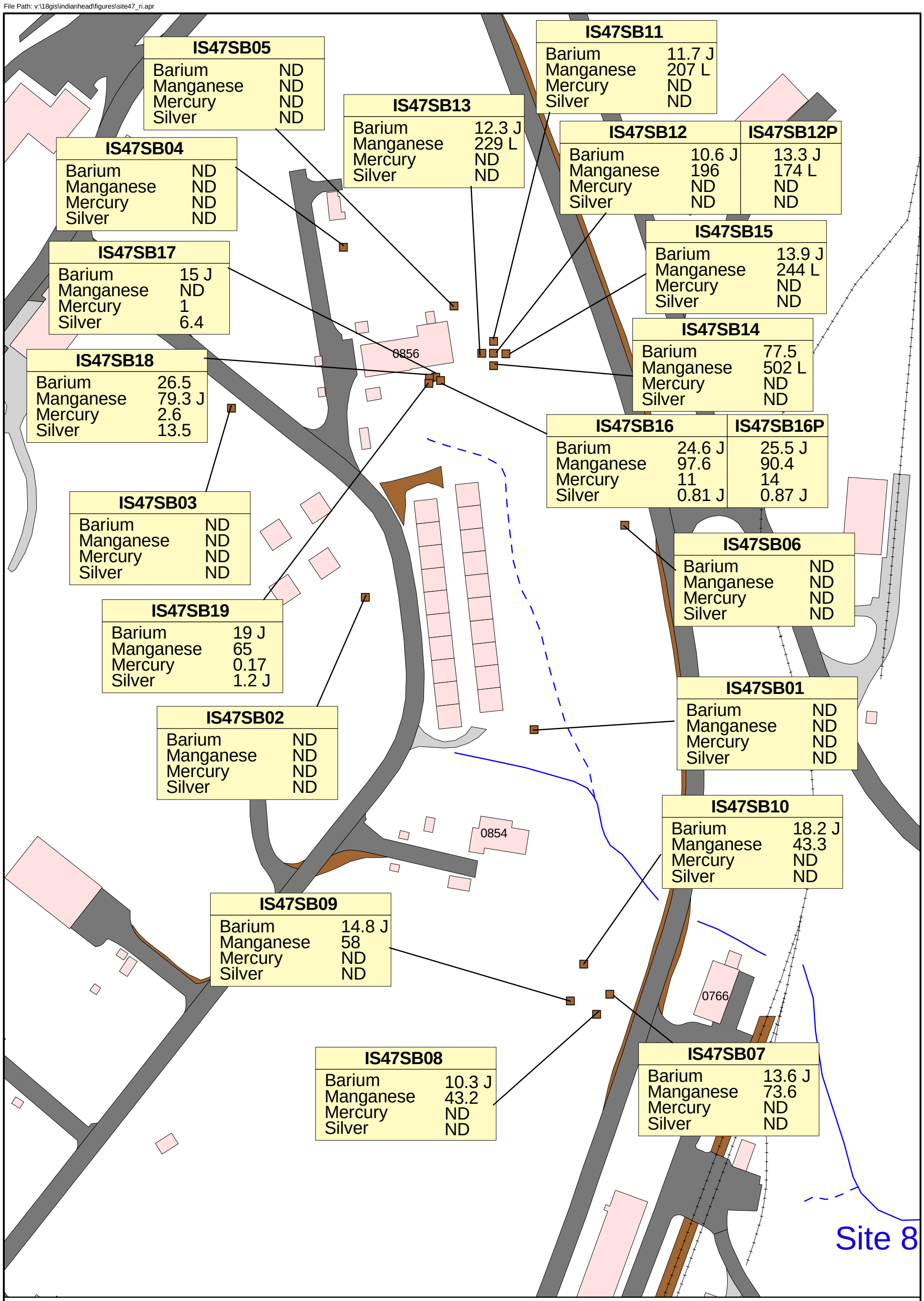

LEGEND
- Subsurface Soil Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Buildings
- Asphalt
- Dirt
- Gravel

Note: Values are in mg/kg.

N

0 100 200 Feet

Figure 6-2
Selected Results in Subsurface Soil Sample Locations
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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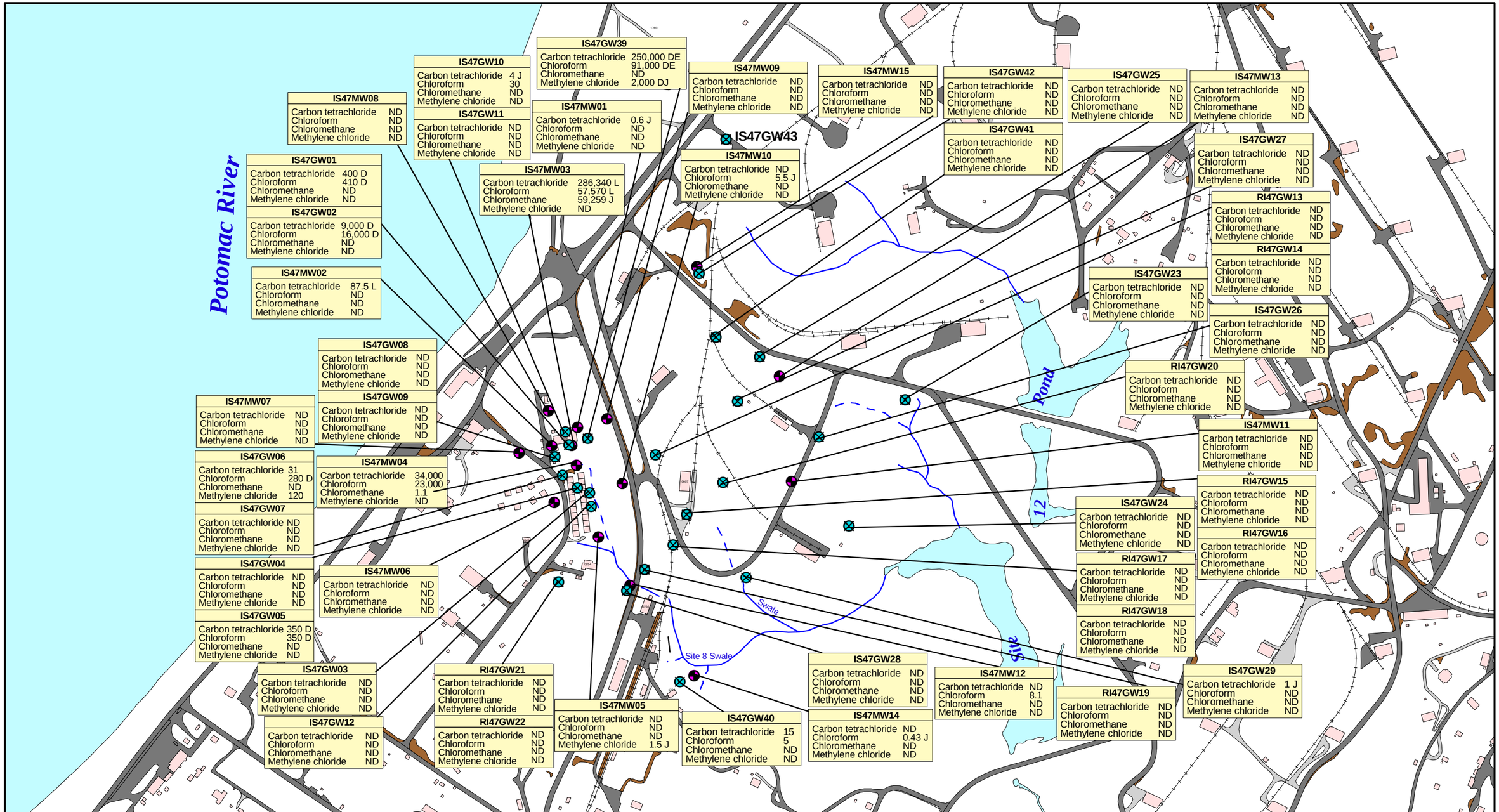

LEGEND

- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Building
- Railroad
- Asphalt
- Dirt
- Gravel

ND = Not Detected

Note: Values are in ug/L.
Laboratory and validation flags are explained in Table 6-3 and 6-4.

N

0 400 800 Feet

Figure 6-3
Carbon Tetrachloride, Chloroform, Chloromethane, and Methylene Chloride Detections in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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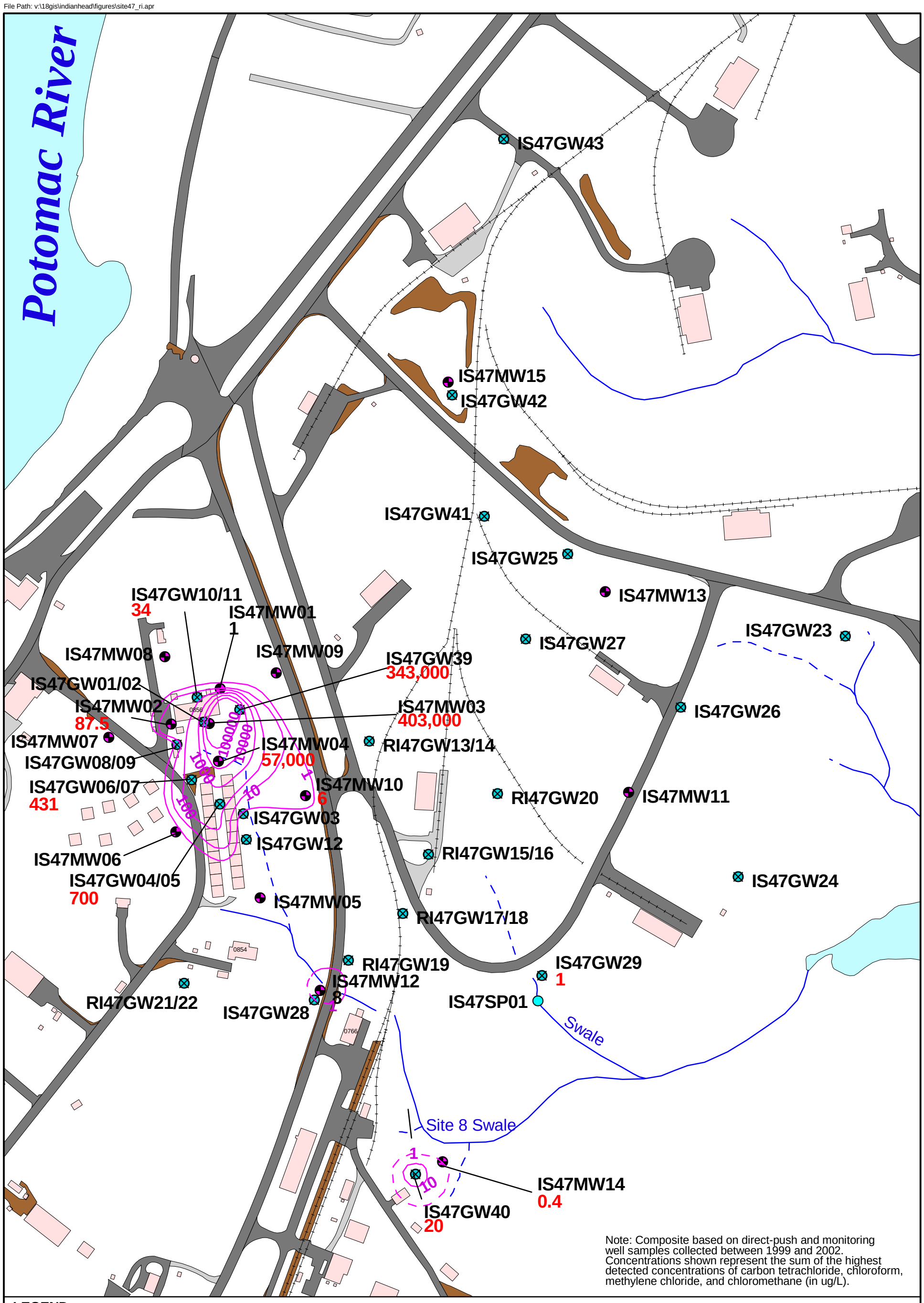

LEGEND

- 10 Interpolated isoconcentration line for Carbon Tetrachloride and breakdown products
- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Building
- Asphalt
- Dirt
- Gravel

N

0 200 400 Feet

Figure 6-4
Composite Groundwater Plume of Carbon Tetrachloride and Breakdown Products
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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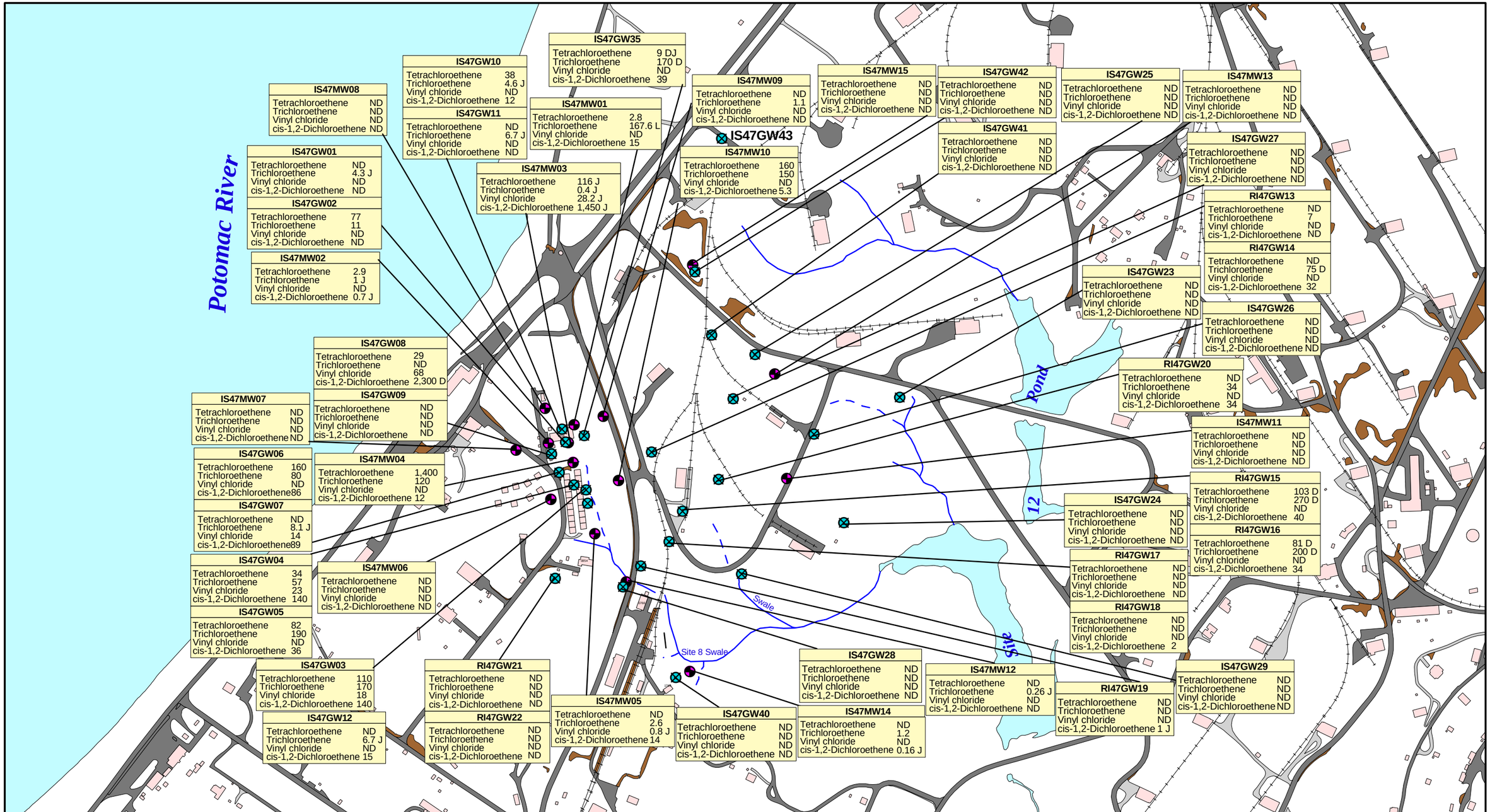
File Path: V:\18gis\IndianHead\figures\site47_ri.apr



LEGEND

- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Buildings
- Railroad
- Asphalt
- Dirt
- Gravel

ND = Not Detected

Note: Values are in ug/L.
Laboratory and validation flags are explained in Table 6-3 and 6-4.

N

0 400 800 Feet

Figure 6-5
Tetrachloroethene, Trichloroethene, Vinyl Chloride, and cis-1,2-Dichloroethene Detections in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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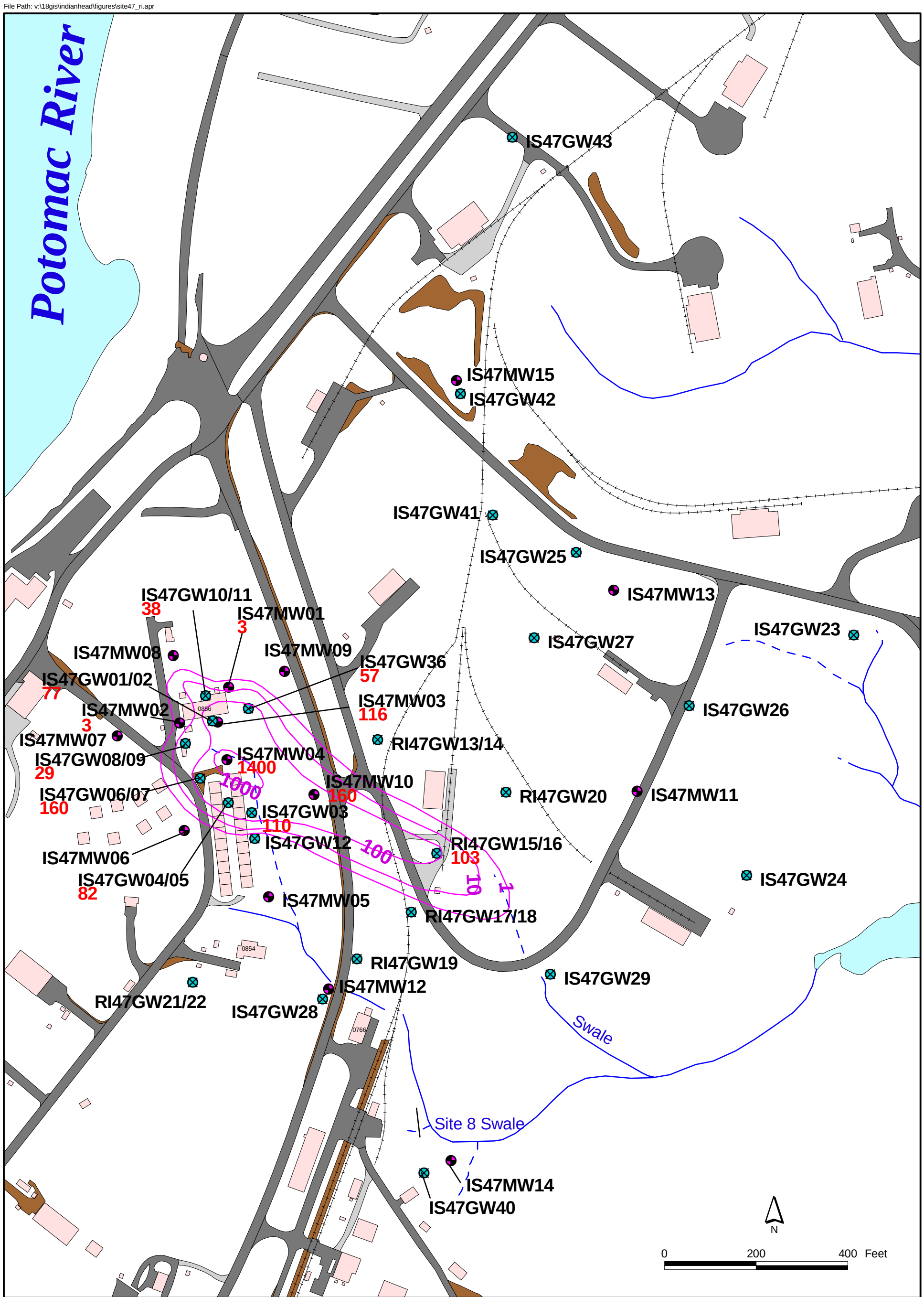
File Path: v:\18gis\indianhead\figures\site47_ri.apr



LEGEND

10 Interpolated isoconcentration line for Tetrachloroethene

Monitoring Well Location

Direct Push Groundwater Sample Location

Perennial Swale

Intermittent Swale

Railroad

Building

Asphalt

Dirt

Gravel

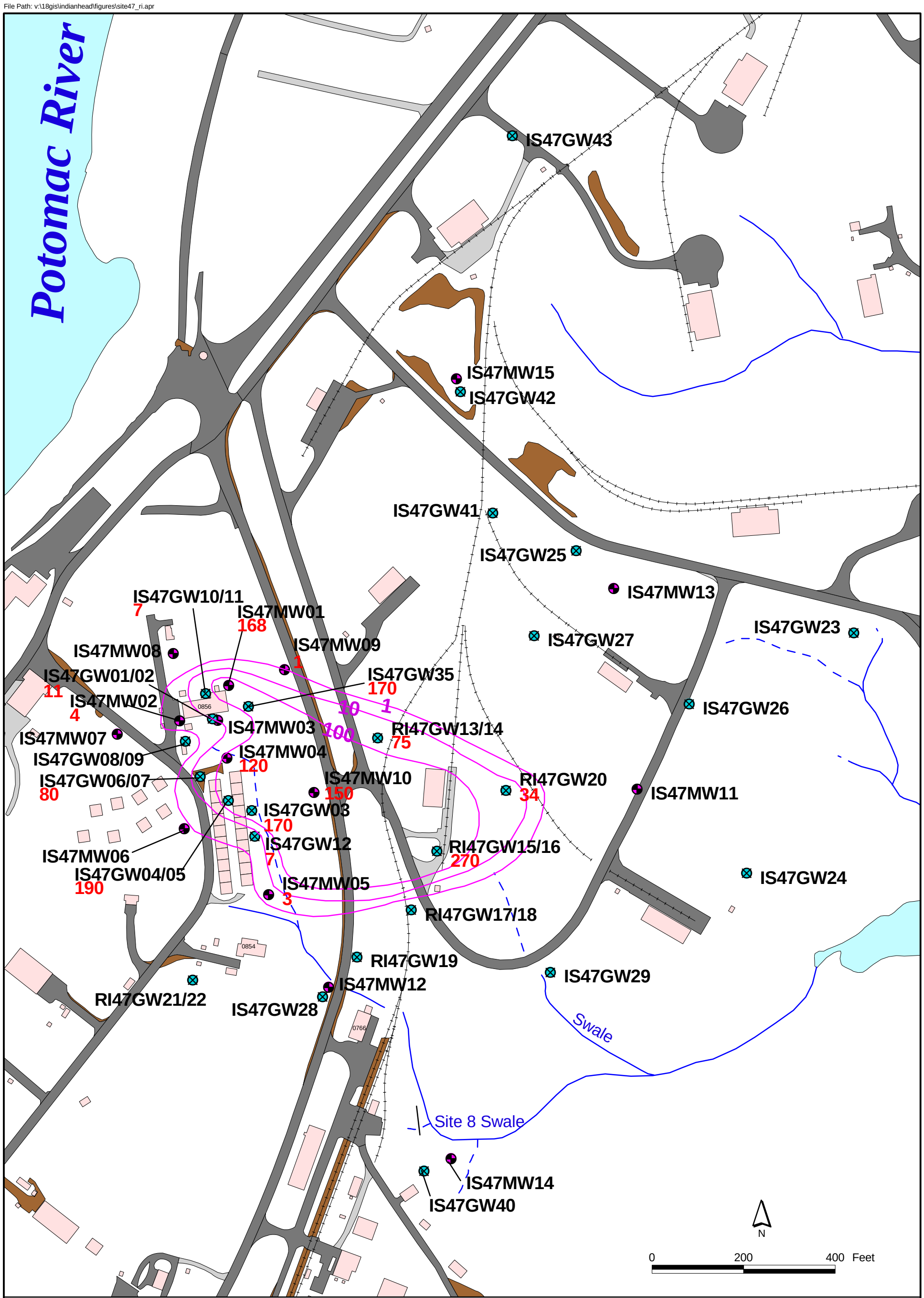
1400 Highest detected tetrachloroethene concentration at location noted (ug/L)

Note: Composite based on direct-push and monitoring well samples collected between 1999 and 2002.

Figure 6-6
Composite Tetrachloroethene Plume in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\site47_ri.apr



LEGEND

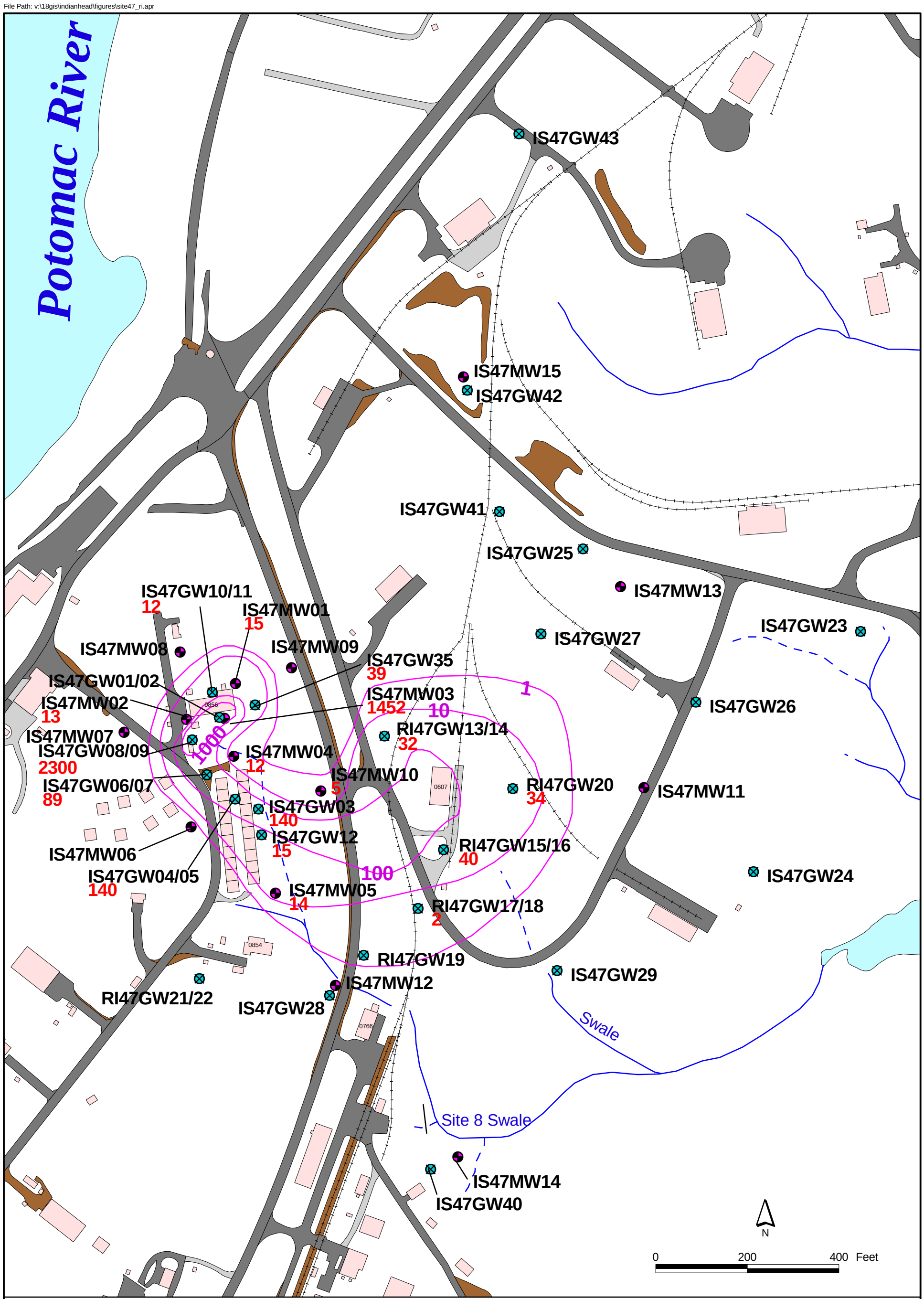
- Interpolated isoconcentration line for Trichloroethene
- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Building
- Asphalt
- Dirt
- Gravel
- 110 Highest detected trichloroethene concentration at location noted (ug/L)

Note: Composite based on direct-push and monitoring well samples collected between 1999 and 2002.

Figure 6-7
Composite Trichloroethene Plume in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\site47_ri.apr



LEGEND

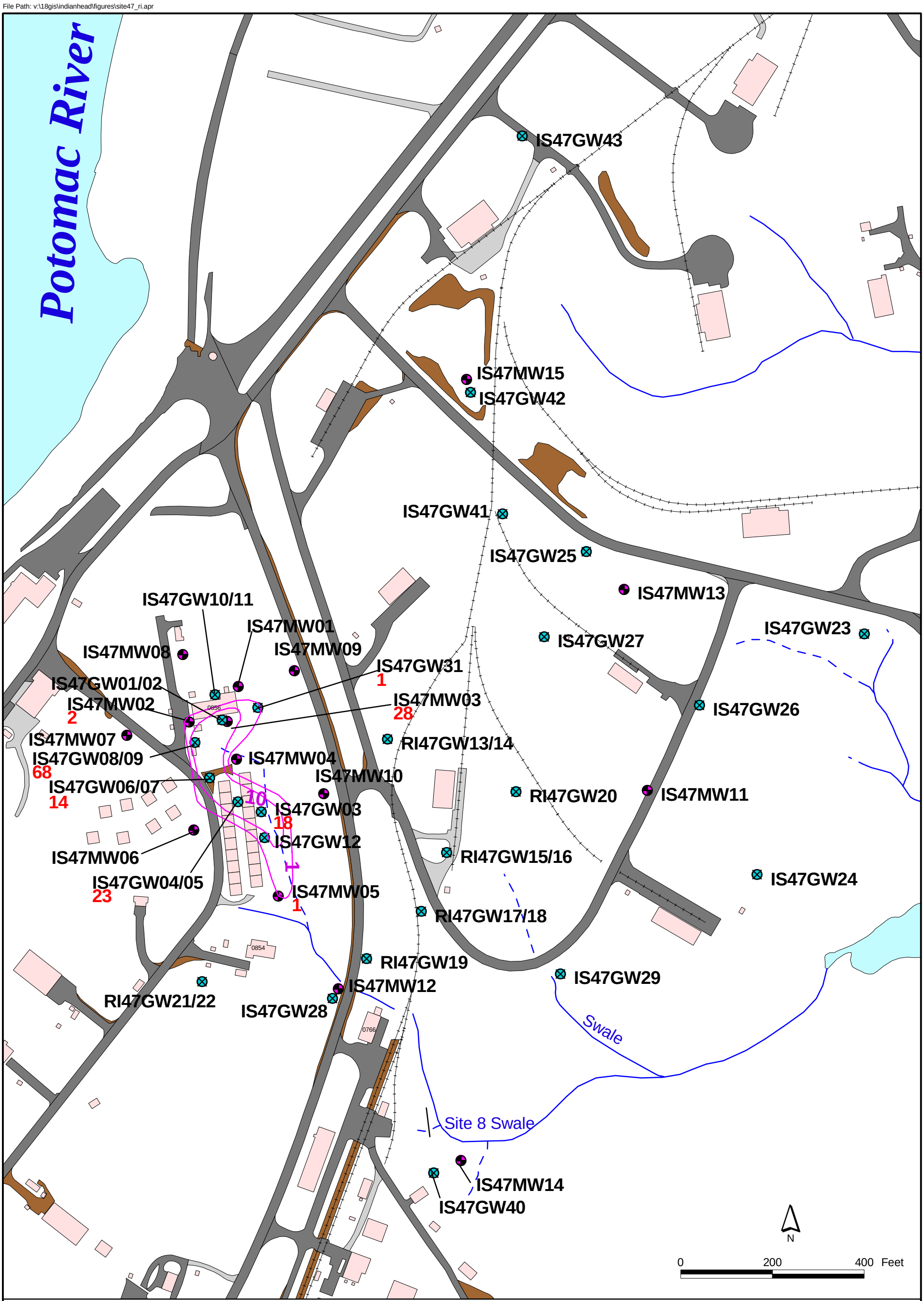
Note: Composite based on direct-push and monitoring well samples collected between 1999 and 2002.

- 10 Interpolated isoconcentration line for cis-1,2-Dichloroethene
- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Building
- Asphalt
- Dirt
- Gravel
- 140 Highest detected cis-1,2-DCE concentration at location noted (ug/L)

Figure 6-8
Composite cis-1,2-Dichloroethene Plume in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\site47_ri.apr



LEGEND

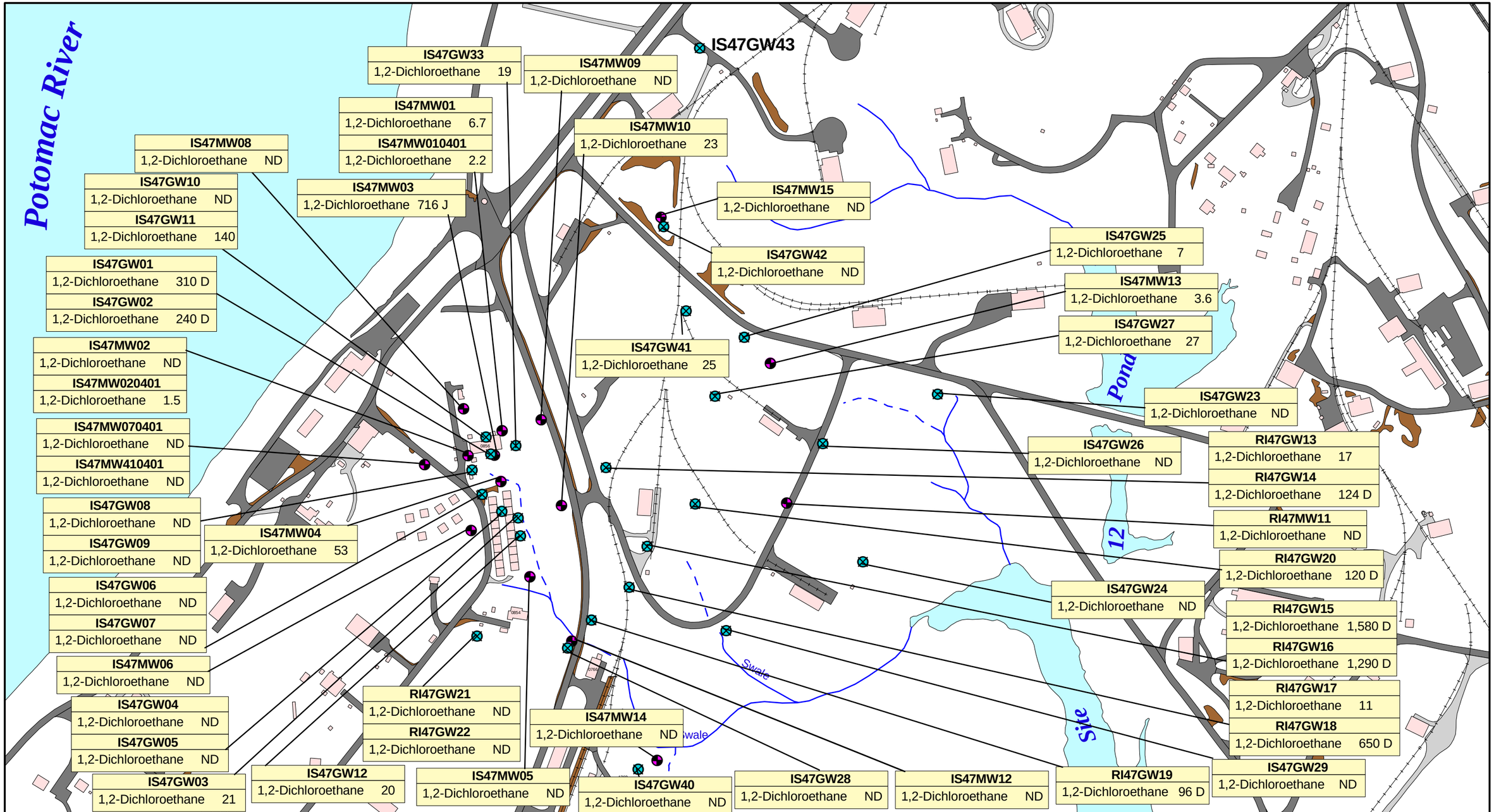
- 10 Interpolated isoconcentration line for Vinyl Chloride
- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Railroad
- Building
- Asphalt
- Dirt
- Gravel
- 68 Highest detected vinyl chloride concentration at location noted (ug/L)

Note: Composite based on direct-push and monitoring well samples collected between 1999 and 2002.

Figure 6-9
Composite Vinyl Chloride Plume in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

File Path: V:\18gis\IndianHead\figures\site47_ri.apr



LEGEND

- Monitoring Well Location
- Direct Push Groundwater Sample Location
- Perennial Swale
- Intermittent Swale
- Building
- Railroad
- Asphalt
- Dirt
- Gravel

ND = Not Detected

Note: Values are in ug/L.
Validation flags are explained in Tables 6-3 and 6-4.

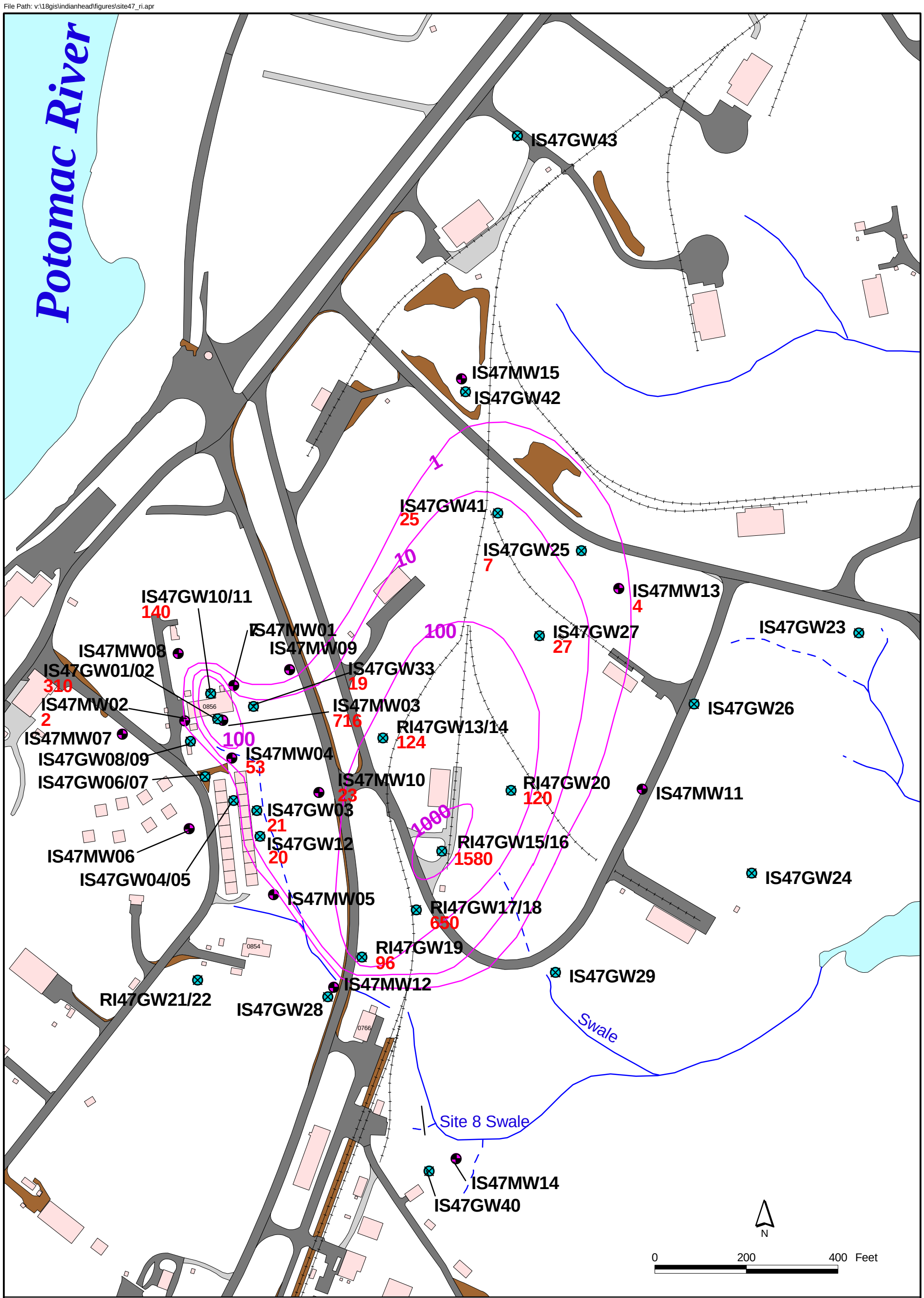
N

0 300 600 Feet

Figure 6-10
1,2-Dichloroethane Detections in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

File Path: v:\18gis\indianhead\figures\site47_ri.apr



LEGEND

10 Interpolated isoconcentration line for 1,2-Dichloroethane

Monitoring Well Location

Direct Push Groundwater Sample Location

Perennial Swale

Intermittent Swale

Railroad

Building

Asphalt

Dirt

Gravel

53 Highest detected 1,2-DCA concentration at location noted (ug/L)

Note: Composite based on direct-push and monitoring well samples collected between 1999 and 2002.

Figure 6-11
Composite 1,2-Dichloroethane Plume in Groundwater
Site 47 RI Report
IHDIV-NSWC, Indian Head, Maryland

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SECTION 7

Contaminant Fate and Transport

The fate and transport of chemicals in soil, sediment, surface water, and groundwater at Site 47 at IHDIV-NSWC Indian Head are discussed in this section. The fate and transport are described to support the human-health and ecological risk assessments and to aid in defining remedial alternatives.

7.1 Contaminant Mobility and Persistence

Their physical, chemical, and biological interaction with the environment determine the probable behavior of the potential contaminants at the site. The mobility and persistence of the chemicals in the environment are two key characteristics in determining probable behavior. Mobility is the potential for a chemical to migrate from a site, and persistence is a measure of how long a chemical will remain in the environment. Environmental factors that affect the mobility and persistence of the contaminants include: pH, concentration of other chemicals in the media, soil moisture, oxidation-reduction potential (measured as Eh), water chemistry, organic-matter content, and the presence of microorganisms.

The behavior also is determined by the physical and hydraulic properties of the water-bearing units through which the contaminants are being transported. These properties control the advection and dispersion of the contaminants

7.1.1 Contaminant Groups

Many organic and inorganic constituents were detected in environmental media at the site. The nature and extent of these chemicals are discussed in detail for the different media in Section 6. Discussing the fate and transport of all of these chemicals would be infeasible. Instead, the mobility and persistence of these chemicals are discussed as groups (i.e., VOCs, SVOCs, and inorganics), with only occasional reference to particular chemicals that are representative of each of these groups.

Certain chemicals were selected to represent the range of chemicals associated with the site. The representative chemicals were selected on the basis of high concentrations, frequency of occurrence, occurrence in several media, variable migration potential, and likely contribution to overall risk to human health and the environment. The chemicals discussed in this section are listed in Table 7-1 and their specific fate and transport properties are described in the next section. These properties provide a range of the properties characteristic of each of the chemical groups.

7.1.2 Physical and Chemical Properties

Various basic physical and chemical properties affect the transport of chemicals in the environment at the site. The following are considered to be the most important properties:

- Sorption
- Volatilization
- Degradation
- Transformation
- Bioaccumulation

Table 7-2 contains data for the representative chemicals on the physical and chemical properties that are relevant to fate and transport. Table 3-3 contains data on pH, conductivity, temperature, and dissolved oxygen in groundwater obtained during groundwater sampling at the site. The properties themselves are briefly described below.

7.1.2.1 Sorption

Sorption is the tendency for chemicals to adsorb to and desorb from materials in the media through which the contaminants are being transported. The subsurface materials likely to sorb chemicals typically are clays and organic material, both of which exist in the environment at the site. In addition, inorganic chemicals adsorb onto iron, manganese, and aluminum oxyhydroxide and oxide coatings on soil and sediment grains. Adsorption of metals can be irreversible because of the process of fixation.

The conventional measure of sorption is the distribution coefficient (K_d) of soil and geologic material for the chemical. The K_d for organic chemicals is the product of a partition coefficient (K_{oc}) and the fraction of organic carbon (f_{oc}). In general, chemicals with a K_{oc} greater than 10,000 milliliters per gram (ml/g) (e.g., many SVOCs and metals) have high degrees of adsorption and consequently low mobility, whereas chemicals with a K_{oc} lower than 1,000 ml/g (e.g., many VOCs) have lower degrees of adsorption and consequently higher mobility. A higher K_{oc} also contributes to greater bioaccumulation. The K_d for inorganic chemicals is a complex function of pH, organic content, oxide coatings, and other factors; therefore, K_d is not easily estimated by methods other than site-specific testing. As shown in Table 7-2, the representative chemicals have a wide range of K_ds.

The migration rates of dissolved contaminants range widely between different chemicals because of their degree of adsorption. As a first estimate, they will move at the rate of groundwater flow, or by advection. The rate of groundwater flow is estimated using Darcy's Law and dividing it by the effective porosity:

$$v = K \times \nabla h / n_e$$

where v = Groundwater-flow velocity (ft/day)

K = Hydraulic conductivity (ft/day)

∇h = Hydraulic gradient (dimensionless)

n_e = Effective porosity (dimensionless)

Typically, contaminants will not move as rapidly as the groundwater because of adsorption of the contaminant on the geologic media. For each contaminant detected at the site, it is theoretically possible to calculate a retardation coefficient, which is an estimate of the degree to which the contaminant is slowed by adsorption in relation to the groundwater-flow velocity. The retardation coefficient is calculated according to the following equation:

$$R = 1 + pb \times Kd / ne$$

where R = Retardation coefficient (dimensionless)

p_b = Bulk density (gm/cm^3)

K_d = Distribution coefficient (ml/gm)

The effect of retardation is estimated by dividing the groundwater-flow velocity by the retardation coefficient R, which provides a value of migration that is either equal to the flow rate (in the case of no retardation) or less than the flow rate (in the presence of retardation).

In order to estimate the K_d of the soil for a particular organic chemical it is necessary to have an estimate of the total organic carbon (TOC) in the soil. The TOC value was converted to an f_{oc} by dividing by 1,000,000. TOC values of subsurface soil from the site ranged from 1.5 mg/kg to 2,300 mg/kg (Table 6-2). The average TOC of 600 mg/kg was used to obtain an estimate of f_{oc} = 0.0006. The K_d then was estimated by multiplying the f_{oc} by the K_{oc} (from Table 7-2) for the particular organic chemical. These results are listed in Table 7-3. For inorganics, this simple relationship is not applicable and site-specific data on K_ds were not collected. Instead, estimates obtained from the literature and provided in Table 7-2 were used; these values also are listed in Table 7-3.

Retardation coefficients for each of the major chemical groups were estimated and are provided in Table 7-3. A bulk density of 1.85 grams per cubic centimeter (typical of silty sand) and an effective porosity of 0.25 were assumed. The estimates of retardation show a wide range. Typically, VOCs are retarded the least, with the rate of contaminant migration from one-half to one order of magnitude lower than the rate of groundwater flow. For example, if the rate of groundwater flow is 1 foot per day (ft/day), then the rate of carbon tetrachloride migration is on the order of 0.5 ft/day.

The K_ds of the contaminants associated with the site vary widely between the organic and inorganic analytes. The K_d of arsenic also varies widely depending upon the valence state, the pH, and other conditions encountered in the subsurface. The data provided in Table 7-2 are from various reports and documents in the literature, not from the site. Therefore, the estimate of the retardation coefficients for arsenic, mercury, and silver have even more of a level of uncertainty than do the estimates of the rates of groundwater flow. As a result, estimates of the rates of contaminant migration are very approximate.

7.1.2.2 Volatilization

Volatilization is the tendency for some chemicals, particularly VOCs, to change from a liquid or adsorbed state to a gas. A conventional measure of volatility is Henry's Law Constant (K_h). Values of K_h for the representative organic chemicals are provided in Table 7-2.

Compounds with K_h values higher than 10^{-3} atmosphere-cubic meter per mole (atm-m^3/M) (e.g., carbon tetrachloride) are expected to volatilize readily from water to air, whereas those with K_h values lower than 10^{-5} atm-m^3/M (e.g., benzo[a]pyrene) are relatively non-volatile. Most inorganic chemicals are not volatile under normal temperature and pressure conditions. Carbon tetrachloride and chloroform would be expected to volatilize strongly from groundwater into the unsaturated soil.

7.1.2.3 Degradation

Degradation is the transformation of one chemical to another by such processes as hydrolysis, photolysis, and biodegradation. Hydrolysis is the reaction of a chemical with water and photolysis is the result of exposing the chemical to light.

Degradation is commonly expressed as a half-life that composites the degradation by whatever processes may be operating. Estimates of half-lives for the representative chemicals are provided in Table 7-2. For example, in groundwater, carbon tetrachloride would be expected to degrade much more rapidly than benzo(a)pyrene.

7.1.2.4 Transformation

Transformation occurs when metals are increased or reduced in valence state by oxidation or reduction, respectively. Transformation may have a significant effect on the mobility of a metal, either increasing or decreasing it. Transformation can be caused by Eh and pH changes and by microbial or non-microbial (abiotic) processes. For example, arsenic is more mobile in its trivalent state than in its more-oxidized, pentavalent state.

7.1.3 Representative Chemicals

The following chemical-specific profiles briefly describe how the chemical and physical properties of the representative chemicals listed in Table 7-1 affect their mobility and persistence in the environment. Most of the information provided in these profiles was obtained from Spectrum Laboratories chemical fact sheets available at website toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.

7.1.3.1 Carbon Tetrachloride and its Degradation Products

Carbon tetrachloride and chloroform were detected at high levels in groundwater at the site but at only low levels in surface soil and not at all in subsurface soil, surface water, or sediment. Methylene chloride was detected in groundwater and some subsurface-soil samples but not in surface soil, surface water, or sediment. Chloromethane was detected in some groundwater samples but no other media.

Releases or spills of carbon tetrachloride on soil should result in rapid evaporation due to high vapor pressure and leaching in soil resulting in groundwater contamination due to its low adsorption to soil. Carbon tetrachloride exhibits relatively high water solubility, low K_{oc}, and low K_{ow}, and, therefore, is expected to be fairly mobile in the soil-groundwater system. It does not tend to bioaccumulate. Transport with infiltrating water is expected, particularly in sandy soil and soil having low organic content. Therefore, carbon tetrachloride is not expected to be retained in soil. In water systems, evaporation appears to be the most important removal process.

Biodegradation may be important under aerobic or anaerobic conditions, but the data are limited. In the environment, carbon tetrachloride degrades to chloroform by reductive dechlorination. Chloroform then degrades to methylene chloride (also known as dichloromethane), which in turn degrades to chloromethane (also known as methyl chloride).

If carbon tetrachloride is present at a sufficiently high concentration to form a distinct and separate phase from water, it will sink as a dense non-aqueous phase liquid (DNAPL) to the low-permeability layer underlying the shallow water-bearing unit. Carbon tetrachloride was detected in groundwater at concentrations over 286 mg/L, over one-third of its solubility in water. This suggests that carbon tetrachloride exists as a DNAPL in the vicinity of where the sample was collected (i.e., well IS47MW03). Such high concentrations of carbon tetrachloride were only detected in the vicinity of Building 856. Chloroform can form a DNAPL when present in undissolved form. The solubility of chloroform is 8,000 mg/L. Concentrations in groundwater over about 80 mg/L (i.e., 1 percent of solubility) would suggest the presence of DNAPL chloroform in the subsurface. However, the highest detected concentration of chloroform was under 60 mg/L, suggesting that the chloroform at the site is derived from the degradation of carbon tetrachloride rather than being present as a DNAPL of its own. It is unlikely that the other degradation products exist as DNAPLs because their concentrations are too low.

7.1.3.2 TCE, PCE, and their Degradation Products

PCE and TCE were detected in groundwater and in a few surface- and subsurface-soil samples. PCE was not detected in surface water or sediment and TCE was detected in only one sediment sample. Cis-1,2-DCE and vinyl chloride were detected only in groundwater.

In this discussion, PCE and TCE are treated as potential separate sources of contamination at the site. However, it also is likely that TCE was derived from the degradation of PCE instead.

The dominant process for removing PCE and TCE from shallow soil and surface water is volatilization into the atmosphere, indicated by their relatively high vapor pressure and K_h. Once in the atmosphere, they are degraded through reaction with hydroxyl radicals, which forms hydrogen chloride, carbon monoxide, carbon dioxide, and carboxylic acid.

The K_{oc} value indicates that PCE and TCE have medium to high mobility through soil and will not partition significantly from water to soil. The relatively low K_{ow} values indicates that they tend to remain in the aqueous phase and are not readily bioaccumulated.

The most important transformation processes for PCE, TCE, and other chlorinated aliphatic compounds in natural water systems and soil are anaerobic and aerobic biodegradation. Anaerobic degradation of the chlorinated aliphatics proceeds along a reductive dehalogenation pathway:

PCE > TCE > DCE > vinyl chloride > ethylene

Biodegradation rates of PCE and TCE in soil and groundwater vary considerably with type of soil, water chemistry, hydrologic conditions, types of microbes, humus content, temperature, pH, Eh, amount of oxygen, and presence of other nutrients. The expected half-lives of PCE and TCE in groundwater range from 2 to 4.5 years.

Although PCE and TCE may form DNAPLs, their concentrations in groundwater at the site indicate that they are not present at the site in that form.

7.1.3.3 1,2-Dichloroethane

1,2-Dichloroethane was only detected in groundwater at the site.

This chemical typically is not used as a primary material; therefore, it is most likely to have been derived from the degradation of 1,1,2-trichloroethane, which was infrequently detected in the subsurface at the site. It has similar properties to the VOCs discussed earlier. It is fairly volatile and mobile in the environment and degrades rather quickly.

7.1.3.4 Benzo(a)pyrene

Benzo(a)pyrene was detected in surface soil and sediment at the site but not in subsurface soil, groundwater, or surface water.

Very-low vapor pressure and solubility in water and high K_{oc} and K_d values indicate that benzo(a)pyrene is strongly adsorbed to organic matter in soil. Volatilization is an insignificant transport mechanism. Transport by groundwater may be limited because of the low solubility and its preference for adsorbing to organic material in soil. PAHs such as benzo(a)pyrene do not contain functional groups that are susceptible to hydrolytic reactions. Therefore, hydrolysis is not a significant degradation process for this compound. Biodegradation of PAHs is well-documented and likely is the ultimate fate of benzo(a)pyrene. Limited nutrient and oxygen availability and the presence of such potential microbe inhibitors as arsenic could limit the effectiveness of biodegradation.

PAHs in general exhibit short-term bioaccumulation but it is not an important process because of the rapid metabolism and excretion of them by most aquatic organisms.

7.1.3.5 Arsenic

Arsenic exceeded its background concentration in surface soil and in groundwater. It also was detected in both surface water and sediment but no background results are available for these media.

The predominant form of arsenic in oxidizing environments is arsenate (As[+5]). Under slightly reducing and acidic conditions, such as temporary flooding, the more toxic and mobile arsenite (As[+3]) form dominates. Arsenite and methylated arsine predominate in moderately reducing soil, such as tidal marshes and consistently flooded soil. In natural environments, arsenic also may exist in the As(-3) and As(0) states, but only under highly reducing conditions. Such reducing conditions do not appear to exist at the site.

Transport and partitioning of arsenic in water depend on the oxidation state of the arsenic and on interactions with other materials present. Organic matter, divalent metals, and dissolved sulfide enhance the reduction of the arsenic valence state to a more mobile form. Soluble forms move with water, but arsenic may be adsorbed from water onto sediment or soil, especially clays, iron oxyhydroxides and oxides, aluminum hydroxides, manganese compounds, and organic material. Adsorption to oxyhydroxides is the most important natural adsorption process.

Microbes are capable of methylating arsenic to trimethylarsine gas, which is a more-volatile and more-mobile form than inorganic arsenic.

Bioaccumulation of arsenic occurs in aquatic organisms, particularly algae and lower invertebrates. Although some fish and invertebrates may contain high levels of arsenic compounds, the predominant arsenic form, arsenobetaine, is relatively inert. Biomagnification in aquatic food chains does not appear to be significant.

7.1.3.6 Lead

Lead exceeded its background concentration in surface and subsurface soil and in groundwater. Lead also was detected in sediment but not in surface water; there are no background data for either media.

The dominant species of lead in the aqueous solution is Pb(+2) under acidic conditions and Pb(+2)-carbonate complexes under alkaline conditions. Adsorption and precipitation increase with increasing pH, with most lead precipitating out at pH greater than 6. In oxidizing systems, the least soluble common forms of lead are the carbonate, hydroxide, and hydroxycarbonate. In reducing conditions where sulfur is present, lead sulfide is the stable solid.

Lead is an extremely stable metal, although it dissolves in acid. Due to its very low vapor pressure, volatilization of lead from the soil and water is negligible, although benthic microbes may convert methylated lead to tetramethyl lead, which tends to volatilize to the atmosphere. Lead complexes with organic matter and clay minerals that limit its mobility. Only a small fraction of lead in soil will be in a water-soluble form.

Lead is effectively removed from water to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (especially as lead sulfide), and the reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates as the process for removing lead from solution. If released into the water, metallic lead will sink into the sediment.

Lead may bioconcentrate in fish or other biota.

7.1.3.7 Mercury

Mercury exceeded its background concentration in surface and subsurface soil and in groundwater. Mercury also was detected in sediment but not in surface water; there are no background data for either media.

Two characteristics of mercury, its volatility and biotransformation, distinguish it from other metals. Its high volatility is a great concern due to its high toxicity. Elemental mercury volatilizes so that much of the mercury in the atmosphere is in atomic form. Some mercury in the atmosphere is associated with particulate matter. Volatile organomercury compounds, such as dimethylmercury, and monomethylmercury salts, are also present in the atmosphere. Mercury in the environment is deposited and revolatilized many times, with a residence time in the atmosphere of at least a few days. Atmospheric mercury can be deposited by both dry and wet deposition. In the volatile phase, mercury can be transported hundreds of kilometers.

Most inorganic compounds of this element are relatively insoluble. In aquatic environments, mercury binds strongly to dissolved matter or fine particulates. Mercury can be desorbed from sediment into the water column. Desorbed mercury in the water column can be transported when bound or chelated to fine particles or dissolved substances. The dominant process controlling the distribution of mercury compounds in the environment appears to be this sorption of nonvolatile forms to soil and sediment, with little re-suspension from the sediments back into the surface water.

Mercury concentrations in water and in fish tissue result from the formation of soluble monomethylmercury ion and volatile dimethylmercury by anaerobic bacteria in sediments. Water and sediment in which anaerobic decay is occurring likely contain all the necessary ingredients for producing methylmercury. Mercury in the form of dimethylmercury or monomethylmercury becomes concentrated in fatty tissues (Manahan, 1990). Concentrations in tissue may be as much as 10,0000 times the concentrations in water. Bioconcentration factors (BCFs) of 63,000 for freshwater fish and 10,000 for saltwater fish have been found. Marine plants, invertebrates, and fish have BCFs of approximately 1,000; 100,000; and 1,670; respectively. Freshwater plants, invertebrates, and fish have BCFs of 1,000; 100,000; and 1,000; respectively.

7.1.3.8 Silver

Silver exceeded its background concentration in soil. Silver also was detected in sediment but not in surface water or groundwater; there are no background data for sediment or surface water.

Silver compounds are commonly found in nature as halides (i.e., Cl, Br, I, F), cyanide, thiocyanate, oxides, hydroxides, carbonates, nitrate, sulfate, sulfides, ferrocyanide complexes, and thiosulfate complexes. Most silver compounds are insoluble, with the exception of nitrate, which is miscible. The oxides, sulfates, carbonates, and phosphates of silver are moderately soluble. These compounds are not likely to remain as solids or precipitates in the natural environment (1). Silver also will exist as Ag+ ions in solution or as elemental Ag(s) under environmental conditions.

When released to air, silver compounds are expected to exist solely in the particulate phase in the ambient atmosphere. Particulate-phase silver will be removed from the atmosphere by wet and dry deposition. Volatilization of silver compounds from moist soil surfaces is not expected to be an important fate process because silver compounds are expected to exist as ions which do not volatilize. Silver compounds are not expected to volatilize from dry soil surfaces based upon their ionic character and low vapor pressures of the non-ionizing compounds. Silver compounds are expected to exist as ions in the environment and, therefore, volatilization from water surfaces is not expected to be an important fate process.

The partition coefficient for silver ranges from 10 to 10,000, which indicates that silver compounds have a range of mobilities in soil, suspended solids, and sediment. Thus, silver-contaminated sediments may become a source of dissolved silver to overlying waters due to the remobilization of silver from particulate to dissolved phases. The same would be true of soil water infiltrating past silver-contaminated soil. Partitioning of silver compounds are primarily controlled by their speciation both in solution and on soils. Organic colloids also appear to sorb silver ions. Relatively large amounts of organic colloids will substantially

lower the Kd of silver and remobilize adsorbed silver. Manganese oxide has a strong affinity to adsorb silver ions.

Inorganic silver ion species will not bioconcentrate in aquatic organisms.

7.1.4 Aquifer Properties

The following physical mechanisms control the fate and transport of contaminants dissolved in groundwater during migration:

- Advection, the transport of dissolved contaminants by the bulk motion of flowing groundwater, is the primary transport mechanism for dissolved contamination along the hydraulic gradient. Advection controls the rate and direction of contaminant migration.
- Dispersion, the spreading of dissolved contaminants from the path they would be expected to follow during advection, results from the spatial variation in aquifer permeability, fluid mixing, and molecular diffusion. Dispersion primarily controls the concentration of the contaminant at any point in the flow system.

Dispersion occurs in moving groundwater because of local variations in flow velocities caused by the variability of the hydraulic conductivity of the porous media. Typically, the degree of dispersion is greater in the direction of water flow than in directions perpendicular to it. The concentrations of the chemicals at the center of the contaminant plume will decrease as dispersion dilutes the contaminant mass. Some contaminants will migrate more rapidly than the center of mass of the concentration and some will migrate more slowly. The center of mass would move at the rate estimated by dividing the groundwater-flow velocity by the retardation coefficient of the migrating chemical, as described earlier in this section.

7.2 Contaminant Migration at Site 47

This section describes the source areas and potential mechanisms for contaminant release and migration from the source areas at Site 47. The discussion is organized by media at the site that may experience contaminant transport.

Fundamental to describing fate and transport at the site is the conceptual site model, which is described in this section. The conceptual site model qualitatively defines the various contaminant sources, release mechanisms, relative rates of migration and persistence of contaminants, and migration pathways for contaminants at the site.

7.2.1 Source Area

Based on the chemical and physical data gathered for the site and information provided by IHDIV-NSWC, the following potential contaminant source areas have been identified or may exist at the site:

- Disposal near Building 856 in the former Mercuric Nitrate Disposal pit, the barium disposal pit, and perhaps other locations of solutions of metals, organic solvents, and possibly other chemicals
- Surface and subsurface soil contaminated by other site operations

The former Mercuric Nitrate Disposal pit is considered to be a potential contaminant source because historical records indicate that liquid chemicals, including acid solutions containing mercuric nitrate, were disposed of at the location. Soil sampling has not confirmed this disposal, although some of the highest concentrations of SVOCs in surface soil were detected near the former pit, and the monitoring well containing the highest levels and largest number of contaminants at the site is near the former pit. Anecdotal information also indicates that carbon tetrachloride likely was disposed of in the former pit because it was used as a solvent during processes at Building 856.

It appears that another waste disposal area existed approximately 50 feet to the east of Building 856. Reportedly, waste solutions of water and barium sulfate generated from equipment cleaning at Building 856 would be pumped monthly into pits dug for the purpose and then covered over. It is noted that very high concentrations of VOCs were detected in *in situ* groundwater samples collected in the vicinity of this disposal area, suggesting that there may have been a similar amount of solvent disposal in this area as there was at the former Mercuric Nitrate Disposal Pit.

Other wastes may have been disposed of in these pits. VOC and SVOC detections in surface soil at widely scattered locations at the site suggest that chemicals have been disposed of on the ground surface at the site. The SVOCs detected in surface soil at the site are common combustion products, and may be the result of stack releases from an incinerator or other sources at or near the site.

Soil samples collected at the site have concentrations of such inorganic contaminants as arsenic, lead, mercury, and silver that exceed background concentrations. It is probable that contamination by mercury is site-related due to past site activities. There may also be other site-related contamination. The presence of lead and silver in manhole IW91 suggests that at least these chemicals have been released from the site into the stormwater-sewer system, and the only known sewer entering this manhole originates in Building 856. High levels of nitroglycerin also were detected in sediment in the manhole. Furthermore, mercuric nitrate was disposed of in the former pit near Building 856. Additional information on whether other inorganics listed here may have been used at the site is provided in Jim Dolph's *Site 47 Literature Search* (2001).

The primary mechanisms for contaminant transport from the source areas at the site are believed to be:

- Entrainment of contaminated surface soil into the air by wind erosion
- Leaching of contaminants from the soil by precipitation and transport by overland flow or flow through the soil to drainage ditches
- Erosion of surface soil from the site and deposition in drainage-ditch sediments
- Leaching of contaminants from the soil by infiltrating precipitation and transport to the underlying groundwater system
- Migration of contaminants in groundwater

7.2.2 Releases from Soil to the Atmosphere

Wind erosion and vehicular traffic typically are considered to be the primary mechanisms for releases of site contaminants to the atmosphere from soil. Inorganics and many SVOCs tend to bind to the soil and can be released to the atmosphere as dust during windy conditions or site activities such as soil excavation. However, the potential for release of site contaminants to the atmosphere is considered to be minimal because most of the site is either grassed or paved and there is little vehicular traffic at the site that would move at a rate great enough to mobilize dust into the air.

Volatilization, which is the primary mechanism for releasing volatile contaminants from soil to the atmosphere, is not considered to be a significant part of potential contaminant release at the sites. Few VOCs were detected in surface soil at the site and their concentrations are very low.

7.2.3 Releases from Soil to Surface Water and Sediment

There is no surface water at the site except during periods of sustained rainfall, when surface runoff collects in the drainage ditches and is carried downstream. The few surface-water samples collected at the site showed little impact from contamination at the site. Sediment samples, however, showed contamination from SVOCs and some metals that likely are derived from the site.

Contamination in surface soil at the site is not especially free to be transported to nearby drainage ditches because most of the site is grassed. However, some transport may occur by wind erosion and by overland flow. Contaminants may be transported by overland flow either in the dissolved phase or as suspended particulates. The load carried by surface runoff is deposited in the drainage ditches as the flow rate declines after a storm. The sediment usually is deposited under oxidizing conditions and, therefore, transported chemicals may be oxidized if the transport times are long enough. This may enhance the mobility of some metals such as chromium but reduce the potential transport of others, such as arsenic.

There were few VOCs detected in surface soil or sediment; therefore, surface soil at the site is not expected to be a significant source of VOCs in the drainage ditches. However, the surface soil may be a source of several SVOCs and inorganics. All of the SVOCs that were detected in sediment were detected in surface soil at the site. All of the inorganics detected in sediment also were detected in soil. Therefore, the assumption is that the contaminants detected in sediment in the drainage ditches at the site have been derived from the surface soil on the site. In many cases, the concentrations in sediment are higher than those in the soil, probably because of the tendency for contaminants to adhere more strongly to fine-grained material and the bias of sampling toward more fine-grained material in the ditches.

Sediment sampled in the IW91 sewer manhole contained lead, silver, and NG at elevated concentrations. However, no exit from this sewer could be found at its reported location along the Potomac River shoreline due to collapse of the bluffs along the shoreline. Therefore, it is likely that the discharge of the sewer is sealed and that there no longer is any discharge from the sewer.

7.2.4 Releases from Soil to Groundwater

Percolation of precipitation, both rainfall and snowmelt, through the unsaturated soil can dissolve contaminants and strip them from the soil, then transport them to the underlying groundwater. Thus, subsurface soil can serve as a source of contaminants to groundwater.

So few VOCs were detected in surface and subsurface soil and at such low concentrations that it is unlikely that they represent a source of contamination to groundwater. The one high value of PCE (3,100 µg/kg) in surface-soil sample IS47SA01 appears to be an isolated incidence. Other VOCs detected in this surface soil sample include TCE (32 µg/kg), CT (41 µg/kg), and chloroform (68 µg/kg). These compounds were detected in only one other surface soil sample, at estimated part-per-billion concentrations near the detection limit. The area around IS47SA01 is well-constrained by other borings without PCE detections. Therefore, this detection of PCE appears to be an isolated occurrence.

Table 7-4 lists the soil-screening levels (SSLs) proposed by USEPA (2002) for protection of groundwater from soil contamination for most of the representative chemicals. The SSLs listed assume a dilution-attenuation factor in the groundwater of 20, which assumes some mixing of contaminated infiltration with clean groundwater beneath the site. Both chloroform and carbon tetrachloride were detected in soil during the RI at concentrations that exceeded their respective SSLs. However, they and other VOCs were detected at very few locations at the site and, therefore, do not appear to continue to be sources of contamination of groundwater. Benzo(a)pyrene, arsenic, and silver were detected above their SSLs at many locations. Therefore, there is a potential that these and other PAHs and metals could continue as sources of contamination to groundwater. However, arsenic was detected on the same order as in background, and SSL exceedances by benzo(a)pyrene and silver were few and far between. Therefore, these chemicals are not considered to be significant contributors to groundwater contamination via leaching from the soil.

7.2.5 Migration of Contaminants in Groundwater

7.2.5.1 General Conceptual Model of Groundwater Flow

At the site, precipitation that does not run off of the surface of the ground toward surface-water features like the drainage ditches, or is evaporated or transpired into the air, infiltrates the surface of the ground. Most infiltration occurs in areas of the site where there is grass cover and the ground is flat or has only a low slope. Most of the site has these conditions.

The infiltrating water moves by gravity downward through the unsaturated soil. At some depth (generally on the order of 6 to 14 feet bgs), the infiltrating water reaches the water table and enters the shallow groundwater system.

The water table and the shallow water-bearing unit at the site are located in fine- to medium-grained silty sand overlying a hard, dense clay layer. The thickness of the shallow water-bearing unit ranges from 1 to 24 feet, depending upon the surface elevation. The thickness of the clay exceeds 30 feet at 6 drilling locations and likely is at least this thick throughout the site. Therefore, the clay appears to represent an areally extensive barrier to vertical groundwater flow.

As discussed in Section 5, groundwater beneath the site predominantly flows eastward toward the Site 12 Pond and the Site 8 Swale. This is consistent with what would be expected based on the topography of the site. Around the site, however, the groundwater-flow directions are less distinct because the site appears to be on a groundwater divide. As a result, the hydraulic gradients are very low and may actually change direction over time. This could cause groundwater to flow in different directions at different times in this area.

7.2.5.2 Conceptual Model of Contaminant Transport

Previous sections have described how contamination in soil and waste may be removed and transported to the groundwater and how groundwater moves at the site. In this section, the migration of contaminants in groundwater at the site is described. First, the upgradient contamination conditions are discussed. These conditions should provide a background against which possible effects of the site on the groundwater can be evaluated. Then the migration of contamination through the groundwater underlying and downgradient of the site and the likely effects of the site on the groundwater are discussed. Finally, the potential for discharge of contaminated groundwater to surface water is discussed.

Upgradient Conditions. Upgradient conditions may not exist at the site, or at best they are very temporal. The apparent source of most, if not all, contamination at the site is in the vicinity of Building 856. The vicinity of the building is on a groundwater divide, and groundwater may flow away from it in several directions. Therefore, there typically is no groundwater upgradient of the site. As mentioned in Section 7.2.5.1, there are times when the divide moves and groundwater-flow directions may change. If the divide moves to the west of the source areas, then there may be upgradient groundwater that moves eastward beneath the site. Alternatively, if the divide moves eastward, then there may be upgradient groundwater that moves westward beneath the site. The fact that wells north, south, and west of the site (i.e., IS47MW06 through IS47MW08) have no detected levels of VOCs and only low levels of SVOCs and metals compared to other wells at the site suggest that groundwater typically flows eastward rather than in any other direction.

Groundwater Flow Beneath and Downgradient of the Site. Figures 6-3 through 6-11 in Section 6 show the VOC concentrations and the general distributions of the VOC plumes. The VOC plumes have some features in common:

- With the exception of DCA, the plumes show the highest concentrations in the vicinity of Building 856
- The plumes typically are elongated to the east and southeast from the vicinity of Building 856
- Contaminants have not migrated more than about 1,000 feet from the vicinity of Building 856
- Daughter products of carbon tetrachloride, PCE, and TCE such as chloroform, methylene chloride, chloromethane, cis-1,2-dichloroethene, and vinyl chloride are well-represented within the contaminant plumes
- The more-mobile parent and daughter products (e.g., TCE, cis-1,2-DCE, and chloroform) typically have migrated further downgradient than carbon tetrachloride and PCE

The high concentrations of most VOCs around Building 856 suggest that this is the source area for these VOCs. Migration appears to be in the predominant flow direction of groundwater, which is toward the Site 12 Pond. According to the available data, few if any VOCs have reached the Site 12 Pond, or even the Site 8 Swale or other swales downgradient of the apparent source area. The presence of typical daughter products strongly indicates that the parent products are degrading.

There are some significant differences between the VOC plumes, also:

- The plume of carbon tetrachloride and its daughter products is smaller than those of the other major VOC contaminants; this may be due to the shorter half-lives of these chemicals, which indicates more rapid degradation and prevents them from migrating very far at significant concentrations.

  Carbon tetrachloride and chloroform were detected in the *in situ* groundwater sample from location IS47GW40 and carbon tetrachloride, chloroform, TCE, and cis-1,2-DCE were detected in well IS47MW14, both of which are located slightly south of the Site 8 Swale and apparently not in the typical direction of groundwater flow from the apparent source area. Although these chemicals may have migrated from the vicinity of Building 856 during unusual groundwater-flow conditions, it is more likely that they are derived from another, smaller source, perhaps in the vicinity of buildings 765 or 1769. However, there are no groundwater elevation data available in the vicinity of Buildings 765 or 1769. The conclusions regarding potential sources in the vicinity of these buildings is based solely on chemical data. Hydraulic data were not collected at a scale sufficient to support this analysis.

- The plume of PCE is smaller than the plumes of its daughter products TCE and cis-1,2-DCE because it is degrading into these products, which then can migrate beyond the limits of the parent chemical.

- The plume of vinyl chloride is very small and is restricted to an area close to the apparent source because of the low rate of degradation to this chemical from cis-1,2,-DCE.

- The plume of 1,2-DCA has its highest concentration at *in situ* groundwater sampling locations IS47GW15/16, in the vicinity of Building 607, and was detected at locations IS47GW25 and IS47GW27 and well IS47MW13, which are not in the apparent direction of groundwater flow. Because it degrades fairly rapidly it is unlikely that this high concentration represents a "slug" of 1,2-DCA migrating downgradient from the vicinity of Building 856 (where the concentrations of 1,2-DCA were lower). It is more likely that this indicates sources of this chemical (likely through the degradation of 1,1,2-trichloroethane) in the vicinity of Building 607 and northeast of Building 856.

Under the assumption that groundwater predominantly moves toward the east, the rate of horizontal advective flow in the shallow groundwater can be estimated, using the equations described in Section 7.1.2.1:

$K = 0.6$ to 14.5 feet/day (from slug tests performed at the site)

$\nabla h = 0.007$ (representative gradient east of the site [Figure 5-1])

$n_e = 0.25$

v = Range of 0.017 to 0.41 feet/day

This is a considerable range but may provide an upper limit to the flow rate.

The rate of vertical advective flow across the clay layer underlying the shallow water-bearing unit is unknown because there are no data on the water-level gradient across the layer. However, the results of laboratory tests on undisturbed samples of the clay indicate that the vertical hydraulic conductivity of the layer is on the order of 10^{-4} feet/day, a value low enough to greatly retard the migration of contaminants vertically downward. Therefore, it is unlikely that any contamination has migrated through the clay.

It should be stressed that these values are simply approximations of the likely groundwater-flow velocities in the groundwater system at the site. The uncertainty in the hydraulic conductivity and the variability make dependable and representative values difficult to estimate.

As described in Section 7.1.2.1, the actual migration rates of contaminants can be estimated using the rates of groundwater flow and estimates of the retardation coefficient for each chemical. The rates of migration are discussed for each chemical group below.

Carbon tetrachloride was the VOC detected at the highest concentration in groundwater at the site. Using the retardation coefficient of 2 calculated in Table 7-3, the highest rate of migration of this chemical in groundwater is 0.41 feet/day/2 = 0.21 feet/day or 77 feet per year (feet/yr). Under the assumption that carbon tetrachloride was disposed of in the former pit during the same period as the mercuric nitrate solution (1957 to 1965) and that it entered the groundwater starting in 1957, then in the intervening 43 years, it could have moved a distance of over 3,300 feet. Other VOCs with lower retardation coefficients (e.g., chloroform, TCE, and 1,2-DCA) could have moved farther. The fact that they moved only a few hundred feet (see figures in Section 6) strongly suggests that the VOCs are being degraded in the subsurface.

Several SVOCs were detected in groundwater at the site but only at low concentrations. These contaminants would not be expected to migrate as rapidly as VOCs. However, they tend not to degrade as quickly.

As shown in Table 7-3, the retardation of arsenic, mercury, and silver would be greater than that of the VOCs and greater than most SVOCs. Therefore, metals have not likely migrated as far as the VOCs or SVOCs. However, metals do not degrade and, therefore, may maintain higher concentrations with distance downgradient.

The possibility that the solvent effect of high levels of carbon tetrachloride and chloroform moving through the soil and occurring in the groundwater may be removing metals from the geologic materials at the site was considered. In fact, the highest concentrations of most metals were detected in wells IS47MW03 and IS47MW04, which historically has contained the highest levels of VOCs. Although the water-bearing unit consists primarily of silty sand, which is made up of quartz and feldspar rather than clay that might contribute such minerals as iron, manganese, and traces of a few of the other metals detected in the groundwater, there appears to be sufficient trace metals in the subsurface materials to provide elevated concentrations in these wells.

As discussed in Section 6, it is likely that DNAPL carbon tetrachloride is present in the subsurface, presumably derived from direct disposal to the former pits. As a DNAPL, this liquid would migrate downward through the subsurface under the influence of gravity. The downward movement would be temporarily arrested when the DNAPL reaches the hard, dense clay layer at depths ranging from 1 to 24 feet bgs at the site. The DNAPL then could move slowly down the slope of the top surface of the clay layer. Site data (shown in the cross sections in figures 4-3 and 4-4 and the elevation of the top of the clay in Figure 4-5) indicate that the layer generally slopes to the southeast, toward the Site 12 Pond. There are some irregularities in the top of this surface that could trap DNAPL in pools or redirect its migration in other directions. However, concentration data from wells in some of these possible traps (e.g., well IS47MW10 as shown in Figure 4-2) as well as other wells downgradient of Building 856 do not suggest the presence of DNAPLs in these areas. Therefore, it is most likely that any DNAPLs in the subsurface are still retained close to the their original locations near Building 856 and are moving very slowly, if at all.

As noted above, high levels of cyanide were detected in samples from several wells at many points around Building 856, with the highest concentration near well IS47MW07 (which is west of Building 856) and well IS47MW09 (which is northeast of Building 856). It also is noted that those wells in the immediate vicinity of Building 856 (IS47MW01 through IS47MW04) contained no detections of cyanide. Cyanide commonly comes from metal plating and color photography, so these might be considered as sources of the material. However, there is no available information indicating disposal of chemicals containing cyanide at Site 47.

Groundwater Discharge. The groundwater-flow directions measured at the site indicate that groundwater generally flows eastward. This is consistent with the presence of likely discharge areas in the Site 12 Pond and the lower reaches of the Site 8 Swale. During times of higher water table, shallow groundwater may discharge to the upper reaches of the Site 8 Swale and other swales in the area. However, all of these swales ultimately discharge into the Site 12 Pond.

7.3 References

Dolph, James E. January 2001. *Site 47 Literature Search Naval Surface Warfare Center, Indian Head, Maryland.*

USEPA. May 1996. *Soil Screening Guidance: Technical Background Document.* Emergency Response Document EPA/540/R-95/128. May 1996.

TABLE 7-1
Representative Chemicals
Site 47 Remedial Investigation
IHDIV-NSWC

Volatile Organic Compounds
Carbon tetrachloride and its degradation products
Tetrachloroethene, trichloroethene, and their degradation products
1,2-Dichloroethane
Semivolatile Organic Compounds
Benzo(a)pyrene
Inorganics
Arsenic
Lead
Mercury
Silver

TABLE 7-2
Physical, Chemical, and Half-Life Data of Representative Chemicals
Site 47 Remedial Investigation
IHDIV-NSWC

Chemical	Molecular Weight (g/mole)	Specific Gravity (unitless)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m^3/mole)	K_d or Log K_{oc} [1] (mg/g)	Log K_{ow} (ml/g)	Half-Life Range (days)					
								Soil		Groundwater		Surface Water	
								Low	High	Low	High	Low	High
Volatiles													
Carbon tetrachloride	153.82 (1)	1.59 (1)	800 (1)	90 (1)	0.0302 (1)	2.35 (1)	2.83 (1)	183 (2)	365 (2)	7 (2)	365 (2)	183 (2)	365 (2)
Chloroform	119.38 (1)	1.48 (1)	8,000 (1)	160 (1)	0.0029 (1)	1.64 (1)	1.97 (1)	28 (2)	183 (2)	56 (2)	1825 (2)	28 (2)	183 (2)
Methylene chloride	84.93 (1)	1.33 (1)	20,000 (1)	348.9 (1)	0.0020 (1)	0.94 (1)	1.30 (1)	7 (2)	30 (2)	14 (2)	56 (2)	7 (2)	30 (2)
Chloromethane	50.48 (1)	0.92 (1)	6,450 (1)	3,789 (1)	0.0082 (1)	1.40 (1)	0.90 (1)	7 (2)	30 (2)	14 (2)	56 (2)	7 (2)	30 (2)
Tetrachloroethene	165.83 (1)	1.63 (1)	150 (1)	10 (1)	0.0153 (1)	2.42 (1)	2.60 (1)	183 (2)	365 (2)	365 (2)	730 (2)	183 (2)	365 (2)
Trichloroethene	131.39 (1)	1.46 (1)	1,100 (1)	35.2 (1)	0.0091 (1)	1.81 (1)	2.53 (1)	183 (2)	365 (2)	320 (2)	1643 (2)	183 (2)	365 (2)
cis-1,2-Dichloroethene	96.94 (1)	1.26 (1)	6,300 (1)	64 (1)	0.0072 (1)	1.77 (1)	2.09 (1)	28 (2)	183 (2)	56 (2)	2850 (2)	28 (2)	183 (2)
Vinyl chloride	62.50 (1)	0.91 (1)	1,100 (1)	2,580 (1)	0.056 (1)	0.39 (1)	0.60 (1)	28 (2)	183 (2)	56 (2)	2850 (2)	28 (2)	183 (2)
1,2-Dichloroethane	98.96 (1)	1.24 (1)	8,690 (1)	64 (1)	0.0011 (1)	1.15 (1)	1.48 (1)	100 (2)	183 (2)	100 (2)	365 (2)	100 (2)	183 (2)
Semivolatiles													
Benzo(a)pyrene	252.32 (1)	1.35 (1)	0.003 (1)	5.6E-09 (1)	<2.4E-06 (1)	5.60 (1)	6.50 (1)	57 (2)	529 (2)	114 (2)	1,060 (2)	<1 (2)	<1 (2)
Inorganics													
Arsenic	U	U	U	U	U	1 - 18 (3)	U	U	U	U	U	U	U
Lead	U	U	U	U	U	NA	U	U	U	U	U	U	U
Mercury	U	U	U	U	U	322 - 5280 (4)	U	U	U	U	U	U	U
Silver	U	U	U	U	U	10 - 1000 (3)	U	U	U	U	U	U	U

[1] K_d for inorganics and log K_{oc} for organics K_d = Distribution coefficient K_{oc} = Organic carbon partition coefficient K_{ow} = Octanol-water partition coefficient

U = No value is provided because of the uncertainty in the form of this chemical in the environment.

NA = Indicates data not available

Data sources:

(1) Montgomery and Welkom. 1989. Groundwater Chemicals Desk Reference. Volume 1.

(2) Howard, Ph. H. et al. 1991. *Handbook of Environmental Degradation Rates.*

(3) Dragun. 1998. *The Soil Chemistry of Hazardous Materials.* K_d estimates, not K_{oc}

(4) USEPA. 1996. *Soil Screening Guidance: Technical Background Document.* Kd estimates, not Koc

TABLE 7-3
Retardation Coefficients for Representative Chemicals
Site 47 Remedial Investigation
IHDIV-NSWC

Chemical Group	Log K_{oc}	K_d	Retardation Coefficient
Volatiles			
Carbon tetrachloride	2.35	0.13	2.0
Chloroform	1.64	0.03	1.2
Methylene chloride	0.94	0.01	1.0
Chloromethane	1.4	0.02	1.1
Tetrachloroethene	2.42	0.16	2.2
Trichloroethene	1.81	0.04	1.3
cis-1,2-Dichloroethene	1.77	0.04	1.3
Vinyl chloride	0.39	0.00	1.0
1,2-Dichloroethane	1.15	0.01	1.1
Semivolatiles			
Benzo(a)pyrene	5.60	239	1,769
Inorganics			
Arsenic	NP	1 - 18	8.4 - 134
Lead	NA	NA	NA
Mercury	NP	322 - 5280	2384 - 39073
Silver	NP	10 - 1000	75 - 7401

K_{oc} = Organic carbon partition coefficient

K_d = Distribution coefficient

R = Retardation coefficient = $1 + K_d \times p_b / n_e$

p_b = Soil bulk density = 1.85 grams per cubic centimeter

n_e = Effective porosity = 0.25

NP = Not applicable; K_d provided

NA = Not available

For organics, $K_d = K_{oc}$ x fraction of organic carbon, estimated to be 0.0006 based on site-specific subsurface-soil data

TABLE 7-4
Leaching-Based Soil Screening Levels for Representative Chemicals
Site 47 Remedial Investigation
IHDIV-NSWC

Chemical	Soil-Screening Level (mg/kg)
Volatile Organic Compounds	
Carbon tetrachloride	0.0021
Tetrachloroethene	0.029
Trichloroethene	0.00026
Semivolatile Organic Compounds	
Benzo(a)pyrene	0.37
Metals	
Arsenic	0.026
Lead	NA
Mercury	NA
Silver	31

Note: Soil-screening levels are from USEPA (2002)
Levels assume a dilution-attenuation factor of 20
NA = Not available

SECTION 8

Baseline Human-Health Risk Assessment

8.1 Introduction

This section presents the results of an assessment of potential human health risks associated with the presence of site-related soil, sediment, surface water, groundwater, and concrete at Site 47 (Mercuric Nitrate Disposal Area) at IHDIV-NSWC. Analytical results from these media were used to examine the potential human health risks. This baseline risk assessment, which characterizes the human health risks at Site 47 if no additional remedial action is implemented, was conducted to assess the potential human health impacts from the site under current conditions, as well as to determine if any further actions are needed at the site to be sufficiently protective of human health. This risk assessment has been prepared utilizing conservative assumptions, and all feasible exposure pathways have been considered based on current site conditions and current and potential future site usage. The risk assessment incorporates the general methodology described in *Risk Assessment Guidance for Superfund (RAGs), Volume 1, Human Health Evaluation Manual, Part A* (USEPA, December 1989), *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part D* (USEPA, December 1997), and USEPA Region III Technical Guidance Manuals for Risk Assessment.

The results of the Site 47 baseline human health risk assessment will be used to help determine whether remediation is necessary, to document the potential for endangerment to human health, to provide a basis to select action levels, and to assist in identifying the exposure media that may need to be addressed through remedial action.

8.1.1 Overview

Chapter 2 provides an overview of site features and historical uses.

8.1.2 Scope of Risk Assessment

The human health risk assessment for Site 47 is comprised of the following components:

- **Risk Assessment Results Summary –** summarizes the findings of the HHRA.
- **Identification of Chemicals of Potential Concern (COPCs) -** identifies and characterizes the distribution of COPCs found on the site. Chemicals identified in this screening are the focus of the subsequent evaluation in the risk assessment.
- **Exposure Assessment** - identifies potential pathways by which exposure could occur, characterizes the potentially exposed populations (e.g., industrial workers, construction workers, trespassers) and estimates the magnitude, frequency, and duration of exposures.
- **Toxicity Assessment** - identifies the types of adverse health effects associated with exposure to COPCs, lists available toxicity factors (e.g., cancer slope factors and

reference dose values), and summarizes the relationship between magnitude of exposure and occurrence of adverse health effects. It also identifies related uncertainties (such as the weight-of-evidence for carcinogenic effects of a particular chemical in humans) associated with these values.

- **Risk Characterization** - integrates the results of the exposure assessment and toxicity assessment to estimate the potential risks to human health. Both cancer and noncancer human health effects are evaluated. Pathways that pose an unacceptable risk based on quantitative risk characterization are identified.
- **Uncertainty Assessment** - identifies sources of uncertainty associated with the data, methodology, and the values used in the risk assessment estimation.

These components are described briefly in the following sections. Spreadsheets prepared in accordance with USEPA RAGS Part D were used to screen for COPCs, and to calculate estimated exposures and health risks associated with the COPCs. These spreadsheets are presented in Appendix H.

8.2 Risk Assessment Results Summary

A summary of the results of the HHRA is presented here for the convenience of the reader. Subsequent sections describe the process used to determine these results, the key inputs used to calculate the risks, and the uncertainty in these calculations. Tables 8-4 and 8-5 summarize the calculated risks.

This risk assessment was conducted to evaluate the potential human health risks associated with the presence of site-related soil, groundwater, sediment, surface water, and concrete contamination at Site 47, Indian Head. Potential risks were calculated for a current industrial worker, current/future other worker, current/future adolescent trespasser/ visitor, future adult resident, future child resident, future lifetime resident, future construction worker, and future industrial worker. Table 8-3 identifies the exposure pathways evaluated for each of these receptors. The risks for each receptor are summarized below.

- **Current Industrial Worker:** The risk assessment assumed that a current industrial worker could be exposed to surface soil at the site. The total current RME noncarcinogenic hazard to an adult industrial worker exposed to surface soil is below USEPA's target noncarcinogenic hazard level. The carcinogenic risk to an adult industrial worker exposed to surface soil is within the USEPA's target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$.
- **Current/Future Trespasser/Visitor, Adolescent**: The risk assessment assumed that a trespasser/visitor may be exposed to surface soil at Site 47 and the surface water and sediment in the drainage swales at the site. The total RME noncarcinogenic hazard to adolescent trespassers/visitors exposed to surface soil, surface water, and sediment exceeds USEPA's target noncarcinogenic hazard level. Surface soil is the only media that contributes a hazard above the target level, primarily associated with dermal contact with the soil. The total RME carcinogenic risk to adolescent trespassers exposed to the surface soil, surface water, and sediment is within USEPA's target risk range.

- **Current/Future Other Worker**: The risk assessment assumed that a worker may be exposed to surface water and sediment in the industrial wastewater discharge manhole and the drainage swales at the site. The total RME noncarcinogenic hazard to the worker exposed to surface water and sediment does not exceed USEPA's target noncarcinogenic hazard level. The total RME carcinogenic risk to workers exposed to the surface water and sediment is within USEPA's target risk range.

- **Future Resident, Adult**: The risk assessment assumed that a future resident may be exposed to groundwater through potable use, and to combined surface and subsurface soil. Exposure to groundwater would result in a hazard greater than USEPA's target level for an adult resident. All three exposure pathways (ingestion, dermal, and inhalation) contribute to the unacceptable hazard. The hazard is mainly associated with VOCs in the groundwater, with a smaller contribution from arsenic, cyanide, iron, and vanadium. The RME noncarcinogenic hazard to adult residents exposed to soil is below USEPA's target noncarcinogenic hazard level.

  A CT hazard analysis was conducted for exposure to groundwater for the adult resident. The resulting CT hazard for the adult exposed to groundwater is greater than 1.0.

- **Future Resident, Child**: The risk assessment assumed that a future resident may be exposed to groundwater through potable use, and to combined surface and subsurface soil. Exposure to groundwater would result in a hazard greater than USEPA's target level for a child resident. Both exposure pathways (ingestion and dermal contact) contribute to the unacceptable hazard for the child. The hazard to the resident is mainly associated with VOCs in the groundwater, with a smaller contribution from arsenic, cyanide, iron, and vanadium. The RME noncarcinogenic hazard to child residents exposed to soil slightly exceeds USEPA's target noncarcinogenic hazard level, primarily associated with the ingestion of inorganics, although none of the constituents have a hazard quotient above 1.0 soil.

  A CT hazard analysis was conducted for exposure to groundwater and soil for the child resident. The resulting CT hazard for the child exposed to groundwater is greater than 1.0. The CT hazard for the child resident exposed to soil is below USEPA's target level.

Future Lifetime Resident: The risk assessment assumed that a future resident may be exposed to groundwater through potable use, and to combined surface and subsurface soil. Exposure to groundwater through potable use by a lifetime resident would result in a carcinogenic risk greater than USEPA's target risk range, based on RME exposure assumptions. The risk drivers for the groundwater are VOCs and arsenic. The RME carcinogenic risk for exposure to soil by a resident over his or her lifetime is within USEPA's target risk range.

A CT risk evaluation was conducted for groundwater for a lifetime resident. The CT carcinogenic risk for groundwater is above $1x10^{-4}$.

- **Future Construction Worker:** Exposure to soil through incidental ingestion, dermal contact, and inhalation of fugitive dust, to concrete troughs through incidental ingestion and dermal contact, and to groundwater through dermal contact and inhalation of

volatiles was evaluated for a future construction worker. The total potential future RME noncarcinogenic hazard exceeds USEPA's target hazard level, associated with exposure to groundwater. Dermal contact with the VOCs, primarily carbon tetrachloride, is the main contributor to the risk. The RME carcinogenic risk for a construction worker exposed to groundwater exceeds the USEPA's target range. Dermal contact with carbon tetrachloride is the main contributor to the risk. The RME noncarcinogenic hazard and carcinogenic risk associated with exposure to soil and concrete troughs are below or within USEPA's target levels.

A CT risk calculation was performed for noncarcinogenic and carcinogenic risks for groundwater. As with the RME risks, the CT risks for exposure to groundwater exceeded USEPA's target risk levels.

- **Future Industrial Worker**: The risk assessment assumed that a future industrial worker may be exposed to soil. The total future RME noncarcinogenic hazard for an adult industrial worker exposed to soil is slightly above USEPA's target noncarcinogenic hazard level. None of the individual constituents contribute hazards above 1. The RME carcinogenic risks to the industrial worker exposed to the soil are within the USEPA's target risk range.

  CT noncarcinogenic hazards were calculated for the industrial worker exposure to soil. The CT noncarcinogenic hazard is below USEPA's target level.

As shown above, groundwater and soil are the only media that had carcinogenic risks or noncarcinogenic hazards greater than the USEPA target levels. All pathways and all receptors evaluated for the groundwater scenario exceeded USEPA target levels. The shallow groundwater is not currently used as a potable-water supply and will most likely never be used as a potable-water supply. The risk drivers for the groundwater scenario are primarily the VOCs, and arsenic and cyanide (with a smaller contribution from some of the other metals) detected in the groundwater. Additionally, the maximum detected concentrations of the VOCs in groundwater were used as the exposure point concentrations because the calculated 95% UCLs exceeded the maximum detected concentrations. This was because the concentrations detected in MW03 and MW04 were much higher than those detected (or not detected) in the other monitoring wells. For exposure to soil, future child residents and industrial workers would have noncarcinogenic hazards slightly above USEPA's target hazard level.

8.3 Identification of Chemicals of Potential Concern

The identification of COPCs includes data collection, data evaluation, and data screening steps. The data collection and evaluation steps involve gathering and reviewing the available site data and identifying a set of data that is of acceptable quality for the risk assessment. This data set is then further screened against concentrations that are protective of human health to reduce the data set to those chemicals and media of potential concern. The data used for the quantitative risk analysis were validated and found to meet the data quality objectives (DQOs) prior to use in the risk assessment.

Section 8.2.1 discusses the selection of data used for the quantitative risk assessment. The data were selected from the set of validated data determined usable for risk assessment. Section 8.2.2 discusses the methodology used to further reduce the risk assessment data set to the constituents and media which are of primary concern to human health and Section 8.2.3 identifies the COPCs that were quantitatively assessed in the risk assessment.

8.3.1 Data Evaluation and Selection

Field investigations and sampling and monitoring programs have generated information on the Site 47 contaminants. Data are available for contaminant levels in soil, concrete, groundwater, surface water, and sediment. Detailed results of the sampling and monitoring program for Site 47 are presented in Section 6 of this RI Report. Data used in the risk assessment are presented in this section. Table 8-1 summarizes the samples that were used to estimate potential exposures and risks in each medium (i.e. soil, groundwater, surface water, sediment, and concrete).

As stated in the *Methods for Preparing the Human Health Risk Assessment for Indian Head* (CH2M HILL, March 2, 2000), the SI and RI soil, groundwater, surface water, sediment, and concrete data that were fully validated and met DQOs were used in the quantitative risk assessment.

Available data were reviewed to determine their reliability for the quantitative risk assessment. A review of the data and discussions with USEPA, MDE, and the Navy (Conference Calls on 10/22/99, and 11/1/99) identified the following items for data usability:

- Estimated values flagged with a J qualifier were treated as unqualified detected concentrations.
- Data qualified with an R (rejected) were not used in the risk assessment and were not included in the total count of samples analyzed for a constituent.
- Data qualified with a B (blank contamination) were used in the risk assessment as if they were non-detects, with the blank-related concentrations of each constituent used as the sample quantitation limit. One-half of the blank-related concentrations were used to calculate exposure point concentrations in the risk assessment.
- One-half of the sample quantitation limit (SQL) or sample detection limit (DL) were used in the risk assessment for cases where no detectable contaminant quantities were found in that sample, but the contaminant was detected in that medium at the site.
- For duplicate samples, the higher of the two concentrations was used. In calculating the frequency of detection and the 95 percent UCL, the duplicates were counted as a single sample.

8.3.1.1 Data Summary

All of the data used in the risk assessment have been fully validated and are assumed to represent current conditions. A discussion on the data quality is included in Section 6. Data collected from soil, groundwater, surface water, sediment, and concrete, that were used in the risk assessment, are presented in this section. For each medium, chemical-specific

summary statistics are presented in Appendix H for the data set used for the risk calculations. These summary statistics include frequency of detection, minimum and maximum detected values, normal and lognormal arithmetic mean, normal and lognormal standard deviation, results of W-test, and 95 percent upper confidence limit (95 percent UCL) for normal and lognormal distribution. Methods for calculating exposure point concentrations, arithmetic mean, and the 95 percent UCL values for those chemicals detected are discussed in Section 8.3.3.

8.3.1.2 Soil

A site inspection was performed at the site in 1992 (E/A & H, 1994). Twelve surface soil samples were collected in and around the former pit to determine if past mercury disposal contaminated soil at the site. The samples were analyzed for VOCs, SVOCs, select explosives and TAL metals.

In 1999, as part of the RI, ten surface-soil samples were collected in the vicinity of the disposal area at Site 47 and two surface-soil samples were collected in the vicinity of Building 856A. The soil samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, and explosives.

In 1999, as part of the RI, four sediment samples were collected in the vicinity of the disposal area at Site 47. These samples were designated as sediment samples because they were collected from depressional areas (i.e., drainage ditches). However, the locations sampled are not covered with water. Therefore, these samples are evaluated in the risk assessment as surface soil samples. These samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, and explosives.

In 2001, as part of the additional RI sampling, nine surface soil samples and 19 subsurface soil samples were collected in the vicinity of the disposal area at Site 47. These samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, and explosives.

In June of 2002, five additional subsurface soil samples were collected and were analyzed for TAL inorganics.

Table 8-1 identifies the soil samples collected at Site 47 and the corresponding laboratory analysis. Analytical results for the soil samples are summarized in Appendix H. A statistical summary of constituents detected in surface soil is presented in Tables 2.1, 2.2, 2.6, and 2.7, and a statistical summary of the constituents detected in the combined surface and subsurface soil is presented in Tables 2.12 and 2.13.

8.3.1.3 Groundwater

In 1999, as part of the RI, groundwater samples were collected from the four monitoring wells installed in the surficial aquifer at Site 47. The samples were analyzed for TCL VOCs, TCL SVOCs, TAL total and dissolved inorganics, and explosives. These wells were sampled again in 2001, along with samples from six additional monitoring wells, and analyzed for TCL VOCs, TCL SVOCs, TAL total and dissolved inorganics, and explosives. In 2002, groundwater samples were collected from four new monitoring wells. The 2002 groundwater samples were analyzed for selected VOCs. Table 8-1 identifies the groundwater samples collected and the corresponding analyses.

The groundwater in the surficial aquifer is not currently used and is not expected to be used in the future as a potable water supply at the facility. However, to provide a conservative assessment of groundwater quality at the site, the groundwater data from the site was evaluated in the risk assessment for the future exposure scenario. It is also likely that workers may come into contact with the shallow groundwater (i.e., an excavation could occur to the depth of the shallow groundwater). Therefore, the shallow groundwater was included in this evaluation for potential exposure during construction activities. It is assumed that during the excavation activities, groundwater from across the entire site will infiltrate the excavation; therefore, all of the monitoring well data were included in the construction worker exposure.

Analytical results for the groundwater samples for on-site residential scenario are summarized in Appendix H. A statistical summary of constituents detected in groundwater for on-site residential scenario is presented in Tables 2.8 and 2.10 in Appendix H. A statistical summary of constituents detected in groundwater for the construction worker scenario is presented in Tables 2.9 and 2.11 in Appendix H.

8.3.1.4 Sediment

In 1999 as part of the RI, one sediment sample was collected from material in the industrial wastewater discharge manhole near Building 856. Two additional sediment samples were collected from downstream locations in the main drainage ditch between Site 47 and Caffee Road in 2001. The sediment samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, and explosives. Table 8-1 identifies the sediment samples collected at Site 47 and the corresponding analyses.

The sediment data were combined into two different data groupings based on expected contact. It is assumed that site workers may be exposed to the sediment at all three of the locations sampled, but that a trespasser/visitor would not be exposed to the sediment from the industrial wastewater discharge manhole, but only to the sediment collected from the other two samples.

Analytical results for the sediment samples are summarized in Appendix H. A statistical summary of constituents detected in sediment is presented in Table 2.3 for the site worker, and Table 2.4 for the trespasser/visitor, in Appendix H.

8.3.1.5 Surface Water

Surface water samples were collected in 2001 and 2002 from the main drainage ditch, from swales north of Building 1769, from a swale east of Building 854, from swales east and northeast of Site 47, and from the Site 8 Swale. Two of the samples collected in 2001 were analyzed for TCL VOCs, TCL SVOCs, explosives, and inorganics. The other two samples collected in 2001 were analyzed for TCL VOCs. The seven surface water samples collected in 2002 were analyzed for low-concentration VOCs. Table 8-1 identifies the surface water samples collected at Site 47 and the corresponding analyses.

Analytical results for the surface water are summarized in Appendix H. A statistical summary of constituents detected in surface water is presented in Table 2.5 in Appendix H.

8.3.1.6 Concrete

In 1999, as part of the RI, two concrete samples were collected from the troughs on the north side of Building 856. The concrete samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, and explosives. Table 8-1 identifies each sample and the corresponding analysis.

The concrete samples were evaluated for a potential future construction scenario which would result in disturbance of the concrete. Analytical results for the concrete samples are summarized in Appendix H. A statistical summary of constituents detected in concrete is presented in Tables 2.14 and 2.15.

8.3.2 Selection of Chemicals of Potential Concern (COPCs)

All of the detected constituents were screened in accordance with USEPA Region III guidelines (USEPA, January 1993), using the steps described below. The COPC selection process was conservative to ensure selection of the constituents comprising most of the potential risk associated with the site. The maximum detected concentration of each constituent in each medium was compared to a screening value to select the COPCs for the medium. If the maximum concentration of a constituent exceeded the screening value, the constituent was selected as a COPC and retained for the risk evaluation.

- **Comparison with Health-based Criteria for Soil:** The maximum detected chemical concentrations in soil were compared with USEPA Region III residential soil RBCs for all scenarios (USEPA, October 2003). RBCs that are based on noncarcinogenic effects were divided by ten to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as present in the most current RBC Table (USEPA, October 2003). Constituents with maximum detected concentrations below the RBC were not retained as COPCs. Lead concentrations in soil were compared to the USEPA residential child soil screening value of 400 ppm as determined by the Integrated Exposure Uptake Biokinetic (IEUBK) Model. If the lead concentration exceeded the screening value, it was evaluated quantitatively for the site worker using the adult lead model and for the residents using IEUBK model.

- **Comparison with Health-based Criteria for Air:** The maximum detected air concentrations calculated based on fugitive and/or volatile emissions from soil and concrete were compared with the USEPA Region III ambient air RBCs (USEPA October 2003). RBCs that are based on noncarcinogenic effects were divided by ten to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as present in the most current RBC Table (USEPA, October 2003). Constituents with maximum detected concentrations below the RBC were not retained as COPCs.

- **Comparison with Health-based Criteria for Groundwater:** The maximum detected chemical concentrations in groundwater were compared with USEPA Region III tap water RBCs (USEPA, October 2003). RBCs that are based on noncarcinogenic effects were divided by ten to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as present in the most current RBC Table (USEPA, October 2003). Constituents with maximum detected concentrations below the RBC were not retained as COPCs. Lead concentrations in groundwater were compared to the action level of 15 ppb. If the lead concentration exceeded the screening value, it was discussed qualitatively in the toxicity assessment section.

- **Comparison with Health-based Criteria for Sediment:** The maximum detected chemical concentrations in sediment were compared with ten times the USEPA Region III industrial soil RBCs (USEPA, October 2003). RBCs that are based on noncarcinogenic effects were used as presented in the most current RBC table (USEPA, October 2003). RBCs based on carcinogenic effects were multiplied by ten. Constituents with maximum detected concentrations below the RBC were not retained as COPCs. Lead concentrations in sediment were compared to the USEPA residential child soil screening value of 400 ppm as determined by the IEUBK Model. If the lead concentration exceeded the screening value, it was discussed qualitatively in the toxicity assessment section.
- **Comparison with Health-based Criteria for Surface Water:** The maximum detected chemical concentrations in surface water were compared with ten times the USEPA Region III tap water RBCs (USEPA, October2003). RBCs that are based on noncarcinogenic effects were used as presented in the most current RBC table (USEPA, October 2003). RBCs based on carcinogenic effects were multiplied by ten. Constituents with maximum detected concentrations below the RBC were not retained as COPCs. Lead concentrations in surface water were compared to the action level of 15 ppb. If the lead concentration exceeded the screening value, it was discussed qualitatively in the toxicity assessment section.
- **Comparison with Health-based Criteria for Concrete:** The maximum detected chemical concentrations in concrete were conservatively compared with USEPA Region III industrial soil RBCs (USEPA, October 2003). RBCs that are based on noncarcinogenic effects were divided by ten to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as present in the most current RBC Table (USEPA, October 2003). Constituents with maximum detected concentrations below the RBC were not retained as COPCs. Lead concentrations in concrete were compared to the USEPA residential child soil screening value of 400 ppm as determined by the IEUBK Model. If the lead concentration exceeded the screening value, it was evaluated quantitatively for the site worker using the adult lead model.
- **Comparison with Recommended Dietary Allowances (RDAs):** Chemicals which are human nutrients, present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and toxic only at very high doses were eliminated from the quantitative risk analysis. These constituents are calcium, magnesium, potassium, and sodium.

Constituents were considered for inclusion in the risk assessment even if they have been eliminated through one of the methods above based on historical information, exceptional toxicity, mobility, persistence, or bioaccumulation, special treatability problems, or ARARs exceedance.

8.3.3 Chemicals of Potential Concern

Table 8-2 identifies the chemicals that were selected as COPCs based on the above screening methodology for soil, groundwater, sediment, surface water, and concrete. Details of the screening process are shown in the screening tables (Table 2.1 through 2.15) in Appendix H.

8.4 Exposure Assessment

Exposure refers to the potential contact of an individual with a chemical. The exposure assessment identifies pathways and routes by which an individual may be exposed to the COPCs and estimates the magnitude, frequency, and duration of potential exposure. The magnitude of exposure is determined by estimating the amount of a constituent available at the exchange boundaries (i.e., the lungs, gastrointestinal tract, and skin). Chemical intakes and associated health risks are only quantified for complete exposure pathways.

Contaminant fate and transport is evaluated in Section 7, which discusses the potential release mechanisms at the sites. A conceptual exposure model showing potential exposure scenarios identified under current and potential future conditions is presented in Figure 8-1. The following sections discuss the three components of exposure assessment:

- Characterization of exposure setting
- Identification of exposure pathways
- Quantification of exposure

8.4.1 Characterization of Exposure Setting

Characterizing an exposure setting consists of two parts: (1) presenting the physical characteristics of the site as they relate to exposure, and (2) characterizing human populations on or near the site.

8.4.1.1 Physical Characteristics

Basic site characteristics such as physical setting, climate, groundwater hydrology, and the presence and location of surface water were summarized in Sections 4 and 5.

8.4.1.2 Potentially Exposed Populations

Potentially exposed populations are identified based on their locations relative to the site, their activity patterns, and the presence of potential sensitive subpopulations. Past activities at and near Site 47 have resulted in detections of VOCs, SVOCs, cyanide, and metals in site media. Table 1, in Appendix H, summarizes the potentially exposed populations evaluated in this risk assessment.

Current Land Use. Site 47 is currently used as an industrial area. Site 47 is located in the central portion of the facility with no residential areas in the vicinity of the site. Vehicle access to the site is restricted. Though unlikely, adolescent trespassers could gain access to the site via Mattawoman Creek or the Potomac River, and therefore, could contact the surface soil in this area. These trespassers could also contact the surface water and the sediment in the drainage swales at the site. Additionally, other workers (i.e. maintenance workers) may come in contact with the surface water and sediment under current site conditions. They may be exposed to the surface water and sediment in the industrial wastewater discharge manhole, in addition to the surface water and sediment in the drainage swales. The industrial workers at the facility may contact the surface soil at the site. Groundwater from the surficial aquifer is not currently used as a potable water supply at the base.

Potential Future Uses. Site 47 is anticipated to remain an industrial area in the future. Therefore, the exposure under current site use would also be the exposure for future site use. However, the most conservative future use of the site is residential development. The potential future exposure scenario assumes that during construction and re-development activities the subsurface soil will be excavated and become surface soil. Therefore, the future residents may be exposed to the combined surface and subsurface soil. Additionally, future industrial workers and construction workers may be exposed to the combined surface and subsurface soil.

Groundwater from the surficial aquifer is not anticipated to be used as a potable water supply at the base. However, groundwater data from the site will be used as a conservative assessment of groundwater quality at the site for the future residential exposure scenario. The site groundwater data will be used to evaluate potential on-site and off-site potable use of the groundwater. The construction worker may also be exposed to the shallow groundwater during excavation or construction activities. The construction worker exposure to the groundwater is a conservative scenario because under normal excavation activities the water table would be drawn down to reduce the actual groundwater infiltration into the excavation, thus reducing the potential for contact with the groundwater. However, the potential exposure by the construction worker to groundwater was included to provide a conservative evaluation of site risks.

In the future, the concrete troughs may be excavated. The construction worker may be exposed to the concrete debris during excavation activities through dermal contact and inhalation of dusts.

It is not likely that future residents or site workers would be exposed to the surface water or sediment evaluated for the current other worker and trespasser/visitor scenario. If the site is re-developed, it is likely that the existing drainage ditches would be regraded, and additionally, the current contributors to the surface water and sediment in the drainage ditches would no longer be present at the site.

There are no plans for the site to be used for residential development in the future. Institutional controls will be implemented to prevent future use of the site without further site evaluation. However, soil and groundwater data from the site will be used as a conservative assessment for the future residential exposure scenario.

8.4.2 Identification of Exposure Pathways

An exposure pathway can be described as a mechanism that moves a COPC from its source to an exposed population or individual, referred to as a receptor. An exposure pathway must be complete or exposure cannot occur. A complete exposure pathway has five elements:

- A source (e.g., chemical residues in soil)
- A mechanism for release and migration of chemical (e.g., leaching)
- An environmental transport medium (e.g., groundwater)
- A point or site of potential human contact (exposure point, e.g., drinking water)
- A route of intake (e.g., ingestion of groundwater used as a drinking water source)

All five elements must be present for a pathway to be considered complete. If one or more elements are not present, then the pathway is incomplete and there is no possibility of exposure. The following subsections discuss the elements as they pertain to the site.

8.4.2.1 Contaminant Sources

Contaminant sources at Site 47 include past disposal of hazardous and liquid waste as described in Section 2.7.

8.4.2.2 Release and Transport Mechanisms

The fate and transport of chemicals in soil, groundwater, sediment, surface water, and concrete troughs are determined by physical characteristics of the site as well as by the chemical and physical properties of the constituents. A detailed analysis of the fate and transport of site contamination is included in Section 7.

The primary transport mechanism from sources at the Site 47 appears to be chemical leaching through soil to groundwater followed by downgradient transport in groundwater. COPCs in groundwater were evaluated directly from concentrations detected in monitoring wells at the site. A mathematical model was used to estimate concentrations of chemicals volatilizing from groundwater during showering as shown in Tables 7.9.RME Supplement and 8.8.RME Supplement and from the open excavation (hypothetical future land use) as shown in Tables 7.10.RME Supplement and 8.9.RME Supplement in Appendix H.

Fate and transport modeling was conducted to determine contaminant concentrations in fugitive dust and volatile emissions from soil. Table 2.2.A in Appendix H, shows the calculation of the volatilization factor used in the risk assessment.

Direct contact with COPCs in soil, concrete troughs and sediment (i.e. ingestion or dermal contact) does not require fate and transport modeling. In these pathways, the receptor is assumed to go to the location of the COPC.

8.4.2.3 Potential Exposure Points and Exposure Routes

Exposure points are locations where humans could come in contact with contamination. Onsite exposure points include surface soil; subsurface soil; concrete in concrete troughs; sediment and surface water in drainage swales, in the industrial wastewater discharge manhole, and at the discharge of the industrial wastewater discharge manhole; and groundwater beneath the site. Groundwater data from the site will be conservatively used to assess groundwater quality at the site for the future residential exposure scenario.

Potential exposure routes are evaluated for current site use and potential future site use. Existing and potential exposure pathways are illustrated in the conceptual exposure model (Figure 8-1). Exposure scenarios and potentially complete exposure pathways evaluated in this risk assessment are presented in Table 8-3.

Current Exposure Routes. The only contaminated media currently accessible at the site are surface soil, sediment, and surface water. Based on current site use, potential receptors include industrial and other (e.g. maintenance) workers, and adolescent trespassers. The groundwater at the facility is not used as a potable supply, and therefore, there is no current exposure to groundwater.

In summary, the current land use exposure routes include:

- Industrial Worker: incidental ingestion of, and dermal contact with, surface soil, and inhalation of fugitive dust and volatile emissions from surface soil.
- Other Worker: incidental ingestion of, and dermal contact with, sediment, and incidental ingestion of, and dermal contact with, surface water.
- Adolescent Trespasser: incidental ingestion of, and dermal contact with, surface soil, and inhalation of fugitive dust and volatile emissions from surface soil; incidental ingestion of, and dermal contact with sediment in the drainage swales, and incidental ingestion of, and dermal contact with, surface water in the drainage swales.

Future Exposure Routes. Based on the proposed future use of the site, the future receptors would be industrial workers and construction workers. The potential future exposure scenario assumes that the subsurface soil will be excavated and become surface soil. Additionally, the construction worker may be exposed to the shallow groundwater during the excavation activities. It was conservatively assumed that groundwater at the site may be used as a potable residential water supply in the future. Potential development of the site for residential use, and residential exposure to soil were also evaluated in the risk assessment.

In summary, the future land use exposure routes include the current exposure routes and the following:

- Industrial Worker: incidental ingestion of, and dermal contact with, soil; inhalation of fugitive dust and volatile emissions from soil.
- Construction Worker: incidental ingestion of, and dermal contact with, soil; inhalation of fugitive dust and volatile emissions from soil; incidental ingestion of, and dermal contact with, concrete, inhalation of fugitive dust from concrete; and dermal contact with, and inhalation of volatiles from, groundwater.
- Resident (adult and child): ingestion of, and dermal contact with, groundwater, and inhalation (adults only) of volatiles from groundwater; incidental ingestion of, dermal contact with, and inhalation of fugitive dusts and volatile emissions from soil.

The exposure pathways listed above were selected in consultation with USEPA Region III, MDE, and the Navy (November 1999). All of these pathways were quantified for potential exposure. The exposure point concentrations used to calculate potential risks to each of the receptors are presented in Appendix H, Tables 3.1 through 3.14. The exposure parameters and equations used to calculate the risks are presented in Appendix H, Tables 4.1 through 4.26.

8.4.3 Quantification of Exposure

Exposure is quantified by estimating the exposure point concentrations and the chemical intake by the receptor.

8.4.3.1 Exposure Point Concentrations

Exposure point concentrations are estimated chemical concentrations that a receptor may contact and are specific to each exposure medium. Exposure point concentrations may be directly monitored or estimated using environmental fate and transport models. For this assessment, fate and transport modeling was used to estimate constituent concentrations in fugitive dust and volatile emissions from soils, in vapors from groundwater while showering, and in vapors volatilized from groundwater from an open excavation. The fugitive dust and volatile emissions were estimated following USEPA's Soil Screening Guidance Document (USEPA, 1996), and the volatile emissions calculations are shown in Table 2.2A in Appendix H. Volatilization while showering was estimated using the Foster and Chrostowski shower model (Foster and Chrostowski, 1987). Volatilization from groundwater in an open excavation was calculated using a Two-Film Volatilization Model and USEPA's Screen 3 model. The groundwater model calculations are shown in Table 7.12.RME Supplement and 7.13.RME Supplement in Appendix H .

The exposure point concentration for the reasonable maximum exposure scenario is based on the 95 percent UCL for a media in which five or more samples were collected. The maximum detected concentration was used in place of the 95 percent UCL when the calculated 95 percent UCL was greater than the maximum detected value, or less than five samples were available. The Shapiro-Wilks W test using an alpha value of one percent was used to determine if the data fit a lognormal or normal distribution. If the W-test was inconclusive, the 95 percent UCL that best fits the data, as indicated by the higher W-test value, was used. For the exposure point concentration for the central tendency evaluation, the arithmetic mean value was used.

The 95 percent UCL for a lognormal distribution was calculated as follows:

$$95\%\ UCL = \exp(TM + 0.5 \times s^2 + (s \times H/(n-1)^{0.5}))$$

Where:

Exp = natural log
TM = transformed mean
s = standard deviation of the transformed data
H = H-statistic
n = sample size

The 95 percent UCL for a normal distribution was calculated as follows:

$$95\%\ UCL = NM+(t \times s/(n)^{0.5})$$

Where:

NM = normal arithmetic mean
t = t-statistic
s = standard deviation
n = sample size

In estimating the 95 percent UCL, data were evaluated for usability based on the factors identified by USEPA (Section 8.2.1). The 95 percent UCL concentrations are included in Table 3.1 through 3.14, in Appendix H.

Data from all of the monitoring wells were used to calculate the groundwater exposure point concentration. Both total and dissolved metals groundwater samples were collected. The dissolved metals groundwater data were used to evaluate the residential scenario because the groundwater is assumed to be filtered prior to use as a potable supply. However, the total groundwater data were used to evaluate potential exposures to the construction worker. The cyanide analyses results from the total metals data were used to evaluate both the residential and construction worker exposure to groundwater scenarios.

8.4.3.2 Estimation of Chemical Intakes for Individual Pathways

Chemical intake is the amount of the chemical contaminant entering the receptor's body. Chemical intakes are generally expressed as follows:

$$I = \frac{C \; x \; CR \; x \; EF \; x \; ED}{BW \; x \; AT} = (mg/kg/day)$$

Where:

I = intake (mg/kg-day)

C = chemical concentration at exposure point (mg/L, mg/kg, mg/m^3)

CR = contact rate, or amount of contaminated medium contacted per unit time or event (L/day, mg/event, m^3/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight of exposed individual (kg)

AT = averaging time, or period over which exposure is averaged (days)

For dermal exposure to groundwater during construction and bathing and dermal exposure to surface water, the non-steady state model or pseudo steady-state model was used to estimate the absorbed dose for organic constituents (USEPA, January 1992). If the exposure time was shorter than the lag time (time to reach pseudo steady state), the non-steady state model was used. If the exposure time was greater than the lag time, the pseudo-steady state model was used. These models are shown for the groundwater and surface water exposure pathways in the Table 4s in Appendix H.

A dermal absorption factor is required for the dermal exposure to soil pathway. Dermal absorption factors were obtained from USEPA's RAGS, Part E (USEPA, September 2001), Exhibit 3-4. For the inorganic constituents not included in this reference, 1 percent was used as the default value (USEPA, December 1995). Three percent was used as the default value (USEPA, December 1995) for the VOC detected in soil, but not included in RAGS Part E.

The intake equation requires specific exposure parameters for each exposure pathway. Exposure parameters are often assumed values, and their magnitude influences the estimates of potential exposure (and risk). The reliability of the values chosen can also contribute substantially to the uncertainty of the resulting risk estimates. Many of the exposure parameters have default values, which were used for this assessment. These assumptions, based on estimates of body weights, media intake levels, and exposure frequencies and duration are provided by USEPA guidance. Other assumptions (e.g.,

exposure duration for the construction worker soil exposure scenario) required consideration of location-specific information and were determined using professional judgment. Tables 4.1 through 4.26 in Appendix H presents the exposure factors used for different scenarios at the site. Both RME and central tendency (CT) intakes were included in this evaluation. CT intakes were calculated for exposure scenarios with RME cancer risks greater than $1x10^{-4}$ or noncancer hazards greater than 1.

For residential exposure to groundwater and soil, lifetime age-adjusted intakes were calculated for carcinogenic constituents. This involved determining age-adjusted factors for ingestion and dermal contact. These factors were calculated using the equations presented in USEPA Region III RBC table (USEPA, October 2003) for calculating age-adjusted factors.

8.5 Toxicity Assessment

Toxicity assessment defines the relationship between the magnitude of exposure and possible severity of adverse effects, and weighs the quality of available toxicological evidence. Toxicity assessment generally consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the chemical along with the type of health effect involved. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population. Toxicity criteria (e.g., reference doses and slope factors) are derived from the dose-response relationship. USEPA has performed the toxicity assessment step for many chemicals and has published the results in the Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEAST) databases.

Health effects are divided into two broad groups: noncarcinogenic and carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. Chemicals causing noncarcinogenic health effects are evaluated independently from those having carcinogenic effects. Some chemicals may produce both noncarcinogenic and carcinogenic effects, and are therefore evaluated in both groups. This section discusses noncarcinogenic and carcinogenic effects separately, and concludes with a brief discussion of the toxicological properties of selected COPC.

The primary source of toxicity values is the USEPA's IRIS database, which contains up-to-date health risk and USEPA regulatory information. IRIS includes only reference doses (RfDs) and slope factors (SFs) that have been verified by USEPA work-groups. The IRIS database is the USEPA's preferred source of toxicity information. The HEAST, which are issued by USEPA's Office of Research and Development, were consulted when data was not available in IRIS. If data were not available from either of these sources, National Center for Environmental Assessment (NCEA) data were used. If no toxicity values were available, the chemical was evaluated qualitatively.

8.5.1 Toxicity Information for Noncarcinogenic Effects

Noncarcinogenic health effects include a variety of toxic effects on body systems, ranging from renal toxicity (toxicity to the kidneys) to central nervous system disorders.

Noncarcinogenic health effects are grouped into two basic categories: acute toxicity and chronic toxicity. Acute toxicity can occur after a single exposure (usually at high doses), and the effect is most often seen immediately. Chronic toxicity generally occurs after repeated exposure (usually at low doses) and is seen weeks, months, or years after the initial exposure. The toxicity of a chemical is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (USEPA, December 1989) defines the chronic RfD as a dose which is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (for example, 7 years to a lifetime), and consider uncertainty in the toxicological data base and sensitive receptors. Chronic RfDs may be overly protective if used to evaluate the potential for adverse health effects resulting from short-term exposure. USEPA's NCEA develops subchronic RfDs for short-term exposure (2 weeks to 7 years). Subchronic RfDs have been peer-reviewed by Agency and outside reviewers, but they have not undergone verification by an intra-Agency workgroup, and as a result are considered interim rather than verified toxicity values. Chronic and subchronic RfDs are developed for both the inhalation and oral exposures. Subchronic RfDs were used for the construction worker scenario because the exposure duration is 1 year.

In the development of RfDs, all available studies examining the toxicity of a chemical following exposure are considered based on their scientific merit. The lowest dose level at which an observed toxic effect is occurring is identified as the "lowest-observed-adverse-effect-level" (LOAEL) and the dose at which no effect is observed is identified as the "no-observed-adverse-effect-level" (NOAEL). Several uncertainty factors (UFs) may be applied to account for uncertainty. UFs account for uncertainties such as poor data quality, extrapolation of data from animal studies to human exposures, or the use of subchronic studies to develop chronic criteria. These UFs range between 10 to 10,000, and are based on professional judgment. Therefore, there are varying degrees of uncertainty in the toxicity criteria.

USEPA-derived oral and inhalation chronic RfDs, and associated UF and modifying factors (MF) values, available for the COPCs at the Site 47 are listed in Tables 5.1 and 5.2 in Appendix H.

Per USEPA guidance, oral RfDs were adjusted from administered dose to absorbed dose for evaluating dermal toxicity. The RfDs were adjusted using oral absorption factors from USEPA's RAGS, Part E (USEPA, September 2001). The adjusted dermal RfDs are summarized in Table 5.1 in Appendix H.

8.5.2 Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects quantified as oral cancer slope factors, inhalation slope factors, or unit risk factors that convert estimated exposures directly to incremental lifetime cancer risks. Slope factors are expressed in units of per milligram per kilogram of body weight per day $(mg/kg\text{-}day)^{-1}$, and unit risk factors are expressed in units of per micrograms per cubic meter $(\mu g/m^3)^{-1}$.

Cancer slope factors (CSFs) may be derived from the results of chronic animal bioassays, human epidemiological studies, or both. Animal bioassays are usually conducted at dose levels that are much higher than are likely to be encountered in the environment. This design detects possible adverse effects in the relatively small test populations used in the studies. A number of mathematical models and procedures have been developed to extrapolate from the high doses used in the studies to the low doses typically associated with environmental exposures.

The USEPA-preferred linearized multistage (LMS) model is usually used to estimate the largest linear slope (within the upper 95 percent UCL) at low extrapolated doses that is consistent with the data. The 95 percent UCL slope of the dose-response curve is subjected to various adjustments, and an inter-species scaling factor is usually applied to derive a cancer slope factor or inhalation unit risk factor for humans. It is assumed that if a cancer response occurs at the dose level in the study, there is some probability that a response will occur at all lower exposure levels (i.e., a dose-response relationship with no threshold is assumed). Dose-response data derived from human epidemiological studies are fitted to dose-time-response curves on an ad hoc basis. In both types of analyses, conservative (e.g., health protective) assumptions are applied and the models are believed to provide rough estimates of the upper limits on potential lifetime risk.

USEPA-derived oral and inhalation cancer slope factors are listed in Tables 6.1 and 6.2 in Appendix H, respectively. Per USEPA guidance, oral SFs were adjusted from administered dose to absorbed dose for evaluating dermal toxicity. The SFs were adjusted using oral absorption factors from USEPA (USEPA, September 2001). The adjusted dermal SFs are summarized in Table 6.1 in Appendix H.

In addition to deriving a quantitative estimate of cancer potency, USEPA also assigns weight-of-evidence classifications to potential carcinogens. Chemicals are classified as Group A, Group B1, Group B2, Group C, Group D, or Group E carcinogens.

- Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.
- Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans with sufficient evidence of carcinogenicity in laboratory animals.
- Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate evidence in humans.
- Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.
- Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.
- Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

8.5.3 Chemicals for Which no USEPA Toxicity Values Are Available

Most of the chemicals detected at the site have toxicity factors, or appropriate surrogate toxicity factors. In this assessment, nitrocellulose in soil, bromochloromethane, cyclohexane, ethane, ethene, and methane in groundwater, and lead in all media, did not have available published toxicity factors. The primary human health concern associated with nitrocellulose is physical harm from fire or explosion. If either chloromethane or bromomethane are used as surrogates for bromochloromethane, the maximum detected concentration is below the RBC. For cyclohexane, the maximum detected concentration is below the hexane RBC. Ethane, ethene, and methane are less toxic than constituents that they may be incorporated in, and therefore, by screening the additional constituents, these three constituents are accounted for in the risk assessment.

There are no oral toxicity factors for mercury. Mercury was screened against the mercuric chloride RBCs and was retained as a COPC for surface soil and combined surface and subsurface soil. Thetoxicity values for mercuric chloride were used to evaluated the risks associated with exposure to mercury in the risk assessment.

Lead is regulated by USEPA based on blood-lead uptake using a physiologically-based pharmakokinetic model referred to as the IEUBK model, in the event of excess lead presence at the site. As a screening tool, lead is screened at 400 mg/kg in soil, concrete, and sediment, and 15 µg/L in groundwater. Lead was detected in the soil at a maximum concentration of 1,310 mg/kg, in the filtered groundwater at a maximum concentration of 34.9 µg/L , in the total groundwater at a maximum concentration 35 µg/L, in the concrete at a maximum concentration 2,110 mg/kg, and in the sediment at a maximum concentration of 5,760 mg/kg, all of which exceeded the screening values.

Risk associated with non-residential adult exposure to lead was evaluated based on *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil, USEPA, December 1996.* This approach utilizes a methodology to relate soil lead intake to blood lead concentrations in women of child-bearing age. The methodology focuses on estimating fetal blood lead concentration in women exposed to lead contaminated soils. This guidance provides a set of default parameter values that can be used in cases where high quality data are not available to support site-specific estimates. The adult lead model is included in Appendix H, and calculates a preliminary remediation goal for lead from 710 mg/kg to 1,712 mg/kg.

Risk associated with residential exposure to lead was evaluated based on the USEPA's IEUBK model. As a screening tool, lead is screened at the residential lead soil screening level of 400 mg/kg. The maximum detected concentration of lead (1310 mg/kg) in the soil exceeds the soil screening level of 400 mg/kg, and lead was retained as a COPC for soil. The mean lead soil concentration (84 mg/kg) is below the residential lead soil screening level. However, because of the exceedance of the maximum detected concentration, risks associated with lead in soil were evaluated using the IEUBK Model.

The principal assumption associated with the use of the IEUBK model is that a child from age 0 to 7 is the receptor for potential exposure to lead in soil. The results of the IEUBK are presented in Appendix H. The IEUBK evaluation resulted in a geometric mean blood concentration of 2.4 micrograms per deciliter of blood (µg/dl) for children 0 to 84 months

old, which is below USEPA's recommended level of 10 µg/dl. Approximately 99 percent of this population had a blood lead level below USEPA's recommended level of 10 µg/dl. With the exception of the lead soil concentration (which was set equal to the average site lead concentration), the default parameters associated with the IEUBK model were used in this evaluation (as shown in Attachment C). The site-specific lead soil concentration is below the default lead concentration normally used in the model. Potential exposure to children by lead in the soil is not expected to result in blood-lead concentrations above USEPA's recommended levels.

8.6 Risk Characterization

Risk characterization is the process of integrating the previous elements of the risk assessment into quantitative and semi-quantitative expressions of risk. The quantification of risk is then used as an integral component in remedial decision-making and selection of potential remedies or actions.

8.6.1 Noncarcinogenic and Carcinogenic Risk Estimation Methods

Potential human health risks are discussed independently for carcinogenic and noncarcinogenic contaminants because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. The noncarcinogenic health impacts from carcinogens are also assessed.

8.6.1.1 Noncarcinogenic Risk Estimation

Noncarcinogenic health risks are estimated by comparing actual or expected exposure levels to threshold concentrations (or RfDs). The expected intake divided by the RfD is equal to the hazard quotient (HQ):

$$\text{Hazard Quotient (HQ)} = \text{Intake} / \text{RfD}$$

The intake and RfD are expressed in the same units and represent the same exposure period (i.e., chronic or subchronic). The intake and RfD also represent the same exposure route, (i.e., inhalation intakes are divided by the inhalation RfD, oral intakes are divided by the oral RfD, and dermal in takes are divided by an adjusted oral RfD). When HQ exceeds unity (i.e., exposure exceeds the RfD), a certain degree of health risk is indicated. To assess the potential for noncarcinogenic health effects posed by exposure to multiple chemicals a "hazard index" approach is used (USEPA, December 1989). This approach assumes that noncarcinogenic hazards associated with exposure to more than one chemical are additive. Synergistic or antagonistic interactions between chemicals are not accounted for. The hazard index (HI) may exceed unity even if all of the individual HQs are less than one. The chemicals may then be segregated by similar mechanisms of toxicity and toxicological effects, and separate HIs derived based on mechanism and target organs affected.

8.6.1.2 Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related contamination is evaluated by estimating excess lifetime cancer risk. Excess lifetime carcinogenic risk is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer. For example, the background

incidence of cancer in the U.S. population is approximately 30 percent (including both lethal and non-lethal forms). Therefore, a $2x10^{-6}$ excess lifetime carcinogenic risk means that an individual's probability of developing cancer in his or her lifetime changes from approximately 0.300000 to 0.300002. Or, expressed another way, for every 1 million people exposed to the carcinogen throughout their lifetime, the incidence of cancer *may* increase by two cases.

Potential carcinogenic risks associated with exposure to individual carcinogens were calculated using the CSFs from IRIS and HEAST presented in the Toxicity Assessment section and the intakes calculated in the Exposure Assessment section. Risk is calculated by multiplying the intake by the CSF.

$$\text{Risk} = \text{Intake} \times \text{CSF}$$

However, the linear equation for calculating risks is only valid at low risk levels. For risks at high levels (above 0.01), for example for carbon tetrachloride and chloromethane in groundwater, the one-hit equation is used. The one-hit equation is calculated as follows:

$$\text{Risk} = 1 - \exp(-\text{Intake} \times \text{CSF})$$

The combined risk from exposure to multiple chemicals at a site was evaluated by adding the risks from individual chemicals. Risks were also added across the pathways, if an individual would be exposed through multiple pathways. For example, a person contacting the soil on-site could be exposed by both the oral and dermal pathways.

When a cumulative carcinogenic risk to an individual receptor under the assumed RME exposure conditions at the site exceeds 100 in a million (10^{-4} excess cancer risk), CERCLA generally requires remedial action to reduce risks at the site (USEPA, March 1991). If the cumulative risk is less than 10^{-4}, action generally is not required, but may be warranted if a risk-based chemical-specific standard for example, maximum contaminant level (MCL) is exceeded. A risk-based remedial decision could be superseded by the presence of noncarcinogenic impact or environmental impact requiring action at the site.

8.6.2 Risk Assessment Results

The results of the risk characterization are presented below. Total risks are summarized by receptor following the media specific discussions. A summary of the results by media is shown in Table 8-4 for the RMEs and Table 8-5 for the CTs. The CT values were calculated only when the RME hazards exceeded 1 or the cancer risks exceeded 10^{-4}.

8.6.2.1 Soil Exposure

Risks were calculated for exposure to surface soil and combined surface and subsurface soil.

Surface Soil Exposure. RME risks estimates for exposure to surface soil were calculated for an adult industrial worker under current site use and an adolescent trespasser/visitor under current/future site use (Appendix H, Tables 7.1.RME, 7.2.RME, 7.7.RME, and 7.8.RME and Tables 8.1.RME, 8.2.RME, 8.7.RME and 8.8.RME). The risks are summarized in Table 8-4. Exposures to surface soil via incidental ingestion, dermal contact, and inhalation of fugitive dust and volatile emissions were evaluated.

The noncarcinogenic hazard associated with exposure to surface soil by industrial workers (0.4) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to surface soil by an industrial worker ($1.8x10^{-5}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface soil by an adolescent trespasser/visitor (1.2) is above USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to surface soil by adolescent trespassers/visitors ($7.6x10^{-6}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Lead was selected as a COPC for the surface soil because the maximum detected concentration exceeded the soil screening level of 400 mg/kg. Therefore, the adult lead model was to be used to evaluate the potential impacts on the industrial receptors. The adult lead model uses the arithmetic mean concentration for comparison purposes. The arithmetic mean concentration (111 mg/kg) in the soil does not exceed the soil screening level, or the preliminary remedial goal calculated by the adult lead model (Appendix H), therefore, the lead in the soil is not expected to impact human health.

Because the RME noncarcinogenic hazards for the adolescent trespasser/visitor exceed the target level, CT exposure risks were calculated. The CT hazards are below USEPA's recommended level for the adolescent trespasser/visitor.

Soil Exposure. RME risk estimates for exposure to soil (combined surface and subsurface soil) were calculated for a future construction worker, industrial worker, and adult, child, and lifetime resident under potential future site use (Appendix H, Tables 7.14.RME through 7.21.RME, and Tables 8.13.RME through 8.18.RME). The calculated soil RME risks are summarized in Table 8-4. It was assumed these receptors would be exposed to soil through incidental ingestion, dermal contact, and inhalation of fugitive and volatile emissions from soil.

The noncarcinogenic hazard associated with exposure to soil for a construction worker (0.9) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to the soil by a construction worker ($8.2x10^{-7}$) is below the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to soil for the industrial worker (1.4) exceeds USEPA's target hazard index of 1.0. None of the constituents contribute individual HQs above the target hazard index and there are no target organs/effects with HIs above 1. The carcinogenic risk associated with exposure to the soil by the industrial worker ($2.4x10^{-5}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to soil for the adult resident (.7) is below USEPA's target hazard index of 1.0. The noncarcinogenic hazard associated with the exposure to soil for the child resident (2.5) is above USEPA's target hazard index of 1.0. The main contributors to the noncancer hazard are ingestion of inorganics, although none of the individual constituents have a hazard quotient greater than 1.0. The carcinogenic risks associated with exposure to the soil by the age-adjusted lifetime resident ($2.9x10^{-5}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Because the RME noncarcinogenic hazards for the industrial worker and child resident exceed the target level, CT exposure risks were calculated. The CT hazards are below USEPA's recommended level for the industrial worker and child resident.

Lead was also selected as a COPC because the maximum detected concentration exceeded the soil screening level of 400 mg/kg. Therefore, the adult lead model was used to evaluate the potential impacts on the non-residential receptors. The adult lead model uses the arithmetic mean concentration for comparison purposes. The arithmetic mean concentration (84 mg/kg) in the soil does not exceed the soil screening level, or the preliminary remediation goal calculated using the adult lead model (Appendix H), therefore, the lead in the soil is not expected to impact human health. The IEUBK model was used to evaluate the potential impact of lead on the residential receptors. Potential exposure to children by lead in the soil is not expected to result in blood-lead concentrations above USEPA's recommended levels (see Section 8.4.3).

8.6.2.2 Groundwater Exposure

Upper aquifer groundwater beneath the site is not currently used as a potable water supply and is not anticipated to be used as a potable water supply in the future. However, groundwater data from the site was evaluated as a worst-case risk estimate for potable groundwater use at the site under a future residential exposure scenario. Risks were also calculated for a construction worker who may be exposed to the groundwater in an open excavation during construction activities. Risk estimates for exposure to groundwater were calculated for the potential future child and adult residents and construction worker (Appendix H, Tables 7.9.RME through 7.13.RME, and Table 8.9.RME through 8.12.RME). The risks are summarized in Table 8-4. It was assumed that a residential user would ingest the water, have dermal contact while bathing, and inhale volatiles while showering (adult only). A construction worker would dermally contact the groundwater, and inhale the volatiles from groundwater in an open excavation.

The RME noncarcinogenic risks associated with use of the groundwater as a potable residential water supply were above USEPA's benchmark noncarcinogenic hazard index of 1.0 for both the future child (33,000) and adult (38,000) resident. For the child, both the ingestion and dermal contact routes had hazards above 1. The main contributors to the noncancer hazard indices for the child are bromomethane, carbon tetrachloride, chloroform, tetrachloroethane, trichloroethane, arsenic, cyanide, iron, and vanadium all contributing individual HQs over 10.

For the adult resident, the ingestion, inhalation, and dermal routes pose hazards greater than 1. The main hazard contributors are bromomethane, carbon tetrachloride, chloroform, chloromethane, 1,2-dichloroethane, trichloroethene, and cyanide, all contributing individual HQs over 10. The HI associated with the inhalation route alone has a HQ of almost 24,000, and is mainly associated with carbon tetrachloride, chloroform, and chloromethane.

The carcinogenic risk for groundwater for the resident is presented as a lifetime or age-adjusted risk. The RME carcinogenic risk associated with use of the groundwater as a potable residential water supply exceeds USEPA's benchmark of $1x10^{-4}$. The residential lifetime carcinogenic risk is $>1x10^{-2}$. All of the exposure pathways contribute to this risk and are all above $1x10^{-4}$. In general, the main risk drivers are VOCs and arsenic.

The RME noncarcinogenic hazard to a construction worker exposed to groundwater (4,900) exceeds USEPA's benchmark of 1.0. Only the dermal contact route poses a hazard greater than 1. The greatest contributor to the hazard is carbon tetrachloride. Additionally, chloroform and trichloroethene contribute individual HQs above 1. The RME carcinogenic risk for a construction worker exposed to groundwater is 6.4×10^{-3}, which also exceeds the USEPA's target range. Dermal contact with carbon tetrachloride is the main contributor to the risk.

Because the RME noncarcinogenic and carcinogenic risks for the resident and construction worker exceed the target levels, CT exposure risks were calculated. The CT hazards and carcinogenic risks also exceeded USEPA's recommended levels for the resident, although they are not nearly as high as the RME risks. The CT hazard and risk for the construction worker are within EPA's target levels.

8.6.2.3 Sediment Exposure

RME risks estimates for exposure to sediment were calculated for an adult other worker and an adolescent trespasser/visitor under current/future site use (Appendix H, Tables 7.3.RME and 7.4.RME and Tables 8.3.RME and 8.4.RME). The sediment risks are summarized in Table 8-4. Exposure to sediment via incidental ingestion and dermal contact were evaluated.

The noncarcinogenic hazard associated with exposure to sediment by other workers (0.5) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to sediment by an other worker (1.5×10^{-5}) is within the USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

The noncarcinogenic hazard associated with exposure to sediment by adolescent trespassers/visitors (0.6) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to sediment by an other worker (2.9×10^{-6}) is within the USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

Lead was also selected as a COPC because the maximum detected concentration exceeded the soil screening level of 400 mg/kg. Therefore, the adult lead model was used to evaluate the potential impacts on the receptors. The adult lead model uses the arithmetic mean concentration for comparison purposes. The arithmetic mean concentration (1,946 mg/kg) in the sediment exceeds the soil screening level, and slightly exceeds the maximum preliminary remediation goal calculated by the adult lead model (Appendix H). However, exposure to the sediment is expected to occur much less frequently than exposure to soil, which is what the model and screening level are based on. Therefore, it is expected that exposure to lead is sediment would not result in an unacceptable risk to industrial receptors.

None of the RME hazards or risks for the sediment are above the USEPA target risk levels.

8.6.2.4 Surface Water Exposure

RME risks estimates for exposure to surface water were calculated for an adult other worker and adolescent trespasser/visitor under current/future site use (Appendix H, Tables 7.5.RME, 7.6.RME, 8.5.RME, and 8.6.RME). The surface water risks are summarized in Table 8-4. Exposure to surface water via incidental ingestion and dermal contact were evaluated.

The only constituent selected as a COPC for the surface water exposure scenario is arsenic. The noncarcinogenic hazard associated with exposure to surface water by other workers (0.003) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to surface water by an other worker ($4.1x10^{-7}$) is below the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface water by adolescent trespassers/visitors (0.007) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to surface water by the adolescent trespassers/visitors ($4.3x10^{-7}$) is below the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

None of the RME hazards or risks for the surface water are above the USEPA target risk levels.

8.6.2.5 Concrete Trough Exposure

The constituents selected as COPCs for the concrete exposure scenario are lead and arsenic. RME risks estimates for exposure to concrete were calculated for construction worker under future site use (Appendix H, Tables 7.22.RME and 8.19.RME). The risks are summarized in Table 8-4. Exposure to concrete via incidental ingestion and dermal contact were evaluated.

The noncarcinogenic hazard associated with exposure to concrete by construction workers (0.005) is below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to concrete by a construction worker ($3.4x10^{-8}$) is below the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Per discussions with USEPA, the exposure to lead in the sewer system was not quantitatively evaluated in this assessment because the exposure scenario is not a likely scenario with a long duration period.

8.6.2.6 Summary of Total Risks Across Pathways and Media

Appendix H, Tables 9.1.RME through 9.8.RME summarize the RME total potential risks to each receptor. Appendix H, Tables 9.9.CT through 9.14.CT summarize the CT total potential risks to each receptor that had risks that exceeded an HI of 1.0 or a carcinogenic risk of $1x10^{4}$ Total potential risks were summarized for a current industrial worker, a current/future adolescent trespasser/visitor, a current/future other worker, a future adult, child, and lifetime resident, a future construction worker, and a future industrial worker. Appendix H, Tables 10.1.RME through 10.6.RME and 10.7.CT through 10.9.CT show only the chemicals that contributed a hazard greater than 0.1 or a carcinogenic risk greater than 10^{-6} for pathways with a hazard greater than 1 and a carcinogenic risk greater than 10^{-4}.

Current Industrial Worker. The risk assessment assumed that a current industrial worker could be exposed to site surface soil. The total current RME noncarcinogenic hazard to an adult industrial worker exposed to surface soil is below USEPA's target noncarcinogenic hazard level (Appendix H, Table 9.1 RME). The carcinogenic risk to an adult industrial worker exposed to surface soil is within the USEPA's target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$.

Current/Future Other Worker. The risk assessment assumed that a current or potential future other worker may be exposed to sediment and surface water in the industrial wastewater

discharge manhole and drainage swales at Site 47. The total RME noncarcinogenic hazard and carcinogenic risk for an adult other worker exposed to sediment and surface water are below USEPA's target levels (Appendix H, Table 9.2.RME).

Current/Future Adolescent Trespasser/Visitor. The risk assessment assumed that a trespasser/visitor may be exposed to surface soil at Site 47 and the surface water and sediment in the drainage swales at the site. The total current RME noncarcinogenic hazard to adolescent trespassers/visitors exposed to surface soil, surface water, and sediment slightly exceeds USEPA's target noncarcinogenic hazard level (Appendix H, Table 9.3.RME). Surface soil is the only media that contributes a hazard above the target level, primarily associated with dermal contact with the soil. The total current RME carcinogenic risk to adolescent trespassers exposed to the surface soil, surface water, and sediment is within USEPA's target risk range.

Future Resident. It was assumed that a potential future child and adult resident living on-site may be exposed to the site groundwater and soil.

Exposure to groundwater would result in a hazard greater than USEPA's target level for a child and adult resident (Appendix H, Tables 9.4.RME and 9.5.RME). All three exposure pathways (ingestion, dermal, and inhalation) contribute to the unacceptable hazard for an adult. The hazard to the resident is mainly associated with VOCs in the groundwater.

Exposure to groundwater through potable use by a lifetime resident would result in a carcinogenic risk greater than USEPA's target risk range, based on RME exposure assumptions (Appendix H, Table 9.6.RME). The risk drivers for the groundwater are VOCs and arsenic.

A CT hazard analysis was conducted for exposure to groundwater for an adult and child resident (Appendix H, Tables 9.10.CT through 9.12.CT). The resulting CT hazard for both a residential child and adult exposed to groundwater is also greater than 1.0. A CT risk evaluation was conducted for groundwater for a lifetime resident. The CT carcinogenic risk for groundwater is also above $1x10^{-4}$.

The RME noncarcinogenic hazard to child residents exposed to soil exceeds USEPA's target noncarcinogenic hazard level (Appendix H, Table 9.4.RME). This hazard is primarily associated with the ingestion of inorganics from the soil, although none of the individual constituents have a hazard quotient above 1.0. The RME noncarcinogenic hazard to adult residents exposed to soil is below USEPA's target hazard level (Appendix H, Table 9.5.RME).

The RME carcinogenic risk for exposure to soil by a resident over his or her lifetime is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$ .. The CT noncarcinogenic hazard was calculated for the child resident. (Tables 9.11.CT in Appendix H). The CT noncarcinogenic hazard for the child resident is belowUSEPA's acceptable levels.

Future Construction Worker. Exposure to soil through incidental ingestion, dermal contact, and inhalation of fugitive dust, and to groundwater through dermal contact and inhalation

of volatiles was evaluated for a future construction worker. The total potential future RME noncarcinogenic hazard exceeds USEPA's target hazard level (Appendix H, Table 9.7.RME). The noncarcinogenic hazard is associated with exposure to groundwater. Dermal contact with the VOCs, and primarily carbon tetrachloride and chloroform, are the main contributor to the risk. The RME carcinogenic risk for a construction worker exposed to groundwater exceeds the USEPA's target range. Dermal contact with carbon tetrachloride is the main contributor to the risk.

A CT risk calculation was performed for noncarcinogenic and carcinogenic risks for groundwater (Appendix H, Table 9.13.CT). The CT risks for exposure to groundwater are below USEPA's target risk levels.

Future Industrial Worker. The risk assessment assumed that a future industrial worker may be exposed to soil. The total future RME noncarcinogenic hazard for an adult industrial worker exposed to soil slightly exceeds USEPA's target noncarcinogenic hazard level (Appendix H, Table 9.8.RME). None of the COPCs contribute individual hazards above 1.0. Additionally, there are no target organs/effects with hazards above 1.0. The RME carcinogenic risks to the industrial worker exposed to the soil are within USEPA's target risk range. CT noncarcinogenic hazards were calculated for the industrial worker exposure to soil (Table 9.14.CT, Appendix H). The CT noncarcinogenic hazard is below USEPA's target hazard level.

8.7 Uncertainty Associated with Human Health Assessment

The risk measures used in site risk assessments are not fully probabilistic estimates of risk but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus it is important to specify fully the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective.

8.7.1.1 General Uncertainty in COPC Selection

The uncertainty in sampling and possibility of missing a contaminated location is expected to be minimal at this site because of the amount of sampling data available for the site. The quantitative uncertainty associated with the other factors is also minimal as the data have been fully validated prior to use in the risk assessment. The general assumptions used in the COPCs selection are conservative to ensure the estimation of highest possible risk.

8.7.1.2 Uncertainty Associated with Exposure Assessment

Most of the exposure pathways analyzed are assumed, and exposure factors used for quantitation of exposure are conservative and reflect worst-case or upper-bound assumptions on the exposure. Exposure to the soil, concrete, groundwater and sediment is assumed to occur at the areas with the highest detected concentrations. However, the area with high contamination is much smaller than a receptor's area of operations during work hours or activity duration.

The maximum detected concentration was used as the exposure point concentration for the VOCs detected in groundwater. The maximum detected concentration (typically in MW03

and MW04) were much higher than the concentrations detected in the other well. This may result in over-estimation of risk if a well is not placed at this location.

The future soil exposure scenario adds additional conservatism by assuming that the subsurface soil will become surface soil during any future construction activities. During many construction projects, clean fill material is placed over the soil that is disturbed during excavation projects. The clean fill material is generally needed to support growth of grass and other landscape plants. Therefore, the future soil scenario was included in the evaluation.

Inhalation exposure point concentrations are estimated using the models suggested by USEPA which assume a continued source of contaminants in the emitting medium and do not account for the depreciation due to volatilization or air-borne dust emission. The inhalation intake estimates also assume that a receptor is always in the downwind direction of the site, while in reality the wind direction changes seasonally.

The percent of a chemical absorbed through the skin is likely to be affected by many parameters. Some of the parameters include soil loading, soil moisture content, organic content, pH, presence of other constituents. The availability of a chemical depends on site-specific fate and transport properties of the chemical species available for eventual absorption of skin. Chemical concentrations, specific properties of the chemical, and soil release kinetics all impact the amount of a chemical that is absorbed. These factors contribute to the uncertainty associated with these estimates and make quantitation of the amount of certain chemicals absorbed from soil difficult.

8.7.1.3 Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the noncarcinogenic toxicity factors are included in Tables 5.1 and 5.2 in Appendix H. The uncertainty associated with CSFs is mostly associated with the low dose extrapolation where carcinogenicity at low doses is assumed to be a straight line response. This is a conservative assumption, which introduces a high uncertainty into slope factors which are from this extrapolated area of the dose-response curve. However, most of the experimental studies indicate the existence of a threshold for carcinogenicity.

Carcinogenic slope factors developed by the USEPA represent upper bound estimates. Any carcinogenic risks generated in this assessment should be regarded as an upper bound estimate on the potential carcinogenic risks rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value.

Additional uncertainty is in the prediction of relative sensitivities of different species of animals and the applicability of animal data to humans.

A few of the constituents detected in the groundwater and one in the soil do not have published toxicity factors (see Section 8.5.3). Therefore, these constituents were not evaluated quantitativley in the risk assessment. This may result in a slight under-estimation of risk.

The RfD for vanadium used in the risk assessment is derived from human data (NCEA, May 2000). The same reference (NCEA, May 2000) also lists a RfD derived from animal data,

which is lower. Based on a review of the NCEA document and discussions with EPA toxicologists, it is appropriate to use the higher, human based RfD.

8.7.1.4 Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals such as additivity, synergism, potentiation, susceptibility of exposed receptors, etc.

8.8 Summary

This risk assessment was conducted to evaluate the potential human health risks associated with the presence of site-related soil, groundwater, sediment, surface water, and concrete contamination at Site 47, Indian Head. Potential risks were calculated for a current industrial worker, current/future other worker, current/future adolescent trespasser/ visitor, future adult resident, future child resident, future lifetime resident, future construction worker, and future industrial worker. This baseline risk assessment was conducted to characterize the potential future human health risks at Site 47 if no additional remediation is implemented.

Appendix H, Tables 9.1.RME through 9.8.RME and Tables 9.9.CT through 9.14.CT summarize the RME and CT potential hazards and risks to each receptor. Appendix H, Tables 10.1.RME through 10.6.RME, and 10.7.CT through 10.9.CT show only the chemicals that contributed a total HIs greater than 1.0 or total carcinogenic risks greater than 10^{-4}.

Groundwater and soil are the only media that had carcinogenic risks or noncarcinogenic hazards greater than the USEPA target levels. All pathways and all receptors evaluated for the groundwater scenario exceeded USEPA levels. The shallow groundwater is not currently used as a potable-water supply and will most likely never be used as a potable-water supply. The risk drivers for the groundwater scenario are primarily the VOCs, and arsenic and cyanide (with a smaller contribution from some of the other metals) detected in the groundwater. The exposure point concentrations for all of the VOCs were the maximum detected concentration. This is because the concentrations detected in MW03 and MW04 are much higher than those in the other wells, which resulted in the 95% UCL being greater than the maximum detected concentration. The CT risk, which are slightly above the target levels and much lower than the RME risks are based on the average concentrations of the VOCs in the groundwater.

For exposure to soil, future child residents and industrial workers would have noncarcinogenic hazards slightly above USEPA's target. The risk drivers for the soil, through the ingestion route, are inorganics, although none of the individual constituents have hazard quotients above 1.0 and when separated by target organ/effect, all hazards are below 1.0.

8.9 References

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Table 8-1
Summary of Data used in Risk Assessment
Site 47
Indian Head

Medium	Date of Sampling	Sample Locations	Parameters
Groundwater			
	07/1999	RI47GW01 through RI47GW04	VOC, SVOC, explosives, inorg, Fmetals
	07/1999	RI47GW99[5]	VOC, SVOC, explosives, inorg, Fmetals
	04/09/2001	IS47MW050401 through IS47MW100401	VOC, SVOC, explosives, inorg, Fmetals, cyanide
	04/09/2001	IS47MW410401[6]	VOC, SVOC, explosives, inorg, Fmetals, cyanide
	04/10/2001	IS47MW010401 through IS47MW040401	VOC, SVOC, explosives, inorg, Fmetals, cyanide
	09/26/2002	IS47MW030902	VOC (select)
	09/26/2002	IS47MW040902	VOC (select)
	06/28/2002	IS47MW110602	VOC (select)
	09/26/2002	IS47MW110902	VOC (select)
	09/26/2002	IS47MW120902 through IS47MW150902	VOC (select)
	09/26/2002	IS47MW130902P[7]	VOC (select)
Surface Soil			
	8/28 - 9/4/92	47SA01 through 47SA12	VOC, SVOC, explosives (select), inorg, cyanide
	08/28/1992	47SA01D[1]	VOC (select), SVOC, explosives (select), inorg, cyanide
	09/03/1992	47SA02D[2]	VOC, SVOC, explosives (select), inorg, cyanide
	07/14/1999	RI47SS01 through RI47SS12	VOC, SVOC, explosives, inorg, cyanide
	07/14/1999	RI47SS99[3]	VOC, SVOC, explosives, inorg, cyanide
	07/14/1999	RI47SD01 through RI47SD04	VOC, SVOC, explosives, inorg, cyanide
	07/14/1999	RI47SD99[4]	VOC, SVOC, explosives, inorg, cyanide
	03/20/2001	IS47SS14 through IS47SS22	VOC, SVOC, explosives, inorg
	03/20/2001	IS47SS14P[9]	VOC, SVOC, explosives, inorg
	03/20/2001	IS47SS20P[10]	VOC, SVOC, explosives, inorg
Soil*			
	8/28 - 9/4/92	47SA01 through 47SA12	VOC, SVOC, explosives (select), inorg, cyanide
	08/28/1992	47SA01D[1]	VOC (select), SVOC, explosives (select), inorg, cyanide
	09/03/1992	47SA02D[2]	VOC, SVOC, explosives (select), inorg, cyanide
	07/14/1999	RI47SS01 through RI47SS12	VOC, SVOC, explosives, inorg, cyanide
	07/14/1999	RI47SS99[3]	VOC, SVOC, explosives, inorg, cyanide
	07/14/1999	RI47SD01 through RI47SD04	VOC, SVOC, explosives, inorg, cyanide
	07/14/1999	RI47SD99[4]	VOC, SVOC, explosives, inorg, cyanide
	10/10/2000	IS47SB16 through IS47SB19	VOC, SVOC, inorg, cyanide
	10/10/2000	IS47SB98[8]	VOC, SVOC, inorg, cyanide
	03/20/2001	IS47SS14 through IS47SS22	VOC, SVOC, explosives, inorg
	03/20/2001	IS47SS14P[9]	VOC, SVOC, explosives, inorg
	03/20/2001	IS47SS20P[10]	VOC, SVOC, explosives, inorg
	03/20/2001	IS47SB070304 through IS47SB100304	VOC, SVOC (select), explosives, inorg
	06/19/2002	IS47SB110602 through IS47SB150602	Inorg
	06/19/2002	IS47SB120602P[11]	Inorg
Sediment			
	07/1999	RI47IW91	VOC, SVOC, explosives, inorg, cyanide
	03/20/2001	IS47SD05 and IS47SD06	VOC, SVOC, explosives(select), inorg
Surface Water			
	03/19/2001	IS47SW01	VOC, SVOC, explosives, inorg
	03/19/2001	IS47SW02	VOC, SVOC, explosives, inorg
	03/19/2001	IS47SW02P[12]	VOC, SVOC, explosives, inorg
	06/17/2002	IS47SW050602 through IS47SW080602	VOC(select)
	06/17/2002	IS47SW070602P[13]	VOC(select)
	09/25/2002	IS47SW100902	VOC(select)
	09/25/2002	IS47SW100902P[14]	VOC(select)
	09/25/2002	IS47SW110902	VOC(select)
	09/25/2002	IS47SW120902	VOC(select)
	10/29/2001	RI47SW03	VOC(select)
	10/29/2001	RI47SW04	VOC(select)

Table 8-1 Summary of Data used in Risk Assessment *Site 47* *Indian Head*			
Concrete			
	07/1999	RI47CO01	Inorg
	07/1999	RI47CO02	Inorg

Notes:
VOC - volatile organic constituents
SVOC - semivolatile organic constituents
inorg - inorganic constituents including cyanide
Fmetals - dissolved inorganic constituent (groundwater)
1) duplicate of 47SA01.
2) duplicate of 47SA02.
3) duplicate of RI47SS07.
4) duplicate of RI47SD02.
5) duplicate of RI47GW03.
6) duplicate of IS47MW070401
7) duplicate of IS47MW030401
8) duplicate of IS47SB16
9) duplicate of IS47SS14
10) duplicate of IS47SS20.
11) duplicate of IS47SB120602.
12) duplicate of IS47SW02.
13) duplicate of IS47SW070602.
14) duplicate of IS47SW100902.

*Soil is combined surface and subsurface soil.

Table 8-2
Summary of Chemicals of Potential Concern for the HHRA
Site 47
Indian Head

Groundwater-Upper Aquifer-Tap Water	Groundwater-Upper Aquifer-Shallow groundwater beneath disposal area	Groundwater-Upper Aquifer-Water Vapors at Showerhead and -Volatilization from open excavation	Surface Soil	Sediment-Other Worker	Sediment-Trespasser/Visitor	Surface Water	Soil*	ConcreteTroughs
Ingestion and Dermal Scenarios	*Ingestion and Dermal Scenarios*	*Inhalation Scenario*	*Ingestion and Dermal Scenarios*	*Ingestion and Dermal Scenarios*	*Ingestion and Dermal Scenarios*	*Ingestion and Dermal Scenarios*	*Ingestion and Dermal Scenarios*	*Ingestion and Dermal Scenarios*
1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene	Nitroglycerin	Arsenic	Arsenic	Tetrachloroethene	Arsenic
1,1,2-Trichloroethane	1,1,2-Trichloroethane	1,1,2-Trichloroethane	Benzo(a)anthracene	Arsenic	Iron		Benzo(a)anthracene	Lead
1,1-Dichloroethane	1,1-Dichloroethane	1,1-Dichloroethane	Benzo(a)pyrene	Iron	Vanadium		Benzo(a)pyrene	
1,1-Dichloroethene	1,1-Dichloroethene	1,1-Dichloroethene	Benzo(b)fluoranthene	Lead			Benzo(b)fluoranthene	
1,2-Dibromo-3-chloropropane	1,2-Dibromo-3-chloropropane	1,2-Dibromo-3-chloropropane	Dibenz(a,h)anthracene	Mercury			Dibenz(a,h)anthracene	
1,2-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethane	Indeno(1,2,3-cd)pyrene	Silver			Indeno(1,2,3-cd)pyrene	
1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dichloropropane	Aluminum	Vanadium			Aluminum	
Acetone	Acetone	Acetone	Antimony				Antimony	
Bromodichloromethane	Bromodichloromethane	Bromodichloromethane	Arsenic				Arsenic	
Bromomethane	Bromomethane	Bromomethane	Chromium				Chromium	
Carbon disulfide	Carbon disulfide	Carbon disulfide	Iron				Iron	
Carbon tetrachloride	Carbon tetrachloride	Carbon tetrachloride	Lead				Lead	
Chloroethane	Chloroethane	Chloroethane	Manganese				Manganese	
Chloroform	Chloroform	Chloroform	Mercury				Mercury	
Chloromethane	Chloromethane	Chloromethane	Silver				Silver	
Dibromochloromethane	Dibromochloromethane	Dibromochloromethane	Vanadium				Vanadium	
Tetrachloroethene	Tetrachloroethene	Tetrachloroethene						
Toluene	Toluene	Toluene	*Inhalation Scenario*				*Inhalation Scenario*	
Trichloroethene	Trichloroethene	Trichloroethene	Tetrachloroethene				Tetrachloroethene	
Vinyl chloride	Vinyl chloride	Vinyl chloride						
cis-1,2-Dichloroethene	cis-1,2-Dichloroethene	cis-1,2-Dichloroethene						
trans-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,2-Dichloroethene						
trans-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,3-Dichloropropene						
Hexachloroethane	Hexachloroethane	Naphthalene						
Naphthalene	Naphthalene							
Pentachlorophenol	Pentachlorophenol							
bis(2-Ethylhexyl)phthalate	bis(2-Ethylhexyl)phthalate							
Cyanide	Aluminum							
Aluminum	Arsenic							
Antimony	Barium							
Arsenic	Beryllium							
Barium	Cadmium							
Beryllium	Chromium							
Cadmium	Cobalt							
Chromium	Cyanide							
Cobalt	Iron							
Iron	Lead							
Lead	Manganese							
Manganese	Nickel							
Nickel	Thallium							
Thallium	Vanadium							
Vanadium								

*Soil is combined surface and subsurface soil.

Table 8-3
Exposure Pathways
Site 47
Indian Head

Media	Exposure Route	Current			Future					
		Industrial Worker	Other Worker	Trespasser/ Visitor Adolescents	Construction Worker	Industrial Worker	Other Worker	Trespasser/ Visitor Adolescents	Resident	
									Adult	Child
Groundwater										
	Ingestion								X	X
	Dermal				X				X	X
	Inhalation				X				X	
Surface Soil										
	Ingestion	X		XC				XC		
	Dermal	X		XC				XC		
	Inhalation	X		XC				XC		
Sediment										
	Ingestion		XC	XC			XC	XC		
	Dermal		XC	XC			XC	XC		
	Inhalation									
Surface Water										
	Ingestion		XC	XC			XC	XC		
	Dermal		XC	XC			XC	XC		
	Inhalation									
Soil*										
	Ingestion				X	X			X	X
	Dermal				X	X			X	X
	Inhalation				X	X			X	X
Concrete Troughs										
	Ingestion				X					
	Dermal				X					
	Inhalation				X					

X Quantitative evaluation.

XC Current and Future scenario are the same.

*Soil is combined surface and subsurface soil.

Table 8-4
Summary of RME Cancer Risks and Hazard Indices
Site 47
Indian Head

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Current Industrial Worker	Surface Soil	Ingestion	1.3E-06				0.04	
		Dermal Contact	1.7E-05			Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Arsenic	0.4	
		Inhalation	3.5E-09				0.000007	
		Total	1.8E-05				0.4	
	All Media	Total	1.8E-05				0.4	
Current/Future Other Worker Adult	Sediment	Ingestion	1.4E-06			Nitroglycerin	0.06	
		Dermal Contact	1.4E-05		Nitroglycerin		0.5	
		Inhalation	NA				NA	
		Total	1.5E-05				0.5	
	Surface Water	Ingestion	3.3E-07				0.002	
		Dermal Contact	7.9E-08				0.0005	
		Inhalation	NA				NA	
		Total	4.1E-07				0.003	
	All Media	Total	1.5E-05				0.5	
Current/Future Trespasser/Visitor Adolescent	Sediment	Ingestion	1.5E-06			Arsenic	0.1	
		Dermal Contact	1.4E-06			Arsenic	0.5	
		Inhalation	NA				NA	
		Total	2.9E-06				0.6	
	Surface Water	Ingestion	3.5E-07				0.006	
		Dermal Contact	7.7E-08				0.001	
		Inhalation	NA				NA	
		Total	4.2E-07				0.007	
	Surface Soil	Ingestion	1.5E-06				0.1	
		Dermal Contact	6.1E-06			Benzo(a)pyrene, Dibenz(a,h)anthracene	1.1	
		Inhalation	3.1E-10				0.000002	
		Total	7.6E-06				1.2	
	All Media	Total	1.1E-05				1.9	
Future Resident Adult	Groundwater	Ingestion	NA				1.1E+04	Acetone, Bromomethane, Carbon Disulfide, Carbon Tetrachloride, Chloroform, Tetrachloroethene, Trichloroethene, cis,1,2-Dichloroethene, Cyanide, Arsenic, Iron, Vanadium
		Dermal Contact	NA				2.7E+03	Carbon Tetrachloride, Chloroform, Tetrachloroethene, Trichloroethene
		Inhalation	2.8E-01	1,2-Dichloroethane, Carbon tetrachloride, Chloroform, Chloromethane, Tetrachloroethene, Trichloroethene	Vinyl chloride	1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane	2.4E+04	1,2-Dibromo-3-chloropropane, 1,2,Dichloroethane, Bromomethane, Carbon Disulfide, Carbon Tetrachloride, Chloroform, Chloromethane, Trichloroethene
		Total	2.8E-01				3.8E+04	
	Soil*	Ingestion	NA				0.2	
		Dermal Contact	NA				0.4	
		Inhalation	NA				0.00003	
		Total	NA				0.7	
	All Media	Total	NA				3.8E+04	

Table 8-4
Summary of RME Cancer Risks and Hazard Indices
Site 47
Indian Head

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Child	Groundwater	Ingestion	NA				2.7E+04	Acetone, Bromomethane, Carbon Disulfide, Carbon Tetrachloride, Chloroform, Tetrachloroethene, Trichloroethene, cis,1,2-Dichloroethene, 1,2-Dichloroethane, trans-1,2-Dichloroethene, Cyanide, Aluminum, Arsenic, Iron, Manganese, Thallium, Vanadium
		Dermal Contact	NA				6.0E+03	Carbon Tetrachloride, Chloroform, Tetrachloroethene, Trichloroethene
		Inhalation	NA				NA	
		Total	NA				3.3E+04	
	Soil*	Ingestion	NA				1.9	
		Dermal Contact	NA				0.6	
		Inhalation	NA				0.00007	
		Total	NA				2.5	
	All Media	Total	NA				3.3.E+04	
Future Resident Adult/Child	Groundwater	Ingestion	4.5E-01	1,2-Dibromo-3-chloropropane, 1,2-Dichloroethane, Carbon tetrachloride, Chloromethane, Dibromochloromethane, Tetrachloroethene, Trichloroethene, Vinyl chloride, Arsenic,		1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, 1,2-Dichloropropane, Bromodichloromethane, Chloroethane, trans-1,3-Dichloropropene, Hexachloroethane, Pentachlorophenol, bis(2-Ethylhexyl)phthalate,	NA	
		Dermal Contact	1.2E-01	1,1,2,2-Tetrachloroethane, Carbon tetrachloride, Chloromethane, Tetrachloroethene, Trichloroethene, Pentachlorophenol	1,2-Dichloroethane, Vinyl chloride	Hexachloroethane, Arsenic	NA	
		Inhalation	2.8E-01	1,2-Dichloroethane, Carbon tetrachloride,Chloroform, Chloromethane, Tetrachloroethene, Trichloroethene,	Vinyl chloride	1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane	NA	
		Total	8.5E-01				NA	
	Soil*	Ingestion	2.0E-05			Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Arsenic	NA	
		Dermal Contact	9.0E-06			Benzo(a)pyrene, Dibenz(a,h)anthracene, Arsenic	NA	
		Inhalation	2.1E-08				NA	
		Total	2.9E-05				NA	
	All Media	Total	8.5E-01				NA	

Table 8-4
Summary of RME Cancer Risks and Hazard Indices
Site 47
Indian Head

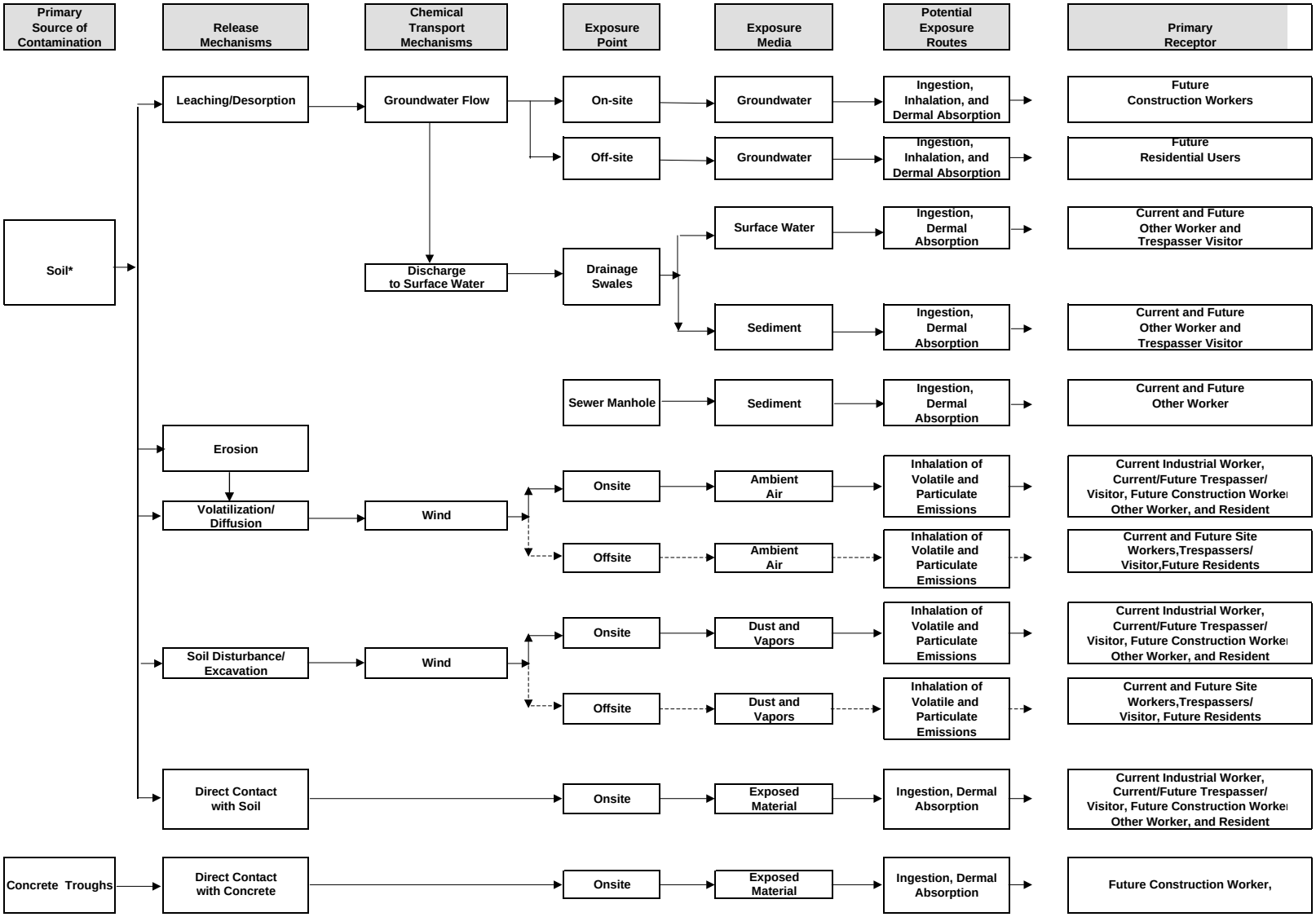
Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Construction Worker	Groundwater	Ingestion	NA				NA	
		Dermal Contact	6.4E-03	Carbon tetrachloride	Chloromethane, Tetrachloroethene, Trichloroethene, Pentachlorophenol,	1,2-Dichloroethane, Dibromochloromethane, Vinyl chloride, bis(2-Ethylhexyl)phthalate, Arsenic	4.9E+03	Bromomethane, Carbon tetrachloride, Chloroform, Tetrachloroethene, Trichloroethene
		Inhalation	5.0E-07				0.001	
		Total	6.4E-03				4.9E+03	
	Soil*	Ingestion	4.2E-07				0.3	
		Dermal Contact	4.0E-07				0.6	
		Inhalation	1.2E-10				0.000006	
		Total	8.2E-07				0.9	
	Concrete troughs	Ingestion	2.5E-08				0.004	
		Dermal Contact	8.4E-09				0.001	
		Inhalation	NA				NA	
		Total	3.4E-08				0.005	
	All Media	Total	6.4E-03				4.9E+03	
Future Industrial Worker	Soil*	Ingestion	4.4E-06			Benzo(a)pyrene, Arsenic	0.1	
		Dermal Contact	2.0E-05			Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Arsenic	1.3	
		Inhalation	9.1E-09				0.00002	
		Total	2.4E-05				1.4	
	All Media	Total	2.4E-05				1.4	

NA - Not applicable, pathway incomplete.

Table 8-5
Summary of CT Cancer Risks and Hazard Indices
Site 47
Indian Head

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Adult	Groundwater	Ingestion	NA				1.6	
		Dermal Contact	NA				0.3	
		Inhalation	1.3E-05			Carbon tetrachloride, Chloroform, Trichloroethene	1.7	Chloroform
		Total	1.3E-05				3.7	
Future Resident Child	Groundwater	Ingestion	NA				1.6	
		Dermal Contact	NA				0.3	
		Inhalation	NA				NA	
		Total	NA				1.9	
	Soil*	Ingestion	NA				--	
		Dermal Contact	NA				--	
		Inhalation	NA				0.00007	
		Total	NA				0.0	
	All Media	Total	NA				1.9	
Future Resident Adult/Child	Groundwater	Ingestion	0.0E+00		1,2-Dibromo-3-chloropropane, Arsenic,	1,1,2,2-Tetrachloroethane, 1,2-Dichloroethane, Carbon tetrachloride, Tetrachloroethene, Trichloroethene, Vinyl chloride, Pentachlorophenol,	NA	
		Dermal Contact	0.0E+00		1,1,2,2-Tetrachloroethane, Pentachlorophenol	Carbon tetrachloride, Trichloroethene	NA	
		Inhalation	0.0E+00			Carbon tetrachloride, Chloroform, Trichloroethene	NA	
		Total	0.0E+00				NA	
Future Construction Worker	Groundwater	Ingestion	NA				NA	
		Dermal Contact	0.0E+00			Pentachlorophenol	0.0	
		Inhalation	NA				NA	
		Total	0.0E+00				0.0	
Future Industrial Worker	Soil*	Ingestion	NA				0.02	
		Dermal Contact	NA				0.01	
		Inhalation	NA				NA	
		Total	NA				0.03	

NA - Not applicable, pathway incomplete.



* Current scenario is for surface soil and future scenarios are for soil (surface and subsurface soil combined).

→ **Complete Pathway**

⇢ **Incomplete Pathway**

Figure 8-1 (Sheet 1 of 1)
Conceptual Site Model for Potential Human Exposures-
Site 47 Remedial Investigation
NSWC Indian Head

SECTION 9

Ecological Risk Assessment

The objective of this section is to present the screening-level ecological risk assessment (SERA) for ecological receptors at Site 47 at the IHDIV-NSWC, Indian Head, Maryland. Site 47 is located in the northwest central portion of the base (Figure 2-1). Between 1957 and 1965, mercuric nitrate was disposed of off the southeastern corner of Building 856. A dry drainage ditch originates from this main disposal point. The ditch eventually becomes a small stream that flows south through forest to a tidal marsh and then into Mattawoman Creek. With the exception of a bordering wooded area, the upland habitat in the vicinity of Building 856, including the banks and bottom of the drainage ditch, is mowed grass.

The risk assessment was prepared in accordance with the USEPA 8-step process for conducting ecological risk assessments (ERA) (USEPA, 1997) and US Navy policy for conducting ERA's (5 April, 1999 memo from the Chief of Naval Operations). Steps 1 and 2 are included in this evaluation. These steps constitute the SERA for the site.

9.1 Summary of Ecological Risk Conclusions

The results of the SERA are summarized here for the reader's convenience. Subsequent sections explain the screening process, the inputs to the risk calculations, and the uncertainties inherent in these calculations. Tables 9-10 and 9-11 summarize the risk conclusions.

The assessment endpoints for the site were not met (i.e., the SERA indicates site-related chemicals may impact the growth, survival and/or reproduction of the receptor species and receptor communities). As such, the results of the SERA are not sufficient to show that risks to ecological receptor populations at Site 47 are negligible. For all the endpoints there were multiple chemicals that were associated with HQs in excess of 1 (Tables 9-10 and 9-11). HQs for mercury were greater than 100 for all endpoints, with the exception of the carnivorous terrestrial mammal (represented by red fox). In addition, there were chemicals that could not be fully evaluated due to the lack of a media-specific screening value and/or reference toxicity value.

Soil Invertebrates and Plants. HQs > 1 were calculated for VOCs, SVOCs, and inorganics. However, the majority of the VOCs with HQs >1 were compounds that were not detected at the site (6 out of 7 VOCs; retained based on a screen of one-half the detection limit against the screening value).

Soil Invertebrate-Eating Birds. HQs for several inorganics exceeded 1.

Herbivorous Birds. HQs for several inorganics exceeded 1.

Carnivorous Birds. HQs for aluminum, lead, and mercury exceeded 1.

Omnivorous Terrestrial Mammals. HQs for several inorganics exceeded 1 and the HQ for n-nitroso-di-n-propylamine, although it was not detected, was 1.67.

Carnivorous Terrestrial Mammals. HQs for several inorganics exceeded 1.

9.2 Screening-Level Problem Formulation

The screening-level problem formulation, Step 1 of USEPA's 8-step process, discusses the environmental setting, available analytical data, potential receptors, and complete exposure pathways. The two major products of the problem formulation are the conceptual model and the assessment and measurement endpoints. The conceptual model provides the basis for the screening assessment and will be revised, as appropriate and if necessary, during subsequent steps at Site 47 (e.g., Steps 3 or 7; USEPA 1997).

9.2.1 Environmental Setting

On September 23, 1999, CH2M HILL scientists conducted a qualitative habitat assessment at Site 47. The following description summarizes observations made during the field survey.

Site 47 is an upland area that gently slopes to the southeast. The site is dominated by mowed grass. A narrow, drainage ditch originates off the southeast corner of Building 856 (Figure 1-4). The drainage ditch is about 1 to 2 feet deep with mowed grassy banks. As the site visit was conducted after recent rains, shallow standing water (< 1 inch) was observed within some depressions in the ditch bottom. However, the grade of the ditch and the lack of wetland vegetation indicate that it does not generally hold water. Its primary function is to convey stormwater off-site. The drainage ditch broadens to approximately 3 feet in width near Building 1070. Note that this point corresponds to the farthest downgradient soil sampling point; this issue is discussed in Section 9.1.2. Approximately 100 feet further downgradient, near Building 1073, some of the drainage ditch bank was unmowed, water depth was approximately 2 inches, and wetland vegetation was present. Herbaceous wetland vegetation observed within the channel near Building 1073 included beggars-ticks (*Bidens frondosa*), soft rush (*Juncus effusus*), and wool grass (*Scirpus cyperinus*). Upgradient of Building 1073, the drainage ditch is generally dry. As such, samples collected from the ditch are considered to be soil from an exposure perspective rather than sediment.

The drainage ditch is bordered by open forest to the east. The forest has a mature canopy with little understory or ground cover. The canopy is dominated by chestnut oak (*Quercus prinus*), sweetgum (*Liquidambar styraciflua*), and red maple (*Acer rubrum*). The subcanopy is dominated by American holly (*Ilex opaca*). The sparse shrub layer is dominated by highbush blueberry (*Vaccinium corymbosum*).

From Building 1073 to Caffee Road (about 250 feet), the drainage ditch becomes a stream bordered by forest on both sides. It passes Building 854 and crosses Caffee Road through a 36-inch culvert. The stream is bordered by upland forest dominated by sweetgum. After crossing under Caffee Road, the stream continues southwest past Building 766 (Site 8). A 3-inch drain pipe from Building 766 leads to a concrete pipe which conveys water into the stream. From 1953 to 1981, mercury used in laboratory tests was disposed of through the drain pipe. Mercury contaminated sediment has since been removed along 300 linear feet of stream in this area. Riprap was used to stabilize the stream banks within the sediment removal area, along with wire mesh and tree plantings. Where the stream passes Building

790, lead-contaminated soil and sediment has been removed. The dominant herbaceous vegetation along the portion of stream reach where removal activities were conducted is Japanese grass (*Microstegium vimineum*). Japanese grass is a non-native invasive grass that spreads rapidly in disturbed lowland areas such as this.

Near Building 461, the stream makes a sharp bend to the east and continues southeast before draining into the 700-foot long tidal freshwater emergent marsh known as the Site 12 Pond that is connected to Mattawoman Creek. The total distance from Building 856 to the tidal marsh is about 2,100 feet. The influence of the tide is limited to days of highest tide due to the installation of a weir to control water flow. Approximately 40 percent of the surface water runoff from the Indian Head facility drains into the marsh. The marsh is comprised of emergent vegetation, floating aquatic vegetation, mudflats, and open water. Steep forested banks border the marsh to the west and relatively flat grassy banks to the east. Chestnut oak and red maple dominate the forest canopy with the understory dominated by mountain laurel (*Kalmia latifolia*). The Town Gut Landfill abuts the east bank.

No wildlife was observed near Building 856. Wildlife observed, directly or by sign, near the stream south of Caffee Road included pickerel frog (*Rana palustris*), crayfish, small fish, white-tailed deer (*Odocolius virginianus*), raccoon (*Procyon lotor*), and belted kingfisher (*Ceryle alcyon*). The majority of wildlife observations were made in the vicinity of the tidal freshwater emergent marsh. Birds observed at the marsh included pileated woodpecker (*Dryocopus pileatus*), spotted sandpiper (*Actitis macularia*), great blue heron (*Ardea herodias*), and a pair of bald eagles (*Haliaeetus albicilla*). Amphibians included pickerel frog and reptiles included eastern painted turtle (*Chrysemys picta picta*). Trees recently felled by beaver were also observed along the upland perimeter of the marsh. Wildlife observed in upland areas adjacent to the stream included eastern gray squirrel (*Sciurus carolinensis*), bluejay (*Cyanocitta cristata*), and tufted titmouse (*Parus bicolor*).

Correspondence from the US Fish and Wildlife Service indicates that there are no federally proposed or listed endangered or threatened species known to exist within the Indian Head Division (USFWS, 1999). The letter does indicate the off-base presence of bald eagles on the south side of the Mattawoman Creek. Subsequent to this letter, a bald eagle nest has appeared near Site 21. There are several state-listed species at the base (MDDNR, 1999), but none are known to be present in the vicinity of Site 47.

9.2.2 Summary of Available Analytical Data

Twenty-eight surface soil samples (0-6 inches) were collected from Site 47 as part of site investigation activities. The farthest downstream sample (RI47SD04; see Figure 3-3) was collected in the drainage ditch just northeast of Building 1070, about 100 feet north of the occurrence of wetland vegetation. Although not included in the SERA, groundwater data have also been collected at the site. The sampling activities that have been conducted at the site and the analytical results are discussed in Sections 3 and 6, respectively. A complete set of raw data is included in Appendix J.

Surface-soil samples were analyzed for VOCs, SVOCs, TAL inorganics, and explosives. Based on the soil sampling data, SVOCs and inorganics are the chemical classes of concern at the site. The frequency and level of detection of VOCs and explosives in soil were low.

9.2.3 Preliminary Conceptual Model

Information on chemical sources, potential receptors, and the fate and transport of site-related chemicals was used to develop a conceptual model for the site (Figure 9-1). The conceptual model includes two components, exposure pathways and endpoints.

9.2.3.1 Exposure Pathways

Complete exposure pathways exist at the site (Figure 9-1). Disposal activities at Building 856 have caused the release of chemicals into the upland areas around the building. Through surface runoff, chemicals have been transported from the vicinity of Building 856 into the drainage system. These chemicals may be taken up and accumulated in biota.

Receptors at the site include invertebrates, birds, and mammals. These receptors may be exposed to chemicals though direct contact with soil, ingestion of soil, and/or ingestion of biota that contain chemical body burdens. Plants may also be exposed to soils contaminants by uptake through the roots.

Soil invertebrates could be exposed to contaminants in soil through dermal contact and ingestion. Because these organisms are the prey base for other animals, they can also serve as an exposure source.

Terrestrial vertebrates, including mammals and birds, can be exposed to contaminants through the consumption of contaminated abiotic media or food items. Incidental ingestion of soil can occur in association with grooming, burrowing, or foraging. Some animals deliberately ingest soil as a source of grit or minerals. Dermal contact and inhalation are expected to contribute minimally to total exposure at Site 47.

Aquatic organisms are not considered receptors over the length of the drainage ditch covered by the sampling program. The vegetative community, topography, and field reconnaissance indicate that the drainage ditch does not generally hold water and, therefore, does not have aquatic receptors. As such, “sediment” collected with the drainage ditch is considered soil from an exposure perspective.

Chemicals in surface soil might also leach into subsurface soil and groundwater. Although there are likely no direct exposure pathways to groundwater, groundwater could discharge to surface water near Building 1073 where the drainage ditch begins to take on the characteristics of a stream.

9.2.3.2 Endpoints

The conclusion of the Problem Formulation stage includes the selection of assessment and measurement endpoints, based on the preliminary conceptual model. Endpoints in the SERA define ecological attributes that are to be protected (assessment endpoints) and measurable characteristics of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or could occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site (USEPA, 1997). Assessment endpoints contain an entity (e.g., soil invertebrate eating birds) and an attribute of that entity (e.g., survival rate). A surrogate

species (e.g., American robin) is often used to represent the assessment endpoint in the measurement endpoint.

Based on the habitat and types of contaminants present, six assessment endpoints were chosen to evaluate the risk to ecological receptor populations from chemicals disposed of at Site 47. A specific species was chosen to represent each of the assessment endpoints involving upper trophic level receptors. Species chosen to represent each endpoint were selected based on the following:

- Potential for exposure to site-related chemicals
- Life history characteristics
- Likelihood that they inhabit the area
- Availability of information on exposure parameters (body weight, ingestion rate, etc.) and response to chemical exposure.

Each assessment endpoint and corresponding representative species are described below.

1. *Soil invertebrate and plant community survival and reproduction* - Soil invertebrates and plants serve as a forage base for many terrestrial species. The soils at the site will support fewer birds and mammals if chemical concentrations are limiting the survival and reproduction of soil invertebrate and plant communities.

2. *Survival and reproduction of soil invertebrate eating birds* – These birds are second order consumers and are susceptible to bioaccumulative chemicals. Some species also have significant contact with soil. American robin (*Turdus migratorius*) was chosen to represent the endpoint. Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. Robins forage on the ground in open areas, along edge habitats, or along the edges of streams. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-dwelling insects in low tree branches (Malmborg and Willson, 1988).

3. *Survival and reproduction of herbivorous birds* – These birds are primary consumers that are susceptible to chemicals that bioaccumulate in plants, and to chemicals adsorbed to soil particles. The mourning dove (*Zenaida macroura*) was chosen to represent this endpoint. The mourning dove is common in open grassland and ruderal habitats. It feeds almost exclusively on cereal grains, forbs, and grasses. It also ingests grit (small grain-sized stones) as a digestive aid. Although the mourning dove typically nests in trees, it uses grass in nest building.

4. *Survival and reproduction of carnivorous terrestrial birds* – These receptors are top level consumers and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The red-tailed hawk (*Buteo jamaicensis*) was chosen to represent this endpoint. Red-tailed hawks nest primarily in woodlands and feed in open country on a wide variety of small- to medium-sized prey. Small mammals, including mice, shrews, voles, rabbits, and squirrels comprise a large portion of their diet.

5. *Survival and reproduction of omnivorous terrestrial mammals* – These receptors are second order consumers and susceptible to bioaccumulative chemicals. The white-footed mouse (*Peromyscus leucopus*) was chosen to represent this endpoint. The white-footed mouse inhabits nearly all types of dry-land habitats within their range (Burt and Grossenheider, 1980). They are opportunistic feeders and eat seeds, arthropods, some green vegetation, roots, and fruit.

6. *Survival and reproduction of carnivorous terrestrial mammals* – These receptors are top level consumers and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The red fox (*Vulpes vulpes*) was chosen to represent this endpoint. Red fox utilize many different types of habitats including salt marshes, cropland, rolling farmland, brush, pastures, hardwood stands, and coniferous forests. Their diet consists primarily of small mammals including meadow voles, mice, and rabbits. They also consume plant material mainly in the summer and fall when fruits, berries, and nuts become available.

Measurement endpoints associated with each assessment endpoint were defined as follows:

Assessment Endpoints		Measurement Endpoints
Impact on the survival or reproduction of soil invertebrate and plant communities	⇨	Comparison of hazard quotients (HQs) for soil invertebrates and plants to a target HQ of 1. Media-specific HQs are calculated for individual contaminants by dividing the maximum soil concentration by a soil benchmark that is intended to be protective of soil invertebrates and plants.
Impact on survival or reproduction of soil invertebrate eating birds	⇨	Comparison of HQs for robin to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure by a screening toxicity value that is associated with no adverse effects. Exposure estimates will include contributions from the consumption of invertebrates and soil.
Impact on survival or reproduction of herbivorous birds	⇨	Comparison of HQs for mourning dove to a target HQ of 1. Exposure estimates will include contributions from the consumption of plants and soil.
Impact on survival or reproduction of carnivorous birds	⇨	Comparison of HQs for red-tailed hawk to a target HQ of 1. Exposure estimates will include contributions from the consumption of small mammals and soil.
Impact on survival or reproduction of omnivorous mammals	⇨	Comparison of HQs for white-footed mouse to a target HQ of 1. Exposure estimates will include contributions from the consumption of invertebrates, plants, and soil.
Impact on survival or reproduction of carnivorous mammals	⇨	Comparison of HQs for red fox to a target HQ of 1. Exposure estimates will include contributions from the consumption of small mammals and soil.

For upper trophic level endpoints, the assessment endpoint references an impact on survival or reproduction. Some chemical exposures may be associated with sub-lethal effects that do not directly influence mortality or reproductive success. However, these sub-lethal effects may increase the probability of death or negatively influence reproduction by enhancing

susceptibility to predation or parasitism, or weakening competitive ability. For this SERA, it is assumed that the screening toxicity values representing sub-lethal and non-reproductive endpoints, might indirectly affect the survival or reproduction of the exposed individual, thus potentially leading to a reduction in study area populations.

9.3 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels that represent conservative thresholds for adverse ecological effects. The characterization of effects involves determining the intensities of exposure to chemicals (i.e., media concentrations or dose) at which potential effects on receptor groups may occur. This characterization was accomplished by identifying ecological effects, as represented by sediment and toxicological benchmarks, for benthic organisms and upper trophic level receptors, respectively.

9.3.1 Medium-Specific Screening Values

A combination of USEPA Region III BTAG screening values (USEPA, 1985) and other conservative screening values obtained from the literature (Appendix I) were used to screen soil samples to identify preliminary ecological threats.

For some chemicals, CH2M HILL has proposed alternate soil benchmarks (flora and/or fauna) (Appendix I). In some cases the alternates are higher than BTAG values. In other cases they are lower. The list of potential screening values for the SERA included alternate benchmarks and BTAG values when no alternate was proposed. Of this list, the lowest value (flora or fauna) was selected as the soil screening value.

9.3.2 Ingestion Screening Values

Available no observed adverse effect levels (NOAELs) were obtained from the literature for contaminants and were used as screening toxicity values for each indicator species. These values were used in conjunction with the ingestion-based exposure modeling to identify preliminary COPCs for upper trophic level receptors potentially exposed through the foodchain. Toxicity studies involving long term exposure and the ingestion route were utilized if available. In the event that only a lowest observed adverse affect level (LOAEL) was available, a NOAEL was calculated by dividing the LOAEL by a factor of 10. This approach is recommended in USEPA (1997). NOAELs were calculated from LD_{50}s by dividing by 100 (USEPA, 1997). Ecotoxicity values were not adjusted for body weight differences between test species and receptor species. Toxicological benchmark values for ingestion exposures are summarized in Tables 9-1 and 9-2 for avian and mammalian receptors, respectively.

9.4 Screening-Level Exposure Estimate

The purpose of this section is to present the methods used to estimate the concentrations of chemicals to which receptors might be potentially exposed.

9.4.1 Exposure Estimation

Maximum chemical concentrations detected in soil were used as the basis for estimating the exposure of receptors to contaminants. The maximum detection limit for contaminants that were analyzed for but not detected were also compared to media-specific screening values and used for trophic modeling. This was done to ensure that detection limits were similar to chemical concentrations that are not expected to cause adverse effects to ecological receptors. For samples with duplicate analyses, the higher concentration was used in the screening (i.e., when both values were detects or both values were non-detects). In cases where one result was a detection and the other a non-detect, the detected value was used in the assessment.

Volatile organic compounds were not evaluated in the food chain models. Most of the volatiles have low octanol-water partitioning coefficients, and as such, are not expected to accumulate in tissue to any significant degree. The potential for organic chemicals to accumulate in organisms has been shown to correlate well with the octanol-water partition coefficient (K_{ow}). USEPA (1985) recommends that only chemicals for which the log K_{ow} is greater than 3.5 be considered for further evaluation of bioaccumulation potential since chemicals with log K_{ow} values less than 3.5 are not likely to bioaccumulate to a significant degree.

For receptor species used in food chain modeling, the dose of each chemical (in mg chemical per kg of body weight per day) was calculated using species-specific life history information, where available (Table 9-3). Minimum body weights and maximum ingestion rates for food were used to develop exposure estimates. Average BAFs presented in Sample et al. (1998a;b) and BCFs presented in Bechtel Jacobs Company, Inc. (1998) were used to estimate the concentration of chemicals in receptor food items (i.e., small mammals, invertebrates, and plants, respectively) (Table 9-4). Maximum chemical concentrations in soil were multiplied by BAFs or BCFs for each food type to determine the concentration of the chemical in the food item (on a dry weight basis). A BAF or BCF of 1 was assumed when no literature value was readily available.

Chemical contributions from the consumption of prey items were estimated using the following equation:

$$Dose_{food} = FCR * C_{food}$$

where,

$Dose_{food}$ = chemical ingested per day via food (mg chemical/kg body weight [wet]-day)
FCR = food consumption rate (kg food [dry]/kg body weight [wet]-day)
C_{food} = chemical concentration in food (mg chemical/kg food [dry])

The same equation was used for soil to calculate the dose attributable to soil ingestion. Soil ingestion rates were calculated by multiplying estimates of soil ingestion found in the literature (expressed as a percentage of total food intake) by the food consumption rate. In cases where a species-specific soil ingestion value was not available in the literature, a value from a species with similar foraging habits was used or a conservative value was assumed.

$$Dose_{soil} = SCR * C_{soil}$$

where,

$Dose_{soil}$ = chemical ingested per day via soil (mg chemical/kg body weight [wet]-day);
SCR = soil consumption rate (kg soil [dry]/kg body weight [wet]-day);
C_{soil} = maximum chemical concentration in soil (mg chemical/kg soil [dry]);

Food ingestion rates were adjusted downward to account for soil/sediment ingestion. Total chemical doses were calculated by summing doses via the ingestion of food and soil with the following equation:

$$Dose_{total} = Dose_{food} + Dose_{soil}$$

where,

Dosetotal = the total amount of chemical ingested per day per kg body weight (mg chemical/kg body weight [wet] - day).

Exposure parameters for each indicator species are presented in Table 9-3. In addition to the other assumptions already discussed, exposure estimates (Tables 9-5 through 9-9) were calculated assuming the following conservative assumptions:

- Receptors are exposed to the maximum concentration of every chemical;
- Site use factor is 100%;
- Contaminant bioavailability is 100%;
- Minimum adult body weight is associated with maximum body weight ingestion rate; and
- 100% of diet is contaminated.

Methods used to estimate the concentrations of chemicals in food items are presented below.

Terrestrial Plants. Estimates of plant tissue concentrations were necessary for chemical ingestion modeling for dove and mouse. Tissue concentrations in plants were estimated by multiplying the maximum measured soil concentration for each chemical by a soil-to-plant BCF obtained from Bechtel Jacobs Company, Inc. (1998) (Table 9-4). BCFs (dry weight to dry weight) are arithmetic mean values. For chemicals without literature-based BCFs, a soil-to-plant BCF of 1.0 (dry weight to dry weight) was assumed.

Soil Invertebrates. Estimates of soil invertebrate tissue concentrations were necessary for chemical ingestion modeling for the robin and mouse. Tissue concentrations in invertebrates were estimated by multiplying the maximum measured soil concentration for each chemical by a soil-to-earthworm BAF obtained from the literature (Table 9-4). BAF values (dry weight to dry weight) obtained from Sample et al. (1998a) are central tendency values. For chemicals without literature-based BAFs, a soil-to-earthworm BAF of 1.0 (dry weight to dry weight) was assumed.

Small Mammals. Estimates of small mammal tissue concentrations were also necessary for chemical ingestion modeling for the hawk and red fox. Whole-body tissue concentrations in small mammals were estimated using literature-based soil-to-small mammal BAF (dry weight to dry weight) values (Table 9-4). The small mammal tissue concentration was obtained by multiplying the maximum measured soil concentration for each chemical by the soil-to-small mammal BAF obtained from the literature. BAF values (dry weight to dry weight) obtained from Sample et al. (1998b) are central tendency values for insectivores (or for general small mammals if insectivore values were unavailable). For chemicals without literature-based BAFs, a soil-to-small mammal BAF of 1.0 (dry weight to dry weight) was assumed.

9.5 Screening-Level Risk Estimation

Section 9.5 represents the conclusion of Step 2, where risk estimates (HQs) are reported. At the conclusion of Step 2, a determination is made that either the screening-level ERA is adequate to determine that ecological risks are negligible, or that additional information is required.

9.5.1 Selection of Preliminary Chemicals of Potential Concern (COPCs)

Preliminary COPCs were selected by comparing the chemical concentrations in soil to screening benchmarks (Table 9-10) and estimated exposure doses to reference toxicity values (Tables 9-11). This comparison was made by calculating Hazard Quotients (HQs) for each receptor group.

For soil invertebrates, HQs were calculated as follows:

$$HQ = \text{maximum soil concentration} / \text{soil benchmark}.$$

For receptor species used in trophic modeling, HQs were calculated as follows:

$$HQ = Dose_{total} / NOAEL.$$

An HQ of 10 would indicate that a receptor is exposed to a concentration that is ten times greater than a concentration known not to cause an effect, while an HQ of 1 would indicate that a receptor is exposed to a concentration that is known not to cause an effect. An HQ less than 1 indicates that the constituent is unlikely to cause adverse ecological effects (USEPA, 1997) and thus does not warrant further evaluation. Chemicals with HQs in excess of and equal to 1 were selected as preliminary COPCs (Tables 9-10 and 9-11). This group included chemicals which were not detected but still had maximum detection limits in excess of or equal to screening values, or estimated exposure doses in excess of or equal to NOAELs. Chemicals that could not be evaluated due to lack of a media-specific screening value or appropriate NOAEL were also selected as preliminary COPCs. Many of these chemicals were never detected at the site.

The comparison of chemical concentrations with soil benchmarks revealed that many chemicals exceeded their respective benchmarks and thus potentially pose a risk to soil invertebrates and/or plants (Table 9-10). However, most of the VOCs and SVOCs that exceeded benchmarks were not detected at the site; these compounds were retained based on a comparison of one-half the detection limit to the screening value.

The ingestion-based exposure evaluation revealed that the potential risk to upper trophic level receptors is limited to inorganic chemicals in site soils, with one exception (the white-footed mouse HQ for N-nitroso-di-n-propylamine was 1.7) (Table 9-11). Aluminum, lead, and mercury could not be ruled out from posing a potential risk to soil invertebrate eating, herbivorous and carnivorous birds, and omnivorous and carnivorous mammals, as the calculated exposure of these metals all exceeded their respective NOAELs. Several other metals pose a potential risk to one or more of the assessment endpoints.

9.5.2 Fate and Transport Mechanisms of the Preliminary COPCs

This section presents a brief overview of the fate and transport of preliminary COPCs in soils at Site 47. For a more detailed description of the fate and transport of selected representative chemicals, refer Section to 7, *Contaminant Fate and Tranpsort*).

Several VOCs were detected in soil at Site 47. VOCs generally degrade rapidly from soil and evaporate, for example, most of the carbon tetrachloride released to soil or surface water evaporates within a few days (Irwin et al., 1997a). A fraction of the carbon tetrachloride may remain bound to soil organic matter, but is expected to remain moderately mobile in most soils. The other VOCs detected in site soils can be expected to behave similarly.

Several SVOCs were detected in soil at Site 47. Most of the SVOCs detected were polynuclear aromatic hydrocarbons (PAHs). PAHs are ubiquitous in nature, being found in sediments, soil, air, surface waters, and plant and animal tissues, primarily as a result of natural processes, such as forest fires. PAHs degrade by photodegradation and microbial transformation. PAHs may also be metabolized by plants and animals (Eisler, 1997a).

Several inorganics were detected in soil at Site 47. Of these, mercury is the only inorganic which biomagnifies through the food chain. Mercury exposure could be important for the higher order predators at Site 47. The biological transformation of a variety of forms of mercury to methylmercury (the most harmful form) can take place in both terrestrial and aquatic environments (Olson and Cooper, 1977, and Rogers, 1976 *cited in* Heinz, 1996). Although they were detected at relatively low levels in Site 47 soil, other inorganics that will bioaccumulate include copper, cadmium, and zinc.

9.5.3 Mechanisms of Toxicity for the Preliminary COPCs

There is little tendency for the VOCs detected at the site to bioaccumulate, because of their low K_{ow} values. For example, carbon tetrachloride is readily metabolized and excreted by organisms, therefore little bioaccumulation occurs (Irwin et al., 1997a). However, these compounds can be toxic to organisms through direct contact and inhalation. Many of the chlorinated ethanes, especially those that are highly chlorinated, such as 1,1,1-trichloroethane, can be toxic (Irwin et al., 1997b).

The majority of the SVOCs detected at the site were PAHs. PAHs in soil can be toxic to invertebrates (Lotufo and Fleeger, 1996). PAHs can also bioaccumulate in invertebrates (Beyer and Stafford, 1993; Eisler, 1987a). Furthermore, some of the PAHs are very potent carcinogens and have been shown to cause tumors in invertebrates and plants. (Eisler, 1987a).

Several metals were identified as preliminary COPCs in Site 47 soils. Of these metals, aluminum, lead, mercury and zinc seem to pose the greatest risk, based on the magnitudes and frequencies of exceedance of soil screening benchmarks and toxicity values. The toxicity of metals in mammals is associated with the electrochemical character of the metals. Among the heavier metals, toxicity increases with electropositivity within each subgroup: Group IB (Au > Ag > Cu); Group IIB (Hg > Cd > Zn); and Group IIA (Tl > In > Ga > Al) (Luckey and Venugopal, 1977). Of the four metals mentioned above, mercury probably poses the greatest risk to ecological receptors because it is highly toxic and is known to bioaccumulate and biomagnify through foodchains. Furthermore, mercury is a mutagen, teratogen, and carcinogen (Eisler, 1987b).

9.6 Risk Conclusions

The assessment endpoints for the site were not met (i.e., the SERA indicates site-related chemicals may impact the growth, survival and/or reproduction of the receptor species and receptor communities). As such, the results of the SERA are not sufficient to show that risks to ecological receptor populations at Site 47 are negligible. For all the endpoints there were multiple chemicals that were associated with HQs in excess of 1 (Tables 9-10 and 9-11). HQs for mercury were greater than 100 for all endpoints, with the exception of the carnivorous terrestrial mammal (represented by red fox). In addition, there were chemicals that could not be fully evaluated due to the lack of a media-specific screening value and/or reference toxicity value.

Soil Invertebrates and Plants. HQs > 1 were calculated for VOCs, SVOCs, and inorganics. However, the majority of the VOCs with HQs >1 were compounds that were not detected at the site (6 out of 7 VOCs; retained based on a screen of one-half the detection limit against the screening value).

Soil Invertebrate-Eating Birds. HQs for several inorganics exceeded 1.

Herbivorous Birds. HQs for several inorganics exceeded 1.

Carnivorous Birds. HQs for aluminum, lead, and mercury exceeded 1.

Omnivorous Terrestrial Mammals. HQs for several inorganics exceeded 1 and the HQ for n-nitroso-di-n-propylamine, although it was not detected, was 1.67.

Carnivorous Terrestrial Mammals. HQs for several inorganics exceeded 1.

9.7 Uncertainties and Data Gaps

9.7.1 Uncertainties

The development of these measures of risk are based on a variety of assumptions regarding levels of exposure and toxicity. However, the SERA is designed to counter some of the associated uncertainty through the use of very conservative assumptions. Sources of exposure uncertainty include the representativeness of the analytical data collected for the assessment, the use of literature values to develop exposure estimates rather than site-

specific information (e.g., BAFs), and the assumption that all areas of the site are equally used by receptors.

Another source of exposure uncertainty is the use of literature values or default assumptions for exposure parameters rather than site-specific information. BAFs provide an example. Although BAFs for bioaccumulative metals were readily available and incorporated into the assessment, the use of a default BAF of 1 to estimate the concentration of other chemicals in receptor prey items is a source of uncertainty. However, for most of the chemicals analyzed for at the site, the assumption that the chemical body burden in the prey item is the same as the concentration in soil is conservative, particularly when many of the chemicals are known not to accumulate to any significant degree.

There is also uncertainty regarding the effects of site chemicals on receptor communities and species. Reference toxicity values for receptor species and communities were based on literature values for, in most cases, other species. The sensitivity of receptors at the site may be different than the sensitivity of species used in tests reported in the literature. In the absence of speciation analyses, assumptions must also be made about the equality of chemical form between laboratory tests and site conditions. This is a source of uncertainty since toxicity may vary with the form of the toxicant in the environment.

Another source of uncertainty is the extrapolation of NOAELs to LOAELs using an uncertainty factor of ten. This approach is likely conservative. Dourson and Stara (1983 *cited in* USEPA, 1997) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of five or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

9.7.2 Data Gaps

The site should be carried through the remainder of the 8-step process because the evaluation indicates there is a potential for site chemicals to pose a risk to ecological receptor populations. Therefore, the initial steps of a baseline ERA (BERA), Steps 3A and 3B, were conducted. The results of Step 3 were presented to the IHIRT separately in a technical memorandum (CH2M HILL, 2002).

In Step 3A, risk estimates are recalculated based on refined exposure assumptions, site-specific data, and/or detailed literature review. Step 3B is the problem formulation phase of the BERA. It involves an evaluation of the toxicity of site-related chemicals, and the refinement of the assessment endpoints and conceptual model developed in the SERA based on the results of the Step 3A evaluation. The result of Step 3A was a refined list of site COPCs. After Step 3A, the problem formulation was revised (Step 3B). The next step will be to prepare a BERA work plan for additional risk assessment investigation (Step 4). Additional work will likely include soil and sediment toxicity testing and additional sampling to fill remaining data gaps.

9.8 References

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TABLE 9-1
Reference Toxicity Values For Avian Receptors
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical [1]	Test Species	Body Weight (kg)	Exposure Route and Duration Class	Duration	System	Test RTV mg/kgbw - d	Test RTV Type	NOAEL [2] mg/kgbw - d	Source [3]
Semivolatile Organics									
1,2,4-Trichlorobenzene						NA		NA	
1,2-Dichlorobenzene [5]	northern bobwhite	0.157	oral gavage (sub-acute)	14 d	mortality and growth	250	NOAEL	250	Grimes and Jaber, 1989
1,3-Dichlorobenzene [5]	northern bobwhite	0.157	oral gavage (sub-acute)	14 d	mortality and growth	250	NOAEL	250	Grimes and Jaber, 1989
1,4-Dichlorobenzene	northern bobwhite	0.157	oral gavage (sub-acute)	14 d	mortality and growth	250	NOAEL	250	Grimes and Jaber, 1989
2,2'-oxybis(1-Chloropropane)						NA		NA	
2,4,5-Trichlorophenol						NA		NA	
2,4,6-Trichlorophenol						NA		NA	
2,4-Dichlorophenol						NA		NA	
2,4-Dimethylphenol						NA		NA	
2,4-Dinitrophenol						NA		NA	
2,4-Dinitrotoluene						NA		NA	
2,6-Dinitrotoluene						NA		NA	
2-Chloronaphthalene						NA		NA	
2-Chlorophenol						NA		NA	
2-Methylnaphthalene						NA		NA	
2-Methylphenol						NA		NA	
2-Nitroaniline						NA		NA	
2-Nitrophenol						NA		NA	
3,3'-Dichlorobenzidine						NA		NA	
3-Nitroaniline						NA		NA	
4,6-Dinitro-2-methylphenol						NA		NA	
4-Bromophenyl-phenylether						NA		NA	
4-Chloro-3-methylphenol						NA		NA	
4-Chloroaniline						NA		NA	
4-Chlorophenyl-phenylether						NA		NA	
4-Methylphenol						NA		NA	
4-Nitroaniline						NA		NA	
4-Nitrophenol	northern bobwhite	0.157	oral gavage (sub-acute)	14 d	mortality	577	LD50	5.77	EPA TERRETOX, 1998 - accession #1040269
Acenaphthene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Acenaphthylene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Anthracene	mallard	1.043	oral in diet (chronic)	7 months	increased liver weight and blood flow to liver	228	LOAEL	22.8	Patton and Dieter, 1980
Benzo(a)anthracene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Benzo(a)pyrene	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Benzo(b)fluoranthene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Benzo(g,h,i)perylene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Benzo(k)fluoranthene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
bis(2-Chloroethoxy)methane						NA		NA	
bis(2-Chloroethyl)ether						NA		NA	
bis-(2-Ethylhexyl)phthalate	ringed dove	0.16	oral in diet (chronic)	4 wk	reproductive	10.0	NOAEL	10.0	Sample et al., 1996
Butylbenzylphthalate						NA		NA	
Carbazole						NA		NA	
Chrysene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Di-n-butylphthalate	ringed dove	0.16	oral in diet (chronic)	4 wk	reproductive	1.1	LOAEL	0.11	Sample et al., 1996
Di-n-octyl phthalate	ring-necked pheasant	1	oral in diet (subacute)	8 d	mortality	290	NOAEL	290	Hill et al., 1975
Dibenz(a,h)anthracene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Dibenzofuran						NA		NA	
Diethylphthalate						NA		NA	
Dimethylphthalate						NA		NA	
Fluoranthene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Fluorene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Hexachlorobenzene						NA		NA	
Hexachlorobutadiene						NA		NA	
Hexachlorocyclopentadiene						NA		NA	
Hexachloroethane						NA		NA	
Indeno(1,2,3-cd)pyrene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Isophorone						NA		NA	
N-Nitroso-di-n-propylamine						NA		NA	
N-nitrosodiphenylamine						NA		NA	
Naphthalene	mallard	1.04	oral in diet (chronic)	7 months	increased liver weight and blood flow to liver	228	LOAEL	22.8	Patton and Dieter, 1980
Nitrobenzene						NA		NA	

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Indian Head, Maryland

Chemical [1]	Test Species	Body Weight (kg)	Exposure Route and Duration Class	Duration	System	Test RTV mg/kgbw - d	Test RTV Type	NOAEL [2] mg/kgbw - d	Source [3]
Pentachlorophenol	northern bobwhite	0.16	oral in geletin capsule (acute)	14 d	mortality, growth, and feed consumption	175	NOAEL	175	Campbell and Jaber, 1993
Phenanthrene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Phenol						NA		NA	
Pyrene [6]	white leghorn chicken	1.5	oral in diet (subchronic)	34 d	fertility and malformations	39.5	NOAEL	39.5	Rigdon and Neal, 1963
Metals									
Aluminum (Aluminum sulfate)	ringed dove	0.16	oral in diet (chronic)	4 months	reproductive	109.7	NOAEL	109.7	Sample et al., 1996
Antimony						NA		NA	
Arsenic (Sodium arsenite)	mallard	1.00	oral in diet (chronic)	128 d	mortality	5.14	NOAEL	5.14	Sample et al., 1996
Barium (Barium hydroxide)	1-day old chickens	0.121	oral in diet (subchronic)	4 wk	mortality	208	NOAEL	208	Sample et al., 1996
Beryllium (Beryllium sulfate)						NA		NA	
Cadmium (Cadmium chloride)	mallard	1.15	oral in diet (chronic)	90 d	reproductive	1.5	NOAEL	1.5	Sample et al., 1996
Calcium						NA		NA	
Chromium (3+ as Chromic potassium sulfate)	black duck	1.25	oral in diet (chronic)	10 months	reproductive	1.0	NOAEL	1.0	Sample et al., 1996
Cobalt	broiler chicken	1.80	oral in food (subacute)	14 d	weight gain (growth)	1.47	NOAEL	1.47	Diaz et al., 1994
Copper (Copper oxide)	1-day old chickens	0.5	oral in diet (chronic)	10 wk	mortality	47.0	NOAEL	47.0	Sample et al., 1996
Cyanide (Potasium cyanide)						NA		NA	
Iron (Ferrous sulfate)						NA		NA	
Lead (Lead acetate)	Japanese quail	0.15	oral in diet (chronic)	12 wk	reproductive	1.1	NOAEL	1.1	Sample et al., 1996
Magnsium						NA		NA	
Manganese (Manganese oxide)	1-day old J. quail	0.072	oral in diet (chronic)	75 d	growth	977	NOAEL	977	Sample et al., 1996
Mercury (Methyl mercury dicyandiamide)	mallard	1	oral in diet (chronic)	3 gen	reproductive	0.064	LOAEL	0.0064	Sample et al., 1996
Nickel (Nickel sulfate)	mallard	0.782	oral in diet (chronic)	90 d	mortality	77.4	NOAEL	77.4	Sample et al., 1996
Potasium						NA		NA	
Selenium (Selanomethionine)	mallard	1	oral in diet (chronic)	100 d	reproductive	0.4	NOAEL	0.4	Sample et al., 1996
Silver						NA		NA	
Sodium						NA		NA	
Thallium (Thallium sulfate)						NA		NA	
Vanadium (Vanadyl sulfate)	mallard	1.17	oral in diet (chronic)	12 wk	mortality	11.4	NOAEL	11.4	Sample et al., 1996
Zinc (Zinc sulfate)	white leg-horn	1.935	oral in diet (chronic)	44 wk	reproductive	14.5	NOAEL	14.5	Sample et al., 1996
Explosives									
1,3,5-Trinitrobenzene						NA		NA	
1,3-Dinitrobenzene						NA		NA	
2,4,6-Trinitrotoluene						NA		NA	
2,4-Dinitrotoluene						NA		NA	
2,6-Dinitrotoluene						NA		NA	
2-Amino-4,6-dinitrotoluene						NA		NA	
2-Nitrotoluene						NA		NA	
3-Nitrotoluene						NA		NA	
4-amino-2,6-dinitrotoluene						NA		NA	
4-Nitrotoluene						NA		NA	
HMX						NA		NA	
Nitrobenzene						NA		NA	
RDX						NA		NA	
Tetryl						NA		NA	
Nitroguanidine						NA		NA	
Pentaerythritol tetranitrate						NA		NA	
Nitrocellulose						NA		NA	
Nitroglycerine						NA		NA	

Notes:

NA - Not Available

d - day; wk - week; gen - generations

UF - Uncertainty Factor

RTV - Reference Toxicity Value

NOAEL - No Observed Adverse Effect Level

LOAEL - Lowest Observed Adverse Effect Level

LC/LD50 - Concentration / dose that is lethal to 50% of the test population.

1 Chemical included in the chemical analysis program for the site and, if applicable, the compound used in toxicological testing.

2 LOAELs were divided by a UF of 10 to obtain NOAELs. LD_{50} values were divided by a UF of 100 to obtain NOAELs.

3 Some documents cited are review documents (i.e., secondary sources). Citations for primary sources may be obtained from these documents.

4 Data for 1,2-dichloroethane used for 1,1-dichloroethane.

5 Data for 1,4-dichlorobenzene used for 1,2- and 1,3-dichlorobenzene.

6. Data for benzo(a)pyrene.

TABLE 9-2
Reference Toxicity Values For Mammals
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IHDIV-NSWC
Indian Head, Maryland

Chemical [1]	Test Species	Body Weight (kg) [2]	Exposure Route and Duration Class	Duration	System	Test RTV mg/kg bw - d [5]	Test RTV Type	NOAEL [6] mg/kg bw - d [5]	Source [7]
Semivolatile Organics									
1,2,4-Trichlorobenzene [8]	rat	0.35	oral in water (chronic)	3 gen	adrenal gland weight	8	NOAEL	8	Robinson et al., 1981
1,2-Dichlorobenzene						NA		NA	
1,3-Dichlorobenzene						NA		NA	
1,4-Dichlorobenzene	rat	0.35	NA	NA	NA	250.0	NOAEL	250.0	Giavini et al., 1985
2,2'-oxybis(1-Chloropropane)						NA		NA	
2,4,5-Trichlorophenol [9]	rat	0.35	oral in food (chronic)	98 d	hepatic and renal	80	NOAEL	80	McCollister et al., 1961
2,4,6-Trichlorophenol [10]	rat	0.35	oral in food (chronic)	98 d	hepatic and renal	80	NOAEL	80	McCollister et al., 1961
2,4-Dichlorophenol	rat	0.35	oral in diet (chronic)	103 wk	reproductive	440.0	NOAEL	440.0	NTP, 1989
2,4-Dimethylphenol	mouse	0.03	oral gavage (chronic)	90 d	CNS and blood	50.0	NOAEL	50.0	HEAST, 1995
2,4-Dinitrophenol	rat	0.35	oral in diet (chronic)	26 wk	reproductive	50.0	NOAEL	50.0	Sample et al., 1996
2,4-Dinitrotoluene	rat	0.35	oral in diet (chronic)	104 wk	reproductive	3.9	NOAEL	3.9	Sample et al., 1996
2,6-Dinitrotoluene	rat	0.35	oral in diet (chronic)	13 wk	reproductive	7.0	NOAEL	7.0	Sample et al., 1996
2-Chloronaphthalene						NA		NA	
2-Chlorophenol [11]	rat	0.35	oral in water (chronic)	10 wk	reproductive	4.0	NOAEL	4.0	Exon and Keller, 1982
2-Methylnaphthalene	mouse	0.03	oral in food (chronic)	81 wk	systemic	143.7	NOAEL	143.7	ATSDR, 1995a
2-Methylphenol						NA		NA	
2-Nitroaniline						NA		NA	
2-Nitrophenol						NA		NA	
3,3'-Dichlorobenzidine						NA		NA	
3-Nitroaniline						NA		NA	
4,6-Dinitro-2-methylphenol						NA		NA	
4-Bromophenyl-phenylether						NA		NA	
4-Chloro-3-methylphenol						NA		NA	
4-Chloroaniline						NA		NA	
4-Chlorophenyl-phenylether						NA		NA	
4-Methylphenol						NA		NA	
4-Nitroaniline						NA		NA	
4-Nitrophenol	mouse	0.03	oral gavage (acute)	3 d	mortality	1250	LD50	13	Schafer and Bowles, 1985
Acenaphthene	mouse	0.03	oral gavage (intermediate)	13 wk	reproductive	350	NOAEL	350	ATSDR, 1995b
Acenaphthylene [4]	mouse	0.03	oral in food (intermediate)	19-29 days	reproductive	133.3	NOAEL	133.3	ATSDR, 1995b
Anthracene	mouse	0.03	oral gavage (intermediate)	13 wk	reproductive	1000	NOAEL	1000	ATSDR, 1995b
Benzo(a)anthracene [3]	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.30	NOAEL	1.30	ATSDR, 1995b
Benzo(a)pyrene	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.30	NOAEL	1.30	ATSDR, 1995b
Benzo(b)fluoranthene [3]	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.30	NOAEL	1.30	ATSDR, 1995b
Benzo(g,h,i)perylene [4]	mouse	0.03	oral in food (intermediate)	19-29 days	reproductive	133.3	NOAEL	133.3	ATSDR, 1995b
Benzo(k)fluoranthene [3]	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.30	NOAEL	1.30	ATSDR, 1995b
bis(2-Chloroethoxy)methane						NA		NA	
bis(2-Chloroethyl)ether	rat	0.35	oral in diet (chronic)	78 wk	body weight	25.0	LOAEL	2.5	Sample et al., 1996
bis-(2-Ethylhexyl)phthalate	mouse	0.03	oral in diet (chronic)	105 days	reproductive	18.3	NOAEL	18.3	Sample et al., 1996
Butylbenzylphthalate	rat	0.35	oral in diet (chronic)	2 years	hepatic	240.0	NOAEL	240.0	NTP, 1997
Carbazole [4]	mouse	0.03	oral in food (intermediate)	19-29 days	reproductive	133.3	NOAEL	133.3	ATSDR, 1995b
Chrysene [3]	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.3	NOAEL	1.3	ATSDR, 1995b
Di-n-butylphthalate	mouse	0.03	oral in food (chronic)	105 days	reproductive	550.0	NOAEL	550.0	Sample et al., 1996
Di-n-octyl phthalate	mouse	0.03	oral in food (chronic)	105 days	reproductive	550.0	LOAEL	55.0	Sample et al., 1996
Dibenz(a,h)anthracene [3]	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.3	NOAEL	1.3	ATSDR, 1995b
Dibenzofuran [4]	mouse	0.03	oral in food (intermediate)	19-29 days	reproductive	133.3	NOAEL	133.3	ATSDR, 1995b
Diethylphthalate	mouse	0.03	oral in food (chronic)	105 days	reproductive	4583	NOAEL	4583	Sample et al., 1996
Dimethyl phthalate						NA		NA	
Fluoranthene	mouse	0.03	oral gavage (intermediate)	13 wk	hepatic	125.0	NOAEL	125.0	ATSDR, 1995b
Fluorene	mouse	0.03	oral gavage (intermediate)	13 wk	hematological	125.0	NOAEL	125.0	ATSDR, 1995b
Hexachlorobenzene						NA		NA	
Hexachlorobutadiene	mouse	0.035	oral in diet (chronic)	13 wk	reproductive	19.0	NOAEL	19.0	Sample et al., 1996
Hexachlorocyclopentadiene						NA		NA	
Hexachloroethane						NA		NA	
Indeno(1,2,3-cd)pyrene [3]	mouse	0.03	oral in food (intermediate)	30-197 days	cancer	1.3	NOAEL	1.3	ATSDR, 1995b
Isophorone	rat	0.35	oral gavage (intermediate)	103 wk	renal	250.0	LOAEL	25.0	Sample et al., 1996
N-Nitroso-di-n-propylamine	rat	0.35	oral in diet (chronic)	30 wk	hepatic	0.630	LOAEL	0.063	Sample et al., 1996
N-nitrosodiphenylamine	rat	0.35	oral in food (intermediate)	8-11 wk	systemic	150.0	NOAEL	150.0	ATSDR, 1993
Naphthalene	mouse	0.03	oral gavage (intermediate)	13 wk	reproductive	140.0	NOAEL	140.0	ATSDR, 1995a
Nitrobenzene						NA		NA	
Pentachlorophenol	rat	0.35	oral in diet (chronic)	77 days	reproductive	0.24	NOAEL	0.24	Sample et al., 1996
Phenanthrene [4]	mouse	0.03	oral in food (intermediate)	19-29 days	reproductive	133.3	NOAEL	133.3	ATSDR, 1995b
Phenol	mouse	0.03	oral in water gavage (chronic)	d 6-15 gestation	reproductive	60.0	NOAEL	60.0	NTP, 1983
Pyrene [4]	mouse	0.03	oral in food (intermediate)	19-29 days	reproductive	133.3	NOAEL	133.3	ATSDR, 1995b
Metals									
Aluminum (Aluminum chloride)	mouse	0.03	oral in water (chronic)	3 gen	reproductive	19.3	LOAEL	1.93	Sample et al., 1996
Antimony (Antimony potassium tartrate)	mouse	0.03	oral in water (chronic)	lifetime, >1 year	lifespan	1.25	LOAEL	0.125	Sample et al., 1996
Arsenic (Arsenite)	mouse	0.03	oral in water (chronic)	3 gen	reproductive	1.26	LOAEL	0.126	Sample et al., 1996
Barium (Barium chloride)	rat	0.435	oral in water (chronic)	16 months	growth	5.1	NOAEL	5.1	Sample et al., 1996
Beryllium (Beryllium sulfate)	rat	0.35	oral in water (chronic)	lifetime, >1 year	longevity	0.66	NOAEL	0.66	Sample et al., 1996

TABLE 9-2
Reference Toxicity Values For Mammals
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Chemical [1]	Test Species	Body Weight (kg) [2]	Exposure Route and Duration Class	Duration	System	Test RTV mg/kg bw - d [5]	Test RTV Type	NOAEL [6] mg/kg bw - d [5]	Source [7]
Cadmium (Cadmium chloride)	rat	0.30	oral gavage (chronic)	6 weeks	reproductive	1.0	NOAEL	1.0	Sample et al., 1996
Calcium						NA		NA	
Chromium (Cr VI)	rat	0.35	oral in water (subchronic)	3 months	mortality	131.4	LOAEL	13.1	Sample et al., 1996
Cobalt	rat	0.35	oral in food (intermediate)	69 d	reproductive	5	NOAEL	5	ATSDR, 1992b
Copper (Copper sulfate)	mink	1.0	oral in diet (chronic)	357 d	reproductive	11.7	NOAEL	11.7	Sample et al., 1996
Cyanide (Potasium cyanide)	rat	0.3	oral in diet (chronic)	gestation	reproductive	68.7	NOAEL	68.7	Sample et al., 1996
Iron (Ferrous sulfate)	rat	0.35	oral (acute)	1 time	mortality	319	LD50	3.19	USEPA, 1984
Lead (Lead acetate)	rat	0.35	oral in diet (chronic)	3 gen	reproductive	8.0	NOAEL	8.0	Sample et al., 1996
Magnesium						NA		NA	
Manganese (Manganese oxide)	rat	0.35	oral in diet (chronic)	224 d	reproductive	88	NOAEL	88	Sample et al., 1996
Mercury (Methyl mercury chloride)	rat	0.35	oral in diet (chronic)	3 gen	reproductive	0.032	NOAEL	0.032	Sample et al., 1996
Nickel (Nickel sulfate hexahydrate)	rat	0.35	oral in diet (chronic)	3 gen	reproductive	40	NOAEL	40	Sample et al., 1996
Potasium						NA		NA	
Selenium (Selanate)	rat	0.35	oral in water (chronic)	1 year	reproductive	0.2	NOAEL	0.2	Sample et al., 1996
Silver	rat	0.35	oral in water (acute)	2 wk	mortality	181.2	NOAEL	181.2	ATSDR, 1990
Sodium						NA		NA	
Thallium (Thallium sulfate)	rat	0.37	oral in water (subchronic)	60 d	reproductive	0.74	LOAEL	0.074	Sample et al., 1996
Vanadium (Sodium metavanadate)	rat	0.26	oral intubation (chronic)	60 d +	reproductive	2.1	LOAEL	0.21	Sample et al., 1996
Zinc (Zinc oxide)	rat	0.35	oral in diet (chronic)	d 1-16 of gestation	reproductive	160	NOAEL	160	Sample et al., 1996
Explosives (ug/kg)									
1,3,5-Trinitrobenzene						NA		NA	
1,3-Dinitrobenzene						NA		NA	
2,4,6-Trinitrotoluene						NA		NA	
2,4-Dinitrotoluene	dog	12.7	oral in capsule (chronic)	up to 24 months	CNS and biliary	0.2	NOAEL	0.2	MRI, 1979
2,6-Dinitrotoluene						NA		NA	
2-Amino-4,6-dinitrotoluene						NA		NA	
2-Nitrotoluene						NA		NA	
3-Nitrotoluene						NA		NA	
4-amino-2,6-dinitrotoluene						NA		NA	
4-Nitrotoluene						NA		NA	
HMX						NA		NA	
Nitrobenzene						NA		NA	
RDX						NA		NA	
Tetryl						NA		NA	
Nitroguanidine						NA		NA	
Pentaerythritol tetranitrate						NA		NA	
Nitrocellulose						NA		NA	
Nitroglycerine						NA		NA	

Notes:

NA - Not Available
d - day
wk - week
gen - generations
UF - Uncertainty Factor
RTV - Reference Toxicity Value
NOAEL - No Observed Adverse Effect Level
LOAEL - Lowest Observed Adverse Effect Level
LC/LD50 - Concentration / dose that is lethal to 50% of the test population.

[1] Contaminant included in the chemical analysis program for the site and, if applicable, the compound used in toxicological testing.

[2] Mouse and rat body weights of 0.030 and 0.350 kg based on USEPA (1985b *cited in* Sample *et al*., 1996); other body weights are actual body weights of animals used in test

[3] Lowest carcinogenic LOAEL from PAH toxicological data summarized in ATSDR, 1995b; test used benzo(a)pyrene. USEPA has classified benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, chrysene, and indeno(1,2,3-cd)pyrene as carcinogens (ATSDR, 1995b).

[4] Lowest non-carcinogenic NOAEL from PAH toxicological data summarized in ATSDR (1995b); test used benzo(a)pyrene. USEPA has indicated that acenaphthylene, anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, phenanthrene and pyrene are not classifiable as carcinogens (ATSDR, 1995b). Carbazole and dibenzofuran were included in this group for the development of HQs.

[5] RTVs for studies in which dose was administered five times per week were multiplied for a factor of 0.7.

[6] LOAELs were divided by a UF of 10 to obtain NOAELs. LD_{50}s were divided by a UF of 100 to obtain NOAELs.

[7] Some documents cited are review documents (i.e., secondary sources). Citations for primary sources may be obtained from these documents.

[8] Test RTV based on food concentration of 100 mg/kg. Food ingestion rate of 0.08 kg/kg-day used to convert the food concentration to dose (mg/kg bw - day).

[9] Test RTV based on food concentration of 1,000 mg/kg. Food ingestion rate fo 0.08 kg/kg-day used to convert to dose (mg/kg bw-day).

[10] Data for 2,4,5-trichlorophenol used for 2,4,6-trichlorophenol.

[11] Test RTV based on food concentration of 50 mg/kg. Food ingestion rate of 0.08 kg/kg-day used to convert to dose (mg/kg bw-day).

TABLE 9-3
Summary of Life History Information for Indicator Species [a]
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Common Name	**Body Weight Range**	**Food Ingestion Rate Range**	**Maximum Food Ingestion Rate**	**Food Moisture Content**	**Maximum Food Ingestion Rate**	**Soil in Diet**	**Maximum Soil Ingestion Rate**	**Adjusted Maximum Food Ingestion Rate** [l]	**Composition of Food in Diet**
	kg wet	*kg food wet / kg bw wet*	*kg wet / day*	*%*	*kg dry / day*	*% dry*	*kg dry / day*	*kg dry / day*	*%*
American Robin	0.0773 - 0.0862	0.89 - 1.52	0.12 [m]	71 (i)	0.035	10.4 [c]	0.00364	0.0314	100% invertebrates
Mourning Dove	0.100 - 0.170 [k]	na	na	na	0.0184 [h]	5.0 [d]	0.00065	0.0124	100% plants [g]
Red-tailed Hawk	0.957 - 1.235	na	0.136 - 0.4 [e]	68 (j)	0.13	2.8 [n]	0.00364	0.1264	100% small mammals
White-footed Mouse	0.017 - 0.030 [f]	na	na	na	0.0038 [b]	2.0 [c]	0.00008	0.0037	60% invertebrates, 40% plants
Red Fox	3.2 - 5.25	0.069 - 0.16	0.51 [m]	68 (j)	0.16	2.8 [c]	0.00448	0.1555	100% small mammals

Notes:
na - not available/not applicable
a. Unless note, information was obtained from USEPA, 1993.
b. Calculated using food ingestion rate equation for mammals of rate = 0.0687(bw)^0.822 (Nagy, 1987) and the maximum body weight in kg.
c. Percentage from Beyer et al. (1994). Value for woodcock used for robin.
d. Five percent conservatively assumed.
e. Kirkwood (1980)
f. Jones and Birney (1988)
g. Martin et al. (1961)
h. Calculated using food ingestion rate equation for birds of rate = 0.0582(bw)^0.651 (Nagy, 1987) and the maximum body weight in kg.
i. Average of values presented for invertebrates.
j. Average value presented for mice, voles, and rabbits.
k. Mirarchi and Baskett (1994)
l. Calculated by subtracting the maximum soil ingestion rate from the maximum food ingestion rate.
m. Calculated by multiplying the minimum of the body weight range by the maximum of the food ingestion rate range.
n. Value for red fox used. Hawk exposure to soil assumed to be no greater than for fox.

TABLE 9-4
Bioaccumulation Factors for Foodchain Exposure Modeling
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Analyte	Terrestrial Plants	Invertebrates	Small Mammals	Source
TAL Metals (mg/kg)				
Aluminum	1	1	1	NA
Antimony	1	1	1	NA
Arsenic	0.454	0.329	0.0063	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)
Barium	1	1	0.0696	Sample et al., 1998 (mammals)
Beryllium	1	1	1	NA
Cadmium	1.359	2.822	1.9902	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)
Calcium	1	1	1	NA
Chromium	1	1.15	0.1382	Sample et al., 1998a (invertebrates/mammals)
Cobalt	1	1	0.0371	Sample et al., 1998b (mammals)
Copper	0.341	2.424	0.42	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)
Cyanide	1	1	1	NA
Iron	1	1	0.0137	Sample et al., 1998b (mammals)
Lead	0.245	0.276	0.1615	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)
Magnesium	1	1	1	NA
Manganese	1	1	1	NA
Mercury	1.481	1.422	0.1244	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)
Nickel	0.75	0.857	0.2799	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)
Potassium	1	1	1	NA
Selenium	1	1	1	NA
Silver	1	1	1	NA
Sodium	1	1	1	NA
Thallium	1	1	0.1124	Sample et al., 1998b (mammals)
Vanadium	1	1	1	NA
Zinc	1.021	3.092	1.3352	Sample et al., 1998a;b (invertebrates/mammals); Bechtel Jacobs, 1998 (plants)

Notes:
NA = Not Available
BAF or BCF of 1.0 used when there was no value available.
(BAF / BCF of 1.0 was used for all organic and explosive chemicals)

TABLE 9-5
Foodweb Exposure Estimates for American Robin
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IHDIV-NSWC
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American Robin
(Conservative Inputs)

Body Weight	0.0773 kg
Food Ingestion Rate	0.0314 kg-dry/day
Soil Ingestion Rate	0.0036 kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Invertebrate BAF	Invertebrate Concentration (mg/kg)	Dose (mg/kg-bw/day)	NOAEL (mg/kg-bw/day)	NOAEL HQ_n
SVOCs						
1,2,4-Trichlorobenzene	0.470	1.000	0.470	0.213	NA	--
1,2-Dichlorobenzene	0.470	1.000	0.470	0.213	250	0.001
1,3-Dichlorobenzene	0.470	1.000	0.470	0.213	250	0.001
1,4-Dichlorobenzene	0.470	1.000	0.470	0.213	250	0.001
2,2'-oxybis(1-Chloropropane)	0.470	1.000	0.470	0.213	NA	--
2,4,5-Trichlorophenol	1.200	1.000	1.200	0.543	NA	--
2,4,6-Trichlorophenol	0.470	1.000	0.470	0.213	NA	--
2,4-Dichlorophenol	0.470	1.000	0.470	0.213	NA	--
2,4-Dimethylphenol	0.470	1.000	0.470	0.213	NA	--
2,4-Dinitrophenol	1.200	1.000	1.200	0.543	NA	--
2,4-Dinitrotoluene	0.440	1.000	0.440	0.199	NA	--
2,6-Dinitrotoluene	0.250	1.000	0.250	0.113	NA	--
2-Chloronaphthalene	0.470	1.000	0.470	0.213	NA	--
2-Chlorophenol	0.470	1.000	0.470	0.213	NA	--
2-Methylnaphthalene	0.120	1.000	0.120	0.054	NA	--
2-Methylphenol	0.470	1.000	0.470	0.213	NA	--
2-Nitroaniline	1.200	1.000	1.200	0.543	NA	--
2-Nitrophenol	0.470	1.000	0.470	0.213	NA	--
3,3'-Dichlorobenzidine	0.470	1.000	0.470	0.213	NA	--
3-Nitroaniline	1.200	1.000	1.200	0.543	NA	--
4,6-Dinitro-2-methylphenol	1.200	1.000	1.200	0.543	NA	--
4-Bromophenyl-phenylether	0.470	1.000	0.470	0.213	NA	--
4-Chloro-3-methylphenol	0.470	1.000	0.470	0.213	NA	--
4-Chloroaniline	0.470	1.000	0.470	0.213	NA	--
4-Chlorophenyl-phenylether	0.470	1.000	0.470	0.213	NA	--
4-Methylphenol	0.470	1.000	0.470	0.213	NA	--
4-Nitroaniline	1.200	1.000	1.200	0.543	NA	--
4-Nitrophenol	1.200	1.000	1.200	0.543	5.77	0.094
Acenaphthene	0.480	1.000	0.480	0.217	39.5	0.006
Acenaphthylene	0.180	1.000	0.180	0.082	39.5	0.002
Anthracene	0.750	1.000	0.750	0.340	22.8	0.015
Benzo(a)anthracene	2.200	1.000	2.200	0.996	39.5	0.025
Benzo(a)pyrene	1.900	1.000	1.900	0.860	39.5	0.022
Benzo(b)fluoranthene	4.600	1.000	4.600	2.083	39.5	0.053
Benzo(g,h,i)perylene	2.800	1.000	2.800	1.268	39.5	0.032
Benzo(k)fluoranthene	1.200	1.000	1.200	0.543	39.5	0.014
bis(2-Chloroethoxy)methane	0.470	1.000	0.470	0.213	NA	--
bis(2-Chloroethyl)ether	0.470	1.000	0.470	0.213	NA	--
bis-(2-Ethylhexyl)phthalate	0.470	1.000	0.470	0.213	10	0.021
Butylbenzylphthalate	0.470	1.000	0.470	0.213	NA	--
Carbazole	0.450	1.000	0.450	0.204	NA	--
Chrysene	2.100	1.000	2.100	0.951	39.5	0.024
Di-n-butylphthalate	0.120	1.000	0.120	0.054	0.11	0.494
Di-n-octyl phthalate	0.470	1.000	0.470	0.213	290	0.001
Dibenz(a,h)anthracene	0.850	1.000	0.850	0.385	39.5	0.010
Dibenzofuran	0.350	1.000	0.350	0.158	NA	--
Diethylphthalate	0.082	1.000	0.082	0.037	NA	--
Dimethyl phthalate	0.100	1.000	0.100	0.045	NA	--
Fluoranthene	2.300	1.000	2.300	1.041	39.5	0.026
Fluorene	0.530	1.000	0.530	0.240	39.5	0.006
Hexachlorobenzene	0.470	1.000	0.470	0.213	NA	--
Hexachlorobutadiene	0.710	1.000	0.710	0.321	NA	--
Hexachlorocyclopentadiene	0.470	1.000	0.470	0.213	NA	--
Hexachloroethane	0.048	1.000	0.048	0.022	NA	--
Indeno(1,2,3-cd)pyrene	2.600	1.000	2.600	1.177	39.5	0.030
Isophorone	0.470	1.000	0.470	0.213	NA	--
N-Nitroso-di-n-propylamine	0.470	1.000	0.470	0.213	NA	--
N-Nitrosodiphenylamine	0.470	1.000	0.470	0.213	NA	--
Naphthalene	0.110	1.000	0.110	0.050	22.8	0.002
Nitrobenzene	0.440	1.000	0.440	0.199	NA	--
Pentachlorophenol	0.180	1.000	0.180	0.082	175	0.000

TABLE 9-5
Foodweb Exposure Estimates for American Robin
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

American Robin
(Conservative Inputs)

Body Weight	0.0773 kg
Food Ingestion Rate	0.0314 kg-dry/day
Soil Ingestion Rate	0.0036 kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Invertebrate BAF	Invertebrate Concentration (mg/kg)	Dose (mg/kg-bw/day)	NOAEL (mg/kg-bw/day)	NOAEL HQ_n
Phenanthrene	2.400	1.000	2.400	1.087	39.5	0.028
Phenol	0.470	1.000	0.470	0.213	NA	--
Pyrene	3.200	1.000	3.200	1.449	39.5	0.037
					#REF!	
TAL Metals						
Aluminum	22800.0	1.00	22800.0	10323.4	109.7	94.11
Antimony	1.1	1.00	1.1	0.5	NA	--
Arsenic	7.4	0.33	2.4	1.3	5.14	0.26
Barium	91.7	1.00	91.7	41.5	208	0.20
Beryllium	0.6	1.00	0.6	0.3	NA	--
Cadmium	4.6	2.82	13.0	5.5	1.45	3.78
Calcium	6000.0	1.00	6000.0	2716.7	NA	--
Chromium	40.7	1.15	46.8	20.9	1	20.90
Cobalt	6.5	1.00	6.5	2.9	1.4664	2.01
Copper	113.0	2.42	273.9	116.4	47	2.48
Cyanide	0.3	1.00	0.3	0.2	NA	--
Iron	36000.0	1.00	36000.0	16300.1	NA	--
Lead	1310.0	0.28	361.6	208.4	1.13	184.40
Magnesium	2030.0	1.00	2030.0	919.1	NA	--
Manganese	418.0	1.00	418.0	189.3	977	0.19
Mercury	47.4	1.42	67.4	29.6	0.0064	4621.38
Nickel	22.1	0.86	18.9	8.7	77.4	0.11
Potassium	1370.0	1.00	1370.0	620.3	NA	--
Selenium	1.3	1.00	1.3	0.6	0.4	1.47
Silver	814.0	1.00	814.0	368.6	NA	--
Sodium	275.0	1.00	275.0	124.5	NA	--
Thallium	1.0	1.00	1.0	0.5	NA	--
Vanadium	55.1	1.00	55.1	24.9	11.4	2.19
Zinc	762.0	3.09	2356.1	991.7	14.5	68.40
Explosives						
1,3,5-Trinitrobenzene	0.250	1.00	0.3	0.1	NA	--
1,3-Dinitrobenzene	0.250	1.00	0.3	0.1	NA	--
2,4,6-Trinitrotoluene	0.250	1.00	0.3	0.1	NA	--
2,4-Dinitrotoluene	0.250	1.00	0.3	0.1	NA	--
2,6-Dinitrotoluene	0.250	1.00	0.3	0.1	NA	--
2-Amino-4,6-dinitrotoluene	0.250	1.00	0.3	0.1	NA	--
2-Nitrotoluene	0.500	1.00	0.5	0.2	NA	--
3-Nitrotoluene	0.500	1.00	0.5	0.2	NA	--
4-amino-2,6-dinitrotoluene	0.250	1.00	0.3	0.1	NA	--
4-Nitrotoluene	0.500	1.00	0.5	0.2	NA	--
HMX	0.500	1.00	0.5	0.2	NA	--
Nitrobenzene	0.440	1.00	0.4	0.2	NA	--
RDX	0.500	1.00	0.5	0.2	NA	--
Tetryl	0.500	1.00	0.5	0.2	NA	--
Nitroguanidine	0.120	1.00	0.1	0.1	NA	--
Pentaerythritol tetranitrate	0.250	1.00	0.3	0.1	NA	--
Nitrocellulose (mg/kg)	58.600	1.00	58.6	26.5	NA	--
Nitroglycerine (ug/kg)	23.000	1.00	23.0	10.4	NA	--

NA- not available
Cells with HQ>1 are shaded

TABLE 9-6
Foodweb Exposure Estimates for Mourning Dove
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Mourning Dove
(Conservative Inputs)

Body Weight	0.100	kg
Food Ingestion Rate	0.0124	kg-dry/day
Soil Ingestion Rate	0.00065	kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Vegetation BAF	Vegetation Concentration (mg/kg)	Dose (mg/kg-bw/day)	NOAEL (mg/kg-bw/day)	NOAEL HQ_n
SVOCs						
1,2,4-Trichlorobenzene	0.470	1.000	0.470	0.061	NA	--
1,2-Dichlorobenzene	0.470	1.000	0.470	0.061	250	0.000
1,3-Dichlorobenzene	0.470	1.000	0.470	0.061	250	0.000
1,4-Dichlorobenzene	0.470	1.000	0.470	0.061	250	0.000
2,2'-oxybis(1-Chloropropane)	0.470	1.000	0.470	0.061	NA	--
2,4,5-Trichlorophenol	1.200	1.000	1.200	0.156	NA	--
2,4,6-Trichlorophenol	0.470	1.000	0.470	0.061	NA	--
2,4-Dichlorophenol	0.470	1.000	0.470	0.061	NA	--
2,4-Dimethylphenol	0.470	1.000	0.470	0.061	NA	--
2,4-Dinitrophenol	1.200	1.000	1.200	0.156	NA	--
2,4-Dinitrotoluene	0.440	1.000	0.440	0.057	NA	--
2,6-Dinitrotoluene	0.250	1.000	0.250	0.033	NA	--
2-Chloronaphthalene	0.470	1.000	0.470	0.061	NA	--
2-Chlorophenol	0.470	1.000	0.470	0.061	NA	--
2-Methylnaphthalene	0.120	1.000	0.120	0.016	NA	--
2-Methylphenol	0.470	1.000	0.470	0.061	NA	--
2-Nitroaniline	1.200	1.000	1.200	0.156	NA	--
2-Nitrophenol	0.470	1.000	0.470	0.061	NA	--
3,3'-Dichlorobenzidine	0.470	1.000	0.470	0.061	NA	--
3-Nitroaniline	1.200	1.000	1.200	0.156	NA	--
4,6-Dinitro-2-methylphenol	1.200	1.000	1.200	0.156	NA	--
4-Bromophenyl-phenylether	0.470	1.000	0.470	0.061	NA	--
4-Chloro-3-methylphenol	0.470	1.000	0.470	0.061	NA	--
4-Chloroaniline	0.470	1.000	0.470	0.061	NA	--
4-Chlorophenyl-phenylether	0.470	1.000	0.470	0.061	NA	--
4-Methylphenol	0.470	1.000	0.470	0.061	NA	--
4-Nitroaniline	1.200	1.000	1.200	0.156	NA	--
4-Nitrophenol	1.200	1.000	1.200	0.156	5.77	0.027
Acenaphthene	0.480	1.000	0.480	0.062	39.5	0.002
Acenaphthylene	0.180	1.000	0.180	0.023	39.5	0.001
Anthracene	0.750	1.000	0.750	0.098	22.8	0.004
Benzo(a)anthracene	2.200	1.000	2.200	0.286	39.5	0.007
Benzo(a)pyrene	1.900	1.000	1.900	0.247	39.5	0.006
Benzo(b)fluoranthene	4.600	1.000	4.600	0.598	39.5	0.015
Benzo(g,h,i)perylene	2.800	1.000	2.800	0.364	39.5	0.009
Benzo(k)fluoranthene	1.200	1.000	1.200	0.156	39.5	0.004
bis(2-Chloroethoxy)methane	0.470	1.000	0.470	0.061	NA	--
bis(2-Chloroethyl)ether	0.470	1.000	0.470	0.061	NA	--
bis-(2-Ethylhexyl)phthalate	0.470	1.000	0.470	0.061	10	0.006
Butylbenzylphthalate	0.470	1.000	0.470	0.061	NA	--
Carbazole	0.450	1.000	0.450	0.059	NA	--
Chrysene	2.100	1.000	2.100	0.273	39.5	0.007
Di-n-butylphthalate	0.120	1.000	0.120	0.016	0.11	0.142
Di-n-octyl phthalate	0.470	1.000	0.470	0.061	290	0.000
Dibenz(a,h)anthracene	0.850	1.000	0.850	0.111	39.5	0.003
Dibenzofuran	0.350	1.000	0.350	0.046	NA	--
Diethylphthalate	0.082	1.000	0.082	0.011	NA	--
Dimethyl phthalate	0.100	1.000	0.100	0.013	NA	--
Fluoranthene	2.300	1.000	2.300	0.299	39.5	0.008
Fluorene	0.530	1.000	0.530	0.069	39.5	0.002
Hexachlorobenzene	0.470	1.000	0.470	0.061	NA	--
Hexachlorobutadiene	0.710	1.000	0.710	0.092	NA	--
Hexachlorocyclopentadiene	0.470	1.000	0.470	0.061	NA	--
Hexachloroethane	0.048	1.000	0.048	0.006	NA	--
Indeno(1,2,3-cd)pyrene	2.600	1.000	2.600	0.338	39.5	0.009
Isophorone	0.470	1.000	0.470	0.061	NA	--
N-Nitroso-di-n-propylamine	0.470	1.000	0.470	0.061	NA	--
N-Nitrosodiphenylamine	0.470	1.000	0.470	0.061	NA	--
Naphthalene	0.110	1.000	0.110	0.014	22.8	0.001
Nitrobenzene	0.440	1.000	0.440	0.057	NA	--

TABLE 9-6
Foodweb Exposure Estimates for Mourning Dove
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Mourning Dove
(Conservative Inputs)

Body Weight	0.100	kg
Food Ingestion Rate	0.0124	kg-dry/day
Soil Ingestion Rate	0.00065	kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Vegetation BAF	Vegetation Concentration (mg/kg)	Dose (mg/kg-bw/day)	NOAEL (mg/kg-bw/day)	NOAEL HQ_n
Pentachlorophenol	0.180	1.000	0.180	0.023	175	0.000
Phenanthrene	2.400	1.000	2.400	0.312	39.5	0.008
Phenol	0.470	1.000	0.470	0.061	NA	--
Pyrene	3.200	1.000	3.200	0.416	39.5	0.011
					#REF!	
TAL Metals						
Aluminum	22800.0	1.000	22800.0	2964.0	109.7	27.02
Antimony	1.1	1.000	1.1	0.1	NA	--
Arsenic	7.4	0.454	3.4	0.5	5.14	0.09
Barium	91.7	1.000	91.7	11.9	208	0.06
Beryllium	0.6	1.000	0.6	0.1	NA	--
Cadmium	4.6	1.359	6.3	0.8	1.45	0.55
Calcium	6000.0	1.000	6000.0	780.0	NA	--
Chromium	40.7	1.000	40.7	5.3	1	5.29
Cobalt	6.5	1.000	6.5	0.8	1.4664	0.58
Copper	113.0	0.341	38.5	5.5	47	0.12
Cyanide	0.3	1.000	0.3	0.0	NA	--
Iron	36000.0	1.000	36000.0	4680.0	NA	--
Lead	1310.0	0.245	321.0	48.2	1.13	42.61
Magnesium	2030.0	1.000	2030.0	263.9	NA	--
Manganese	418.0	1.000	418.0	54.3	977	0.06
Mercury	47.4	1.481	70.2	9.0	0.0064	1402.77
Nickel	22.1	0.750	16.6	2.2	77.4	0.03
Potassium	1370.0	1.000	1370.0	178.1	NA	--
Selenium	1.3	1.000	1.3	0.2	0.4	0.42
Silver	814.0	1.000	814.0	105.8	NA	--
Sodium	275.0	1.000	275.0	35.8	NA	--
Thallium	1.0	1.000	1.0	0.1	NA	--
Vanadium	55.1	1.000	55.1	7.2	11.4	0.63
Zinc	762.0	1.021	778.0	101.0	14.5	6.97
Explosives						
1,3,5-Trinitrobenzene	0.250	1.000	0.3	0.0	NA	--
1,3-Dinitrobenzene	0.250	1.000	0.3	0.0	NA	--
2,4,6-Trinitrotoluene	0.250	1.000	0.3	0.0	NA	--
2,4-Dinitrotoluene	0.250	1.000	0.3	0.0	NA	--
2,6-Dinitrotoluene	0.250	1.000	0.3	0.0	NA	--
2-Amino-4,6-dinitrotoluene	0.250	1.000	0.3	0.0	NA	--
2-Nitrotoluene	0.500	1.000	0.5	0.1	NA	--
3-Nitrotoluene	0.500	1.000	0.5	0.1	NA	--
4-amino-2,6-dinitrotoluene	0.250	1.000	0.3	0.0	NA	--
4-Nitrotoluene	0.500	1.000	0.5	0.1	NA	--
HMX	0.500	1.000	0.5	0.1	NA	--
Nitrobenzene	0.440	1.000	0.4	0.1	NA	--
RDX	0.500	1.000	0.5	0.1	NA	--
Tetryl	0.500	1.000	0.5	0.1	NA	--
Nitroguanidine	0.120	1.000	0.1	0.0	NA	--
Pentaerythritol tetranitrate	0.250	1.000	0.3	0.0	NA	--
Nitrocellulose (mg/kg)	58.600	1.000	58.6	7.6	NA	--
Nitroglycerine (ug/kg)	23.000	1.000	23.0	3.0	NA	--

NA- not available
Cells with HQ>1 are shaded

TABLE 9-7
Foodweb Exposure Estimates for Red-tailed Hawk
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Red-Tailed Hawk
(Conservative Inputs)

Body Weight	0.957	kg
Food Ingestion Rate	0.126	kg-dry/day
Soil Ingestion Rate	0.00364	kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Small Mammal BAF	Small Mammal Concentration (mg/kg)	Dose (mg/kg-bw/day)	NOAEL (mg/kg-bw/day)	NOAEL HQ_n
SVOCs						
1,2,4-Trichlorobenzene	0.470	1.000	0.470	0.064	NA	--
1,2-Dichlorobenzene	0.470	1.000	0.470	0.064	250.0	0.00
1,3-Dichlorobenzene	0.470	1.000	0.470	0.064	250.0	0.00
1,4-Dichlorobenzene	0.470	1.000	0.470	0.064	250.0	0.00
2,2'-oxybis(1-Chloropropane)	0.470	1.000	0.470	0.064	NA	--
2,4,5-Trichlorophenol	1.200	1.000	1.200	0.163	NA	--
2,4,6-Trichlorophenol	0.470	1.000	0.470	0.064	NA	--
2,4-Dichlorophenol	0.470	1.000	0.470	0.064	NA	--
2,4-Dimethylphenol	0.470	1.000	0.470	0.064	NA	--
2,4-Dinitrophenol	1.200	1.000	1.200	0.163	NA	--
2,4-Dinitrotoluene	0.440	1.000	0.440	0.060	NA	--
2,6-Dinitrotoluene	0.250	1.000	0.250	0.034	NA	--
2-Chloronaphthalene	0.470	1.000	0.470	0.064	NA	--
2-Chlorophenol	0.470	1.000	0.470	0.064	NA	--
2-Methylnaphthalene	0.120	1.000	0.120	0.016	NA	--
2-Methylphenol	0.470	1.000	0.470	0.064	NA	--
2-Nitroaniline	1.200	1.000	1.200	0.163	NA	--
2-Nitrophenol	0.470	1.000	0.470	0.064	NA	--
3,3'-Dichlorobenzidine	0.470	1.000	0.470	0.064	NA	--
3-Nitroaniline	1.200	1.000	1.200	0.163	NA	--
4,6-Dinitro-2-methylphenol	1.200	1.000	1.200	0.163	NA	--
4-Bromophenyl-phenylether	0.470	1.000	0.470	0.064	NA	--
4-Chloro-3-methylphenol	0.470	1.000	0.470	0.064	NA	--
4-Chloroaniline	0.470	1.000	0.470	0.064	NA	--
4-Chlorophenyl-phenylether	0.470	1.000	0.470	0.064	NA	--
4-Methylphenol	0.470	1.000	0.470	0.064	NA	--
4-Nitroaniline	1.200	1.000	1.200	0.163	NA	--
4-Nitrophenol	1.200	1.000	1.200	0.163	5.8	0.03
Acenaphthene	0.480	1.000	0.480	0.065	39.5	0.00
Acenaphthylene	0.180	1.000	0.180	0.024	39.5	0.00
Anthracene	0.750	1.000	0.750	0.102	22.8	0.00
Benzo(a)anthracene	2.200	1.000	2.200	0.299	39.5	0.01
Benzo(a)pyrene	1.900	1.000	1.900	0.258	39.5	0.01
Benzo(b)fluoranthene	4.600	1.000	4.600	0.625	39.5	0.02
Benzo(g,h,i)perylene	2.800	1.000	2.800	0.380	39.5	0.01
Benzo(k)fluoranthene	1.200	1.000	1.200	0.163	39.5	0.00
bis(2-Chloroethoxy)methane	0.470	1.000	0.470	0.064	NA	--
bis(2-Chloroethyl)ether	0.470	1.000	0.470	0.064	NA	--
bis-(2-Ethylhexyl)phthalate	0.470	1.000	0.470	0.064	10.0	0.01
Butylbenzylphthalate	0.470	1.000	0.470	0.064	NA	--
Carbazole	0.450	1.000	0.450	0.061	NA	--
Chrysene	2.100	1.000	2.100	0.285	39.5	0.01
Di-n-butylphthalate	0.120	1.000	0.120	0.016	0.1	0.15
Di-n-octyl phthalate	0.470	1.000	0.470	0.064	290.0	0.00
Dibenz(a,h)anthracene	0.850	1.000	0.850	0.115	39.5	0.00
Dibenzofuran	0.350	1.000	0.350	0.048	NA	--
Diethylphthalate	0.082	1.000	0.082	0.011	NA	--
Dimethyl phthalate	0.100	1.000	0.100	0.014	NA	--
Fluoranthene	2.300	1.000	2.300	0.312	39.5	0.01
Fluorene	0.530	1.000	0.530	0.072	39.5	0.00
Hexachlorobenzene	0.470	1.000	0.470	0.064	NA	--
Hexachlorobutadiene	0.710	1.000	0.710	0.096	NA	--
Hexachlorocyclopentadiene	0.470	1.000	0.470	0.064	NA	--
Hexachloroethane	0.048	1.000	0.048	0.007	NA	--
Indeno(1,2,3-cd)pyrene	2.600	1.000	2.600	0.353	39.5	0.01
Isophorone	0.470	1.000	0.470	0.064	NA	--
N-Nitroso-di-n-propylamine	0.470	1.000	0.470	0.064	NA	--
N-Nitrosodiphenylamine	0.470	1.000	0.470	0.064	NA	--
Naphthalene	0.110	1.000	0.110	0.015	22.8	0.00
Nitrobenzene	0.440	1.000	0.440	0.060	NA	--

TABLE 9-7
Foodweb Exposure Estimates for Red-tailed Hawk
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Red-Tailed Hawk
(Conservative Inputs)

Body Weight	0.957	kg
Food Ingestion Rate	0.126	kg-dry/day
Soil Ingestion Rate	0.00364	kg-dry/day

Maximum Concentrations

	Soil Concentration	Small Mammal BAF	Small Mammal Concentration	Dose	NOAEL	NOAEL
Pentachlorophenol	0.180	1.000	0.180	0.024	175.0	0.00
Phenanthrene	2.400	1.000	2.400	0.326	39.5	0.01
Phenol	0.470	1.000	0.470	0.064	NA	--
Pyrene	3.200	1.000	3.200	0.435	39.5	0.01
					#REF!	
TAL Metals						
Aluminum	22800.0	1.000	22800.000	3097.179	109.7	28.23
Antimony	1.1	1.000	1.100	0.149	NA	--
Arsenic	7.4	0.006	0.047	0.034	5.1	0.01
Barium	91.7	0.070	6.382	1.191	208.0	0.01
Beryllium	0.6	1.000	0.570	0.077	NA	--
Cadmium	4.6	1.990	9.155	1.226	1.5	0.85
Calcium	6000.0	1.000	6000.000	815.047	NA	--
Chromium	40.7	0.138	5.625	0.897	1.0	0.90
Cobalt	6.5	0.037	0.241	0.057	1.5	0.04
Copper	113.0	0.420	47.460	6.696	47.0	0.14
Cyanide	0.3	1.000	0.340	0.046	NA	--
Iron	36000.0	0.014	493.200	202.049	NA	--
Lead	1310.0	0.162	211.565	32.917	1.1	29.13
Magnesium	2030.0	1.000	2030.000	275.758	NA	--
Manganese	418.0	1.000	418.000	56.782	977.0	0.06
Mercury	47.4	0.124	5.897	0.959	0.0	149.82
Nickel	22.1	0.280	6.186	0.901	77.4	0.01
Potassium	1370.0	1.000	1370.000	186.102	NA	--
Selenium	1.3	1.000	1.300	0.177	0.4	0.44
Silver	814.0	1.000	814.000	110.575	NA	--
Sodium	275.0	1.000	275.000	37.356	NA	--
Thallium	1.0	0.112	0.112	0.019	NA	--
Vanadium	55.1	1.000	55.100	7.485	11.4	0.66
Zinc	762.0	1.335	1017.422	137.236	14.5	9.46
Explosives						
1,3,5-Trinitrobenzene	0.250	1.000	0.250	0.034	NA	--
1,3-Dinitrobenzene	0.250	1.000	0.250	0.034	NA	--
2,4,6-Trinitrotoluene	0.250	1.000	0.250	0.034	NA	--
2,4-Dinitrotoluene	0.250	1.000	0.250	0.034	NA	--
2,6-Dinitrotoluene	0.250	1.000	0.250	0.034	NA	--
2-Amino-4,6-dinitrotoluene	0.250	1.000	0.250	0.034	NA	--
2-Nitrotoluene	0.500	1.000	0.500	0.068	NA	--
3-Nitrotoluene	0.500	1.000	0.500	0.068	NA	--
4-amino-2,6-dinitrotoluene	0.250	1.000	0.250	0.034	NA	--
4-Nitrotoluene	0.500	1.000	0.500	0.068	NA	--
HMX	0.500	1.000	0.500	0.068	NA	--
Nitrobenzene	0.440	1.000	0.440	0.060	NA	--
RDX	0.500	1.000	0.500	0.068	NA	--
Tetryl	0.500	1.000	0.500	0.068	NA	--
Nitroguanidine	0.120	1.000	0.120	0.016	NA	--
Pentaerythritol tetranitrate	0.250	1.000	0.250	0.034	NA	--
Nitrocellulose (mg/kg)	58.600	1.000	58.600	7.960	NA	--
Nitroglycerine (ug/kg)	23.000	1.000	23.000	3.124	NA	--

NA- not available
Cells with HQ>1 are shaded

TABLE 9-8
Foodweb Exposure Estimates for White-footed Mouse
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

White-footed Mouse
(Conservative Inputs)

Body Weight	0.017 kg
Food Ingestion Rate	0.00372 kg-dry/day
Soil Ingestion Rate	0.00008 kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Vegetation BAF	Vegetation Concentration (mg/kg)	Invertebrate BAF	Invertebrate Concentration (mg/kg)	Dose (mg/kg-bw/day)	RTV (NOAEL) (mg/kg-bw/day)	NOAEL HQ_n
SVOCs								
1,2,4-Trichlorobenzene	0.470	1.000	0.470	1.000	0.470	0.105	8.0	0.01
1,2-Dichlorobenzene	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
1,3-Dichlorobenzene	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
1,4-Dichlorobenzene	0.470	1.000	0.470	1.000	0.470	0.105	250.0	0.00
2,2'-oxybis(1-Chloropropane)	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
2,4,5-Trichlorophenol	1.200	1.000	1.200	1.000	1.200	0.269	80.0	0.00
2,4,6-Trichlorophenol	0.470	1.000	0.470	1.000	0.470	0.105	80.0	0.00
2,4-Dichlorophenol	0.470	1.000	0.470	1.000	0.470	0.105	440.0	0.00
2,4-Dimethylphenol	0.470	1.000	0.470	1.000	0.470	0.105	50.0	0.00
2,4-Dinitrophenol	1.200	1.000	1.200	1.000	1.200	0.269	50.0	0.01
2,4-Dinitrotoluene	0.440	1.000	0.440	1.000	0.440	0.098	3.9	0.03
2,6-Dinitrotoluene	0.250	1.000	0.250	1.000	0.250	0.056	7.0	0.01
2-Chloronaphthalene	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
2-Chlorophenol	0.470	1.000	0.470	1.000	0.470	0.105	4.0	0.03
2-Methylnaphthalene	0.120	1.000	0.120	1.000	0.120	0.027	143.7	0.00
2-Methylphenol	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
2-Nitroaniline	1.200	1.000	1.200	1.000	1.200	0.269	NA	--
2-Nitrophenol	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
3,3'-Dichlorobenzidine	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
3-Nitroaniline	1.200	1.000	1.200	1.000	1.200	0.269	NA	--
4,6-Dinitro-2-methylphenol	1.200	1.000	1.200	1.000	1.200	0.269	NA	--
4-Bromophenyl-phenylether	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
4-Chloro-3-methylphenol	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
4-Chloroaniline	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
4-Chlorophenyl-phenylether	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
4-Methylphenol	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
4-Nitroaniline	1.200	1.000	1.200	1.000	1.200	0.269	NA	--
4-Nitrophenol	1.200	1.000	1.200	1.000	1.200	0.269	12.5	0.02
Acenaphthene	0.480	1.000	0.480	1.000	0.480	0.107	350.0	0.00
Acenaphthylene	0.180	1.000	0.180	1.000	0.180	0.040	133.3	0.00
Anthracene	0.750	1.000	0.750	1.000	0.750	0.168	1000.0	0.00
Benzo(a)anthracene	2.200	1.000	2.200	1.000	2.200	0.492	1.3	0.38
Benzo(a)pyrene	1.900	1.000	1.900	1.000	1.900	0.425	1.3	0.33
Benzo(b)fluoranthene	4.600	1.000	4.600	1.000	4.600	1.029	1.3	0.79
Benzo(g,h,i)perylene	2.800	1.000	2.800	1.000	2.800	0.627	133.3	0.00
Benzo(k)fluoranthene	1.200	1.000	1.200	1.000	1.200	0.269	1.3	0.21
bis(2-Chloroethoxy)methane	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
bis(2-Chloroethyl)ether	0.470	1.000	0.470	1.000	0.470	0.105	2.5	0.04
bis-(2-Ethylhexyl)phthalate	0.470	1.000	0.470	1.000	0.470	0.105	18.3	0.01
Butylbenzylphthalate	0.470	1.000	0.470	1.000	0.470	0.105	240.0	0.00
Carbazole	0.450	1.000	0.450	1.000	0.450	0.101	133.3	0.00
Chrysene	2.100	1.000	2.100	1.000	2.100	0.470	1.3	0.36
Di-n-butylphthalate	0.120	1.000	0.120	1.000	0.120	0.027	550.0	0.00
Di-n-octyl phthalate	0.470	1.000	0.470	1.000	0.470	0.105	55.0	0.00
Dibenz(a,h)anthracene	0.850	1.000	0.850	1.000	0.850	0.190	1.3	0.15
Dibenzofuran	0.350	1.000	0.350	1.000	0.350	0.078	133.3	0.00
Diethylphthalate	0.082	1.000	0.082	1.000	0.082	0.018	4583.0	0.00
Dimethyl phthalate	0.100	1.000	0.100	1.000	0.100	0.022	NA	--
Fluoranthene	2.300	1.000	2.300	1.000	2.300	0.515	125.0	0.00
Fluorene	0.530	1.000	0.530	1.000	0.530	0.119	125.0	0.00
Hexachlorobenzene	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
Hexachlorobutadiene	0.710	1.000	0.710	1.000	0.710	0.159	19.0	0.01
Hexachlorocyclopentadiene	0.470	1.000	0.470	1.000	0.470	0.105	NA	--
Hexachloroethane	0.048	1.000	0.048	1.000	0.048	0.011	NA	--
Indeno(1,2,3-cd)pyrene	2.600	1.000	2.600	1.000	2.600	0.582	1.3	0.45
Isophorone	0.470	1.000	0.470	1.000	0.470	0.105	25.0	0.00
N-Nitroso-di-n-propylamine	0.470	1.000	0.470	1.000	0.470	0.105	0.1	1.67
N-Nitrosodiphenylamine	0.470	1.000	0.470	1.000	0.470	0.105	150.0	0.00
Naphthalene	0.110	1.000	0.110	1.000	0.110	0.025	140.0	0.00
Nitrobenzene	0.440	1.000	0.440	1.000	0.440	0.098	NA	--

TABLE 9-8
Foodweb Exposure Estimates for White-footed Mouse
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

White-footed Mouse
(Conservative Inputs)

Body Weight	0.017 kg
Food Ingestion Rate	0.00372 kg-dry/day
Soil Ingestion Rate	0.00008 kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Vegetation BAF	Vegetation Concentration (mg/kg)	Invertebrate BAF	Invertebrate Concentration (mg/kg)	Dose (mg/kg-bw/day)	RTV (NOAEL) (mg/kg-bw/day)	NOAEL HQ_n
Pentachlorophenol	0.180	1.000	0.180	1.000	0.180	0.040	0.2	0.17
Phenanthrene	2.400	1.000	2.400	1.000	2.400	0.537	133.3	0.00
Phenol	0.470	1.000	0.470	1.000	0.470	0.105	60.0	0.00
Pyrene	3.200	1.000	3.200	1.000	3.200	0.716	133.3	0.01
TAL Metals								
Aluminum	22800.0	1.00	22800.0	1.00	22800.0	5101.8	1.9	2643.44
Antimony	1.1	1.00	1.1	1.00	1.1	0.2	0.1	1.97
Arsenic	7.4	0.45	3.4	0.33	2.4	0.6	0.1	5.15
Barium	91.7	1.00	91.7	1.00	91.7	20.5	5.1	4.02
Beryllium	0.6	1.00	0.6	1.00	0.6	0.1	0.7	0.19
Cadmium	4.6	1.36	6.3	2.82	13.0	2.3	1.0	2.28
Calcium	6000.0	1.00	6000.0	1.00	6000.0	1342.6	NA	--
Chromium	40.7	1.00	40.7	1.15	46.8	9.9	13.1	0.75
Cobalt	6.5	1.00	6.5	1.00	6.5	1.5	5.0	0.29
Copper	113.0	0.34	38.5	2.42	273.9	39.9	11.7	3.41
Cyanide	0.3	1.00	0.3	1.00	0.3	0.1	68.7	0.00
Iron	36000.0	1.00	36000.0	1.00	36000.0	8055.5	3.2	2525.24
Lead	1310.0	0.25	321.0	0.28	361.6	81.8	8.0	10.23
Magnesium	2030.0	1.00	2030.0	1.00	2030.0	454.2	NA	--
Manganese	418.0	1.00	418.0	1.00	418.0	93.5	88.0	1.06
Mercury	47.4	1.48	70.2	1.42	67.4	15.2	0.0	476.04
Nickel	22.1	0.75	16.6	0.86	18.9	4.0	40.0	0.10
Potassium	1370.0	1.00	1370.0	1.00	1370.0	306.6	NA	--
Selenium	1.3	1.00	1.3	1.00	1.3	0.3	0.2	1.45
Silver	814.0	1.00	814.0	1.00	814.0	182.1	181.2	1.01
Sodium	275.0	1.00	275.0	1.00	275.0	61.5	NA	--
Thallium	1.0	1.00	1.0	1.00	1.0	0.2	0.1	3.02
Vanadium	55.1	1.00	55.1	1.00	55.1	12.3	0.2	58.71
Zinc	762.0	1.02	778.0	3.09	2356.1	381.4	160.0	2.38
Explosives								
1,3,5-Trinitrobenzene	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
1,3-Dinitrobenzene	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
2,4,6-Trinitrotoluene	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
2,4-Dinitrotoluene	0.250	1.000	0.250	1.000	0.250	0.056	0.2	0.28
2,6-Dinitrotoluene	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
2-Amino-4,6-dinitrotoluene	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
2-Nitrotoluene	0.500	1.000	0.500	1.000	0.500	0.112	NA	--
3-Nitrotoluene	0.500	1.000	0.500	1.000	0.500	0.112	NA	--
4-amino-2,6-dinitrotoluene	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
4-Nitrotoluene	0.500	1.000	0.500	1.000	0.500	0.112	NA	--
HMX	0.500	1.000	0.500	1.000	0.500	0.112	NA	--
Nitrobenzene	0.440	1.000	0.440	1.000	0.440	0.098	NA	--
RDX	0.500	1.000	0.500	1.000	0.500	0.112	NA	--
Tetryl	0.500	1.000	0.500	1.000	0.500	0.112	NA	--
Nitroguanidine	0.120	1.000	0.120	1.000	0.120	0.027	NA	--
Pentaerythritol tetranitrate	0.250	1.000	0.250	1.000	0.250	0.056	NA	--
Nitrocellulose (mg/kg)	58.600	1.000	58.600	1.000	58.600	13.113	NA	--
Nitroglycerine (ug/kg)	23.000	1.000	23.000	1.000	23.000	5.147	NA	--

NA- not available
Cells with HQ>1 are shaded

TABLE 9-9
Foodweb Exposure Estimates for Red Fox
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Red Fox
(Conservative Inputs)

Body Weight	3.200 kg
Food Ingestion Rate	0.156 kg-dry/day
Soil Ingestion Rate	0.00448 kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Small Mammal BAF	Small Mammal Concentration (mg/kg)	Dose (mg/kg-bw/day)	RTV (NOAEL) (mg/kg-bw/day)	NOAEL HQ_n
SVOCs						
1,2,4-Trichlorobenzene	0.470	1.000	0.470	0.024	8.0	0.00
1,2-Dichlorobenzene	0.470	1.000	0.470	0.024	NA	--
1,3-Dichlorobenzene	0.470	1.000	0.470	0.024	NA	--
1,4-Dichlorobenzene	0.470	1.000	0.470	0.024	250.0	0.00
2,2'-oxybis(1-Chloropropane)	0.470	1.000	0.470	0.024	NA	--
2,4,5-Trichlorophenol	1.200	1.000	1.200	0.060	80.0	0.00
2,4,6-Trichlorophenol	0.470	1.000	0.470	0.024	80.0	0.00
2,4-Dichlorophenol	0.470	1.000	0.470	0.024	440.0	0.00
2,4-Dimethylphenol	0.470	1.000	0.470	0.024	50.0	0.00
2,4-Dinitrophenol	1.200	1.000	1.200	0.060	50.0	0.00
2,4-Dinitrotoluene	0.440	1.000	0.440	0.022	3.9	0.01
2,6-Dinitrotoluene	0.250	1.000	0.250	0.013	7.0	0.00
2-Chloronaphthalene	0.470	1.000	0.470	0.024	NA	--
2-Chlorophenol	0.470	1.000	0.470	0.024	4.0	0.01
2-Methylnaphthalene	0.120	1.000	0.120	0.006	143.7	0.00
2-Methylphenol	0.470	1.000	0.470	0.024	NA	--
2-Nitroaniline	1.200	1.000	1.200	0.060	NA	--
2-Nitrophenol	0.470	1.000	0.470	0.024	NA	--
3,3'-Dichlorobenzidine	0.470	1.000	0.470	0.024	NA	--
3-Nitroaniline	1.200	1.000	1.200	0.060	NA	--
4,6-Dinitro-2-methylphenol	1.200	1.000	1.200	0.060	NA	--
4-Bromophenyl-phenylether	0.470	1.000	0.470	0.024	NA	--
4-Chloro-3-methylphenol	0.470	1.000	0.470	0.024	NA	--
4-Chloroaniline	0.470	1.000	0.470	0.024	NA	--
4-Chlorophenyl-phenylether	0.470	1.000	0.470	0.024	NA	--
4-Methylphenol	0.470	1.000	0.470	0.024	NA	--
4-Nitroaniline	1.200	1.000	1.200	0.060	NA	--
4-Nitrophenol	1.200	1.000	1.200	0.060	12.5	0.00
Acenaphthene	0.480	1.000	0.480	0.024	350.0	0.00
Acenaphthylene	0.180	1.000	0.180	0.009	133.3	0.00
Anthracene	0.750	1.000	0.750	0.038	1000.0	0.00
Benzo(a)anthracene	2.200	1.000	2.200	0.110	1.3	0.08
Benzo(a)pyrene	1.900	1.000	1.900	0.095	1.3	0.07
Benzo(b)fluoranthene	4.600	1.000	4.600	0.230	1.3	0.18
Benzo(g,h,i)perylene	2.800	1.000	2.800	0.140	133.3	0.00
Benzo(k)fluoranthene	1.200	1.000	1.200	0.060	1.3	0.05
bis(2-Chloroethoxy)methane	0.470	1.000	0.470	0.024	NA	--
bis(2-Chloroethyl)ether	0.470	1.000	0.470	0.024	2.5	0.01
bis-(2-Ethylhexyl)phthalate	0.470	1.000	0.470	0.024	18.3	0.00
Butylbenzylphthalate	0.470	1.000	0.470	0.024	240.0	0.00
Carbazole	0.450	1.000	0.450	0.023	133.3	0.00
Chrysene	2.100	1.000	2.100	0.105	1.3	0.08
Di-n-butylphthalate	0.120	1.000	0.120	0.006	550.0	0.00
Di-n-octyl phthalate	0.470	1.000	0.470	0.024	55.0	0.00
Dibenz(a,h)anthracene	0.850	1.000	0.850	0.043	1.3	0.03
Dibenzofuran	0.350	1.000	0.350	0.018	133.3	0.00
Diethylphthalate	0.082	1.000	0.082	0.004	4583.0	0.00
Dimethyl phthalate	0.100	1.000	0.100	0.005	NA	--
Fluoranthene	2.300	1.000	2.300	0.115	125.0	0.00
Fluorene	0.530	1.000	0.530	0.027	125.0	0.00
Hexachlorobenzene	0.470	1.000	0.470	0.024	NA	--
Hexachlorobutadiene	0.710	1.000	0.710	0.036	19.0	0.00
Hexachlorocyclopentadiene	0.470	1.000	0.470	0.024	NA	--
Hexachloroethane	0.048	1.000	0.048	0.002	NA	--
Indeno(1,2,3-cd)pyrene	2.600	1.000	2.600	0.130	1.3	0.10
Isophorone	0.470	1.000	0.470	0.024	25.0	0.00
N-Nitroso-di-n-propylamine	0.470	1.000	0.470	0.024	0.1	0.37
N-Nitrosodiphenylamine	0.470	1.000	0.470	0.024	150.0	0.00
Naphthalene	0.110	1.000	0.110	0.006	140.0	0.00
Nitrobenzene	0.440	1.000	0.440	0.022	NA	--
Pentachlorophenol	0.180	1.000	0.180	0.009	0.2	0.04
Phenanthrene	2.400	1.000	2.400	0.120	133.3	0.00

TABLE 9-9
Foodweb Exposure Estimates for Red Fox
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Red Fox
(Conservative Inputs)

Body Weight	3.200 kg
Food Ingestion Rate	0.156 kg-dry/day
Soil Ingestion Rate	0.00448 kg-dry/day

Maximum Concentrations

Chemical	Soil Concentration (mg/kg)	Small Mammal BAF	Small Mammal Concentration (mg/kg)	Dose (mg/kg-bw/day)	RTV (NOAEL) (mg/kg-bw/day)	NOAEL HQ_n
Phenol	0.470	1.000	0.470	0.024	60.0	0.00
Pyrene	3.200	1.000	3.200	0.160	133.3	0.00
TAL Metals						
Aluminum	22800.0	1.00	22800.0	1140.000	1.9	590.67
Antimony	1.1	1.00	1.1	0.055	0.1	0.44
Arsenic	7.4	0.01	0.0	0.013	0.1	0.10
Barium	91.7	0.07	6.4	0.439	5.1	0.09
Beryllium	0.6	1.00	0.6	0.029	0.7	0.04
Cadmium	4.6	1.99	9.2	0.451	1.0	0.45
Calcium	6000.0	1.00	6000.0	300.000	NA	--
Chromium	40.7	0.14	5.6	0.330	13.1	0.03
Cobalt	6.5	0.04	0.2	0.021	5.0	0.00
Copper	113.0	0.42	47.5	2.465	11.7	0.21
Cyanide	0.3	1.00	0.3	0.017	68.7	0.00
Iron	36000.0	0.01	493.2	74.370	3.2	23.31
Lead	1310.0	0.16	211.6	12.116	8.0	1.51
Magnesium	2030.0	1.00	2030.0	101.500	NA	--
Manganese	418.0	1.00	418.0	20.900	88.0	0.24
Mercury	47.4	0.12	5.9	0.353	0.032	11.03
Nickel	22.1	0.28	6.2	0.332	40.0	0.01
Potassium	1370.0	1.00	1370.0	68.500	NA	--
Selenium	1.3	1.00	1.3	0.065	0.2	0.33
Silver	814.0	1.00	814.0	40.700	181.2	0.22
Sodium	275.0	1.00	275.0	13.750	NA	--
Thallium	1.0	0.11	0.1	0.007	0.1	0.09
Vanadium	55.1	1.00	55.1	2.755	0.2	13.12
Zinc	762.0	1.34	1017.4	50.514	160.0	0.32
Explosives						
1,3,5-Trinitrobenzene	0.250	1.000	0.250	0.013	NA	--
1,3-Dinitrobenzene	0.250	1.000	0.250	0.013	NA	--
2,4,6-Trinitrotoluene	0.250	1.000	0.250	0.013	NA	--
2,4-Dinitrotoluene	0.250	1.000	0.250	0.013	0.2	0.06
2,6-Dinitrotoluene	0.250	1.000	0.250	0.013	NA	--
2-Amino-4,6-dinitrotoluene	0.250	1.000	0.250	0.013	NA	--
2-Nitrotoluene	0.500	1.000	0.500	0.025	NA	--
3-Nitrotoluene	0.500	1.000	0.500	0.025	NA	--
4-amino-2,6-dinitrotoluene	0.250	1.000	0.250	0.013	NA	--
4-Nitrotoluene	0.500	1.000	0.500	0.025	NA	--
HMX	0.500	1.000	0.500	0.025	NA	--
Nitrobenzene	0.440	1.000	0.440	0.022	NA	--
RDX	0.500	1.000	0.500	0.025	NA	--
Tetryl	0.500	1.000	0.500	0.025	NA	--
Nitroguanidine	0.120	1.000	0.120	0.006	NA	--
Pentaerythritol tetranitrate	0.250	1.000	0.250	0.013	NA	--
Nitrocellulose (mg/kg)	58.600	1.000	58.600	2.930	NA	--
Nitroglycerine (ug/kg)	23.000	1.000	23.000	1.150	NA	--

NA- not available
Cells with HQ>1 are shaded

TABLE 9-10
Screening for Preliminary COPCs in Soil
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	Max Conc	Data Qualifier	Detect / Non-Detect	Screening Value	Screening Hazard Quotient
VOCs (ug/kg)					
1,1,1-Trichloroethane	2	L	D	300	0.01
1,1,2,2-Tetrachloroethane	1300	U	ND	300	4.33
1,1,2-Trichloroethane	1300	U	ND	300	4.33
1,1-Dichloroethane	2	L	D	300	0.01
1,1-Dichloroethene	2	L	D	NA	--
1,2-Dichloroethane	1	L	D	401	0.00
1,2-Dichloroethene	7	J	D	300	0.02
1,2-Dichloropropane	2	L	D	38300	0.00
2-Butanone	1300	U	ND	NA	--
2-Hexanone	1300	U	ND	NA	--
4-Methyl-2-pentanone	1300	U	ND	10000	0.13
Acetone	5	U	ND	NA	--
Benzene	1300	U	ND	105	12.38
Bromodichloromethane	1	L	D	45000	0.00
Bromoform	1300	U	ND	NA	--
Bromomethane	1300	U	ND	NA	--
Carbon disulfide	2	J	D	NA	--
Carbon tetrachloride	99		D	1000000	0.00
Chlorobenzene	2	L	D	2400	0.00
Chloroethane	2	L	D	NA	--
Chloroform	180		D	1000	0.18
Chloromethane	1300	U	ND	NA	--
cis-1,3-Dichloropropene	1300	U	ND	300	4.33
Dibromochloromethane	1300	U	ND	NA	--
Ethylbenzene	1300	U	D	5005	0.26
Methylene chloride	1300	U	ND	1001	1.30
Styrene	1300	U	ND	10010	0.13
Tetrachloroethene	3100		D	401	7.73
Toluene	1300	U	D	13005	0.10
Total Xylenes	1300	U	D	2505	0.52
trans-1,3-Dichloropropene	1300	U	ND	300	4.33
Trichloroethene	39		D	6000	0.01
Vinyl chloride	2	L	D	300	0.01
SVOCs (ug/kg)					
1,2,4-Trichlorobenzene	470	U	ND	1270	0.37
1,2-Dichlorobenzene	470	U	ND	100	4.70
1,3-Dichlorobenzene	470	U	ND	NA	--
1,4-Dichlorobenzene	470	U	ND	1280	0.37
2,2'-oxybis(1-Chloropropane)	470	U	ND	NA	--
2,4,5-Trichlorophenol	1200	U	ND	430	2.79
2,4,6-Trichlorophenol	470	U	ND	580	0.81
2,4-Dichlorophenol	470	U	ND	13400	0.04
2,4-Dimethylphenol	470	U	ND	100	4.70
2,4-Dinitrophenol	1200	U	ND	20000	0.06
2,4-Dinitrotoluene	440	U	ND	NA	--
2,6-Dinitrotoluene	250	J	D	NA	--
2-Chloronaphthalene	470	U	ND	1033	0.45
2-Chlorophenol	470	U	ND	100	4.70
2-Methylnaphthalene	120	J	D	NA	--
2-Methylphenol	470	U	ND	100	4.70
2-Nitroaniline	1200	U	ND	NA	--
2-Nitrophenol	470	U	ND	NA	--
3,3'-Dichlorobenzidine	470	U	ND	NA	--

TABLE 9-10
Screening for Preliminary COPCs in Soil
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	Max Conc	Data Qualifier	Detect / Non-Detect	Screening Value	Screening Hazard Quotient
3-Nitroaniline	1200	U	ND	NA	--
4,6-Dinitro-2-methylphenol	1200	U	ND	NA	--
4-Bromophenyl-phenylether	470	U	ND	NA	--
4-Chloro-3-methylphenol	470	U	ND	NA	--
4-Chloroaniline	470	U	ND	NA	--
4-Chlorophenyl-phenylether	470	U	ND	NA	--
4-Methylphenol	470	U	ND	100	4.70
4-Nitroaniline	1200	U	ND	NA	--
4-Nitrophenol	1200	U	ND	380	3.16
Acenaphthene	480		D	2500	0.19
Acenaphthylene	180	J	D	100	1.80
Anthracene	750		D	100	7.50
Benzo(a)anthracene	2200		D	100	22.00
Benzo(a)pyrene	1900		D	100	19.00
Benzo(b)fluoranthene	4600		D	100	46.00
Benzo(g,h,i)perylene	2800		D	100	28.00
Benzo(k)fluoranthene	1200		D	100	12.00
bis(2-Chloroethoxy)methane	470	U	ND	NA	--
bis(2-Chloroethyl)ether	470	U	ND	NA	--
bis-(2-Ethylhexyl)phthalate	470	U	ND	NA	--
Butylbenzylphthalate	470	U	ND	NA	--
Carbazole	450		D	NA	--
Chrysene	2100		D	100	21.00
Di-n-butylphthalate	120	J	D	200000	0.00
Di-n-octyl phthalate	470	U	ND	NA	--
Dibenz(a,h)anthracene	850		D	100	8.50
Dibenzofuran	350		D	NA	--
Diethylphthalate	82	J	D	13400	0.01
Dimethyl phthalate	100	J	D	10640	0.01
Fluoranthene	2300		D	100	23.00
Fluorene	530		D	1700	0.31
Hexachlorobenzene	470	U	ND	NA	--
Hexachlorobutadiene	710		D	NA	--
Hexachlorocyclopentadiene	470	U	ND	1000	0.47
Hexachloroethane	48	J	D	NA	--
Indeno(1,2,3-cd)pyrene	2600		D	100	26.00
Isophorone	470	U	ND	NA	--
N-Nitroso-di-n-propylamine	470	U	ND	NA	--
N-Nitrosodiphenylamine	470	U	ND	1090	0.43
Naphthalene	110	J	D	100	1.10
Nitrobenzene	440	U	ND	2260	0.19
Pentachlorophenol	180	J	D	3000	0.06
Phenanthrene	2400		D	100	24.00
Phenol	470	U	ND	1880	0.25
Pyrene	3200		D	100	32.00
TAL Metals (mg/kg)					
Aluminum	22,800		D	50	456.00
Antimony	1.10	J	D	5	0.22
Arsenic	7.40		D	60	0.12
Barium	91.7		D	500	0.18
Beryllium	0.57	J	D	10	0.06
Cadmium	4.6		D	4	1.15
Calcium	6000		D	NA	--
Chromium	40.7		D	0.4	101.75

TABLE 9-10
Screening for Preliminary COPCs in Soil
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	Max Conc	Data Qualifier	Detect / Non-Detect	Screening Value	Screening Hazard Quotient
Cobalt	6.50	J	D	100	0.07
Copper	113		D	50	2.26
Cyanide	0.34		D	0.06	5.67
Iron	36000		D	200	180
Lead	1310	K	D	50	26
Magnesium	2030		D	4400	0.46
Manganese	418		D	500	0.84
Mercury	47.4		D	0.1	474.00
Nickel	22.1		D	30	0.74
Potassium	1370		D	NA	--
Selenium	1.3	U	ND	1.8	0.72
Silver	814		D	2	407
Sodium	275	J	D	NA	--
Thallium	1	U	ND	1	1.00
Vanadium	55.1		D	2	27.55
Zinc	762		D	50	15.24
Explosives (ug/kg)					
1,3,5-Trinitrobenzene	250	U	ND	NA	--
1,3-Dinitrobenzene	250	U	ND	NA	--
2,4,6-Trinitrotoluene	250	U	ND	NA	--
2,4-Dinitrotoluene	250	U	ND	NA	--
2,6-Dinitrotoluene	250	J	D	NA	--
2-Amino-4,6-dinitrotoluene	250	U	ND	NA	--
2-Nitrotoluene	500	U	ND	NA	--
3-Nitrotoluene	500	U	ND	NA	--
4-amino-2,6-dinitrotoluene	250	U	ND	NA	--
4-Nitrotoluene	500	U	ND	NA	--
HMX	500	U	ND	NA	--
Nitrobenzene	440	U	ND	2260	0.19
RDX	500	U	ND	NA	--
Tetryl	500	U	ND	NA	--
Nitroguanidine	120	U	ND	NA	--
Pentaerythritol tetranitrate	250	U	ND	NA	--
Nitrocellulose (mg/kg)	58600		D	NA	--
Nitroglycerine (ug/kg)	23000		D	NA	--

Notes:
NA = No screening concentration available
U = Not Detected (max detection limit reported)
J = Estimated value
B = Blank contamination (treated as non-detect)
L = Reported value may be biased low. Actual value is expected higher.
Sources for screening values provided in Appendix X.
Shaded cells indicate that the HQ exceeded 1. Chemicals without screening values are also considered prelimin

TABLE 9-11
Summary of Hazard Quotients for Upper Trophic Level Receptors
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	American Robin	Mourning Dove	Red-tailed Hawk	White-footed Mouse	Red Fox
SVOCs					
1,2,4-Trichlorobenzene	--	--	--	0.01	0.00
1,2-Dichlorobenzene	0.00	0.00	0.00	--	--
1,3-Dichlorobenzene	0.00	0.00	0.00	--	--
1,4-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00
2,2'-oxybis(1-Chloropropane)	--	--	--	--	--
2,4,5-Trichlorophenol	--	--	--	0.00	0.00
2,4,6-Trichlorophenol	--	--	--	0.00	0.00
2,4-Dichlorophenol	--	--	--	0.00	0.00
2,4-Dimethylphenol	--	--	--	0.00	0.00
2,4-Dinitrophenol	--	--	--	0.01	0.00
2,4-Dinitrotoluene	--	--	--	0.03	0.01
2,6-Dinitrotoluene	--	--	--	0.01	0.00
2-Chloronaphthalene	--	--	--	--	--
2-Chlorophenol	--	--	--	0.03	0.01
2-Methylnaphthalene	--	--	--	0.00	0.00
2-Methylphenol	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--
2-Nitrophenol	--	--	--	--	--
3,3'-Dichlorobenzidine	--	--	--	--	--
3-Nitroaniline	--	--	--	--	--
4,6-Dinitro-2-methylphenol	--	--	--	--	--
4-Bromophenyl-phenylether	--	--	--	--	--
4-Chloro-3-methylphenol	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--
4-Chlorophenyl-phenylether	--	--	--	--	--
4-Methylphenol	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--
4-Nitrophenol	0.09	0.03	0.03	0.02	0.00
Acenaphthene	0.01	0.00	0.00	0.00	0.00
Acenaphthylene	0.00	0.00	0.00	0.00	0.00
Anthracene	0.01	0.00	0.00	0.00	0.00
Benzo(a)anthracene	0.03	0.01	0.01	0.38	0.08
Benzo(a)pyrene	0.02	0.01	0.01	0.33	0.07
Benzo(b)fluoranthene	0.05	0.02	0.02	0.79	0.18
Benzo(g,h,i)perylene	0.03	0.01	0.01	0.00	0.00
Benzo(k)fluoranthene	0.01	0.00	0.00	0.21	0.05
bis(2-Chloroethoxy)methane	--	--	--	--	--
bis(2-Chloroethyl)ether	--	--	--	0.04	0.01
bis-(2-Ethylhexyl)phthalate	0.02	0.01	0.01	0.01	0.00
Butylbenzylphthalate	--	--	--	0.00	0.00
Carbazole	--	--	--	0.00	0.00
Chrysene	0.02	0.01	0.01	0.36	0.08
Di-n-butylphthalate	0.49	0.14	0.15	0.00	0.00
Di-n-octyl phthalate	0.00	0.00	0.00	0.00	0.00
Dibenz(a,h)anthracene	0.01	0.00	0.00	0.15	0.03

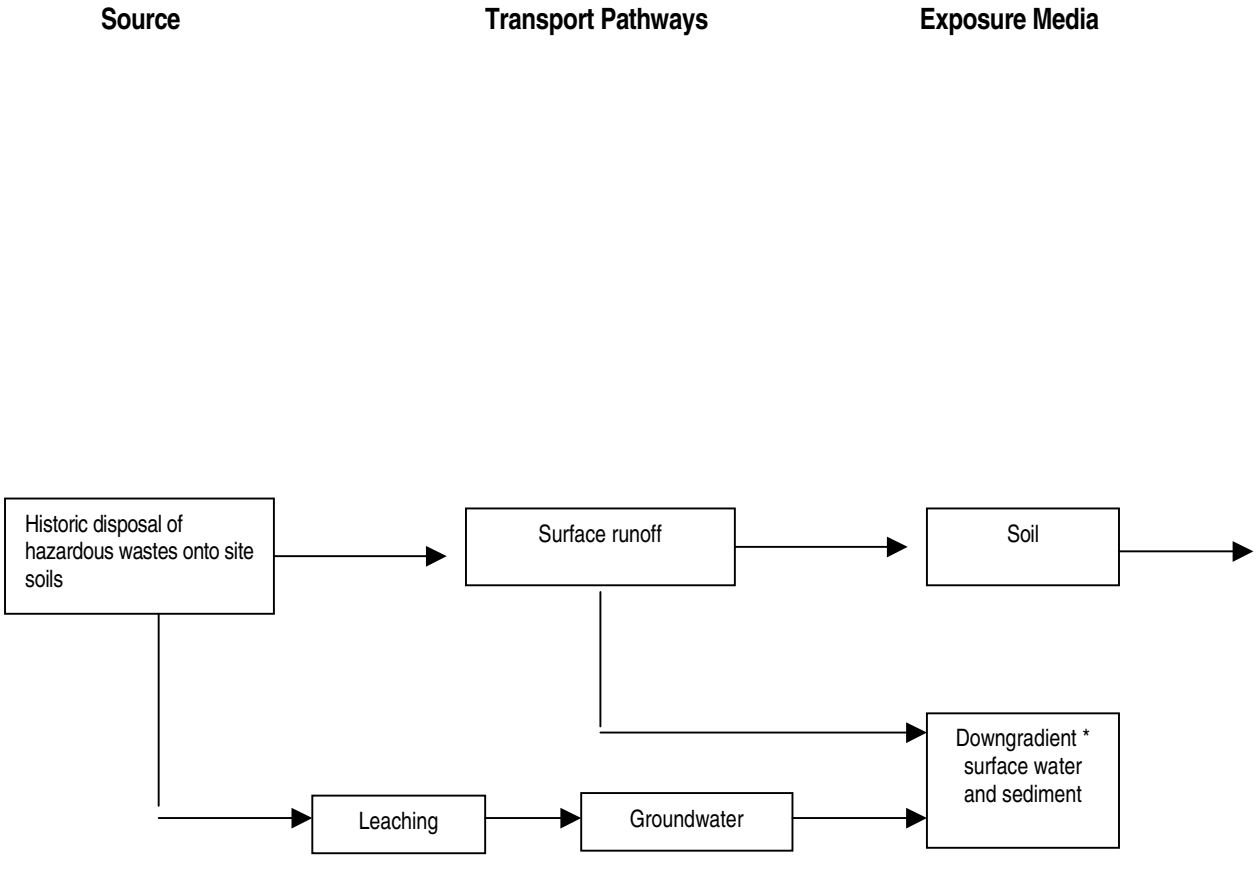
TABLE 9-11
Summary of Hazard Quotients for Upper Trophic Level Receptors
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	American Robin	Mourning Dove	Red-tailed Hawk	White-footed Mouse	Red Fox
Dibenzofuran	--	--	--	0.00	0.00
Diethylphthalate	--	--	--	0.00	0.00
Dimethyl phthalate	--	--	--	--	--
Fluoranthene	0.03	0.01	0.01	0.00	0.00
Fluorene	0.01	0.00	0.00	0.00	0.00
Hexachlorobenzene	--	--	--	--	--
Hexachlorobutadiene	--	--	--	0.01	0.00
Hexachlorocyclopentadiene	--	--	--	--	--
Hexachloroethane	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	0.03	0.01	0.01	0.45	0.10
Isophorone	--	--	--	0.00	0.00
N-Nitroso-di-n-propylamine	--	--	--	1.67	0.37
N-Nitrosodiphenylamine	--	--	--	0.00	0.00
Naphthalene	0.00	0.00	0.00	0.00	0.00
Nitrobenzene	--	--	--	--	--
Pentachlorophenol	0.00	0.00	0.00	0.17	0.04
Phenanthrene	0.03	0.01	0.01	0.00	0.00
Phenol	--	--	--	0.00	0.00
Pyrene	0.04	0.01	0.01	0.01	0.00
TAL Metals					
Aluminum	94.11	27.02	28.23	2643.44	590.67
Antimony	--	--	--	1.97	0.44
Arsenic	0.26	0.09	0.01	5.15	0.10
Barium	0.20	0.06	0.01	4.02	0.09
Beryllium	--	--	--	0.19	0.04
Cadmium	3.78	0.55	0.85	2.28	0.45
Calcium	--	--	--	--	--
Chromium	20.90	5.29	0.90	0.75	0.03
Cobalt	2.01	0.58	0.04	0.29	0.00
Copper	2.48	0.12	0.14	3.41	0.21
Cyanide	--	--	--	0.00	0.00
Iron	--	--	--	2525.24	23.31
Lead	184.40	42.61	29.13	10.23	1.51
Magnesium	--	--	--	--	--
Manganese	0.19	0.06	0.06	1.06	0.24
Mercury	4621.38	1402.77	149.82	476.04	11.03
Nickel	0.11	0.03	0.01	0.10	0.01
Potassium	--	--	--	--	--
Selenium	1.47	0.42	0.44	1.45	0.33
Silver	--	--	--	1.01	0.22
Sodium	--	--	--	--	--
Thallium	--	--	--	3.02	0.09
Vanadium	2.19	0.63	0.66	58.71	13.12
Zinc	68.40	6.97	9.46	2.38	0.32

TABLE 9-11
Summary of Hazard Quotients for Upper Trophic Level Receptors
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	American Robin	Mourning Dove	Red-tailed Hawk	White-footed Mouse	Red Fox
Explosives					
1,3,5-Trinitrobenzene	--	--	--	--	--
1,3-Dinitrobenzene	--	--	--	--	--
2,4,6-Trinitrotoluene	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	0.28	0.06
2,6-Dinitrotoluene	--	--	--	--	--
2-Amino-4,6-dinitrotoluene	--	--	--	--	--
2-Nitrotoluene	--	--	--	--	--
3-Nitrotoluene	--	--	--	--	--
4-amino-2,6-dinitrotoluene	--	--	--	--	--
4-Nitrotoluene	--	--	--	--	--
HMX	--	--	--	--	--
Nitrobenzene	--	--	--	--	--
RDX	--	--	--	--	--
Tetryl	--	--	--	--	--
Nitroguanidine	--	--	--	--	--
Pentaerythritol tetranitrate	--	--	--	--	--
Nitrocellulose	--	--	--	--	--
Nitroglycerine	--	--	--	--	--

Notes:
-- Toxicity value not available
Shaded cells indicate that the HQ exceeded 1. Chemicals without screening values are also considered preliminary COPCs.



	Terrestrial					
	Soil Invertebrates and Plants	Invertebrate-eating Birds	Herbivorous Birds	Carnivorous Birds	Omnivorous Mammals	Carnivorous Mammals
Ingestion	•	•	•	•	•	•
Direct Contact	•	•	•	•	•	•
Trophic Transfer		•	•	•	•	•
Root Uptake	•					

* Downgradient surface water and sediment (between Building 1073 and Caffee Road) have not been sampled.

Figure 9-1
Conceptual Site Model for Ecological Risk Assessment
Site 47 Remedial Investigation
NSWC Indian Head

SECTION 10

Conclusions and Recommendations

This section presents a summary of key results of the RI with respect to nature and extent of contamination, contaminant fate and transport, and potential risks to human health. Because potential risks to the environment have not yet been fully evaluated and are being considered separately through a Baseline Ecological Risk Assessment (BERA), they are not discussed further here. Along with a summary of results, conclusions and recommendations for potential evaluation of remedial action alternatives are presented. The section is organized according to the various media that were sampled and evaluated during the RI.

10.1 Summary of Site History

Mercuric nitrate reportedly was disposed of at the site as a solution containing 1 ounce of mercuric nitrate dissolved in a 55-gallon drum of 98 percent nitric acid. The solution was disposed of over an approximately eight-year period, from 1957 to 1965. An estimated 274 pounds of mercuric nitrate were disposed of at the site (NEESA, 1988). In addition, reports indicate that a waste pit existed approximately 50 feet to the east of Building 856 between 1969 and 1974. A total of approximately 2,000 pounds of barium sulfate may have been disposed of in the pit before it was permanently abandoned.

10.2 Surface Water and Sediment

10.2.1 Summary of Findings

Surface water samples contained very low concentrations of four organics, and no unusual detections of inorganics. Sediment samples contained elevated concentrations of SVOCs, including several polynuclear aromatic hydrocarbons (PAHs), particularly in samples collected from the drainage swale near Building 856. The highest concentrations of most metals were detected in one of the samples from the drainage swale near Building 856 as well. Lead and silver were detected at elevated concentrations in the sediment sample collected from sewer manhole IW-91.

Nitroglycerin (NG) was detected in two of the four sediment samples from the drainage swale near Building 856, at concentrations near 9 mg/kg. The sediment sample collected from sewer manhole IW-91 also contained NG, at a concentration of 3,100 mg/kg. However, the sewer leading from this manhole has been sealed off and is no longer in use. The sewer and drainage swale are on different sides of Building 856 and there is no apparent connection between the two locations.

Human health risks calculated for surface water and sediment did not exceed the USEPA's target risk range.

10.2.2 Conclusions and Recommendations

Sufficient data have been collected to characterize the nature and extent of contamination in surface water and sediment. No further sampling or evaluation is required for surface water and sediment, and no remedial action is warranted for these media.

10.3 Soil

10.3.1 Summary of Findings

Surface soil samples generally contained very low to undetectable concentrations of VOCs. However, two samples collected downslope of Building 856 (east of Building 1794) during the SI contained elevated VOC concentrations, including up to 3.1 mg/kg of tetrachloroethene (PCE). Metals concentrations displayed no significant spatial trends, but lead, silver, and mercury were detected at concentrations significantly exceeding the available background data for soil. Most of the highest detections occurred in samples near Building 856, but there was no clear pattern to the contamination.

NG was detected in three surface soil samples at concentrations ranging from 12 to 23 mg/kg. Nitrocellulose was detected in one surface soil sample at a concentration of 58.6 mg/kg.

Subsurface soil concentrations of VOCs and SVOCs were very low where they were detected at all. Metals were detected at concentrations exceeding background levels, but compounds detected most frequently were primarily low-risk compounds such as human nutrients.

PAHs (benzo(a)pyrene) and metals (arsenic and silver) were detected at sufficiently high concentrations in surface soil that they could serve as a continuing source of contaminant release to groundwater.

The human health risk assessment evaluated exposure pathways associated with surface soil alone, and also evaluated different exposure pathways associated with combined exposure to surface and subsurface soil. Exposure pathways evaluated for surface soil alone concluded that risks for these receptors were within or below USEPA's target risk range. Evaluation of risks to receptors that could be exposed to combined surface and subsurface soil concluded that carcinogenic risks or noncarcinogenic hazards for these receptors exceeded USEPA's target risk range or hazard index. For exposure to soil, hypothetical future residents and industrial workers would have noncarcinogenic hazards above USEPA's target, and future residents would have carcinogenic risks above USEPA's target level. The risk driver for the soil, through the inhalation route, is chloroform. Chloroform was detected only in surface soil, in two samples collected during the SI (in 1992) south of Building 856.

The results of the SERA indicated that site-related chemicals may impact the growth, survival and/or reproduction of the receptor species and receptor communities. As such, the results of the SERA are not sufficient to show that risks to ecological receptor populations at Site 47 are negligible. For all the endpoints there were multiple chemicals that were associated with HQs in excess of 1. The site should be carried through the

remainder of the 8-step process because the evaluation indicates there is a potential for site chemicals to pose a risk to ecological receptor populations. Therefore, the next step will be to perform more detailed site-specific studies as part of a baseline ERA to refine the risk estimates and reduce the uncertainties in the SERA.

10.3.2 Conclusions and Recommendations

Sufficient data were collected for surface and subsurface soil to characterize the nature and extent of contamination at the site. Potential human health risks identified due to exposure to chloroform in surface soil represent very limited potential exposure, not confirmed during later sampling, and are unlikely to pose a continuing real risk. No further evaluation is required and no remedial action is warranted.

10.4 Groundwater

10.4.1 Summary of Findings

The water table and the shallow water-bearing unit at the site are located in fine- to medium-grained silty sand overlying a hard, dense clay layer. The thickness of the shallow water-bearing unit ranges from 1 to 24 feet, depending upon the surface elevation. The thickness of the clay exceeds 30 feet at 6 drilling locations and likely is at least this thick throughout the site. Therefore, the clay appears to represent an areally extensive barrier to vertical groundwater flow.

The groundwater-flow directions measured at the site indicate that groundwater generally flows eastward. This is consistent with the presence of likely discharge areas in the Site 12 Pond and the lower reaches of the Site 8 Swale. During times of higher water table, shallow groundwater may discharge to the upper reaches of the Site 8 Swale and other swales in the area. However, all of these swales ultimately discharge into the Site 12 Pond.

Upgradient conditions may not exist at the site, or at best they are very temporal. The apparent source of most, if not all, contamination at the site is in the vicinity of Building 856. The vicinity of the building is on a groundwater divide, and groundwater may flow away from it in several directions. However, as mentioned earlier, the predominant flow direction appears to be toward the east.

Chemicals detected in groundwater include high concentrations of chlorinated VOCs, including carbon tetrachloride (CT) and its breakdown products; PCE and trichloroethene (TCE), and their breakdown products; and 1,2-dichloroethane (DCA).

Concentrations of CT and its breakdown products are highest east of Building 856 at the approximate location of the reported barium pit. *In situ* groundwater samples collected in the vicinity of the pit contained concentrations of CT at up to 250,000 μg/L; the highest CT concentration detected in a monitoring well was also in this area, at more than 286,000 μg/L. CT and breakdown products also occurred at high concentrations south of Building 856 in both *in situ* samples and monitoring well samples.

PCE, TCE, and their breakdown products are widespread in groundwater, including an area down-slope of Building 856, east of Building 1794, where PCE was detected in soil at up to 3,100 μg/kg. The maximum concentration of PCE detected in groundwater was 1,400 μg/L.

DCA was the most widespread VOC detected in groundwater. The plume appears to have originated in the vicinity of Building 856. DCA is not a common industrial chemical and is likely a degradation product of 1,1,2-trichloroethane (TCA). TCA was detected in *in situ* groundwater samples from the approximate location of the former barium pit at up to 4 µg/L.

The high concentrations of most VOCs around Building 856 suggest that this is the source area for these VOCs. Migration appears to be in the predominant flow direction of groundwater, which is toward the Site 12 Pond. According to the available data, few if any VOCs have reached the Site 12 Pond, or even the Site 8 Swale or other swales downgradient of the apparent source area.

It is likely that DNAPL carbon tetrachloride is present in the subsurface, presumably derived from direct disposal to the former pits. As a DNAPL, this liquid would migrate downward through the subsurface under the influence of gravity. The downward movement would be temporarily arrested when the DNAPL reaches the hard, dense clay layer at depths ranging from 1 to 24 feet bgs at the site. The DNAPL then could move slowly down the slope of the top surface of the clay layer. Site data indicate that the layer generally slopes to the east, toward the Site 12 pond. There are some irregularities in the top of this surface that could trap DNAPL in pools or redirect its migration in other directions. However, concentration data from wells in some of these possible traps, as well as other wells downgradient of Building 856, do not suggest the presence of DNAPL in these areas. Therefore, it is most likely that any DNAPL in the subsurface still is retained close to the original locations near Building 856 and moves only very slowly, if at all.

An evaluation of potential distance traveled by groundwater over the years since contamination was released at the site strongly suggests that dissolved VOCs are being degraded in the subsurface because they have not been detected as far downgradient as expected.

As noted above, high levels of cyanide were detected in several wells at many points around Building 856. It also is noted that those wells in the immediate vicinity of Building 856 contained no detections of cyanide. There is no available information indicating disposal of chemicals containing cyanide at Site 47. Risks and hazards associated with exposure to groundwater exceeded USEPA's target risks and hazards for all receptors. The main contributors to noncancer hazard indices are bromomethane, carbon tetrachloride, chloroform, chloromethane, 1,1-dichloroethane, tetrachloroethane, trichloroethene, arsenic, cyanide, and iron. The main contributors to carcinogenic risks are VOCs and arsenic.

10.4.2 Conclusions and Recommendations

Sufficient data have been collected to characterize the nature and extent of VOC and metals contamination at Site 47. Multiple rounds of monitoring-well data, along with direct-push samples, have been collected in the vicinity of the highest detected VOC and metals concentrations. One round of sampling has been conducted at the outlying wells; this is adequate to confirm characterization as the data are consistent with other site data, including *in situ* groundwater samples at each of the outlying well locations, and serve to confirm the boundary at which contamination has not been detected. Based on the nature and extent of VOC and metals contamination at the site, and the elevated potential human

health risk due to exposure to these compounds, a feasibility study is recommended for groundwater at Site 47.

VOC contamination detected south of the Site 8 Swale has not been fully delineated. However, because an RI/FS will be conducted at Site 8 beginning in 2003, it is appropriate to include any further evaluation of contamination in this area with that investigation.

The unusually elevated levels of cyanide detected in samples from outlying wells north and west of the site need to be confirmed or eliminated through additional sampling.

One round of monitored natural attenuation (MNA) data was collected as a baseline for eventual evaluation of this remedial alternative during the feasibility study. These data will need to be supplemented with at least one additional round of data prior to the feasibility study to allow adequate evaluation of the MNA alternative.

The following specific actions are recommended prior to the FS:

- Install three additional monitoring wells to form a line along the direction of flow for MNA evaluation;
- Collect two additional rounds of MNA data from new and selected existing wells along the direction of flow in addition to selected source area wells; and
- Resample monitoring wells IS47MW07, IS47MW08, and IS47MW09 to confirm previous elevated levels of cyanide.

Appendix A
Boring Logs

CH2MHILL	PROJECT NUMBER: 145185.RI.DR	BORING NUMBER: GW-01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Indian Head Well Installations — LOCATION : Indian Head, Maryland

ELEVATION : 42.3' — DRILLING CONTRACTOR : IMS Environment

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : 12.05' — START : 7/6/99 — END : 7/6/99 — LOGGER : R. Pierpont

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
3						
5	3' - 5'	2'		2, 3, 4, 4	1' - Silty SAND, dull Brown, 10YR 5/4, organic, v. dark mottles present 1' - Silty SAND, sand is fine to med., dark red brown, 10 YR 4/2	Entire sample is dry 0.0ppm on PID
8						
10	8' - 10'	8"		4, 6, 9, 11	SAND, fine to medium grained, some mica present, pink grey orange, 5YR 7/2	Slightly wet 0.0ppm on PID
15	13' - 15'	8"		2, 3, 4, 7	SAND w/ Silty Clay, grey green, 5G 6/1 Sample coarsens downwards, from more clayey to more sandy, and is soft, dense, and plastic throughout spoon.	very wet 0.0ppm on PID
20	18' - 20'	10"		3, 4, 4, 3	4" - SILT, Grey, N6, w/ some fine sand 6" - Silty SAND, Grey, N6	Whole sample is saturated 0.0ppm on PID
25	23' - 25'	13"		3, 4, 4, 4	8" - Slightly Clayey SAND, Mainly red, 10R 4/6 w/ light grey, N6, mottles 3"-CLAY, dense, hard, grey, N6 2"-slightly sandy CLAY, N6	whole spoon is wet 0.00ppm
					END OF BORING	

CH2MHILL	PROJECT NUMBER: 145185.RI.DR	BORING NUMBER: GW-02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Indian Head Well Installations — LOCATION : Indian Head, Maryland

ELEVATION : 44.0' — DRILLING CONTRACTOR : IMS Environment

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : 5.24' — START : 7/7/99 — END : 7/7/99 — LOGGER : R. Pierpont

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
3	3' - 5'	14"		2, 2, 1, 2	SAND, little silt, some pebbles >/1cm, some mica, moderate yellow brown, 10YR 5/4	Sample slightly moist No apparent odor 13.8 ppm on PID
5						
8	8' - 10'	9"		2, 4, 3, 7	2" - Silty SAND, 10YR 6/6, v. wet 7" - Silty SAND, some CLAY closing in on 10' BGS, 5YR 7/2, wet	No apparent odor. No PID Reading taken.
10						
13	13' - 15'	20"		2, 3, 4, 6	14" - Silty SAND, yellow brown, 10YR 5/4 6" - Same as above, but with mica, and color changes to grey green towards 15', 10G 4/2	Saturated throughout sample No PID reading taken due to saturated nature of sample.
15						
18	18' - 20'	14"			2" - Same as above , grey green 10G 4/2 12" - CLAY, dense, medium hard, grey brown 5YR 3/2, no Odor	Saturated throughout No PID reading taken due to saturated nature of sample.
20						
25					**END OF BORING**	

CH2MHILL	PROJECT NUMBER: 145185.RI.DR	BORING NUMBER: GW-03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Indian Head Well Installations — LOCATION : Indian Head, Maryland

ELEVATION :~ 40.0' — DRILLING CONTRACTOR : IMS Environment

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : 9.74' — START : 7/7/99 — END : 7/7/99 — LOGGER : R. Pierpont

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION.
	3 '- 5'	1.5'		3, 4, 5, 6	7" - Silty SAND, Light brown, 5YR 5/6, dry 4" - Silty SAND, light brown, 10 YR 7/4, dry 7" - Silty SAND, yellow orange, 10YR 6/6 natural organic order, slightly moist	Top 7" is highly organic 3.7 ppm on PID
5						
8						
	8' -10'	1'		2, 3, 3, 4	Same as above	Sample becomes wet at 10' 82.6 ppm on PID
10						
13						
	13' - 15'	6"		2, 2, 5, 7	Silty SAND, grey pink orange, 5YR 7/2, some small pebbles throughout spoon	Sample very odorous Samples saturated No PID reading taken due to saturated nature of sample.
15						
18						
	18' - 20'	10"		2, 3, 2, 3	4" - SAND, med. fine to med. grained, grey brown to pink orange, 5YR 3/2 to 5YR 7/2 6" - CLAY, hard, dense, dusky brown, 5YR 3/2 Clay is odorous	Sample is saturated throughout No PID reading taken due to saturated nature of sample.
20						
					END of BORING	
25						

CH2MHILL	PROJECT NUMBER: 145185.RI.DR	BORING NUMBER: GW-04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Indian Head Well Installations — LOCATION : Indian Head, Maryland

ELEVATION : 45.0' — DRILLING CONTRACTOR : IMS Environment

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : 6.18' — START : 7/6/99 — END : 7/6/99 — LOGGER : R. Pierpont

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
3						
5	3' - 5'	14"		1 - 3 - 3 - 6	6" - Silty SAND, light brown, 5YR 5/6, much organic material 2" - Silty SAND, sand is poorly graded and fine, dark brown, 5YR 3/2 6" - SAND, some silt, grey orange pink, 5YR 7/2	No apparent odor 5.1 ppm Sample is wet at 4.5'
10	8' - 10'	8"		2 -3 - 6 - 7	8" - SAND with silt, pale yellow brown, 10YR 6/2	17.3ppm Some petrol odor from soil Whole sample is saturated
15	13' - 15'	N/A	N/A	N/A	No Recovery	
20					**END of BORING**	
25						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47MW05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head — LOCATION : Site 47

TOC ELEVATION : — DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : — START :3/28/01 — END : 3/28/01 — LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	24/24	1-S	2-2-3-2 (5)	top soil light brown fine sand 0.0 PID	Breathing Zone = 0.0 ppm
	4.0	0/24	2-S	2-2-3-4 (5)	no recovery	Breathing Zone = 0.0 ppm
5	6.0	16/24	3-S	5-8-5-14 (13)	8" light brown fine sand 8" light gray fine sand 0.0 PID	Breathing Zone = 0.0 ppm Driller noted water table 4.5 ft below grade
	8.0	24/24	4-S	10-9-9-10 (18)	Wet Intermittent light brown and light gray fine sand 0.0 PID	Breathing Zone = 0.0 ppm
10	10.0	14/24	5-S	5-5-3-5 (8)	2" light brown sand 12" olive/gray silty sand 0.0 PID	Breathing Zone = 0.0 ppm
	12.0	22/24	6-S	3-2-3-3 (5)	20" olive gray silty sand 2" dark gray clay - medium to high plasticity 0.0 PID	Breathing Zone = 0.0 ppm
	14.0	4/24	7-S	10-9-9-10 (18)	light gray clay high plasticity 0.0 PID	Breathing Zone = 0.0 ppm
15					- End of Boring	Monitoring well set to 13 ft below grade
20						
25						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47MW06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head — LOCATION : Site 47

TOC ELEVATION : — DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : — START :3/30/01 — END : 3/30/01 — LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	12/24	1-S	2-4-7-10 (11)	2" top soil 10" silty sand tan & grey Moist 25.3 PID no odor	Breathing Zone = 0.0 ppm
	4.0	24/24	2-S	6-7-12-12 (19)	silty sand tan & grey moist & wet 27.0 PID no odor (PID malfunctioning because of rain/moisture)	Breathing Zone = 0.0 ppm
5	6.0	12/24	3-S	4-3-2-2 (5)	silty sand tan and grey wet no odor	Breathing Zone = 0.0 ppm Driller noted water table 5 ft below grade
	8.0	24/24	4-S	7-12-15-12 (27)	12" tan and grey silty sand 12" grey silty sand wet , no odor	Breathing Zone = 0.0 ppm
10	10.0	24/24	5-S	6-6-7-7 (13)	5" grey silty sand 2.5" clay 16" grey silty sand wet no odor	Breathing Zone = 0.0 ppm
	12.0	24/24	6-S	3-4-15-12 (19)	12" silty sand 1" clay 11" silty sand no odor	Breathing Zone = 0.0 ppm
	14.0	24/24	6-S	6-6-10-12 (16)	21" silty sand 1" dark gray clay 2" ligth grey clay no odor	Breathing Zone = 0.0 ppm
15					- End of Boring collect shelby tube 14-16'	Monitoring well set to 15 ft below grade
20						
25						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47MW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head — LOCATION : Site 47

TOC ELEVATION : — DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : — START :3/29/01 — END : 3/29/01 — LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	24/24	1-S	3-5-3-4 (8)	2" top soil 22" fine silty sand, tan 0.0 PID no odor	Breathing Zone = 0.0 ppm
	4.0	20/24	2-S	7-8-9-7 (17)	find sand less silt, tan 0.0 PID no odor	Breathing Zone = 0.0 ppm
5	6.0	24/24	3-S	5-6-5-8 (11)	24" light brown and light grey fine sand 0.0 PID no odor	Breathing Zone = 0.0 ppm Driller noted water table 5.5 ft below grade
	8.0	12/24	4-S	5-5-5-5 (10)	light brown and light gray fine sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
10	10.0				did not collect spoon	Breathing Zone = 0.0 ppm
	12.0	24/24	5-S	7-9-8-4 (17)	ligth brown + light grey silty sand Wet 0.4 PID no odor	Breathing Zone = 0.0 ppm
	14.0	24/24	6-S	6-5-6-6 (11)	12" silty sand (tan) 12" grey silty sand 0.5 PID no odor	Breathing Zone = 0.0 ppm
15	16.0	24/24	7-S	3-4-6-6 (11)	22" brown and grey silty sand 2" dark brown clay high platicity 0.4 PID	Breathing Zone = 0.0 ppm
	18.0	6/24	8-S	6-6-5-5 (11)	ligth grey clay high plasticity 0.4 PID	Breathing Zone = 0.0 ppm
20					- End of Boring collected shelby tube 18-20'	Monitoring well set to 17 ft below grade
25						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47MW08	SHEET 1 OF 1

CH2MHILL

SOIL BORING LOG

PROJECT : NSWC Indian Head — LOCATION : Site 47

TOC ELEVATION : — DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : — START :3/29/01 — END : 3/29/01 — LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	24/24	1-S	2-4-2-3 (6)	brown fine sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
	4.0	4/24	2-S	3-4-4-15 (8)	brown fine sand little bits of silty sand or clay bits 0.0 PID no odor	Breathing Zone = 0.0 ppm
5	6.0	20/24	3-S	3-3-4-5 (7)	brown fine sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
	8.0	14/24	4-S	6-8-10-11 (18)	light brown and light gray fine sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm Driller noted water table 7.5 ft below grade
10	10.0	24/24	5-S	6-9-9-9 (18)	brown fine sand wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
	12.0	18/24	6-S	5-4-8-11 (12)	8" brown sand 2" grey clay 8" grey fine sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
	14.0	24/24	7-S	6-8-7-7 (5)	grey sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
15	16.0	24/24	8-S	6-8-8-17 (16)	14" grey fine sand and brown sand 2" grey sand 8" grey & brown sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
	18.0	24/24	9-S	4-5-6-5 (11)	fine grey sand 2" dark brown clay high plasticity 0.0 PID	Breathing Zone = 0.0 ppm
20	20.0	6/24	10-S	2-3-4-4 (7)	6" gray clay high plasticity 0.0 PID	Breathing Zone = 0.0 ppm
25					- End of Boring collected shelby tube 20-22'	Monitoring well set to 19 ft below grade

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47MW09	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head — LOCATION : Site 47

TOC ELEVATION : — DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : — START :3/30/01 — END : 3/30/01 — LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	24/24	1-S	2-2-3-2 (5)	2" top soil 10"brown silty sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
	4.0	20/24	2-S	2-2-3-4 (5)	brown silty sand moist 0.0 PID no odor	Breathing Zone = 0.0 ppm
5	6.0	18/24	3-S	3-3-4-5 (7)	brown fine sand Moist 0.0 PID no odor	Breathing Zone = 0.0 ppm
	8.0	16/24	4-S	4-4-4-4 (8)	brown fine sand moist 0.0 PID no odor	Breathing Zone = 0.0 ppm
10	10.0	18/24	5-S	2-3-3-3 (6)	brown fine sand Moist 0.0 PID no odor	Breathing Zone = 0.0 ppm
	12.0	16/24	6-S	2-2-3-9 (5)	8" rusty colored fine sand 8" pinkish gray sand wet 0.0 PID no odor Wate table at 10.5' bgs	Breathing Zone = 0.0 ppm Driller noted water table 10.5 ft below grade
	14.0	14/24	7-S	6-6-8-12 (14)	light gray fine sand wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
15	16.0	23/24	8-S	5-5-14-7 (19)	11" rusty fine sand 12"light gray fine sand wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
	18.0	24/24	9-S	17-22-19-19 (41)	19" light tan fine sand 5" grey silty sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
20	20.0	24/24	10-S	4-7-9-10 (16)	22" pinkish gray fine sand 0.5" dark green clay 1.5" darl gray fine sand 0.0 PID no odor , wet	Breathing Zone = 0.0 ppm
	22.0	24/24	11-S	5-9-15-22 (24)	20" pinkish gray fine sand 4" grey silty sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
	24.0	24/24	12-S	6-6-4-7 (10)	grey silty sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
25	26.0	12/24	13-S	6-5-7-7 (12)	8" grey fine sand 4" dark gray clay high plasticity 0.0 PID no odor	Breathing Zone = 0.0 ppm
					- End of Boring collect shelby tube 26-28'	Monitoring well set to 26 ft below grade

CH2MHILL	PROJECT NUMBER	BORING NUMBER	
	145185.FI.MW	IS47MW10	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head — LOCATION : Site 47

TOC ELEVATION : — DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : — START :3/30/01 — END : 3/30/01 — LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	6/24	1-S	1-1-2-1 (3)	2" top soil 4" tan silty sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
	4.0	16/24	2-S	2-2-2-3 (4)	water table at 3' tan silty sand 0.0 PID no odor	Breathing Zone = 0.0 ppm
5	6.0	14/24	3-S	3-2-4-4 (6)	tan silty sand wet 0.0 PID no odor	Breathing Zone = 0.0 ppm Driller noted water table 5.5 ft below grade
	8.0	0/24	4-S	7-13-13-12 (26)	no recovery	Breathing Zone = 0.0 ppm
10	10.0	24/24	5-S	4-1-7-9 (8)	21" tan fine silty sand 1" dark grey plastic clay 2" grey silty sand	Breathing Zone = 0.0 ppm
	12.0	12/24	6-S	2-4-10-12 (14)	5" grey silty sand 2" grey plastic clay 5" gray silty sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
	14.0	24/24	7-S	8-15-13-10 (28)	8" brown silty sand 2" grey silty sand 16" gray silty sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
15	16.0	24/24	8-S	11-7-6-6 (13)	grey silty sand Wet 0.0 PID no odor	Breathing Zone = 0.0 ppm
	18.0	24/24	9-S	7-11-9-4 (20)	6" gray silty sand 18" dark gray plastic clay high plasticity 0.0 PID	Breathing Zone = 0.0 ppm
20					-End of Boring collect shelby tube 18-20'	Monitoring well set to 17 ft below grade
25						

CH2MHILL	PROJECT NUMBER 145185.FI.MW	BORING NUMBER BH-1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

TOC ELEVATION : DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : START :3/29/01 END : 3/29/01 LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
	2.0	24/24	1-S	1-1-1-12 (2)	2" top soil 22" silty sand & sandy clay Tan Moist 22.4 PID no odor	Breathing Zone = 0.0 ppm
	4.0	24/24	2-S	2-3-6-6 (9)	24" Silty/ clayey sand Tan Moist 32.3 PID no odor	Breathing Zone = 0.0 ppm
5	6.0	12/24	3-S	5-7-8-4 (15)	Silty/ clay sand Tan Moist 35.6 PID no odor	Breathing Zone = 0.0 ppm Driller noted water table 4 ft below grade
	8.0	23/24	4-S	4-7-3-2 (10)	22" gray fine sand 1" of rusty colored sand Wet 70.1 PID no odor	Breathing Zone = 0.0 ppm
10	10.0	20/24	5-S	3-6-4-9 (10)	15" grey fine sand 2" dark grey clay 3" grey fine sand plastic 36.0 PID no odor	Breathing Zone = 0.0 ppm
	12.0	24/24	6-S	5-5-9-11 (14)	brown & grey sand Wet (drillers can smell odor, but logger cannot) 100.7 PID no odor	Breathing Zone = 0.0 ppm
	14.0	24/24	7-S	5-5-5-6 (10)	brown & grey sand Wet 122.0 PID	Breathing Zone = 0.0 ppm
15	16.0	24/24	8-S	4-8-4-4 (12)	18" brown & grey sand 3" clay at 15.5 ft bgs 3" brwon & grey sand 22.0 PID	Breathing Zone = 0.0 ppm
	18.0		9-S	4-5-6-5 (11)	12" grey sand 21.0 PIC 1" dark grey 18.0 PID 11" light grey clay, plastic	Breathing Zone = 0.0 ppm
20	20.0				collected shelby tube 18-20'	Breathing Zone = 0.0 ppm
	22.0	14/24	10-S	4-5-6-5 (11)	4" ligth grey clay, plastic 10" grey fine sand clay layer is from 17 ft bgs to 21 ft bgs	Breathing Zone = 0.0 ppm
25					- End of Boring	

CH2MHILL	PROJECT NUMBER 145185.FI.MW	BORING NUMBER BH-2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

TOC ELEVATION : DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : START :3/30/01 END : 3/30/01 LOGGER : E. Corack

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
10					Started spooning at 22' to see what was below sand at BH-1. BH-2 is 2 feet north of BH-1.	
15						
20						
	22.0					
	24.0	20/24	1-S	3-3-3-3 (6)	12" light gray plastic clay 1" gray fine sand 7" light gray plastic clay 0.0 PID no odor	Breathing Zone = 0.0 ppm
25	26.0	4/24	2-S	1-2-3-2 (5)	light gray plastic clay 0.0 PID no odor	Breathing Zone = 0.0 ppm
	28.0	24/24	3-S	2-2-3-4 (5)	light gray plastic clay 0.0 PID no odor	Breathing Zone = 0.0 ppm
					-End of Boring	

CH2MHILL	PROJECT NUMBER 145185.FI.MW	BORING NUMBER IS47MW11	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head | LOCATION : Site 47

TOC ELEVATION : | DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : | START : 9/3/02 | END : 9/3/02 | LOGGER : D. Steckler

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
5						
7	2.0	24		8-12-12-3 (24)	Silty medium sand, light brown, loose, moist	
10						
12	2.0	24		12-25-20-26 (45)	Clay, gray, stiff, moist	
15					End Boring at 12.0 feet	Set monitoring well IS47MW11
20						
25						

CH2MHILL	PROJECT NUMBER	BORING NUMBER	
	145185.FI.MW	IS47MW12	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

TOC ELEVATION : DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : START : 9/3/02 END : 9/3/02 LOGGER : D. Steckler

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
5						
7	2.0	24		6-11-19-12 (30)	Silty medium sand, light brown, loose, moist	
10						
12	2.0	24		13-13-20-13 (33)	Clay, gray, stiff, moist	
15					End Boring at 12.0 feet	Set monitoring well IS47MW12
20						
25						

CH2MHILL	PROJECT NUMBER 145185.FI.MW	BORING NUMBER IS47MW13	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head | LOCATION : Site 47

TOC ELEVATION : | DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : | START : 9/4/02 | END : 9/4/02 | LOGGER : D. Steckler

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
5						
7	2.0	24		3-15-12-3 (27)	Silty medium sand, light brown, loose, moist	
10						
12	2.0	24		13-15-12-14 (45)	Silty medium sand some clay, light brown, loose, moist	
15						
17	2.0	24		12-25-20-26 (45)	15.0-16.0 Silty sand as above 16.0-17.0 Clay, gray, stiff, moist	
20 25					End Boring at 18 feet	Set monitoring well IS47MW13

CH2MHILL	PROJECT NUMBER 145185.FI.MW	BORING NUMBER IS47MW14	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head | LOCATION : Site 47

TOC ELEVATION : | DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : | START : 9/4/02 | END : 9/4/02 | LOGGER : D. Steckler

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
5						
7	2.0	24		13-9-12-4 (23)	Silty medium sand some clay, light brown, loose, moist	
10						
12	2.0	24		18-16-16-11 (32)	Clay with sand, gray, stiff, moist	
15						
17	2.0	24		12-25-20-26 (45)	Clay some sand and silt, gray, stiff, moist	
20					End Boring at 20 feet	Set monitoring well IS47MW14
25						

CH2MHILL	PROJECT NUMBER 145185.FI.MW	BORING NUMBER IS47MW15	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head | LOCATION : Site 47

TOC ELEVATION : | DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers, CME 75 drill rig

WATER LEVELS : | START : 9/5/02 | END : 9/5/02 | LOGGER : D. Steckler

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
5						
7	2.0	24		7-15-6-14 (21)	Silty medium sand, light brown, loose, moist	
10						
12	2.0	24		8-8-16-14 (24)	Clay with sand, light brown and gray, stiff, moist	
15						
20					End Boring at 15 feet	Set monitoring well Is47MW15
25						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47SB01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Columbia Technologies, Columbia, MD

DRILLING METHOD AND EQUIPMENT USED : Truck-mounted Geoprobe

START: 6/19/02 END: 6/19/02 LOGGER : E. Carpenetti

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
1 2 3 4	4.0	48/48	Macro core	NA		
5 6 7 8	4.0	48/48	Macro core	NA		
9 10						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47SB02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Columbia Technologies, Columbia, MD

DRILLING METHOD AND EQUIPMENT USED : Truck-mounted Geoprobe

START: 6/19/02 END: 6/19/02 LOGGER : E. Carpenetti

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
1 2 3 4	4.0	48/48	Macro core	NA		
5 6 7 8	4.0	48/48	Macro core	NA		
9 10						

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47SB03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Columbia Technologies, Columbia, MD

DRILLING METHOD AND EQUIPMENT USED : Truck-mounted Geoprobe

START: 6/19/02 END: 6/19/02 LOGGER : E. Carpenetti

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	

PROJECT NUMBER	BORING NUMBER	
145185.FI.MW	IS47SB04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Columbia Technologies, Columbia, MD

DRILLING METHOD AND EQUIPMENT USED : Truck-mounted Geoprobe

START: 6/19/02 END: 6/19/02 LOGGER : E. Carpenetti

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm):
1						
2	4.0	48/48	Macro core			
3						
4				NA		
5						
6	4.0	48/48	Macro core			
7						
8				NA		
9						
10						

CH2MHILL	PROJECT NUMBER	BORING NUMBER	
	145185.FI.MW	IS47SB05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Columbia Technologies, Columbia, MD

DRILLING METHOD AND EQUIPMENT USED : Truck-mounted Geoprobe

START: 6/19/02 END: 6/19/02 LOGGER : E. Carpenetti

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS
1 2 3 4	4.0	48/48	Macro core	NA		
5 6 7 8	4.0	48/48	Macro core	NA		
9 10						

Appendix B
Well Completion Diagrams

PROJECT NUMBER:	WELL NUMBER
145185.RI.DR	GW-01 SHEET 1 OF 1

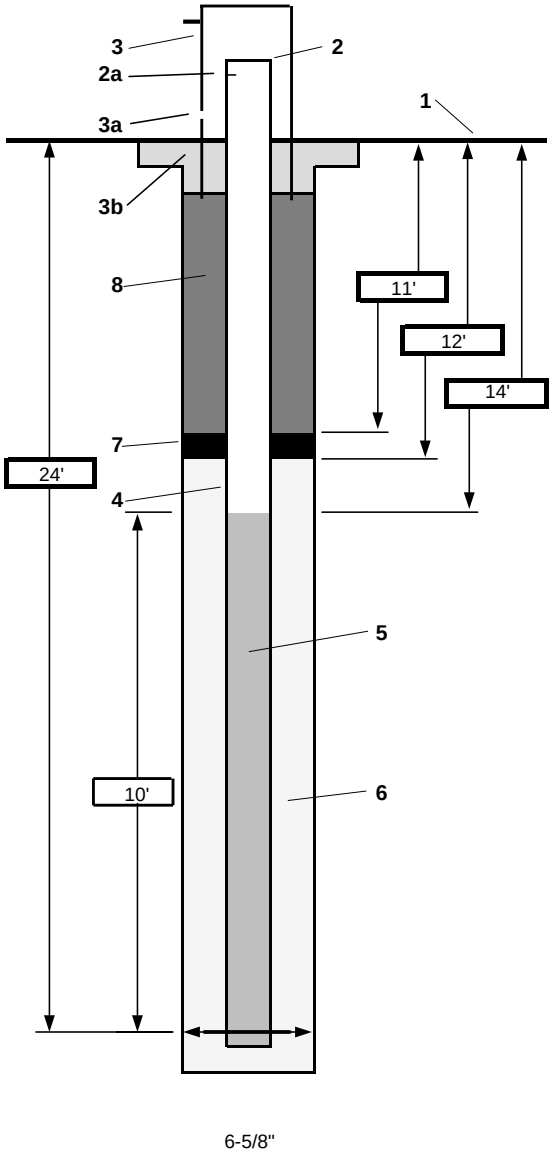
WELL COMPLETION DIAGRAM

PROJECT : Indian Head Monitoring Well Installation — LOCATION : Indian Head, Maryland

DRILLING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : 6-5/8" Hollowstem Auger

WATER LEVELS : 12.05' — START : 7/6/99 — END : 7/6/99 — LOGGER : R. Pierpont



1- Ground elevation at well	~ 45.0'
2- Top of casing elevation	48.77'
a) vent hole?	Yes
3- Wellhead protection cover type	Above ground
a) weep hole?	No
b) concrete pad dimensions	b) 3'x3'x0.5'
4- Dia./type of well casing	2" diameter PVC screen.
5- Type/slot size of screen	2" diameter, 10 slot, PVC screen
6- Type screen filter	
a) Quantity used	24 Gallons of filter sand
7- Type of seal	2 Gallons of Bentonite chips.
a) Quantity used	
8- Grout	
a) Grout mix used	Grout/Bentonite
b) Method of placement	Tremied
c) Vol. of well casing grout	22 Gallons
Development method	Purging
Development time	45 minutes
Estimated purge volume	55 Gallons

Comments: Water at first silty, cleared after only 5 gallons, no apparent odor present.

PROJECT NUMBER	WELL NUMBER	
145185.RI.DR	**GW-02**	SHEET 1 OF 1

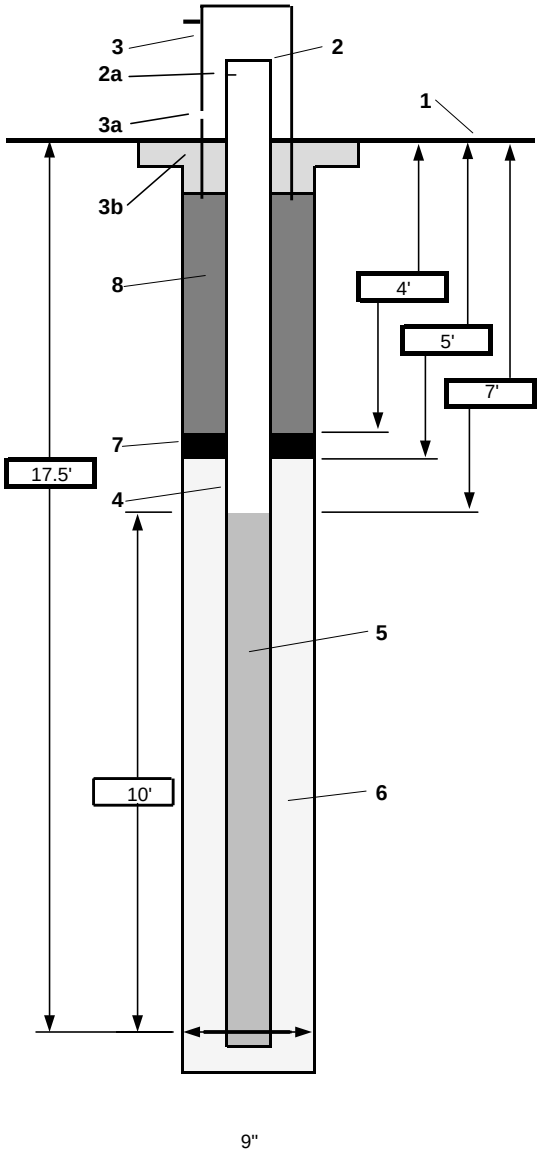
WELL COMPLETION DIAGRAM

PROJECT : Indian Head Monitoring Well Installation LOCATION : Indian Head Maryland

DRILLING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : 6-5/8" Hollowstem Auger

WATER LEVELS : 5.24' START : 7/7/99 END : 7/7/99 LOGGER : R. Pierpont



1-	Ground elevation at well	~ 42.3'
2-	Top of casing elevation	42.01'
	a) vent hole?	Yes
3-	Wellhead protection cover type	Flushmount
	a) weep hole?	No
	b) concrete pad dimensions	3'x3'x0.5'
4-	Dia./type of well casing	2" diameter PVC Riser
5-	Type/slot size of screen	10 slot, PVC, screen 2" diameter
6-	Type screen filter	Filter Sand
	a) Quantity used	24 Gallons
7-	Type of seal	Bentonite Chips
	a) Quantity used	2 Gallons
8-	Grout	
	a) Grout mix used	Portland and bentonite
	b) Method of placement	Tremie
	c) Vol. of well casing grout	10 Gallons
	Development method	Purging
	Development time	2 hours
	Estimated purge volume	65 Gallons

Comments Initial water is only slightly silty, but odorous of eggs. Water cleared, but still had eggy smell. Well did run dry after 30 gallons, and again after 15 gallons before completing development.

PROJECT NUMBER	WELL NUMBER		
145185.RI.DR	GW-03	SHEET 1	OF 1

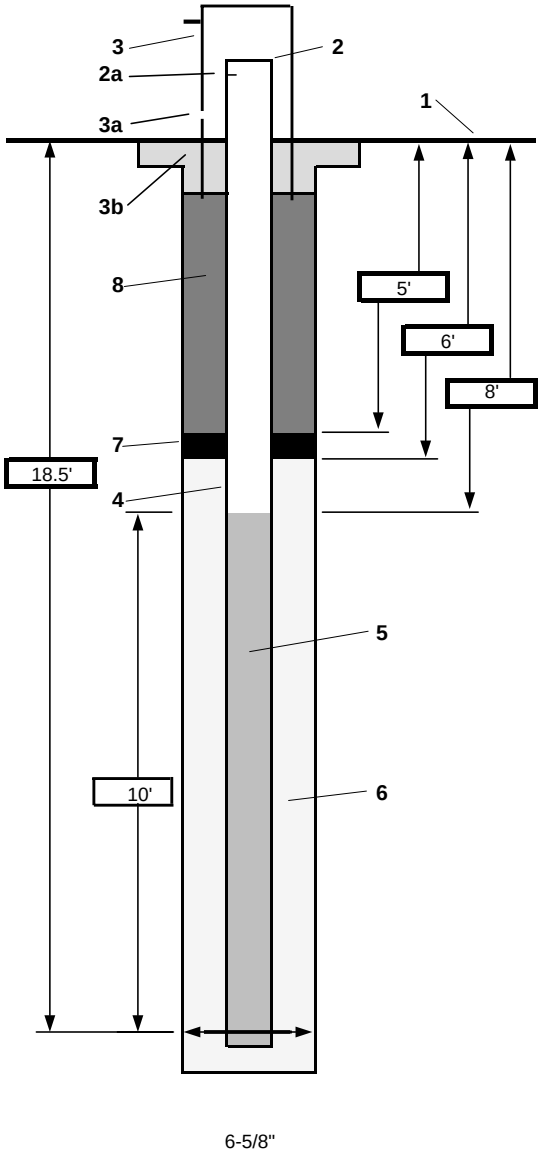
WELL COMPLETION DIAGRAM

PROJECT : Indian Head Monitoring Well Installations LOCATION :Indian Head, Maryland

DRILLING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : 6-5/8" Hollowstem Auger

WATER LEVELS : 9.74' START : 7/7/99 END : 7/7/99 LOGGER : R. Pierpont



1-	Ground elevation at well	~44.0'
2-	Top of casing elevation	47.09'
	a) vent hole?	Yes
3-	Wellhead protection cover type	Above ground
	a) weep hole?	No
	b) concrete pad dimensions	3'x3'x0.5'
4-	Dia./type of well casing	2" diameter PVC Riser
5-	Type/slot size of screen	2" diameter, 10 slot PVC screen
6-	Type screen filter	Filter Sand
	a) Quantity used	24 Gallons
7-	Type of seal	Bentonite chips
	a) Quantity used	2 Gallons
8-	Grout	
	a) Grout mix used	Portland, and bentonite
	b) Method of placement	Tremie
	c) Vol. of well casing grout	10 Gallons
	Development method	Purging
	Development time	80 minutes
	Estimated purge volume	90 Gallons

Comments Initial water is silty and grey, and very odorous. Water cleared, but was still odorous of eggs.

PROJECT NUMBER:	WELL NUMBER	
145185.RI.DR	GW-04	SHEET 1 OF 1

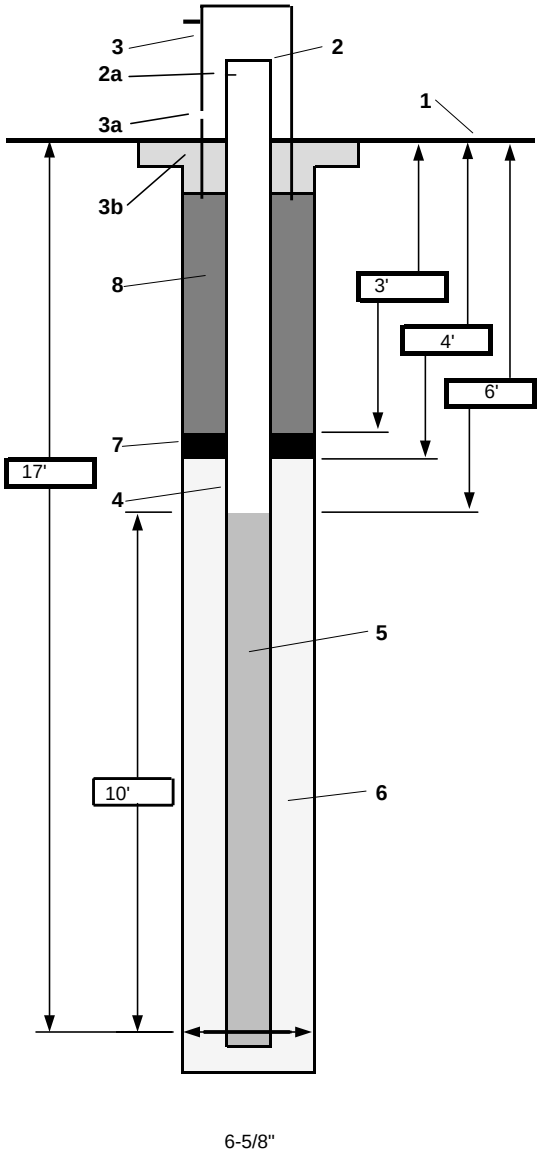
WELL COMPLETION DIAGRAM

PROJECT : Indian Head Monitoring Well Installation — LOCATION : Indian Head, Maryland

DRILLING CONTRACTOR : IMS Environmental

DRILLING METHOD AND EQUIPMENT USED : 6-5/8" Hollowstem Auger

WATER LEVELS : 6.18' — START : 7/7/99 — END : 7/7/99 — LOGGER : R. Pierpont



1- Ground elevation at well	~40.0'
2- Top of casing elevation	43.08'
a) vent hole?	No
3- Wellhead protection cover type	Above ground
a) weep hole?	No
b) concrete pad dimensions	3'x3'x0.5'
4- Dia./type of well casing	2" diameter PVC Riser
5- Type/slot size of screen	2" diameter, 10 Slot, PVC Screen
6- Type screen filter	Filter Sand
a) Quantity used	24 Gallons
7- Type of seal	Bentonite Chips
a) Quantity used	2 Gallons
8- Grout	
a) Grout mix used	Portland and bentonite
b) Method of placement	Tremie
c) Vol. of well casing grout	6 Gallons
Development method	Purging
Development time	35 minutes
Estimated purge volume	55 Gallons

Comments: Water initially slightly silty and quickly cleared up. No apparent odor. pH was between 5 & 6.

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW05	SHEET 1	OF 1

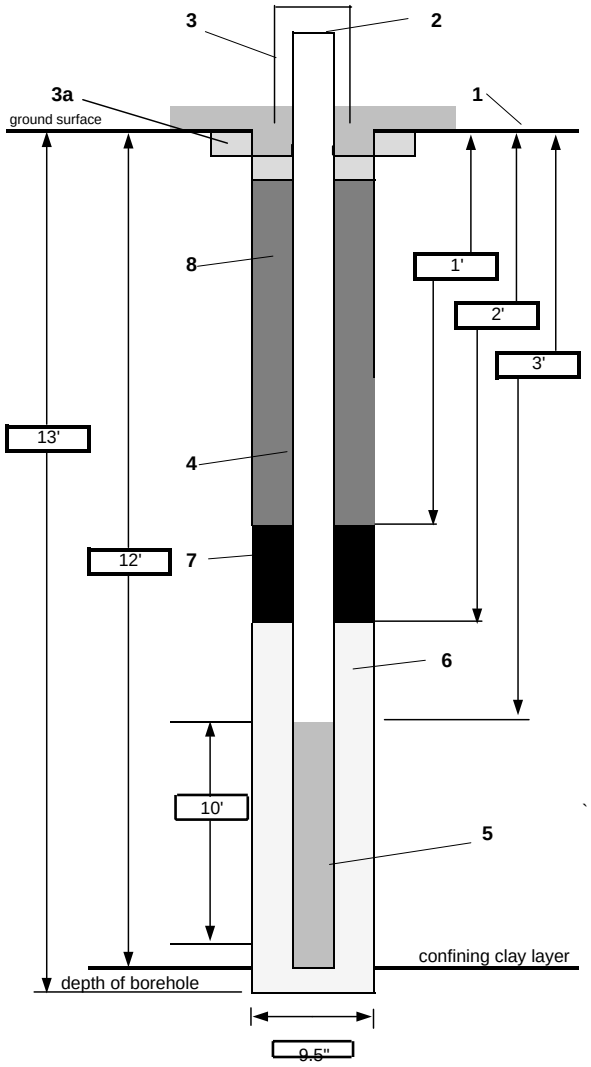
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 3/28/01 END : 3/28/01 LOGGER : E. Corack



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Riser casing with ballards
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~45 gallons

Comments 5' riser pvc length

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW06	SHEET 1	OF 1

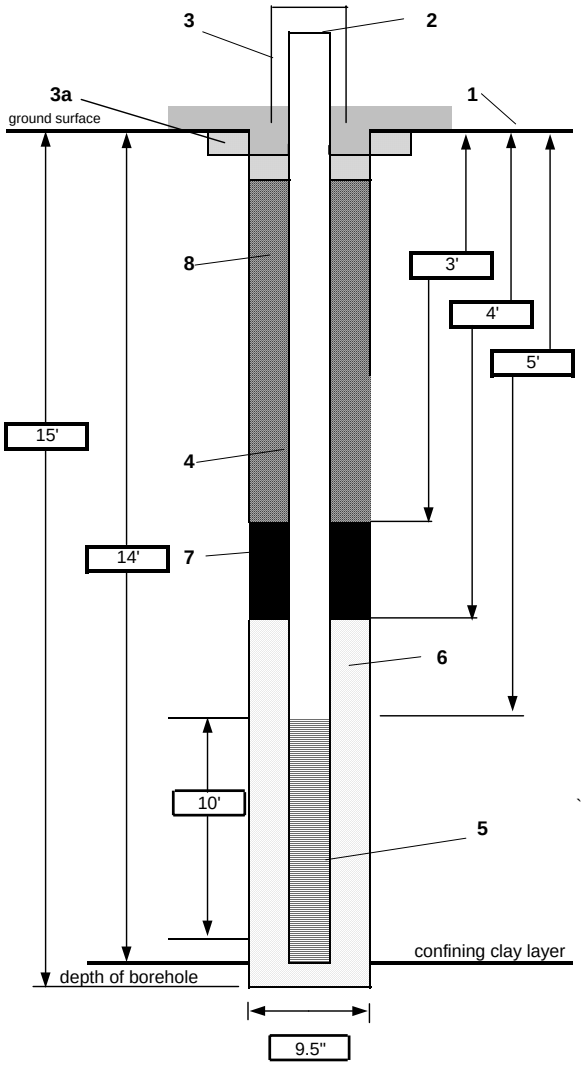
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 3/30/01 END : 3/30/01 LOGGER : E. Corack



1- Ground elevation at well _____

2- Top of casing elevation _____

3- Wellhead protection cover type: Riser casing with ballards
   a) drain tube: sand drain
   b) concrete pad dimensions: 3 ft x 3ft pad

4- Dia./type of well casing: 2" PVC Schedule 40

5- Type/slot size of screen: 2: PVC Schedule 40 10 slot

6- Type screen filter: DSI #1 filter sand
   a) quantity used _____

7- Type of seal: 3/8" Bentonite Chips
   a) quantity used _____

8- Grout
   a) Grout mix used: (concrete pad down to bentonite)
   b) Method of placement _____
   c) Vol. Of well casing grout _____

Development method: surge/submersible pump

Development time _____

Estimated purge volume: ~30 gallons

Comments: 7.5' riser pvc length

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW07	SHEET 1	OF 1

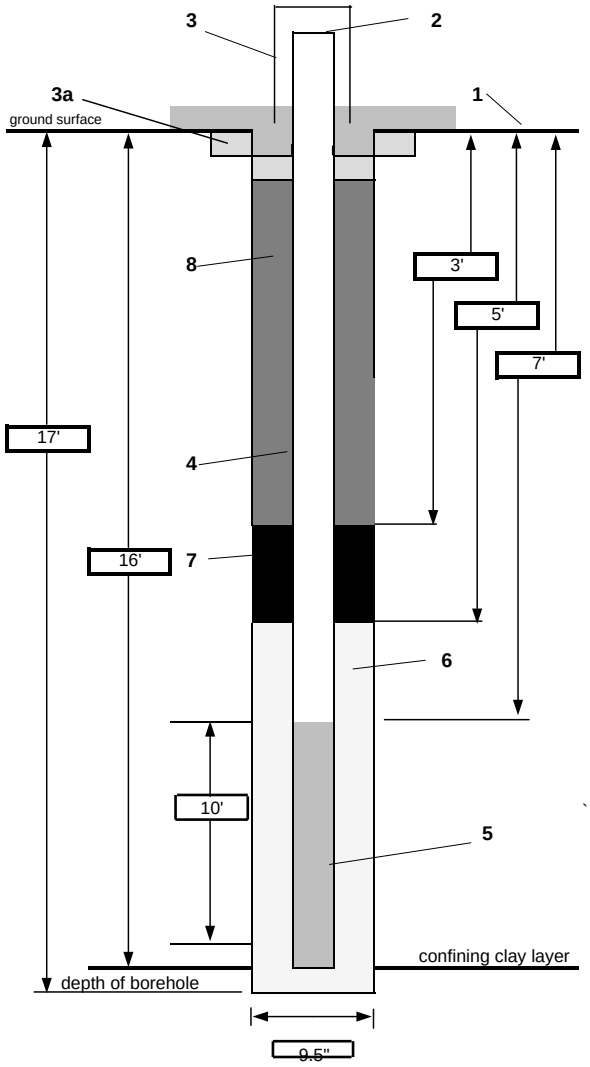
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 3/20/01 END : 3/29/01 LOGGER : E. Corack



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: Riser casing with ballards
a) drain tube: sand drain
b) concrete pad dimensions: 3 ft x 3ft pad

4- Dia./type of well casing: 2" PVC Schedule 40

5- Type/slot size of screen: 2: PVC Schedule 40 10 slot

6- Type screen filter: DSI #1 filter sand
a) quantity used

7- Type of seal: 3/8" Bentonite Chips
a) quantity used

8- Grout
a) Grout mix used: (concrete pad down to bentonite)
b) Method of placement
c) Vol. Of well casing grout

Development method: surge/submersible pump

Development time

Estimated purge volume: ~50 gallons

Comments: 10' riser pvc length

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW08	SHEET 1	OF 1

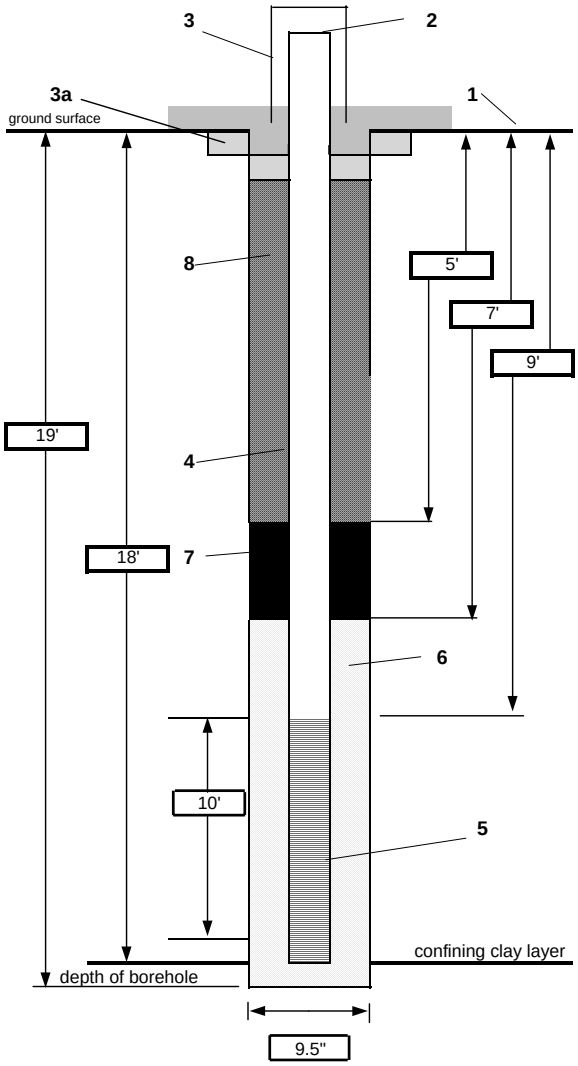
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 3/29/01 END : 3/29/01 LOGGER : E. Corack



1- Ground elevation at well _____

2- Top of casing elevation _____

3- Wellhead protection cover type: Riser casing with ballards
   a) drain tube: sand drain
   b) concrete pad dimensions: 3 ft x 3ft pad

4- Dia./type of well casing: 2" PVC Schedule 40

5- Type/slot size of screen: 2: PVC Schedule 40 10 slot

6- Type screen filter: DSI #1 filter sand
   a) quantity used _____

7- Type of seal: 3/8" Bentonite Chips
   a) quantity used _____

8- Grout
   a) Grout mix used: (concrete pad down to bentonite)
   b) Method of placement _____
   c) Vol. Of well casing grout _____

Development method: surge/submersible pump

Development time _____

Estimated purge volume: ~30 gallons

Comments: 11.5' riser pvc length

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW09	SHEET 1	OF 1

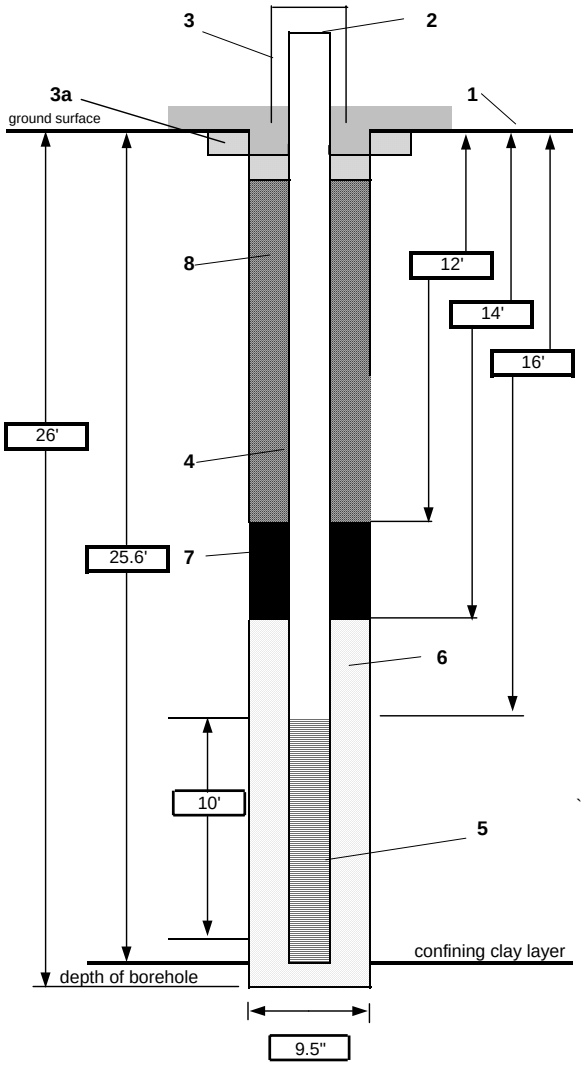
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 3/30/01 END : 3/30/01 LOGGER : E. Corack



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Riser casing with ballards
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~35 gallons

Comments 18.5' riser pvc length

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW10	SHEET 1	OF 1

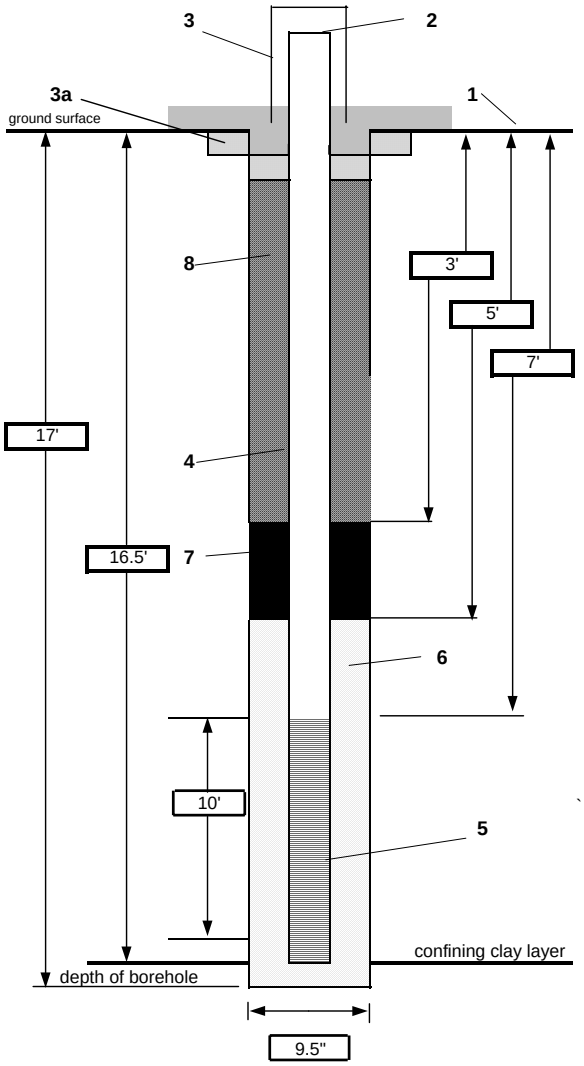
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 3/30/01 END : 3/230/01 LOGGER : E. Corack



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Riser casing with ballards
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~25 gallons

Comments 9.5' riser pvc length

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW11	SHEET 1	OF 1

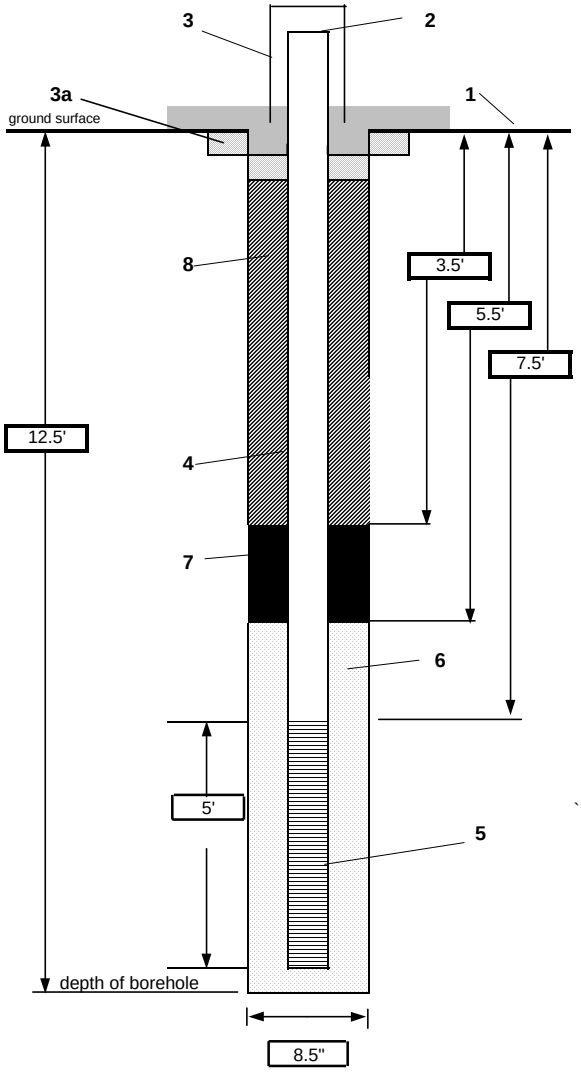
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 9/3/02 END : 9/3/02 LOGGER : D. Steckler



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Riser casing with ballards
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~25 gallons

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW12	SHEET 1	OF 1

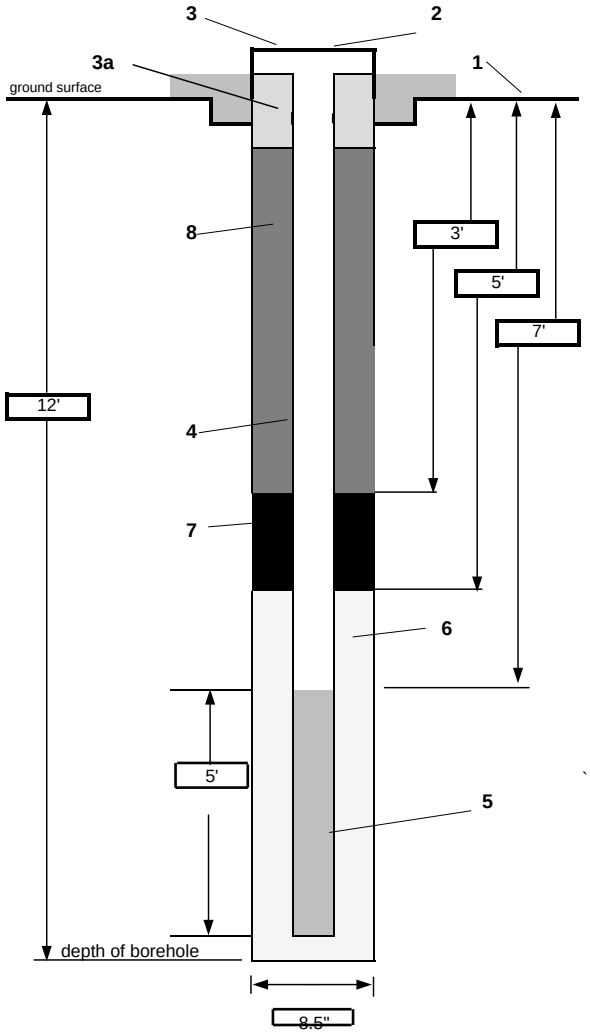
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 9/3/02 END : 9/3/02 LOGGER : D. Steckler



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Flush Mount
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~20 gallons

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW13	SHEET 1	OF 1

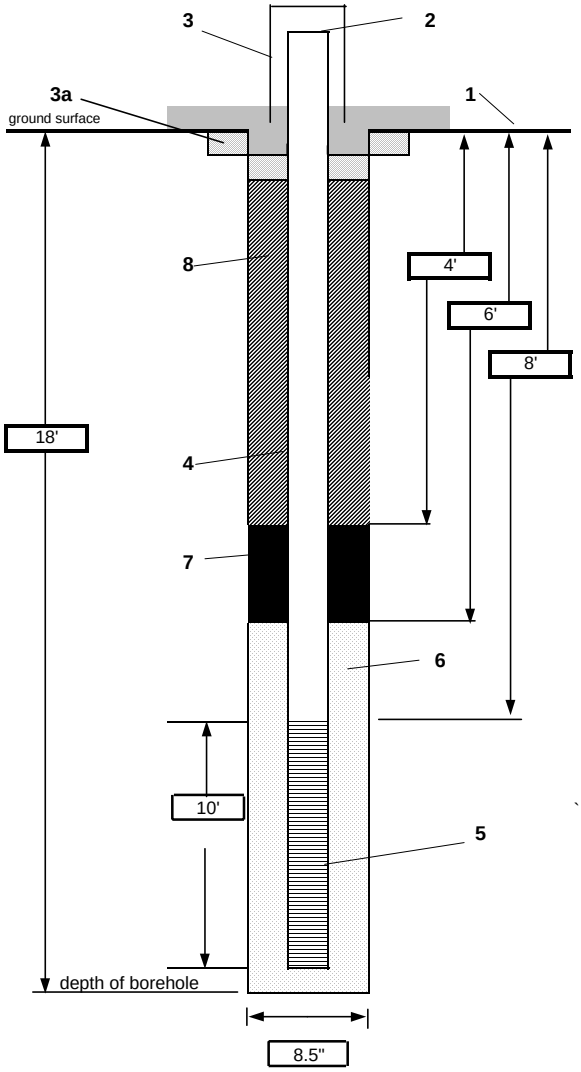
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 9/4/02 END : 9/4/02 LOGGER : D. Steckler



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Riser casing with ballards
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~30 gallons

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW14	SHEET 1	OF 1

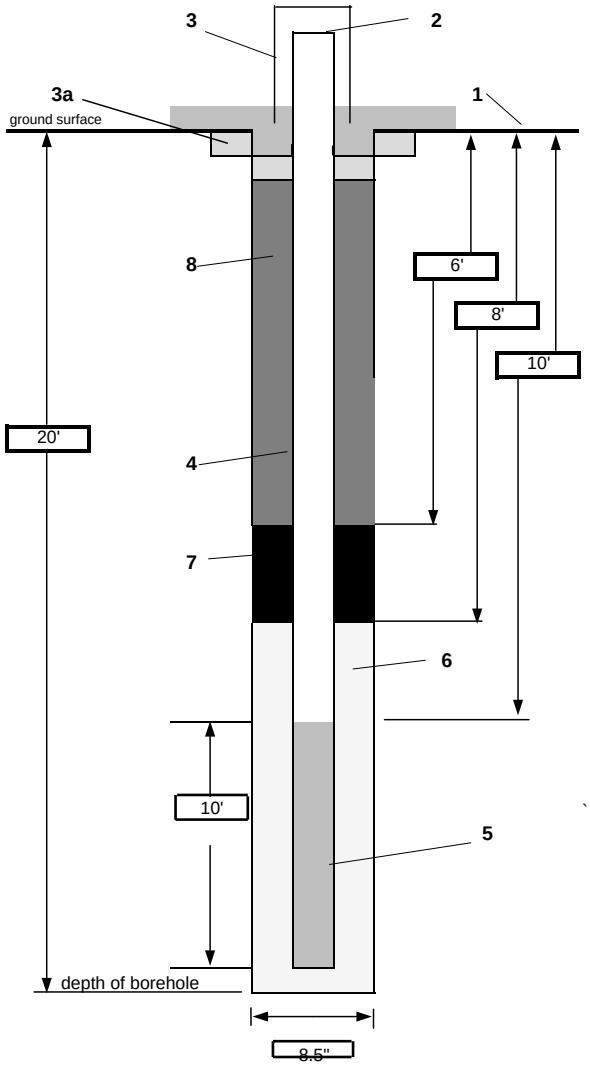
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 9/4/02 END : 9/4/02 LOGGER : D. Steckler



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	Riser casing with ballards
a) drain tube	sand drain
b) concrete pad dimensions	3 ft x 3ft pad
4- Dia./type of well casing	2" PVC Schedule 40
5- Type/slot size of screen	2: PVC Schedule 40 10 slot
6- Type screen filter	DSI #1 filter sand
a) quantity used	
7- Type of seal	3/8" Bentonite Chips
a) quantity used	
8- Grout	
a) Grout mix used	(concrete pad down to bentonite)
b) Method of placement	
c) Vol. Of well casing grout	
Development method	surge/submersible pump
Development time	
Estimated purge volume	~20 gallons

PROJECT NUMBER	WELL NUMBER		
145185.FI.MW	IS47MW15	SHEET 1	OF 1

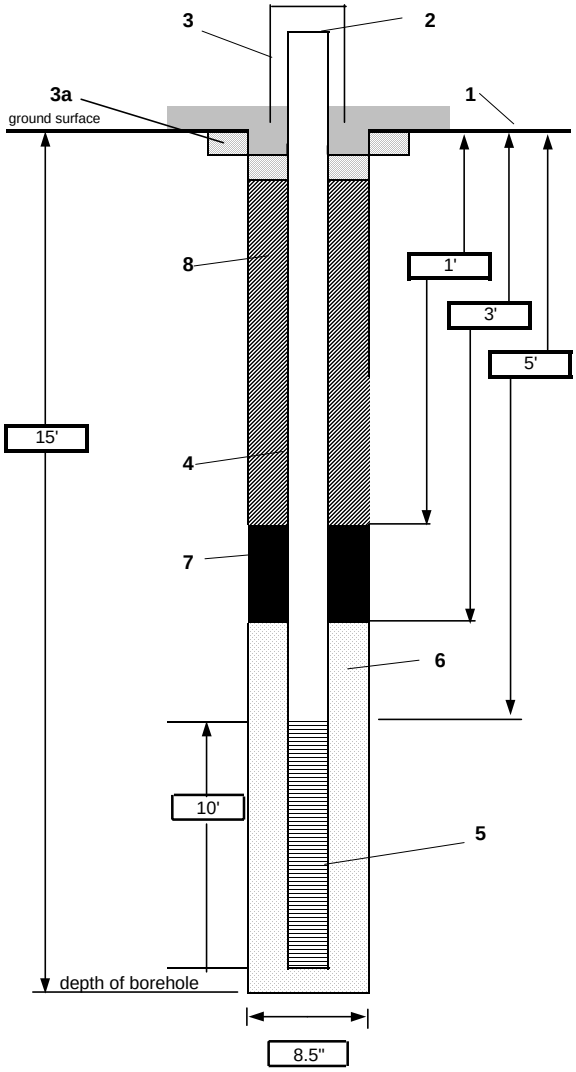
WELL COMPLETION DIAGRAM

PROJECT : NSWC Indian Head LOCATION : Site 47

DRILLING CONTRACTOR : Parratt-Wolff, Hillsborough, NC

DRILLING METHOD AND EQUIPMENT USED : 4-1/4-inch Hollow-stem Augers

WATER LEVELS : START : 9/5/02 END : 9/5/02 LOGGER : D. Steckler



1- Ground elevation at well _____

2- Top of casing elevation _____

3- Wellhead protection cover type: Riser casing with ballards
a) drain tube: sand drain
b) concrete pad dimensions: 3 ft x 3ft pad

4- Dia./type of well casing: 2" PVC Schedule 40

5- Type/slot size of screen: 2: PVC Schedule 40 10 slot

6- Type screen filter: DSI #1 filter sand
a) quantity used _____

7- Type of seal: 3/8" Bentonite Chips
a) quantity used _____

8- Grout
a) Grout mix used: (concrete pad down to bentonite)
b) Method of placement _____
c) Vol. Of well casing grout _____

Development method: surge/submersible pump

Development time _____

Estimated purge volume: ~30 gallons

Comments: 11.5' riser pvc length

C 1 8896 (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED AFTER WELL IS COMPLETED.

COUNTY NUMBER 01-13840-W

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED MM 03 DD 30 YY 01

Depth of Well 17 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 3898

OWNER US NAVY (last name) (7th) (first name)
STREET OR RFD NSWC Indian Head TOWN Indian Head, MD 20640
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist mid Fin sand some silt	0	3	
Brown wet mid Fin sand little silt	3	17	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes Y no N

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M D 017
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO. D

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y no N

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT CM BENTONITE CLAY BC

NO. OF BAGS 1 NO. OF POUNDS
GALLONS OF WATER 7
DEPTH OF GROUT SEAL (to nearest foot)
from 0 (TOP) ft. to 5 (BOTTOM) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL CO CONCRETE PL PLASTIC OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	7

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL BR BRASS BRONZE HO OPEN HOLE PL PLASTIC OT OTHER

C 2 DEPTH (nearest ft.)

EACH SCREEN			
1	PL	7	17
2			
3			

SLOT SIZE 1 010 2 3
DIAMETER OF SCREEN 2 (NEAREST INCH)

	from	to
GRAVEL PACK	5	17
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68		

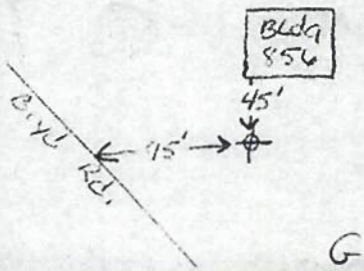
MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1
PUMPING RATE (gal. per min.) 1
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING 1 ft.
WHEN PUMPING 1 ft.
TYPE OF PUMP USED (for test)
A air P piston T turbine C centrifugal R rotary O other (describe below) J jet S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height)
+ above / − below LAND SURFACE 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURES AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



GW-10

⑤ OWNER

C 1 | 8897 | SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED AFTER WELL IS COMPLETED.

COUNTY NUMBER: 01-13841-W

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: MM 03 DD 28 YY 01

Depth of Well: 13 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 3899

OWNER: US NAVY (7th)
STREET OR RFD: NSWC Indian Head — TOWN: Indian Head, MD 20640
SUBDIVISION: ____ SECTION: ____ LOT: ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist medium F/m sand, some silt	0	4	
Brown wet medium F/m sand, little silt	4	13	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M-D-017
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION): [signature]

LIC. NO.: __D___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS: 1 NO. OF POUNDS: ____

GALLONS OF WATER: 7

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. (TOP) to 2 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	3

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below: [ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

DEPTH (nearest ft.) — EACH SCREEN

1	PL	3	13
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN: 2 (NEAREST INCH)

	from	to
GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	2	13

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T ____ (E.R.O.S.) ____ W Q ____
TELESCOPE CASING ____ LOG INDICATOR ____ OTHER DATA ____

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1

PUMPING RATE (gal. per min.): 1

METHOD USED TO MEASURE PUMPING RATE: ____

WATER LEVEL (distance from land surface)
BEFORE PUMPING: 1 ft.
WHEN PUMPING: 1 ft.

TYPE OF PUMP USED (for test)
[A] air [P] piston [T] turbine
[C] centrifugal [R] rotary [O] other (describe below)
[J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

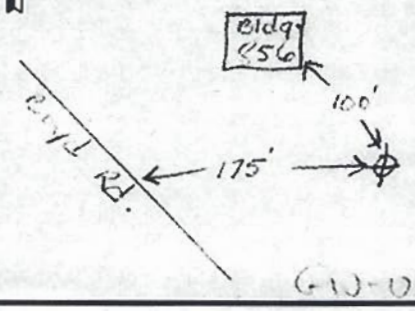
CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)
[+] above LAND SURFACE
[−] below
2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURES AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



G10-05

⑤ OWNER

C 1 | 8898 | SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED AFTER WELL IS COMPLETED.

COUNTY NUMBER 01-13842-W

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED MM 03 DD 30 YY 01

Depth of Well 76 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 3900

OWNER US NAVY (last name) (first name) (7th)
STREET OR RFD NSWC Indian Head TOWN Indian Head, MD 20640
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist m/dense f/m sand, some silt	0	10	
Brown wet m/dense f/m sand some silt, trace clay	10	26	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M ED 0 L 7
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO. __ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] no [N]
TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]
NO. OF BAGS 2 NO. OF POUNDS
GALLONS OF WATER 14
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 14 ft. (BOTTOM)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	16

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 DEPTH (nearest ft.)

EACH SCREEN			
1	PL	16	26
2			
3			

SLOT SIZE 1 .010 2 3
DIAMETER OF SCREEN 2 (NEAREST INCH)

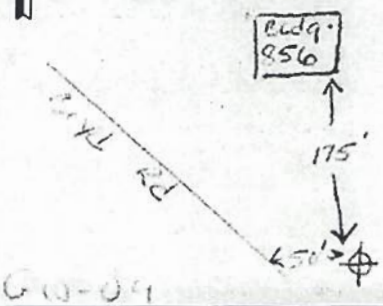
	from	to
GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	14	26

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3 PUMPING TEST
HOURS PUMPED (nearest hour) 1
PUMPING RATE (gal. per min.) 1
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING 1 ft.
WHEN PUMPING 1 ft.
TYPE OF PUMP USED (for test)
[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above [–] below LAND SURFACE 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURES AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



⑤ OWNER

C 1 | 8899 — SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED AFTER WELL IS COMPLETED.

COUNTY NUMBER: 01-13843-W

ST/CO USE ONLY — DATE Received (MM DD YY): 8 – 13

DATE WELL COMPLETED (MM DD YY): 03 29 01 (15 – 20)

Depth of Well: 19 (TO NEAREST FOOT) (22 – 26)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 3901 (28 29 30 31 32 33 34 35 36 37)

OWNER: US NAVY (7th)
STREET OR RFD: NSWC Indian Head (last name / first name) TOWN: Indian Head, MD 20640
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist Medium F/m sand, some silt	0	7.5	
Brown wet Medium F/m sand, little silt	7.5	19	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M E D 0 1 7 1
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION): [signature]
LIC. NO.: __ D ___ 1

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)

NO. OF BAGS: 1 NO. OF POUNDS:
GALLONS OF WATER: 7
DEPTH OF GROUT SEAL (to nearest foot): from 0 (48 TOP 52) ft. to 7 (54 BOTTOM 58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	7 (63 64)	7 (66 70)

EACH CASING — OTHER CASING (if used)

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: [ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 — DEPTH (nearest ft.)

EACH SCREEN			
1	PL (8 9)	9 (11 15)	19 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 ___ 3 ___

DIAMETER OF SCREEN: 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 7 to 19 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) (E.R.O.S.) (72) W Q (74 75 76)
TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8 9)
PUMPING RATE (gal. per min.): 1 (11 15)
METHOD USED TO MEASURE PUMPING RATE:
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 1 (17 20) ft.
WHEN PUMPING: 1 (22 25) ft.

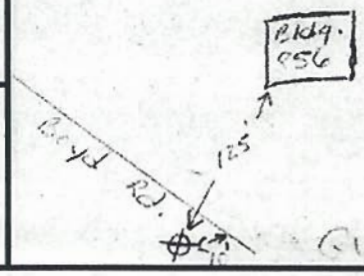
TYPE OF PUMP USED (for test)
[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)
[J] jet (27) [S] submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 – 35)
PUMP HORSE POWER (37 – 41)
PUMP COLUMN LENGTH (nearest ft.) (43 – 47)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above (49) / [–] below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURES AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



⑤ OWNER

DRILLER: REMOVE COPY AND RETAIN FOR YOUR RECORDS. RETURN COUNTY COPY TO COUNTY ENVIRONMENTAL AGENCY. SUBMIT COPY TO OWNER. RETURN ALL OTHER PARTS TO DEPARTMENT OF ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224.

C 1 9146 — SEQUENCE NO. (MDE USE ONLY)
1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 02-15054-W(M)

ST/CO USE ONLY — DATE Received MM DD YY (8–13)

DATE WELL COMPLETED: MM 09 DD 04 YY 02 (15–20)

Depth of Well: 12 (TO NEAREST FOOT) (22–26)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 4993 (28–37)

OWNER: US Navy
STREET OR RFD: NSWC Indian Head (last name / first name) TOWN: Indian Head, MD 2 0640
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist loose F/m sand some silt	0	3'	
Gray wet F/m sand little silt & clay	3'	12'	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 0 1 7
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO.: __ D ___

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)
TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)
NO. OF BAGS: 1 NO. OF POUNDS: 5
GALLONS OF WATER: 8
DEPTH OF GROUT SEAL (to nearest foot): from 0 (48 TOP 52) ft. to 5 (54 BOTTOM 58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL, [CO] CONCRETE, [PL] PLASTIC, [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	7 (66 70)

EACH CASING — OTHER CASING (if used)

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below: [ST] STEEL, [BR] BRASS BRONZE, [HO] OPEN HOLE, [PL] PLASTIC, [OT] OTHER

C 2 — DEPTH (nearest ft.)

EACH SCREEN			
1	PL (8 9)	7 (11 15)	12 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 ____ 3 ____
DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 5 to 12 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 72

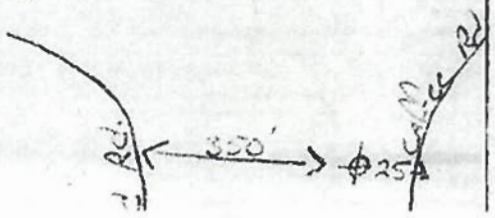
C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8 9)
PUMPING RATE (gal. per min.): 1 (11 15)
METHOD USED TO MEASURE PUMPING RATE:
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 1 (17 20) ft.
WHEN PUMPING: 1 (22 25) ft.

TYPE OF PUMP USED (for test)
- [A] air (27)
- [P] piston (27)
- [T] turbine (27)
- [C] centrifugal (27)
- [R] rotary (27)
- [O] other (describe below) (27)
- [J] jet (27)
- [S] submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)
PUMP HORSE POWER (37 41)
PUMP COLUMN LENGTH (nearest ft.) (43 47)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above (49) / [–] below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



C 1 9147 — SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER: 02-15053-W(M)

ST/CO USE ONLY DATE Received MM DD YY (8–13)

DATE WELL COMPLETED: MM 09 DD 04 YY 02 (15–20)

Depth of Well: 15 (TO NEAREST FOOT) (22–26)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 4992 (28–37)

OWNER: US Navy

STREET OR RFD: NSWC Indian Head (last name / first name) TOWN: Indian Head, MD 20640

SUBDIVISION: — SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist Loose F/m Sand some silt	0	4	
Gray wet Loose F/m Sand Little silt & clay	4'	-15'	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD017

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: __D___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)

NO. OF BAGS: 1 NO. OF POUNDS: 5

GALLONS OF WATER: 8

DEPTH OF GROUT SEAL (to nearest foot): from 0 (48) TOP (52) ft. to 3 (54) BOTTOM (58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL, [CO] CONCRETE, [PL] PLASTIC, [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	5 (66–70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: [ST] STEEL, [BR] BRASS BRONZE, [HO] OPEN HOLE, [PL] PLASTIC, [OT] OTHER

C 2 (1 2) — DEPTH (nearest ft.) — EACH SCREEN

1 PL (6 9)	5 (11–15)	15 (17–21)
2 (23 24)	(26–30)	(32–36)
3 (38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 ___ 3 ___

DIAMETER OF SCREEN: 2 (56–60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 3 to 15 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) TELESCOPE CASING; (E.R.O.S.) (72) LOG INDICATOR; W Q (74 75 76) OTHER DATA

C 3 (1 2)

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8 9)

PUMPING RATE (gal. per min.): 1 (11–15)

METHOD USED TO MEASURE PUMPING RATE:

WATER LEVEL (distance from land surface)

BEFORE PUMPING: 1 (17–20) ft.

WHEN PUMPING: 1 (22–25) ft.

TYPE OF PUMP USED (for test) (27)
- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below)
- [J] jet
- [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)

PUMP HORSE POWER (37–41)

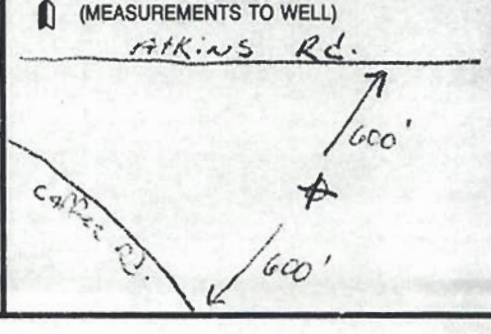
PUMP COLUMN LENGTH (nearest ft.) (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)
- [+] above (49)
- [–] below (49)

LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



ENVIRONMENTAL AGENCY. SUBMIT COPY TO OWNER. RETURN ALL OTHER ARTS TO DEPARTMENT OF ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224.

C 1 9148 — SEQUENCE NO. (MDE USE ONLY)
1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER · 02-15052-W(M)

ST/CO USE ONLY
DATE Received MM DD YY (8–13)

DATE WELL COMPLETED MM DD YY: 09 04 02 (15–20)

Depth of Well: 17 (TO NEAREST FOOT) (22–26)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 4991 (28–37)

OWNER: US Navy (last name / first name)
STREET OR RFD: NSWC Indian Head — TOWN: Indian Head, MD 20640
SUBDIVISION: — SECTION: — LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist med/loose fm sand some silt little clay	0	13'	
Gray wet loose fm sand little silt	13	17	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M GD 017
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO.: D

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)
TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)
NO. OF BAGS: 1 NO. OF POUNDS: 5
GALLONS OF WATER: 8
DEPTH OF GROUT SEAL (to nearest foot): from 0 (48 TOP 52) ft. to 5 (54 BOTTOM 58) ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL, [CO] CONCRETE, [PL] PLASTIC, [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	7 (66–70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below: [ST] STEEL, [BR] BRASS BRONZE, [HO] OPEN HOLE, [PL] PLASTIC, [OT] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	7 (11–15)	17 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 ____ 3 ____
DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

	from	to
GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	5	17

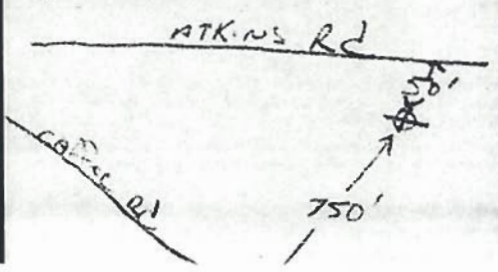
MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) (E.R.O.S.) (72) W Q (74 75 76)
TELESCOPE LOG INDICATOR OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8 9)
PUMPING RATE (gal. per min.): 1 (11–15)
METHOD USED TO MEASURE PUMPING RATE:
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 1 (17 20) ft.
WHEN PUMPING: 1 (22 25) ft.
TYPE OF PUMP USED (for test) (27):
[A] air, [P] piston, [T] turbine, [C] centrifugal, [R] rotary, [O] other (describe below), [J] jet, [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)
PUMP HORSE POWER (37–41)
PUMP COLUMN LENGTH (nearest ft.) (43–47)
CASING HEIGHT (circle appropriate box and enter casing height): [+] above (49), [–] below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DRILLER: REMOVE COPY AND RETAIN FOR YOUR RECORDS. RETURN COUNTY COPY TO COUNTY ENVIRONMENTAL AGENCY. SUBMIT COPY TO OWNER. RETURN ALL OTHER PARTS TO DEPARTMENT OF ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224.

C 1 9149 — SEQUENCE NO. (MDE USE ONLY)
1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER: 02-150-51-W(M)

ST/CO USE ONLY
DATE Received MM DD YY (8–13)

DATE WELL COMPLETED: MM 09 DD 04 YY 07 (15–20)

Depth of Well: 12 (22–26) (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 4990 (28–37)

OWNER: US Navy Indian Head Division (last name / first name)
STREET OR RFD: NSWC Indian Head — TOWN: Indian Head, MD 20640
SUBDIVISION: ____ SECTION: ____ LOT: ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist med dense F/m sand little silt trace clay	0	6	
Gray wet loose F/m sand little silt & clay	6	12	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 0 1 7
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO.: ___ D ___

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] (44) no [N] (44)
TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45–46) BENTONITE CLAY [BC] (45–46)
NO. OF BAGS: 1 NO. OF POUNDS: 5
GALLONS OF WATER: 8
DEPTH OF GROUT SEAL (to nearest foot): from 0 (48) TOP (52) ft. to 5 (54) BOTTOM (58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL, [CO] CONCRETE, [PL] PLASTIC, [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60–61)	2 (63–64)	7 (66–70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below: [ST] STEEL, [BR] BRASS BRONZE, [HO] OPEN HOLE, [PL] PLASTIC, [OT] OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	PL (8–9)	7 (11–15)	12 (17–21)
2	(23–24)	(26–30)	(32–36)
3	(38–39)	(41–45)	(47–51)

SLOT SIZE 1: 010 2: ____ 3: ____
DIAMETER OF SCREEN: 2 (56–60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 5 to 12 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) (E.R.O.S.) (72) W Q

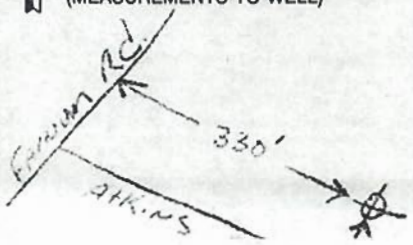
C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1 (8–9)
PUMPING RATE (gal. per min.): 1 (11–15)
METHOD USED TO MEASURE PUMPING RATE: ____
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 1 (17–20) ft.
WHEN PUMPING: 1 (22–25) ft.
TYPE OF PUMP USED (for test) (27):
- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below)
- [J] jet
- [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon): ____ (31–35)
PUMP HORSE POWER: ____ (37–41)
PUMP COLUMN LENGTH (nearest ft.): ____ (43–47)
CASING HEIGHT (circle appropriate box and enter casing height) LAND SURFACE
- [+] above (49)
- [–] below (49)

2 (nearest foot) (50–51)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



C 1 | 5200 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 01-13844-W

ST/CO USE ONLY
DATE Received MM DD YY (8–13)

DATE WELL COMPLETED MM 03 DD 29 YY 01 (15–20)

Depth of Well 22 18 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 3902 (28 29 30 31 32 33 34 35 36 37)

OWNER US NAVY (7th)
STREET OR RFD NSWC Indian Head (first name) TOWN Indian Head, MD 20640
SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist m/dense f/m sand, some silt	0	5.5	
Brown wet m/dense f/m sand, little silt	5.5	18	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M GD 007
Kile
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M __ D ____

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] (44) no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] (45 46) BENTONITE CLAY [BC] (45 46)

NO. OF BAGS 1 NO. OF POUNDS ____
GALLONS OF WATER 7
DEPTH OF GROUT SEAL (to nearest foot)
from 0 (48 TOP 52) ft. to 5.5 (54 BOTTOM 58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	8 (66 70)

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 (1 2) DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	8 (11 15)	18 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 ____ 3 ____
DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

	from	to
GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68	6	18

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 TELESCOPE CASING; 72 LOG INDICATOR; 74 75 76 OTHER DATA

C 3 (1 2)

PUMPING TEST
HOURS PUMPED (nearest hour) 1 (8 9)
PUMPING RATE (gal. per min.) 1 (11 15)
METHOD USED TO MEASURE PUMPING RATE ____
WATER LEVEL (distance from land surface)
BEFORE PUMPING 1 (17 20) ft.
WHEN PUMPING 1 (22 25) ft.

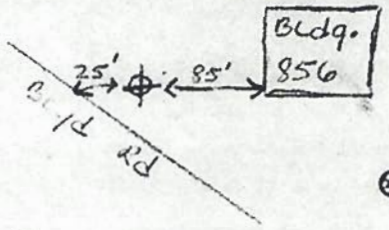
TYPE OF PUMP USED (for test)
[A] air (27) [P] piston (27) [T] turbine (27)
[C] centrifugal (27) [R] rotary (27) [O] other (describe below) (27)
[J] jet (27) [S] submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____ (29)
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ (31 35)
PUMP HORSE POWER ____ (37 41)
PUMP COLUMN LENGTH (nearest ft.) ____ (43 47)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above (49) / [–] below (49) LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



GW-07

DENV-CR97 OWNER

C 1 | 5201 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 01-13885-W

ST/CO USE ONLY
DATE Received MM DD YY (8–13)

DATE WELL COMPLETED MM 03 DD 30 YY 01 (15–20)

Depth of Well 15 (22–26) (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CH - 94 - 3903 (28–37)

OWNER US NAVE NCWC Indian Head (last name) (first name) (7th)

STREET OR RFD Indian Head, MD 20640 TOWN

SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist intense f/m sand, some silt	0	4	
Brown wet intense f/m sand little silt	4	15	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes Y no N

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M G D 0 1 7

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: M D

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y (44) no N (44)

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT CM (45 46) BENTONITE CLAY BC (45 46)

NO. OF BAGS 1 NO. OF POUNDS

GALLONS OF WATER 7

DEPTH OF GROUT SEAL (to nearest foot) from 0 (48 TOP 52) ft. to 3 (54 BOTTOM 58) ft.

(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

ST STEEL | CO CONCRETE | PL PLASTIC | OT OTHER

MAIN CASING TYPE PL (60 61) | Nominal diameter top (main) casing (nearest inch)! 2 (63 64) | Total depth of main casing (nearest foot) 5 (66–70)

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below

ST STEEL | BR BRASS BRONZE | HO OPEN HOLE | PL PLASTIC | OT OTHER

C 2 (1 2)

DEPTH (nearest ft.)

EACH SCREEN			
1	PL (8 9)	5 (11–15)	15 (17–21)
2	(23 24)	(26–30)	(32–36)
3	(38 39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 3

DIAMETER OF SCREEN 2 (56–60) (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 — from 3 to 15 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74 75 76)

TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3 (1 2)

PUMPING TEST
HOURS PUMPED (nearest hour) 1 (8 9)

PUMPING RATE (gal. per min.) 1 (11–15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING 1 (17–20) ft.

WHEN PUMPING 1 (22–25) ft.

TYPE OF PUMP USED (for test)

A air (27) | P piston (27) | T turbine (27)

C centrifugal (27) | R rotary (27) | O other (describe below) (27)

J jet (27) | S submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)

PUMP HORSE POWER (37–41)

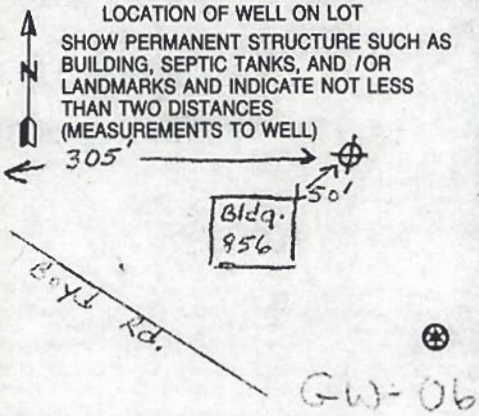
PUMP COLUMN LENGTH (nearest ft.) (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)

+ (49) above | – (49) below — LAND SURFACE 2 (50 51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)

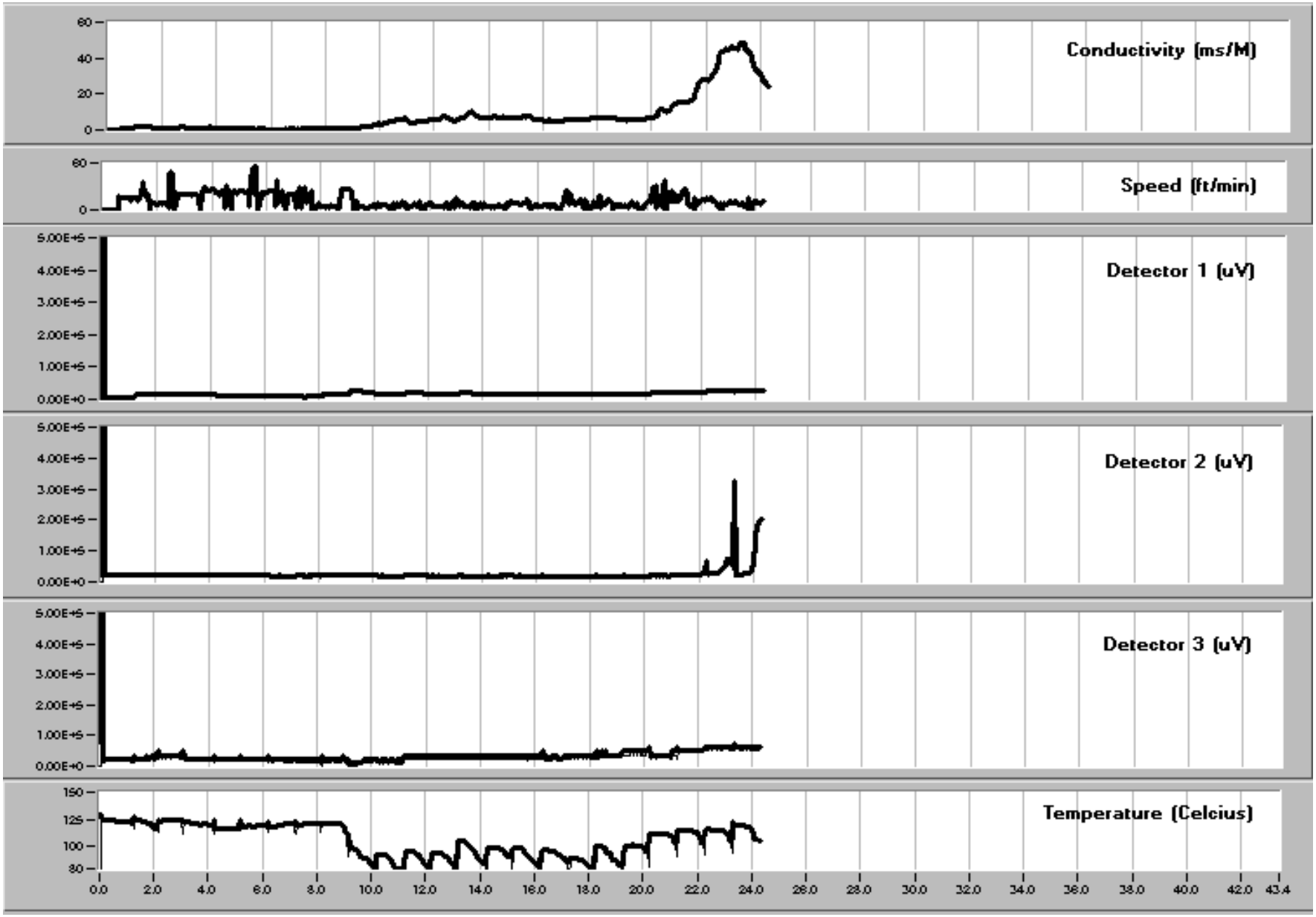


DENV-CR97

OWNER

Appendix C
MIP/EC Logs

BH-1



CH2M Hill
Indian Head
All MIP Logs

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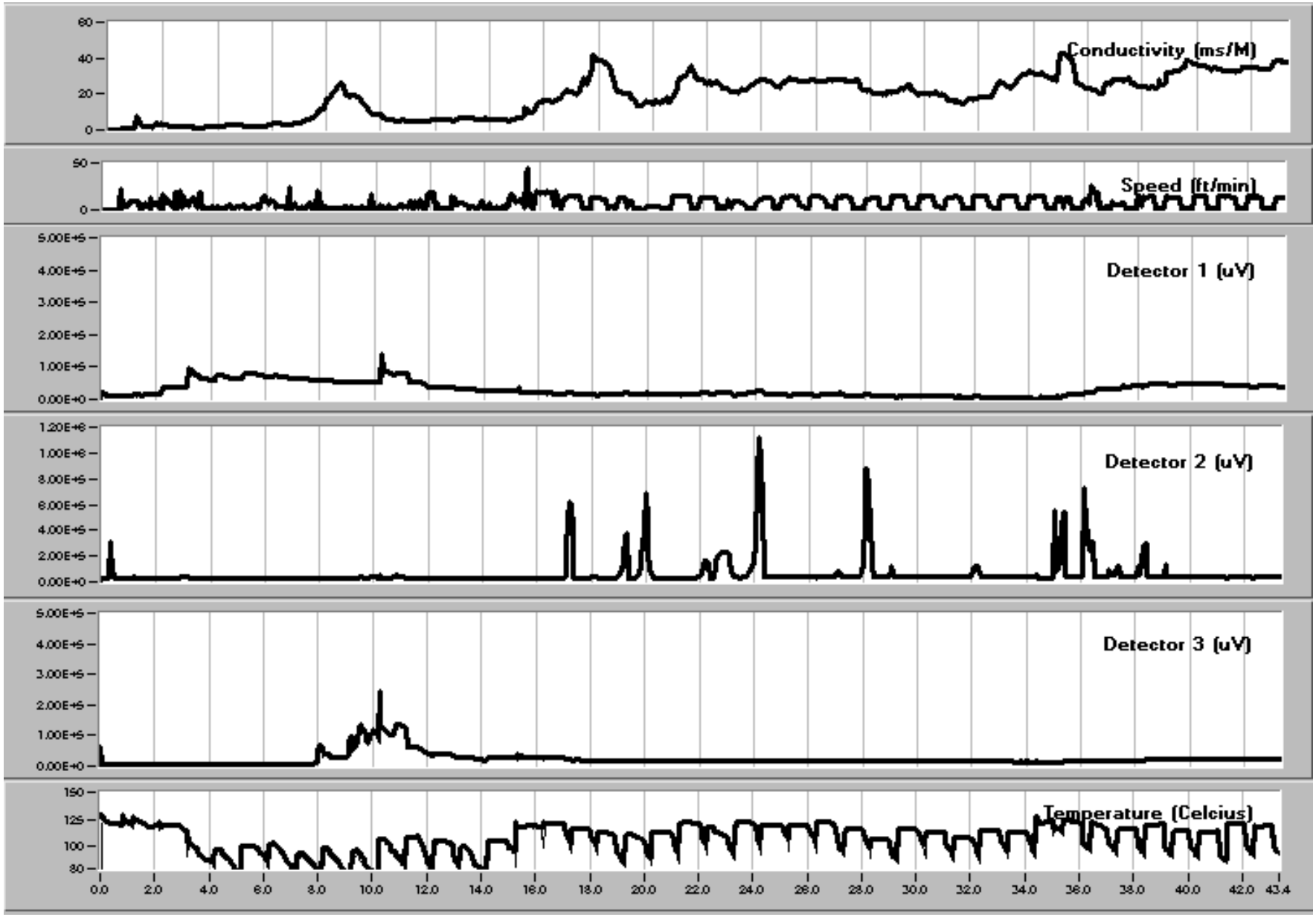
BH-2



CH2M Hill
Indian Head
All MIP Logs

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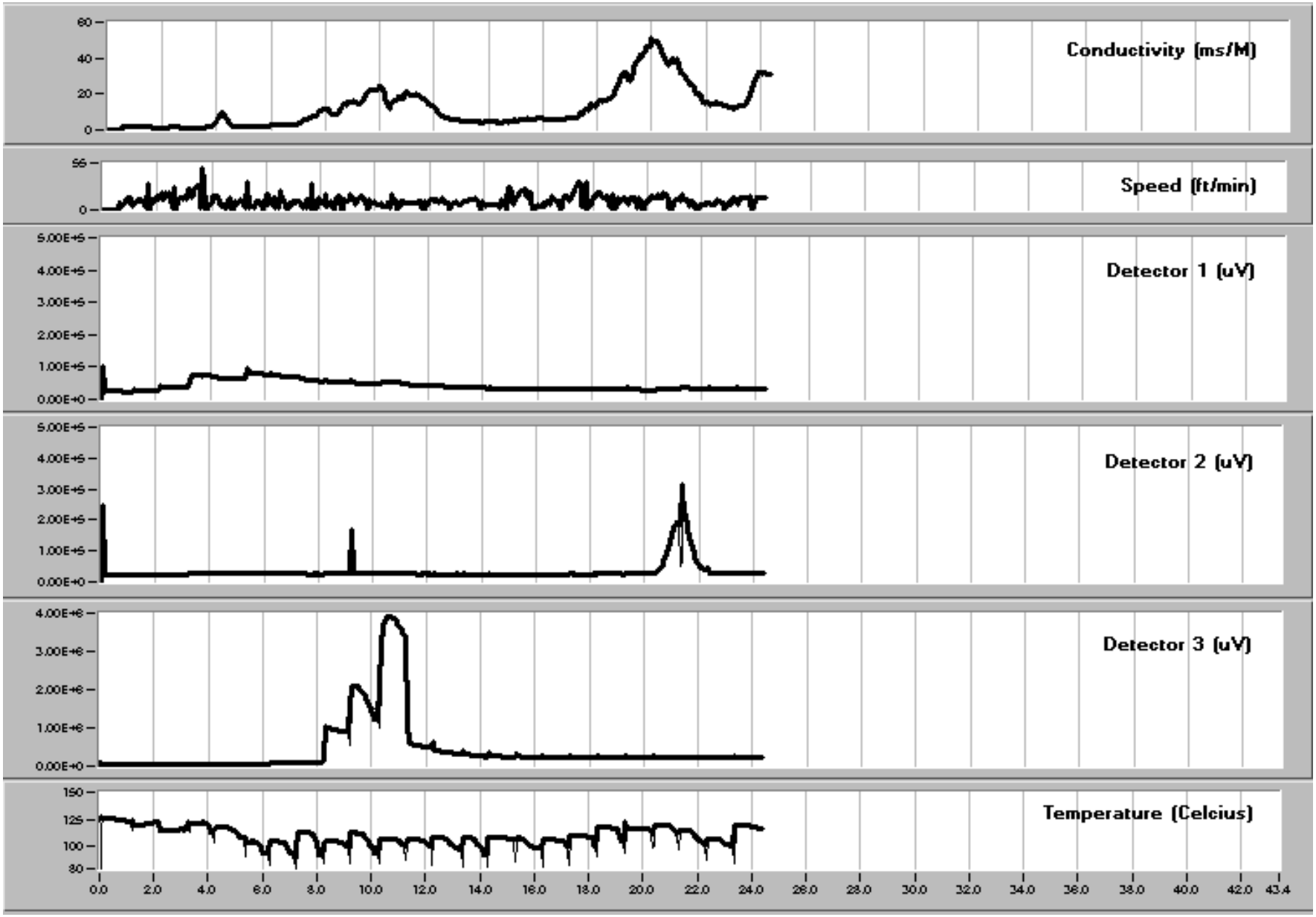
MIP-1



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Indian Head
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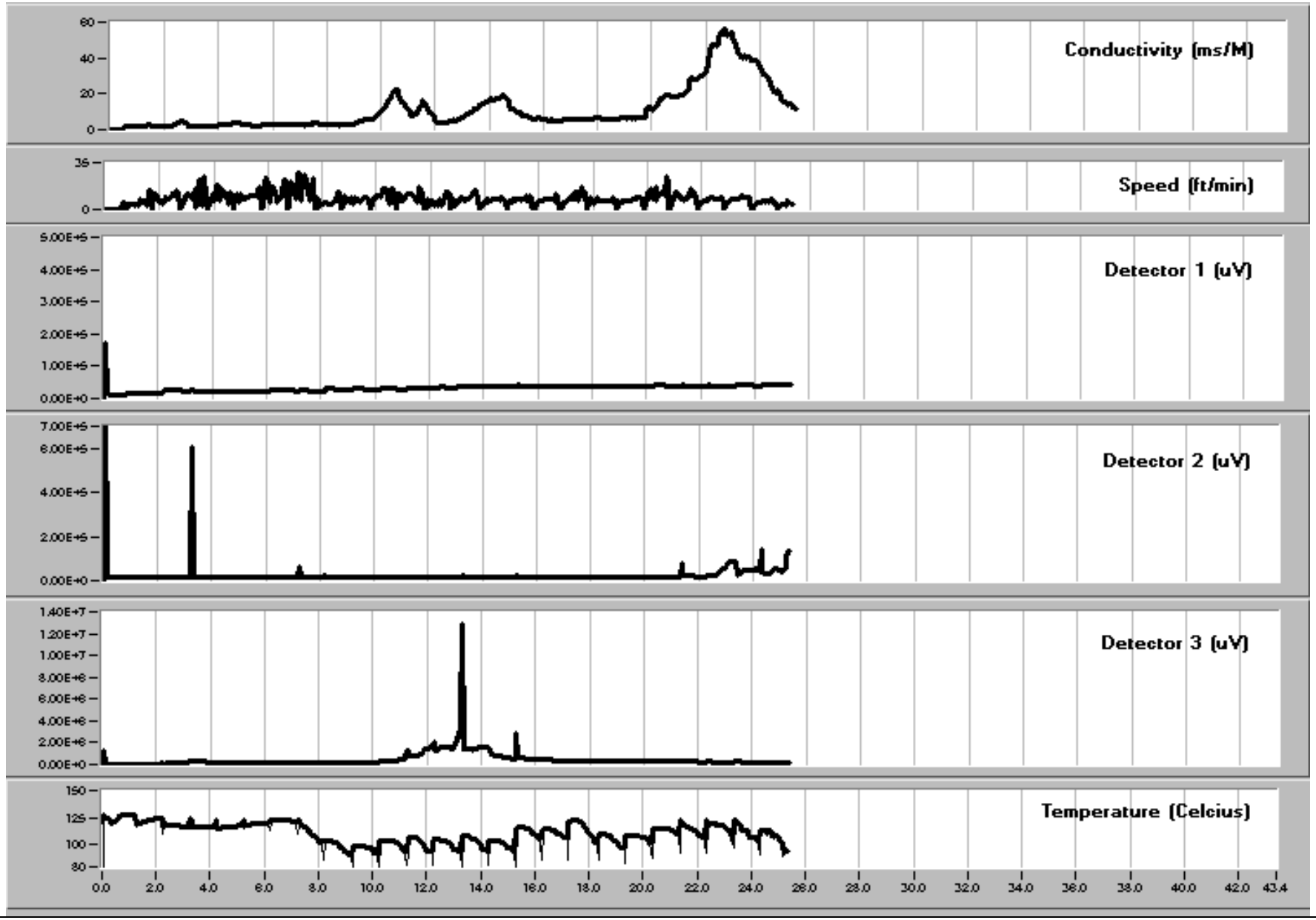
MIP-2



CH2M Hill
Indian Head
All MIP Logs

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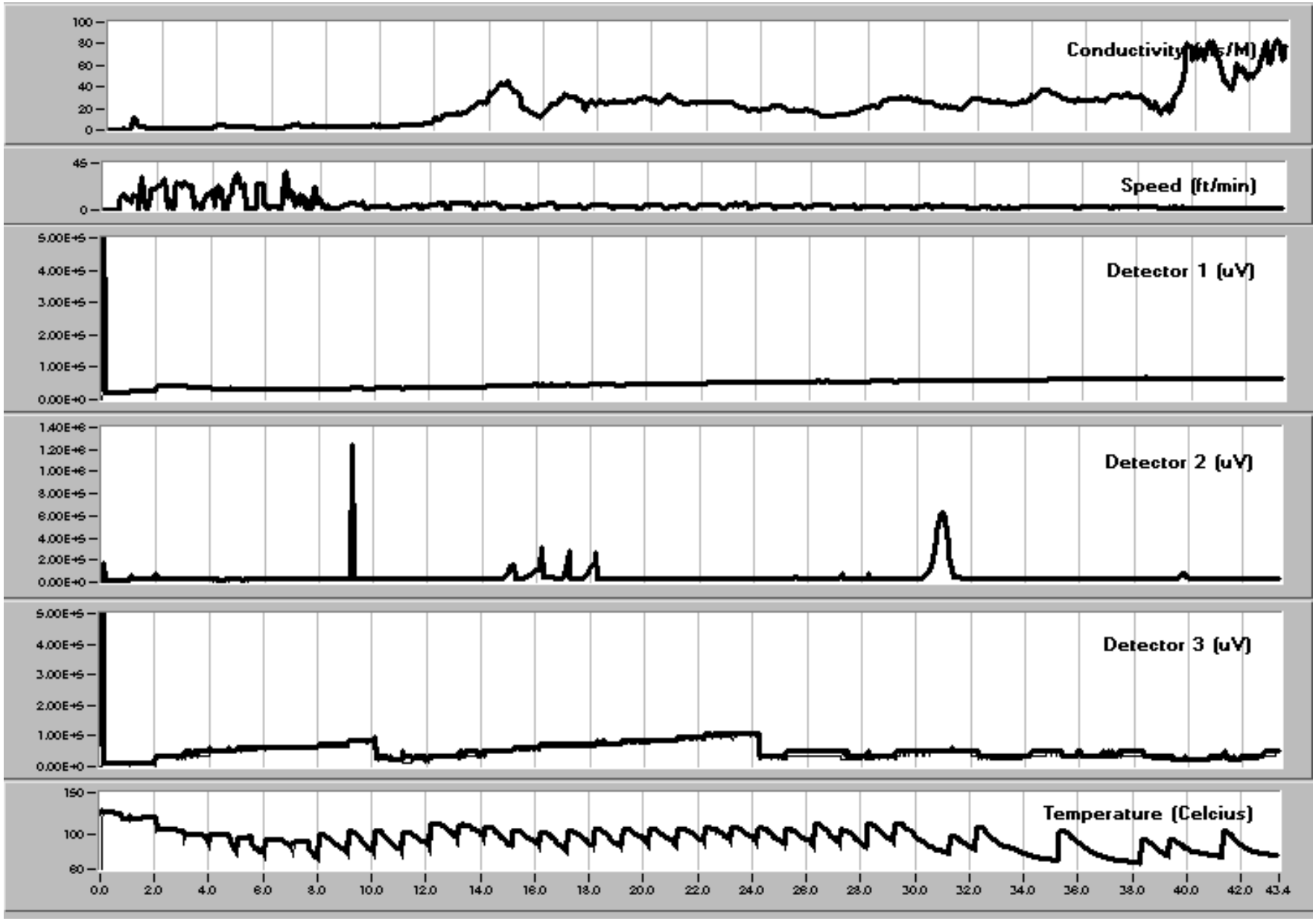
MIP-3



CH2M Hill
Indian Head
All MIP Logs

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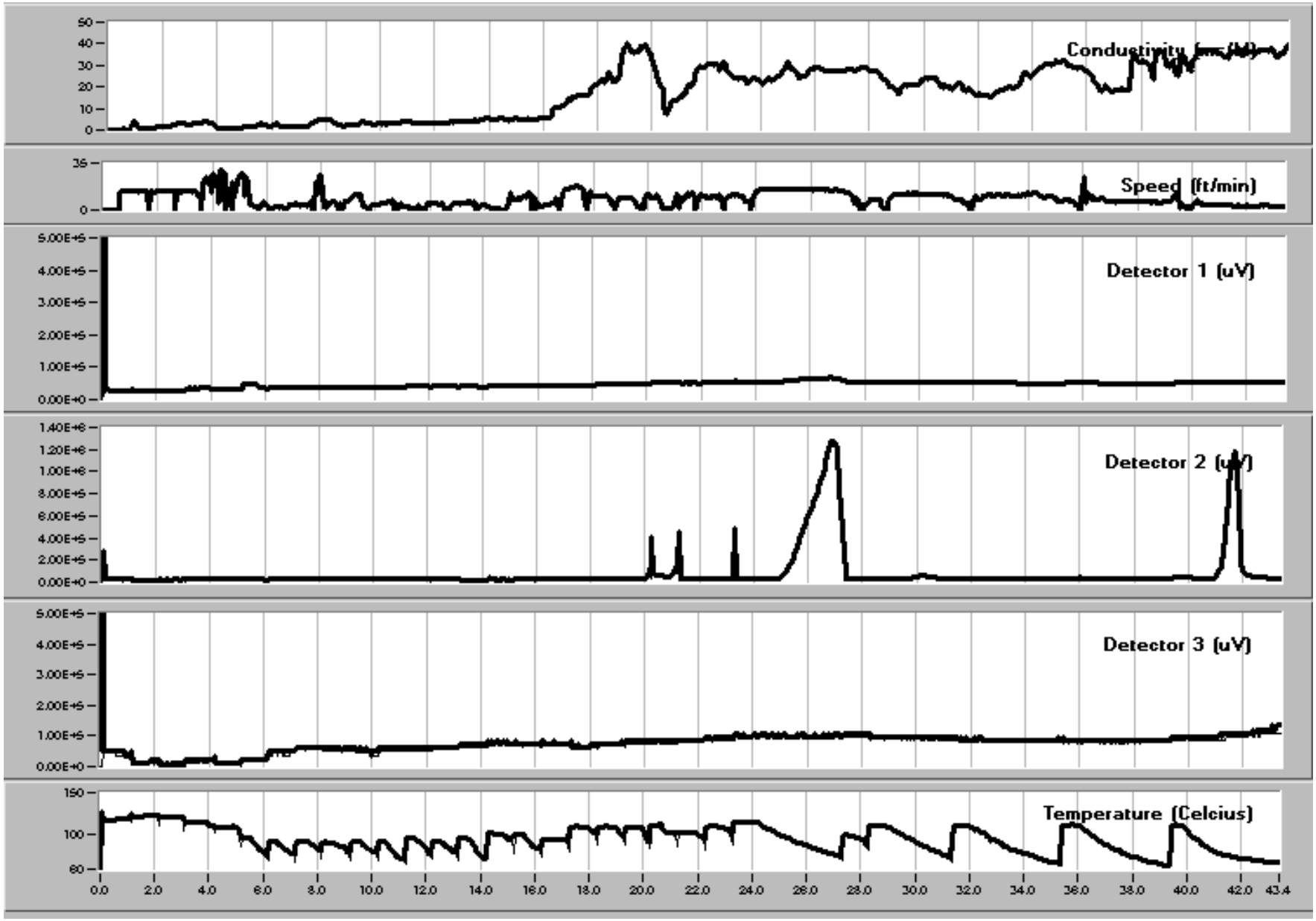
MIP-4



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Indian Head
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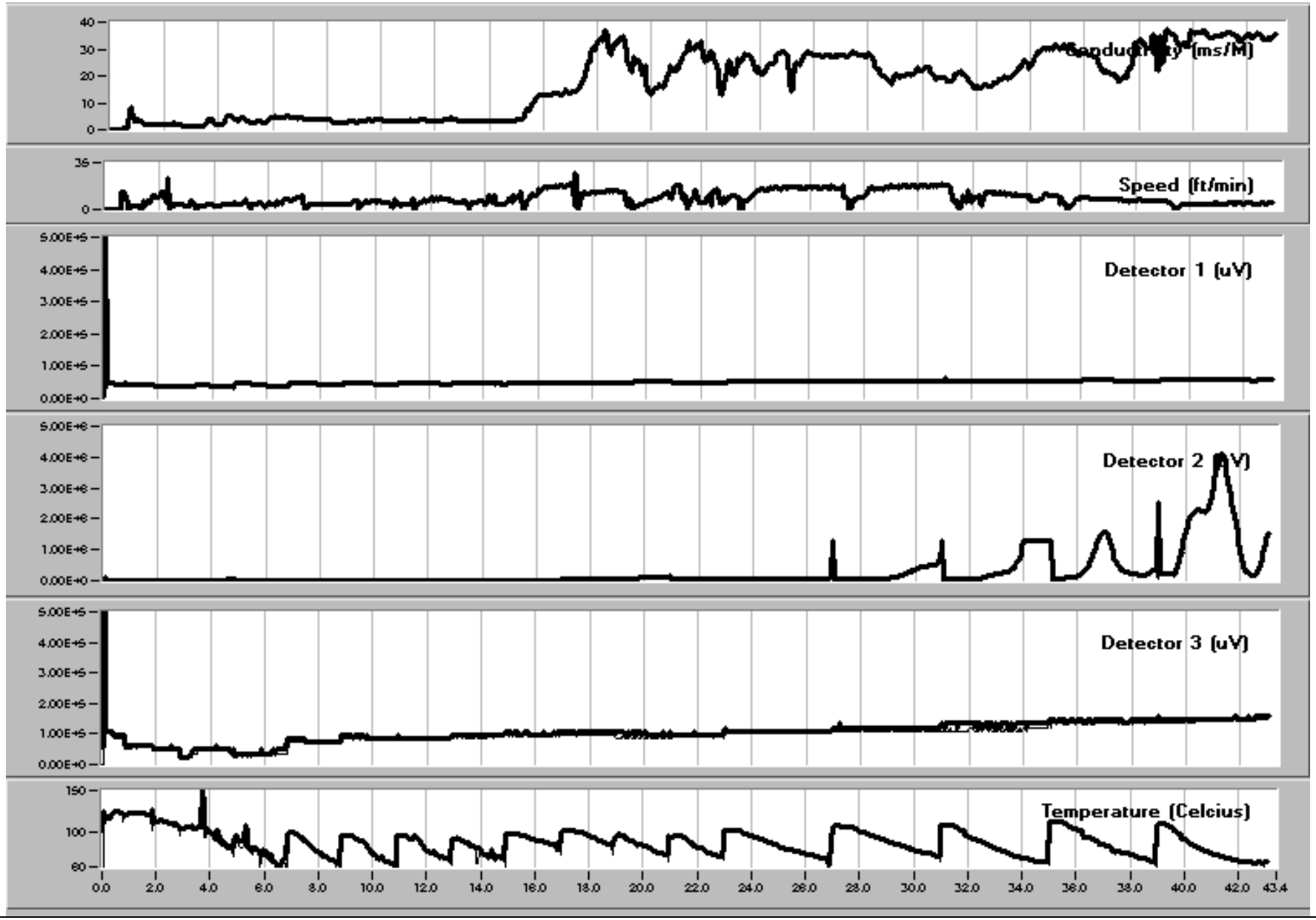
MIP-5



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Indian Head
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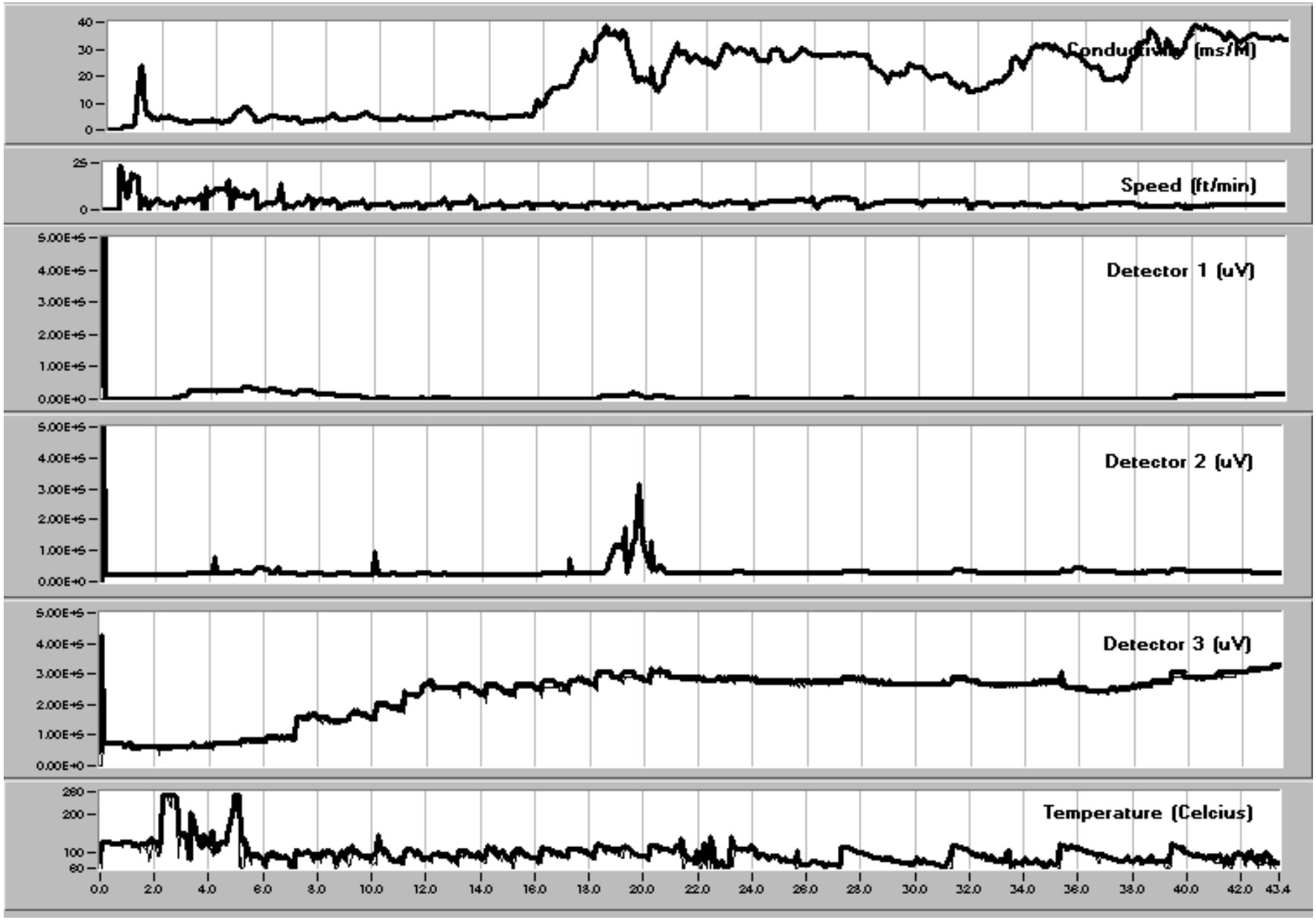
MIP-6



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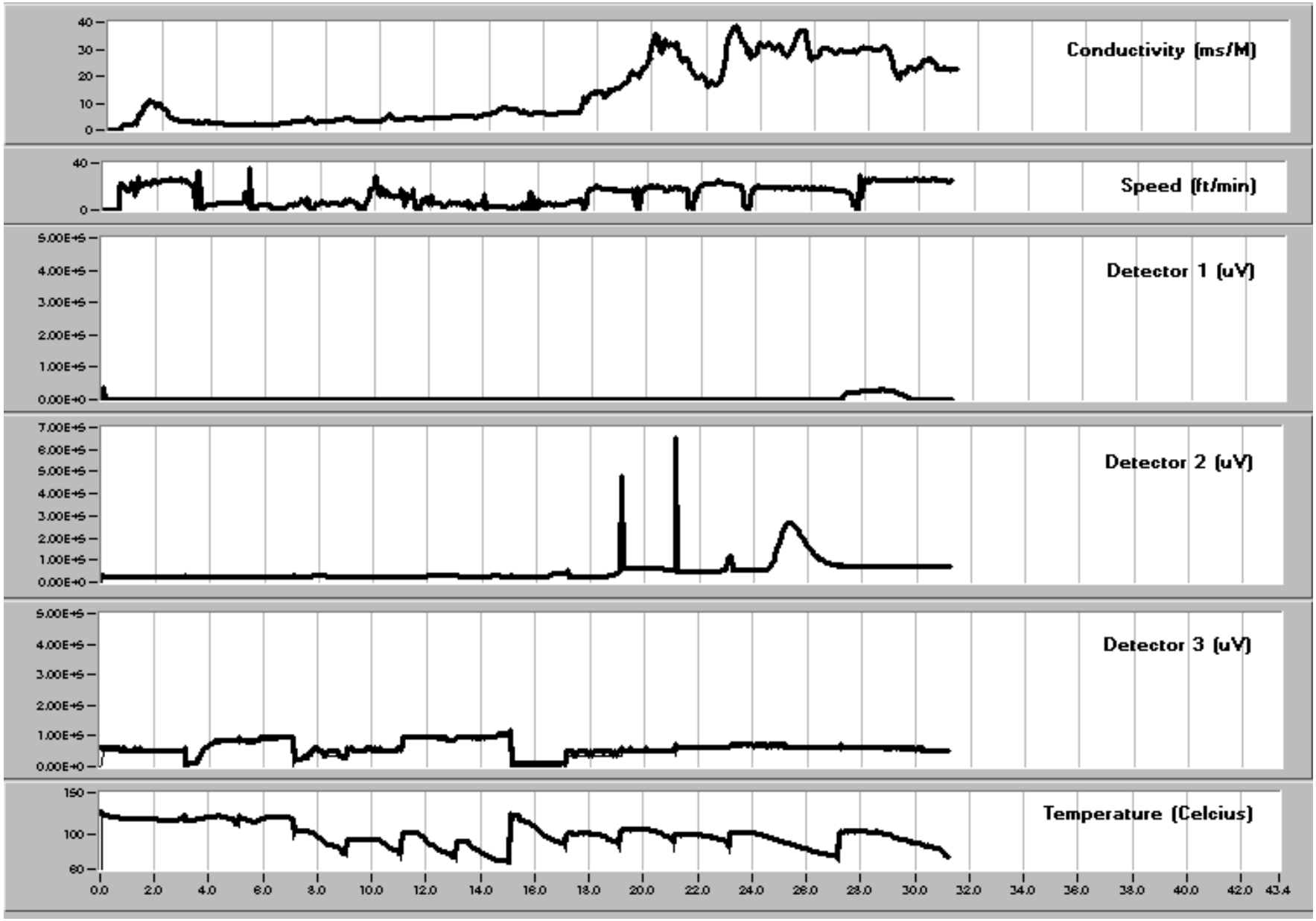
MIP-7



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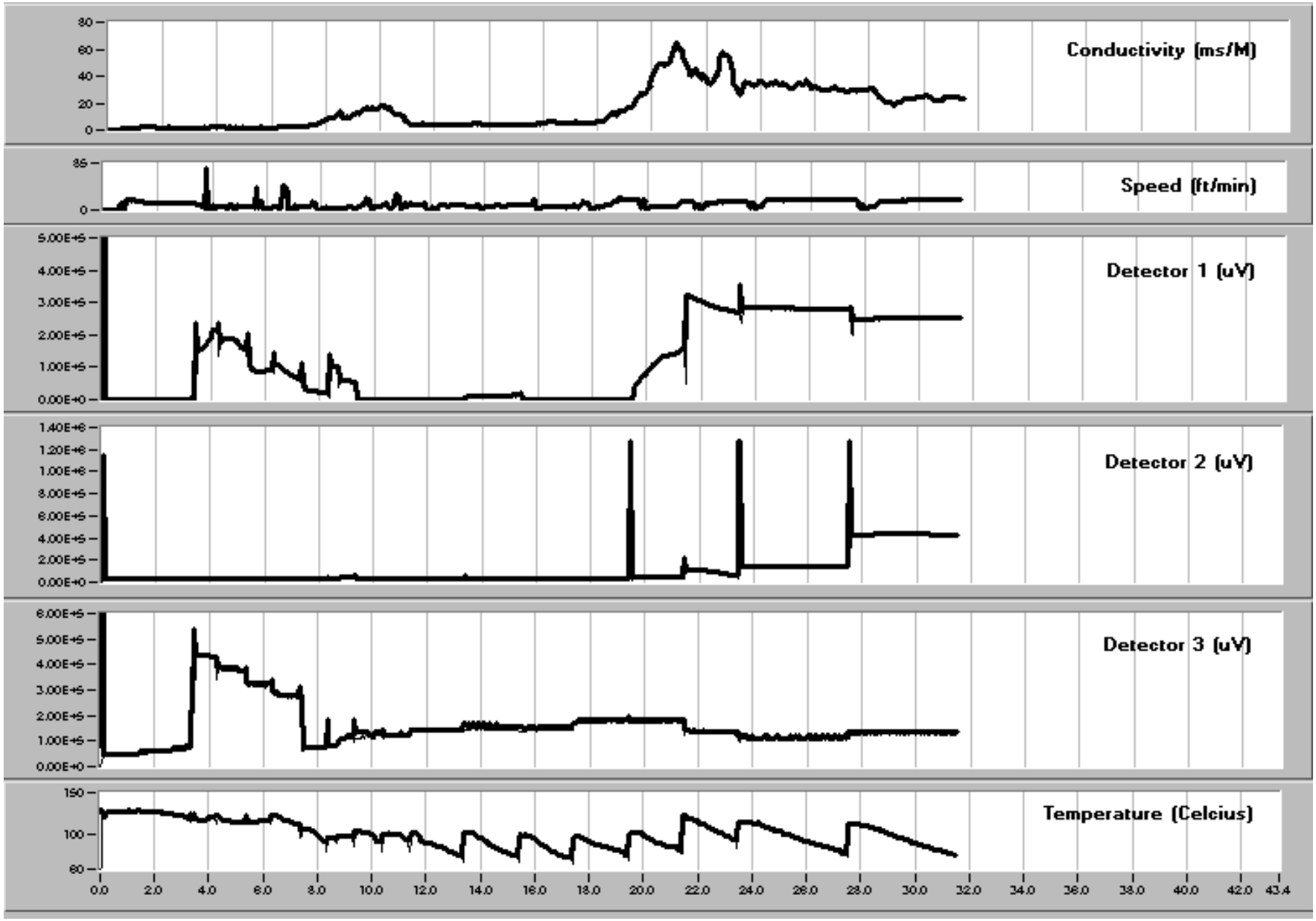
MIP-8



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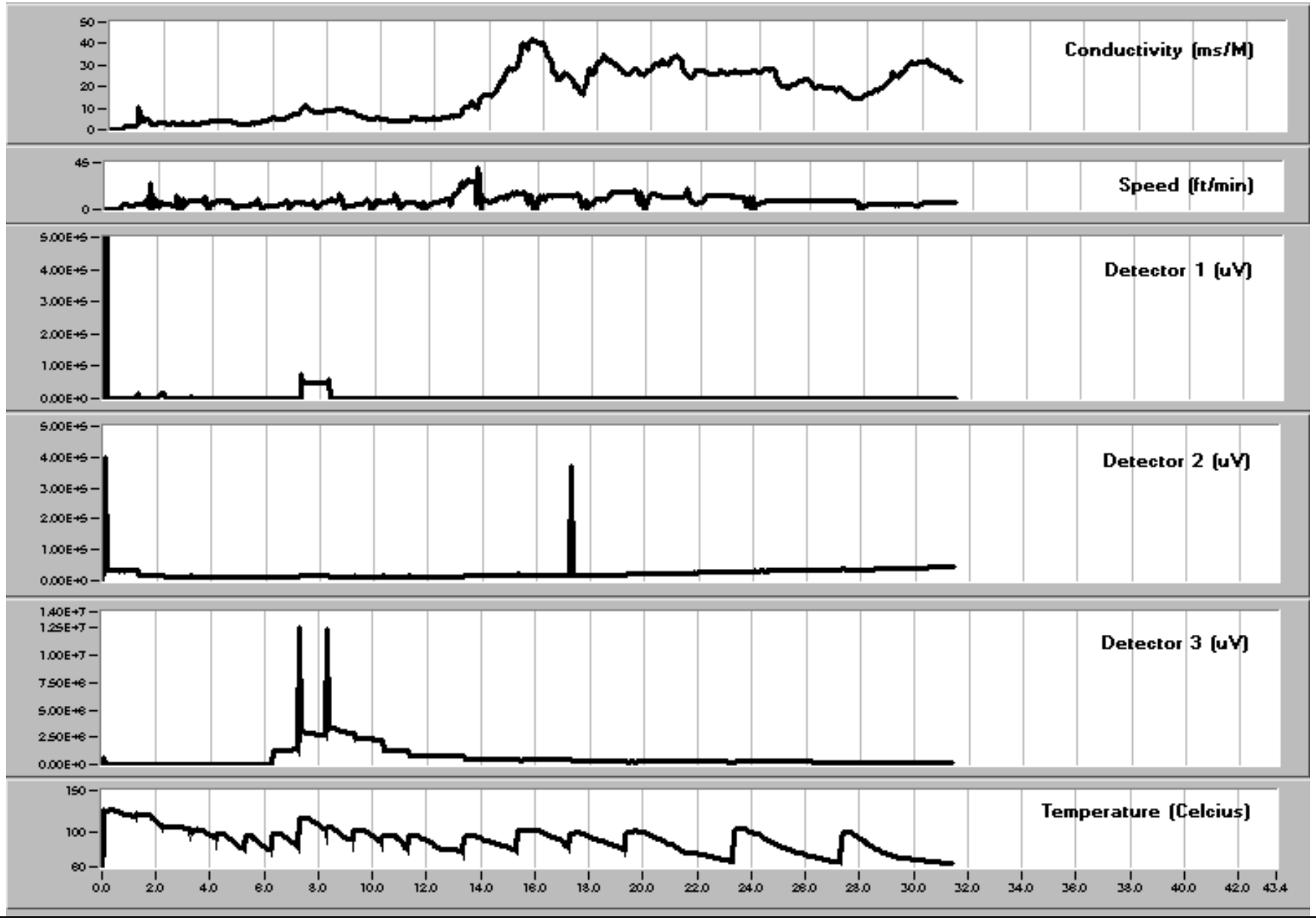
MIP-9



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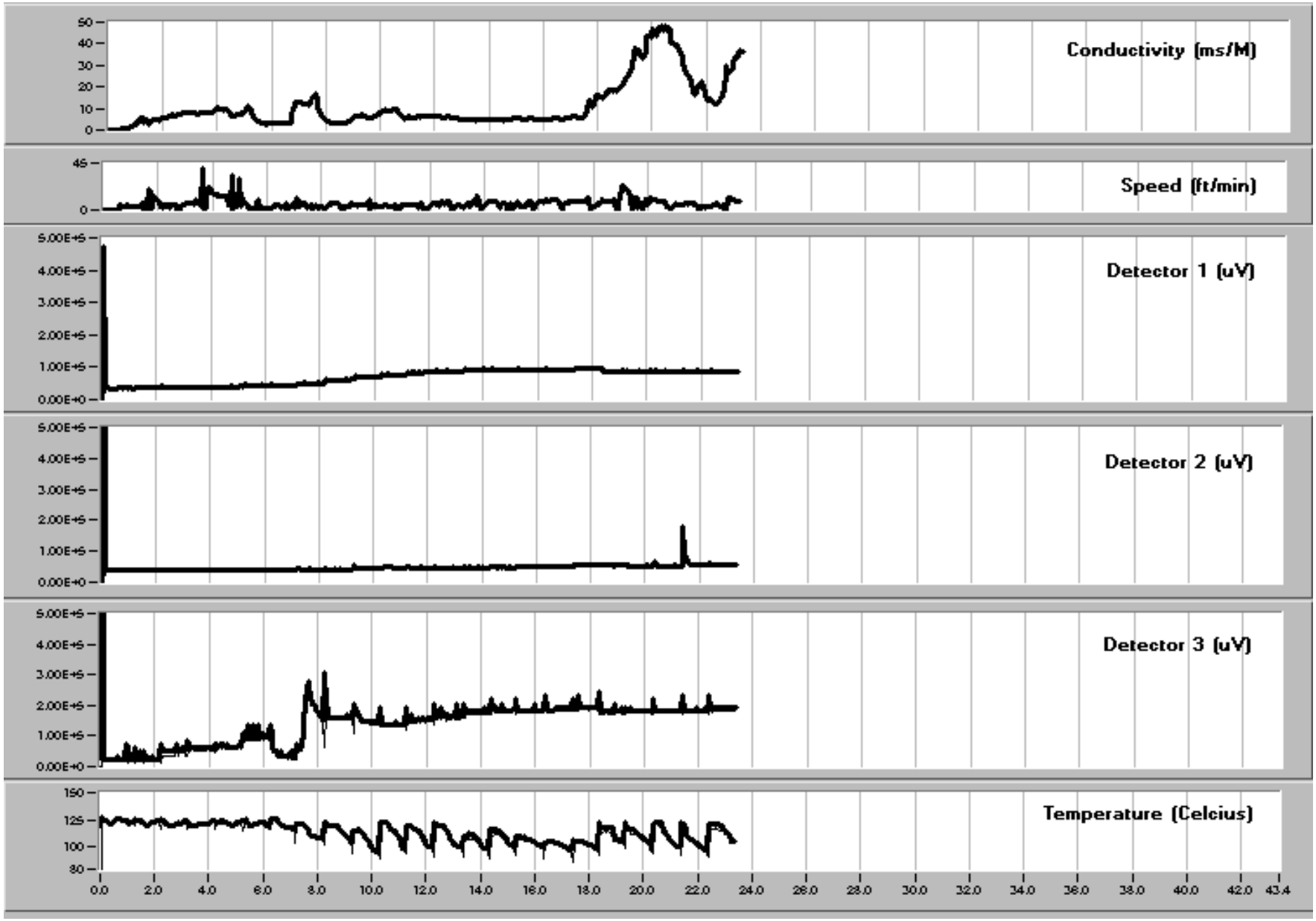
MIP-10



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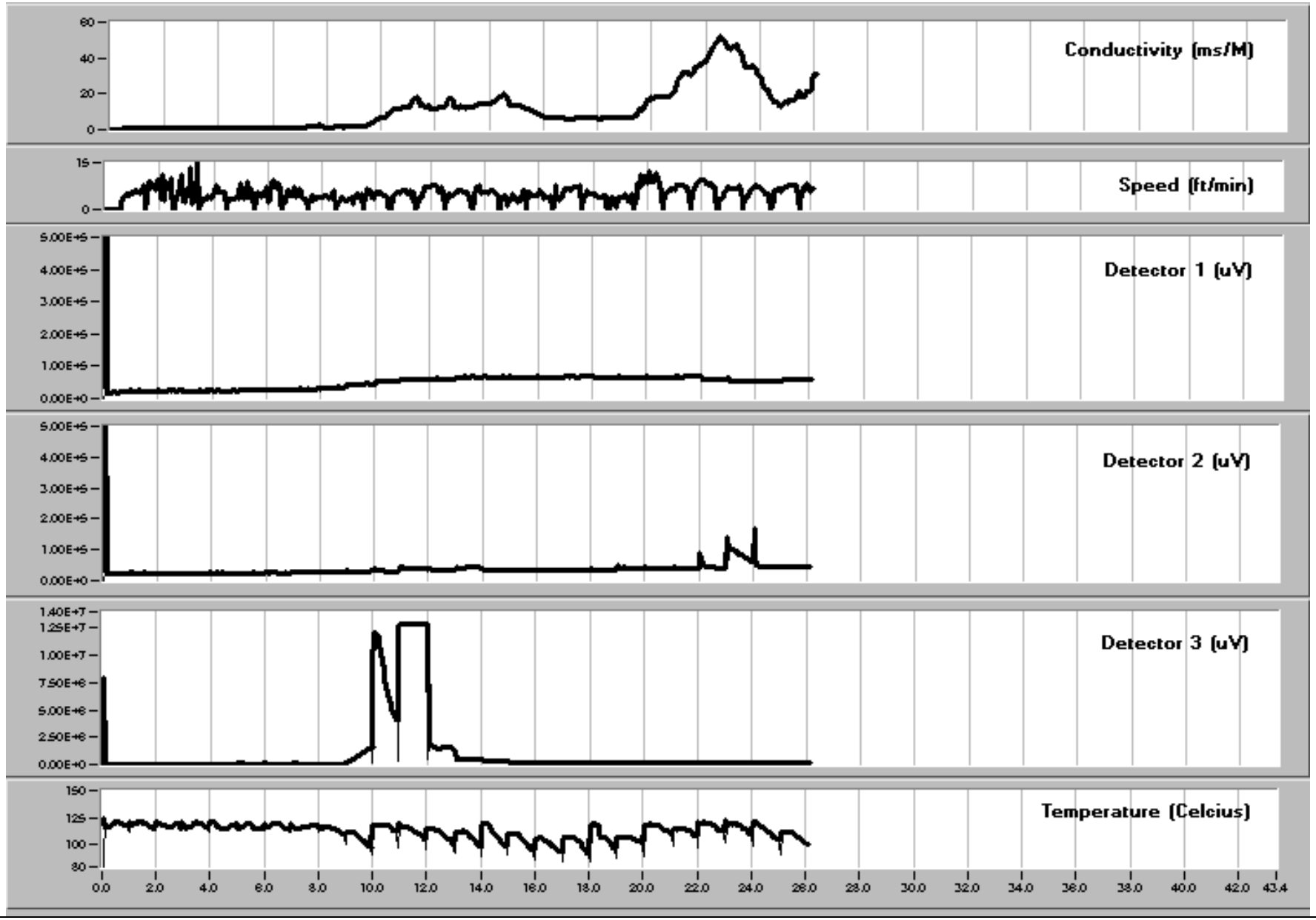
MIP-11



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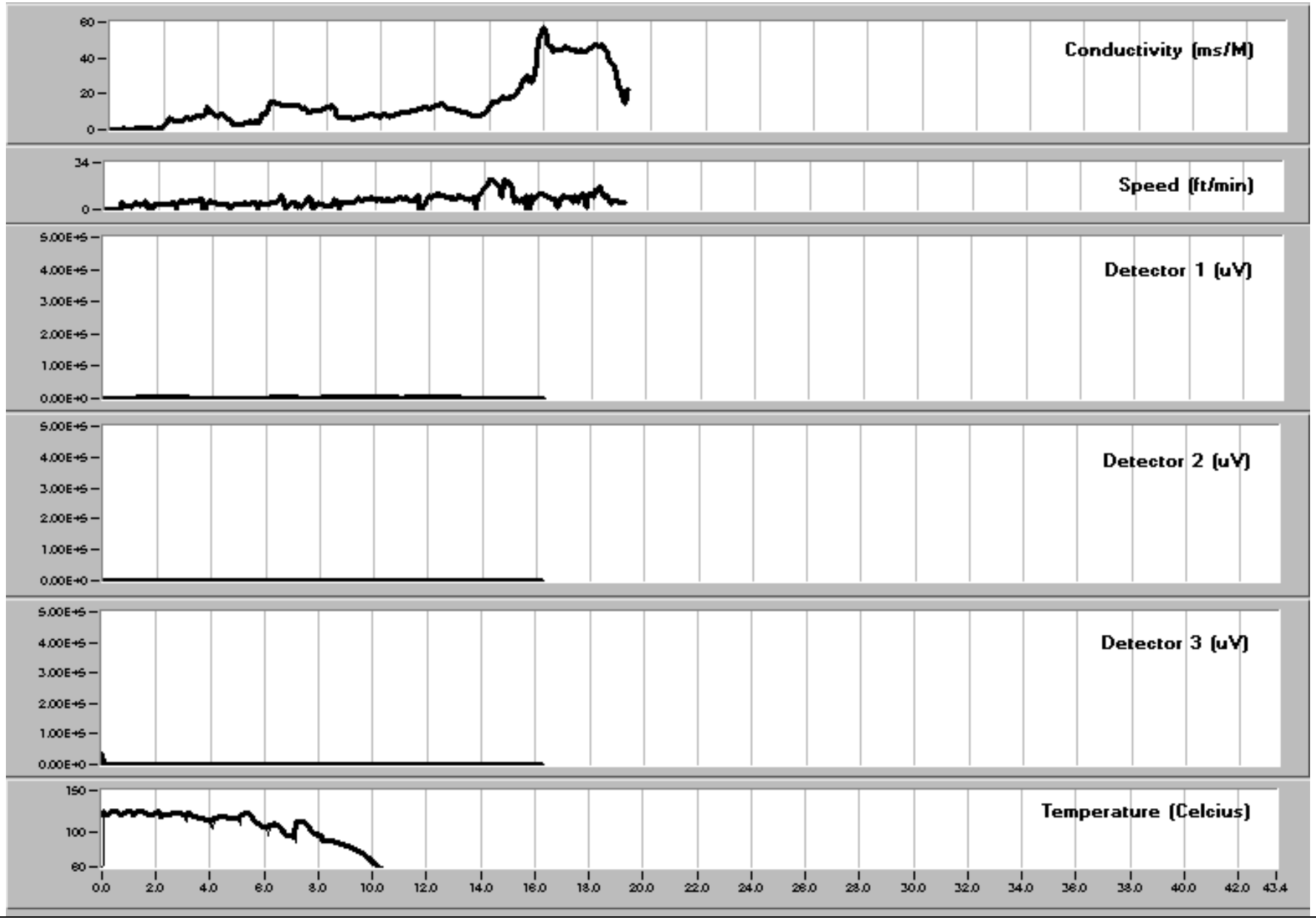
MIP-12



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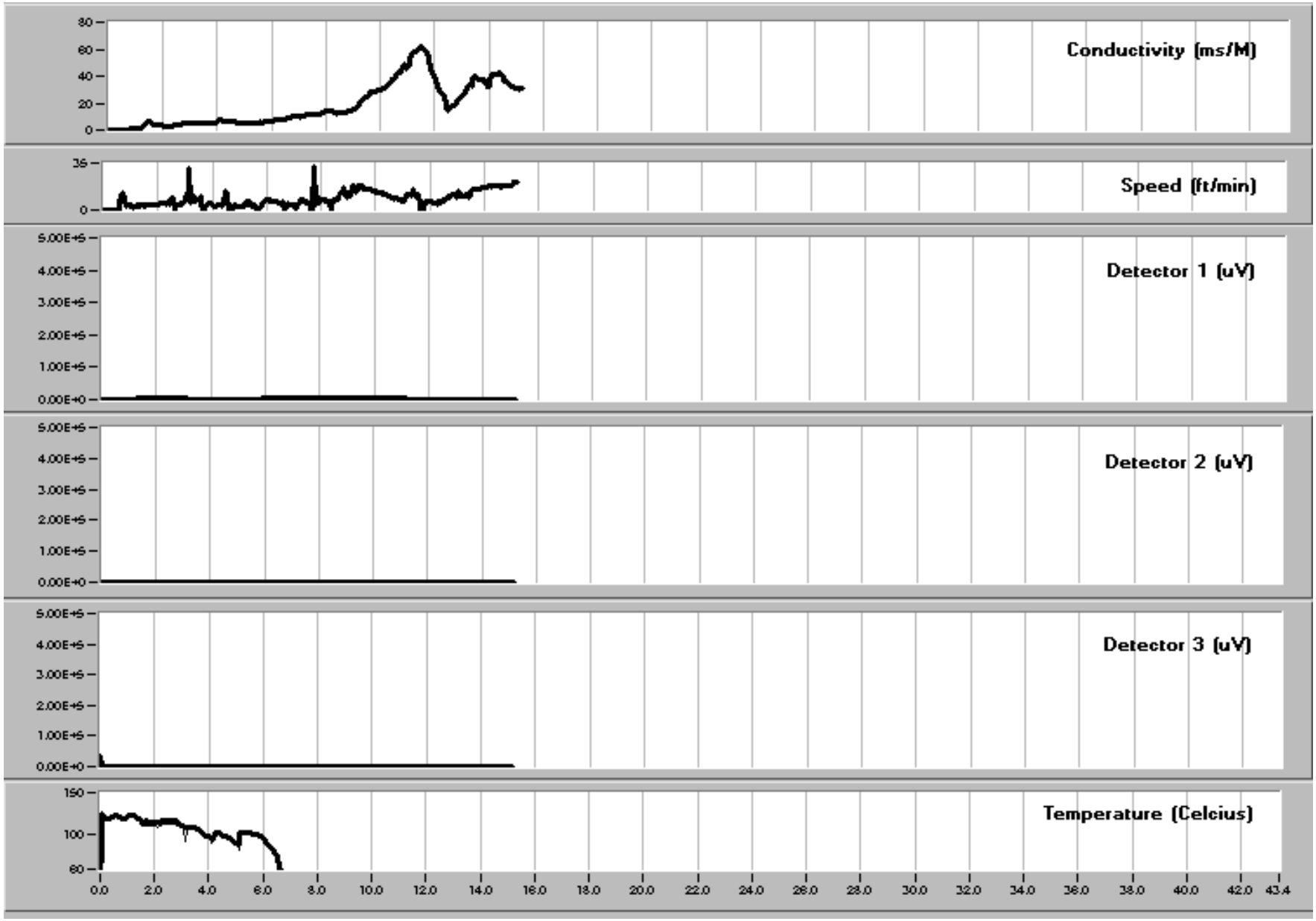
MIP-13



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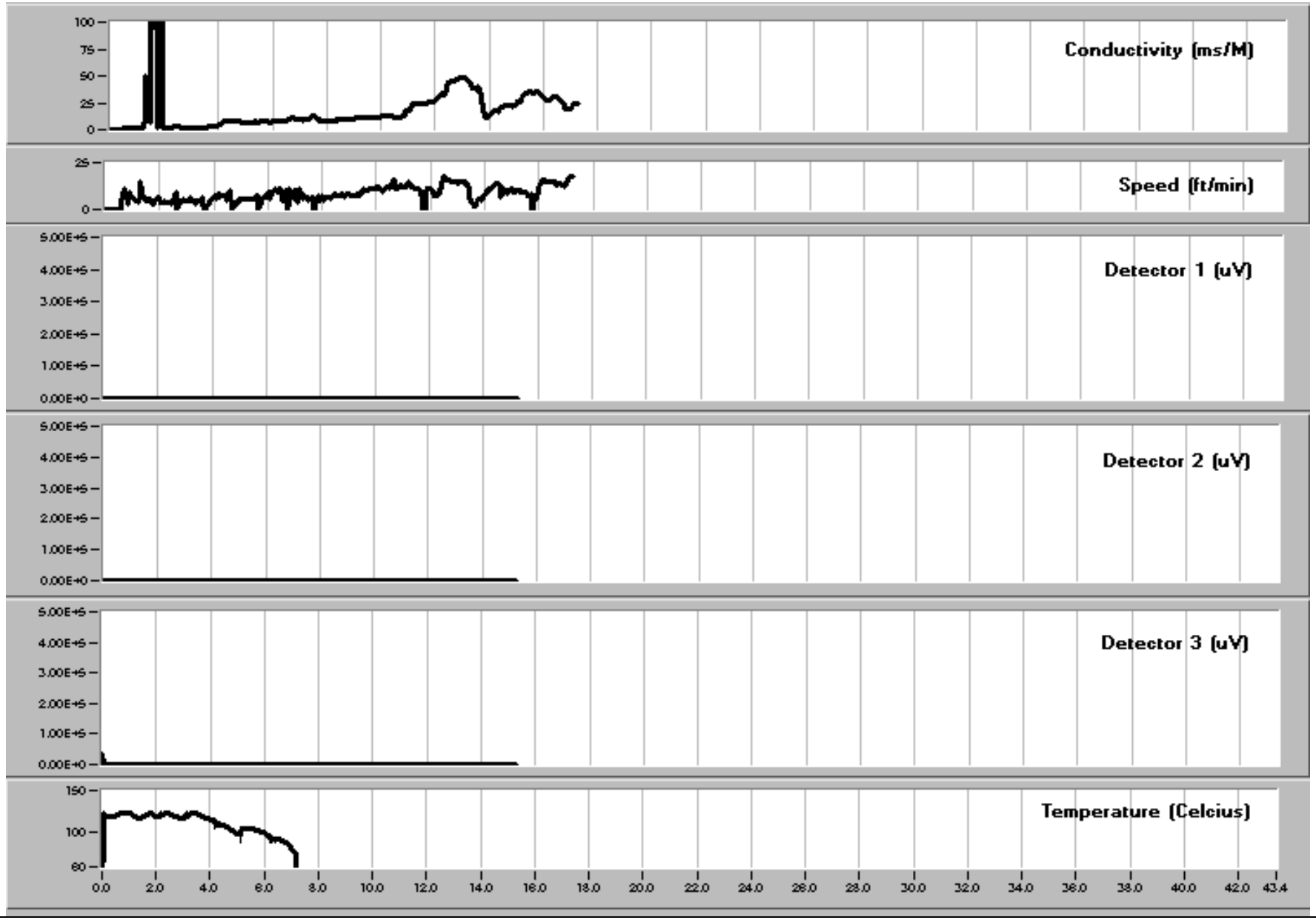
MIP-14



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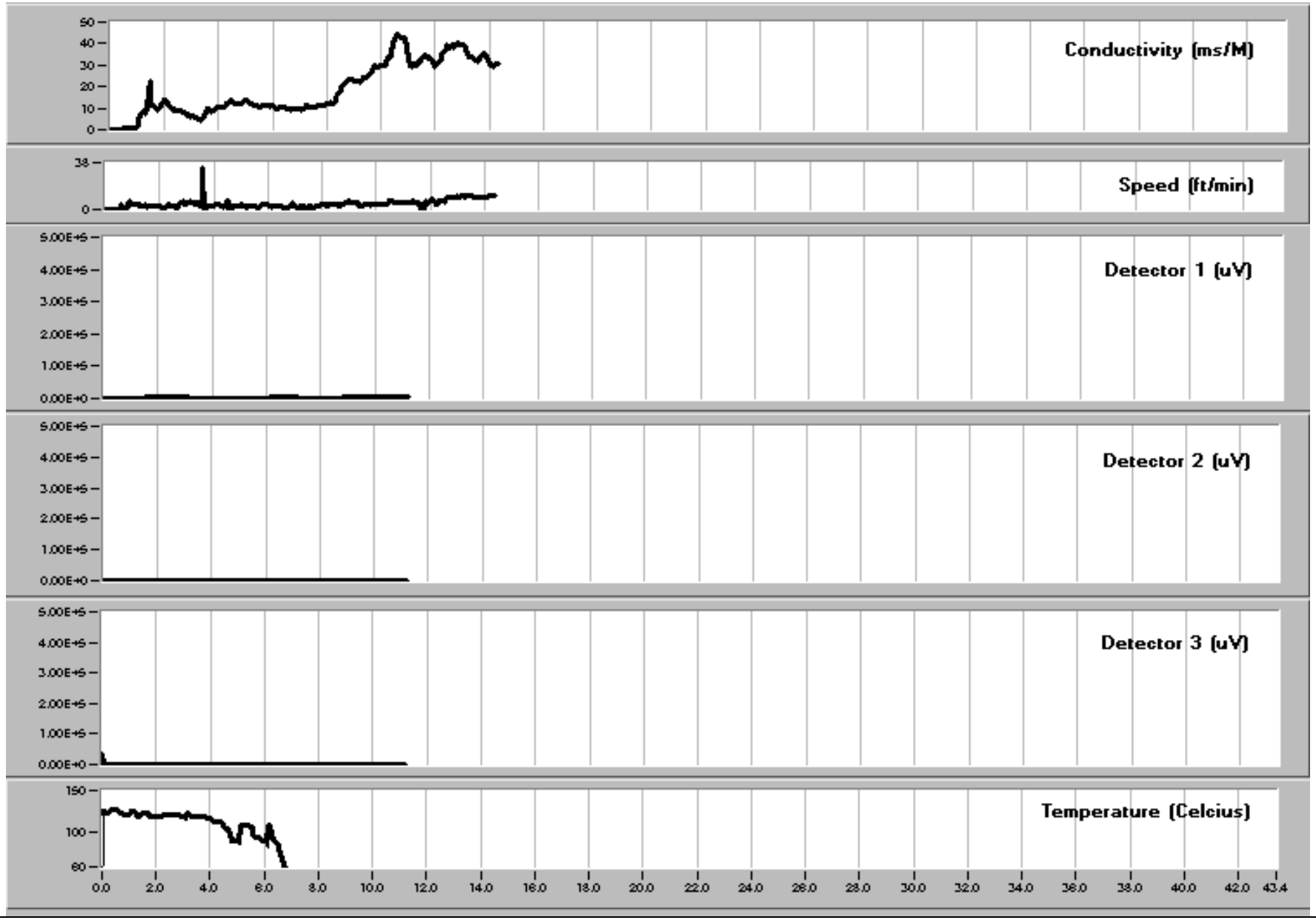
MIP-15



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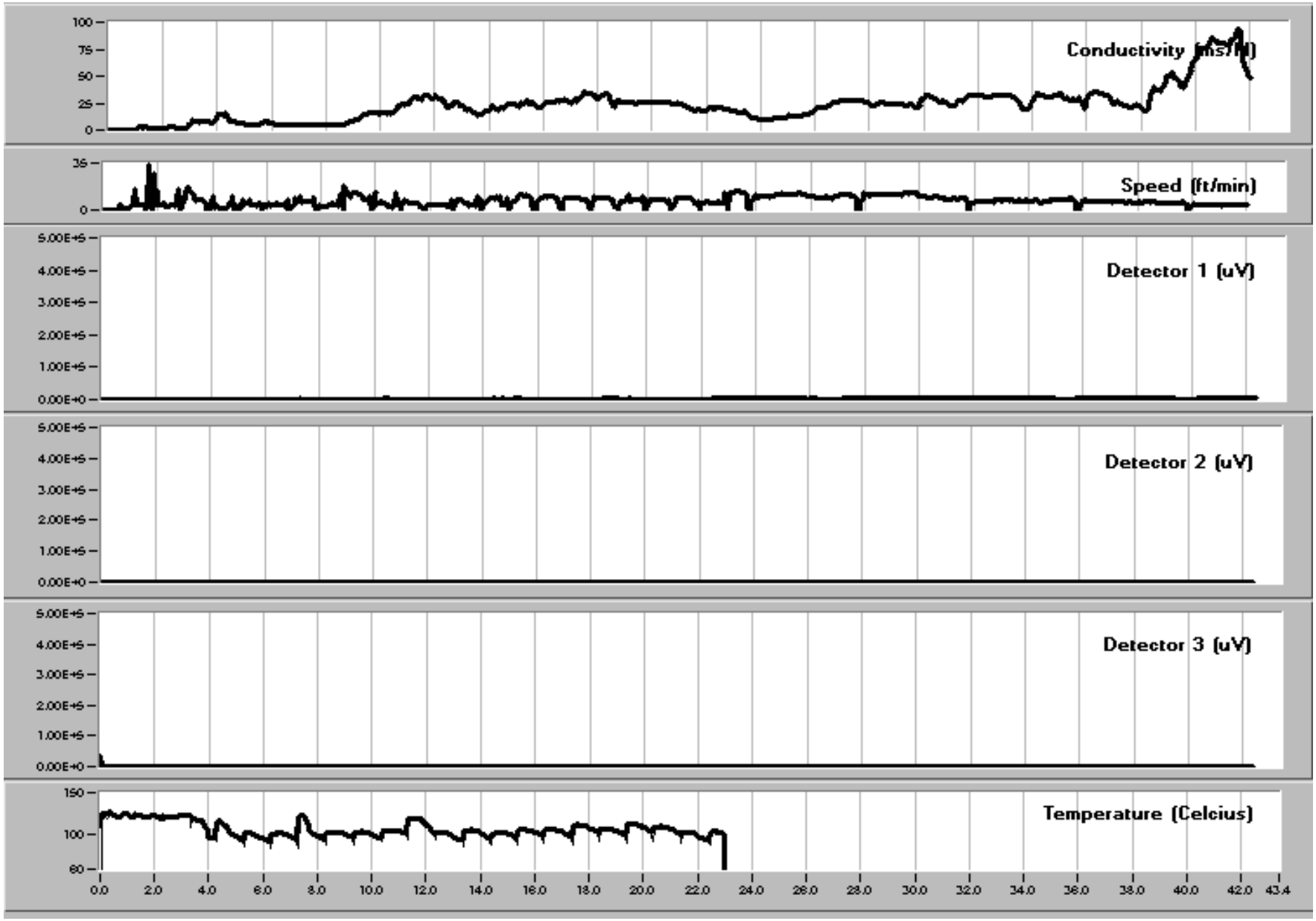
MIP-16



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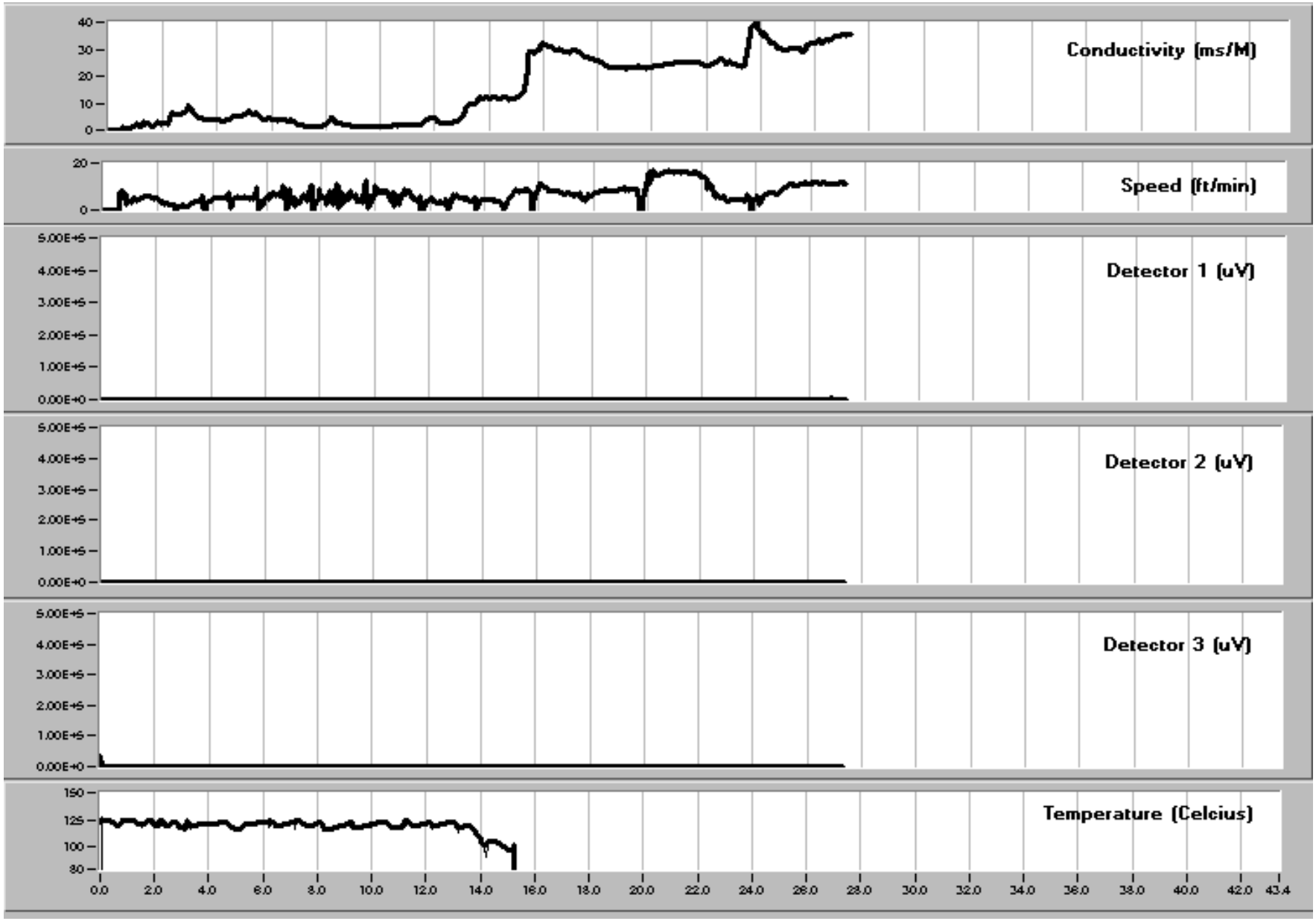
MIP-17



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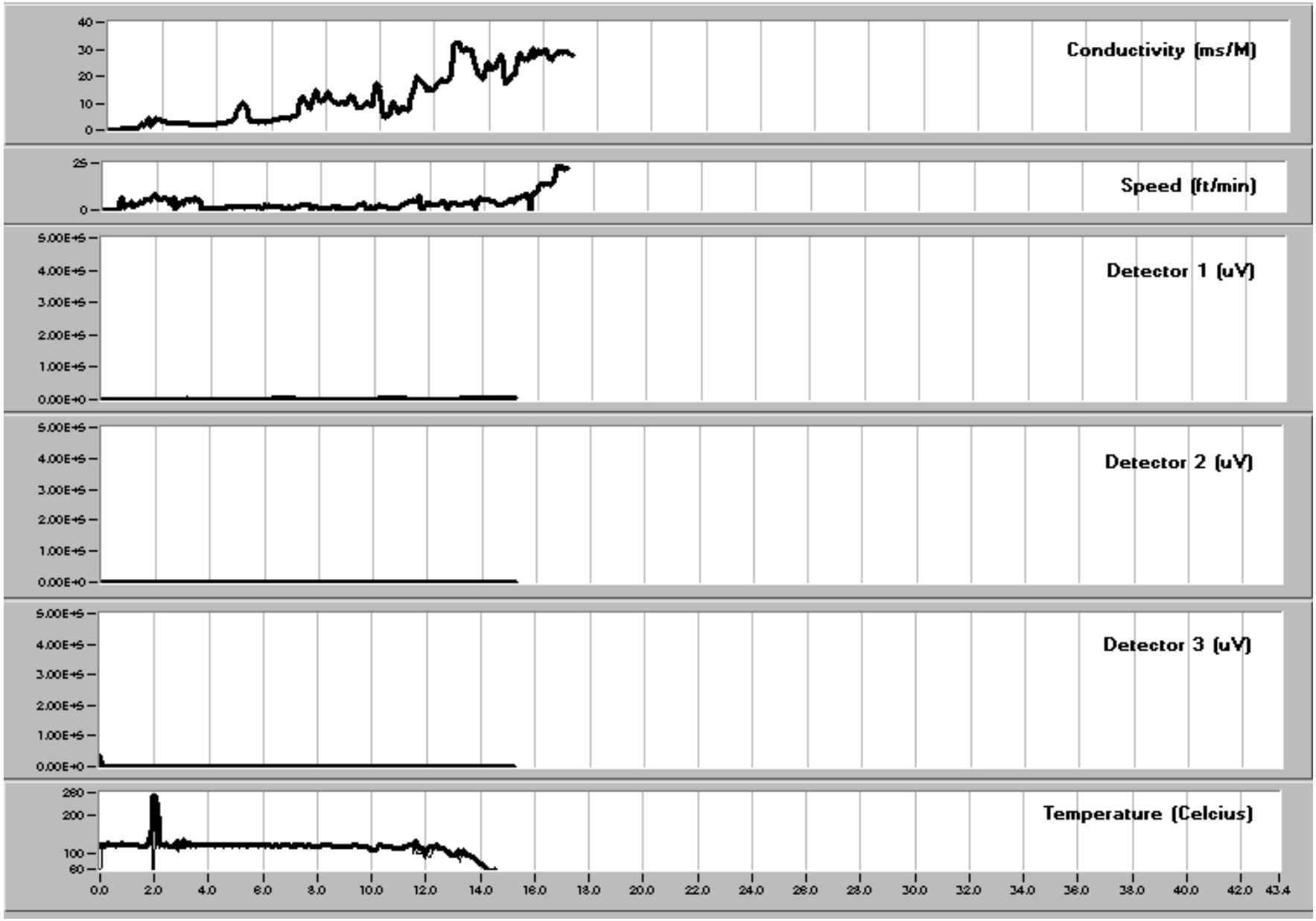
MIP-18



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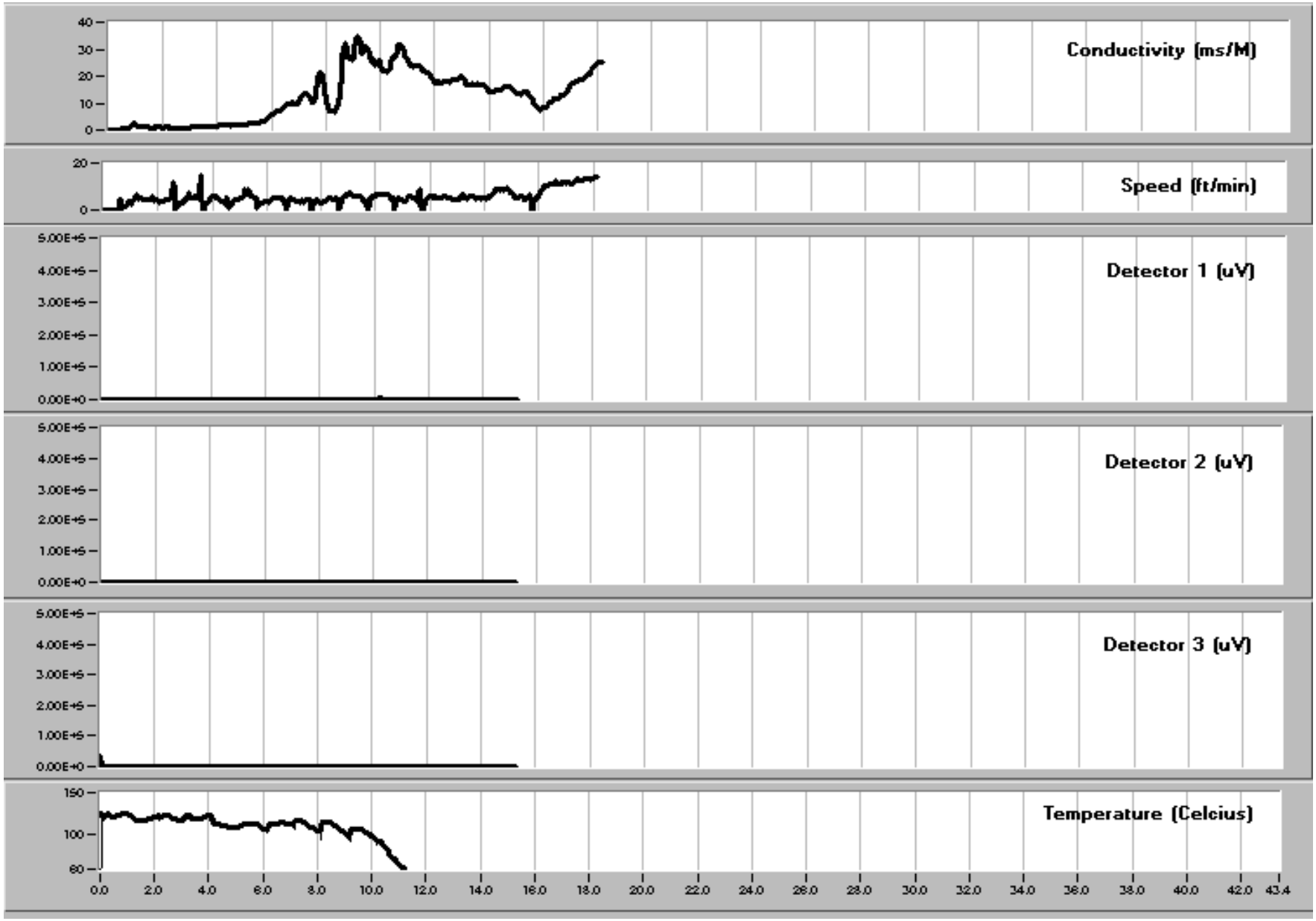
MIP-19



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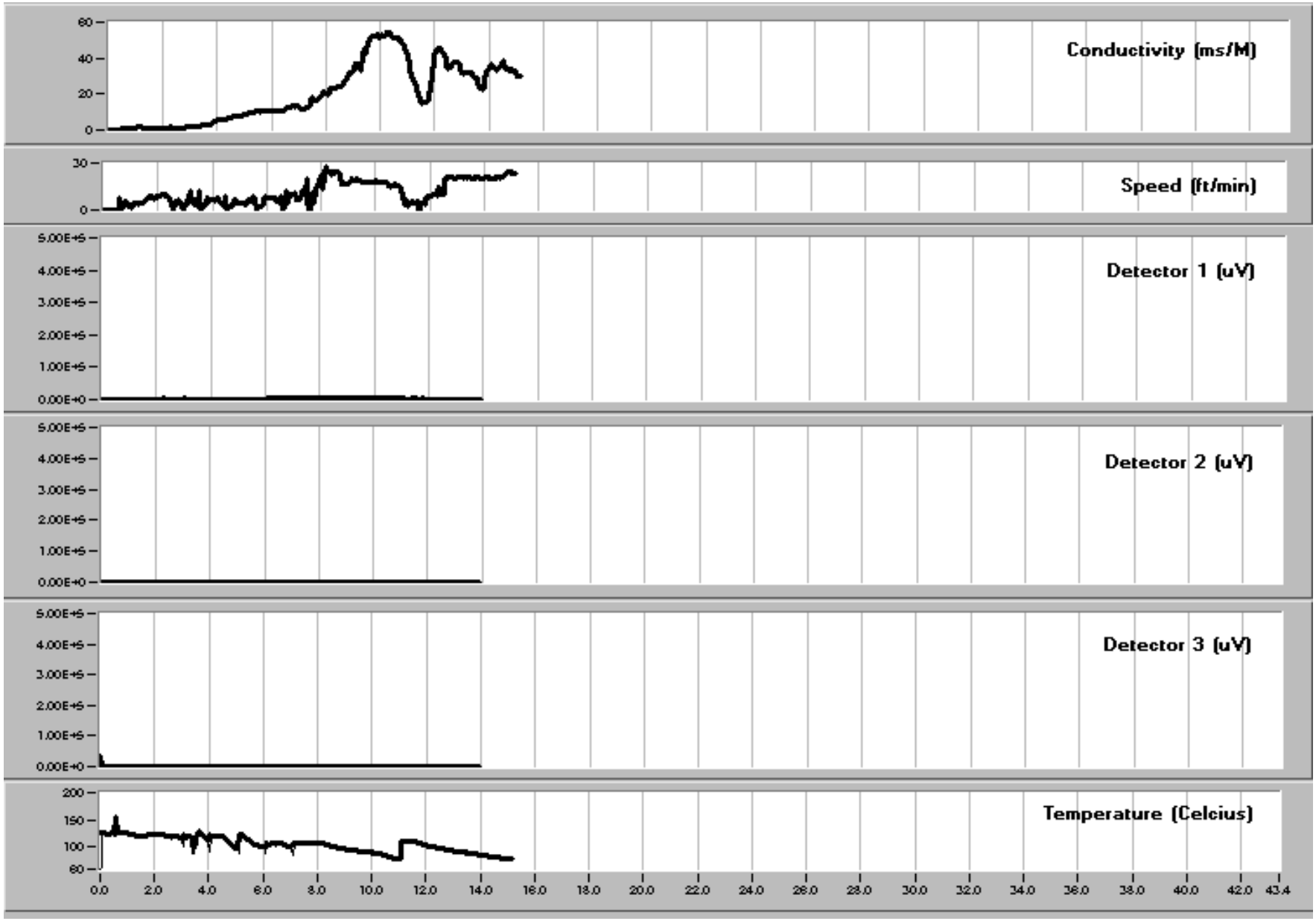
MIP-20



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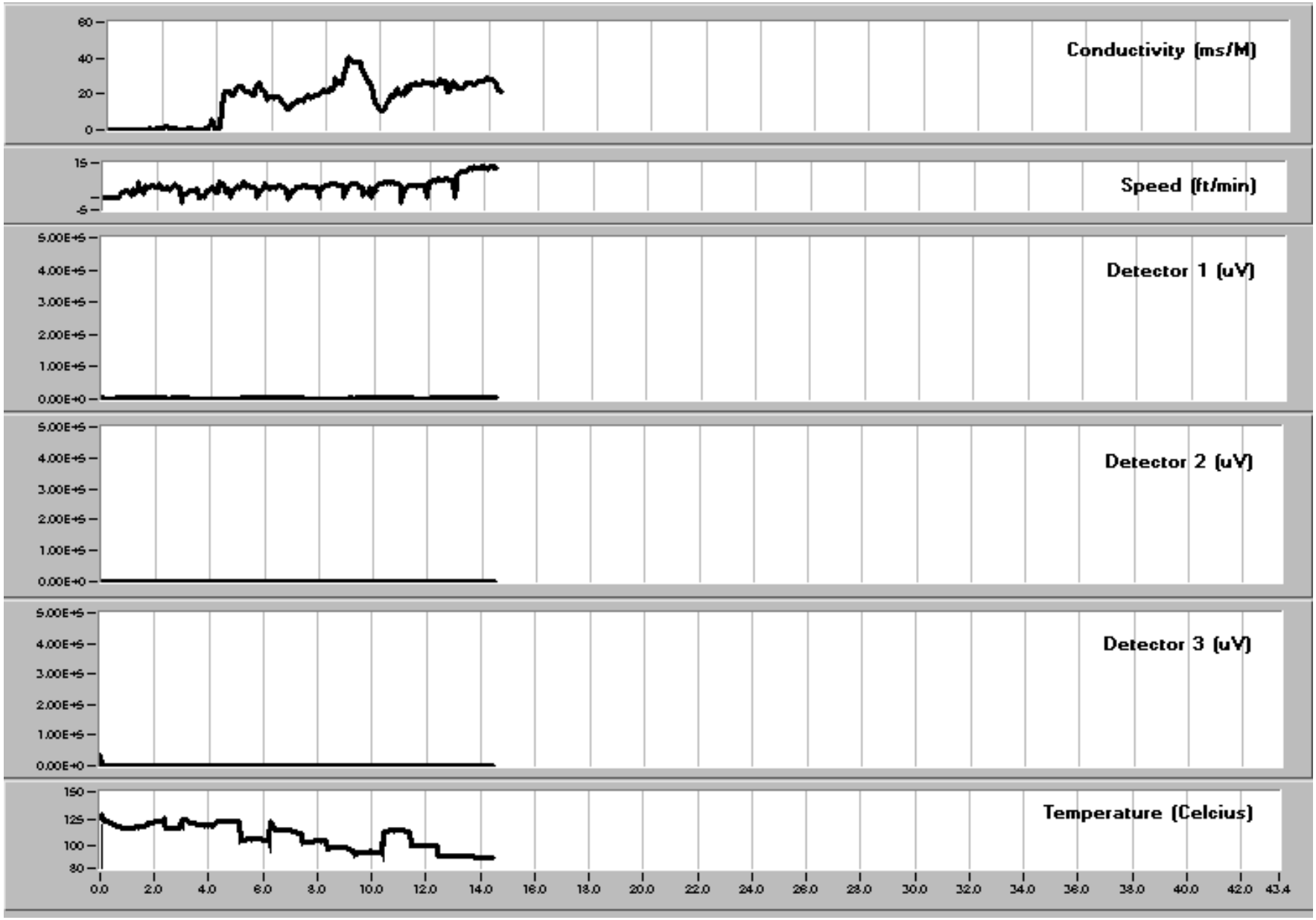
MIP-21



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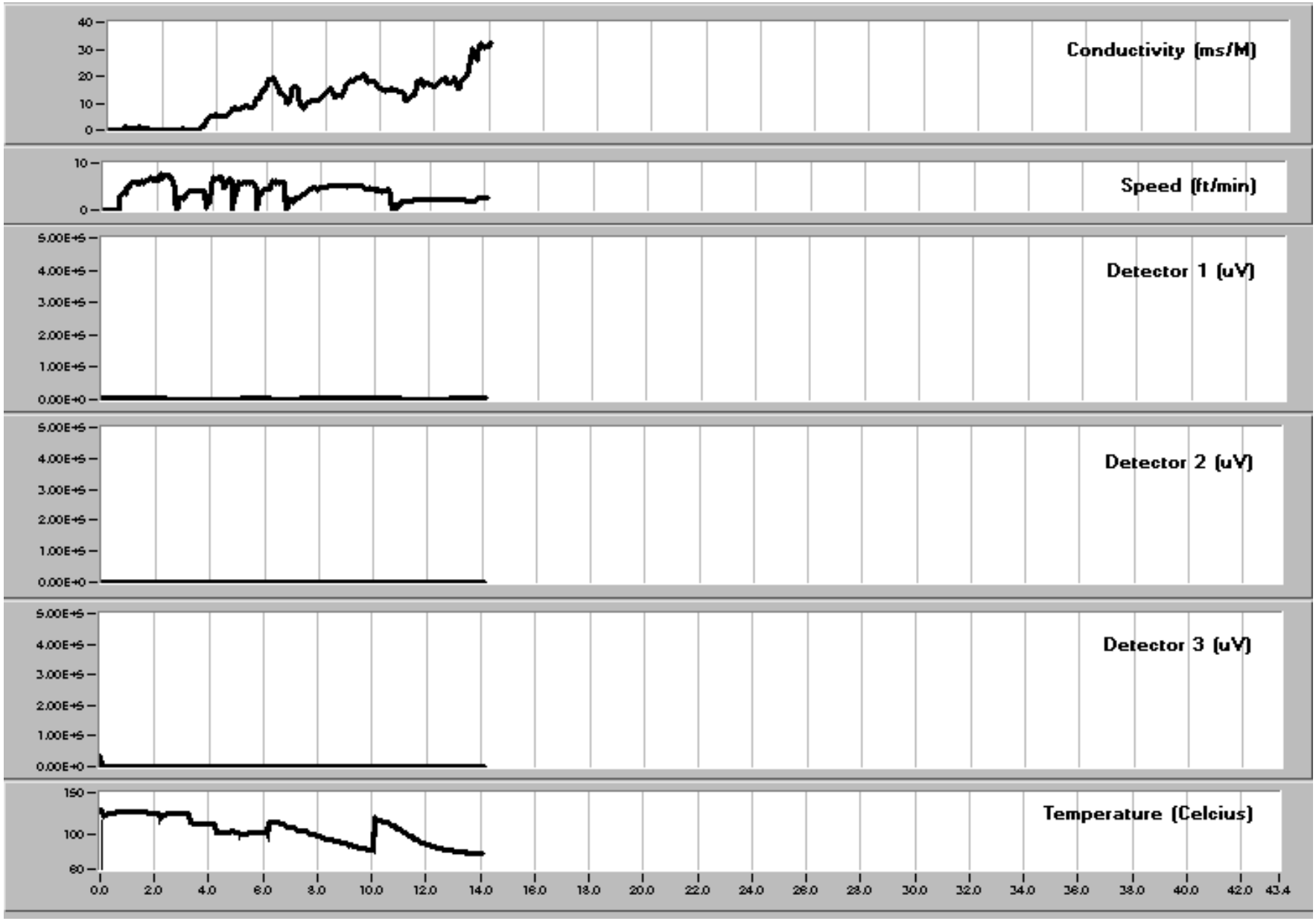
MIP-22



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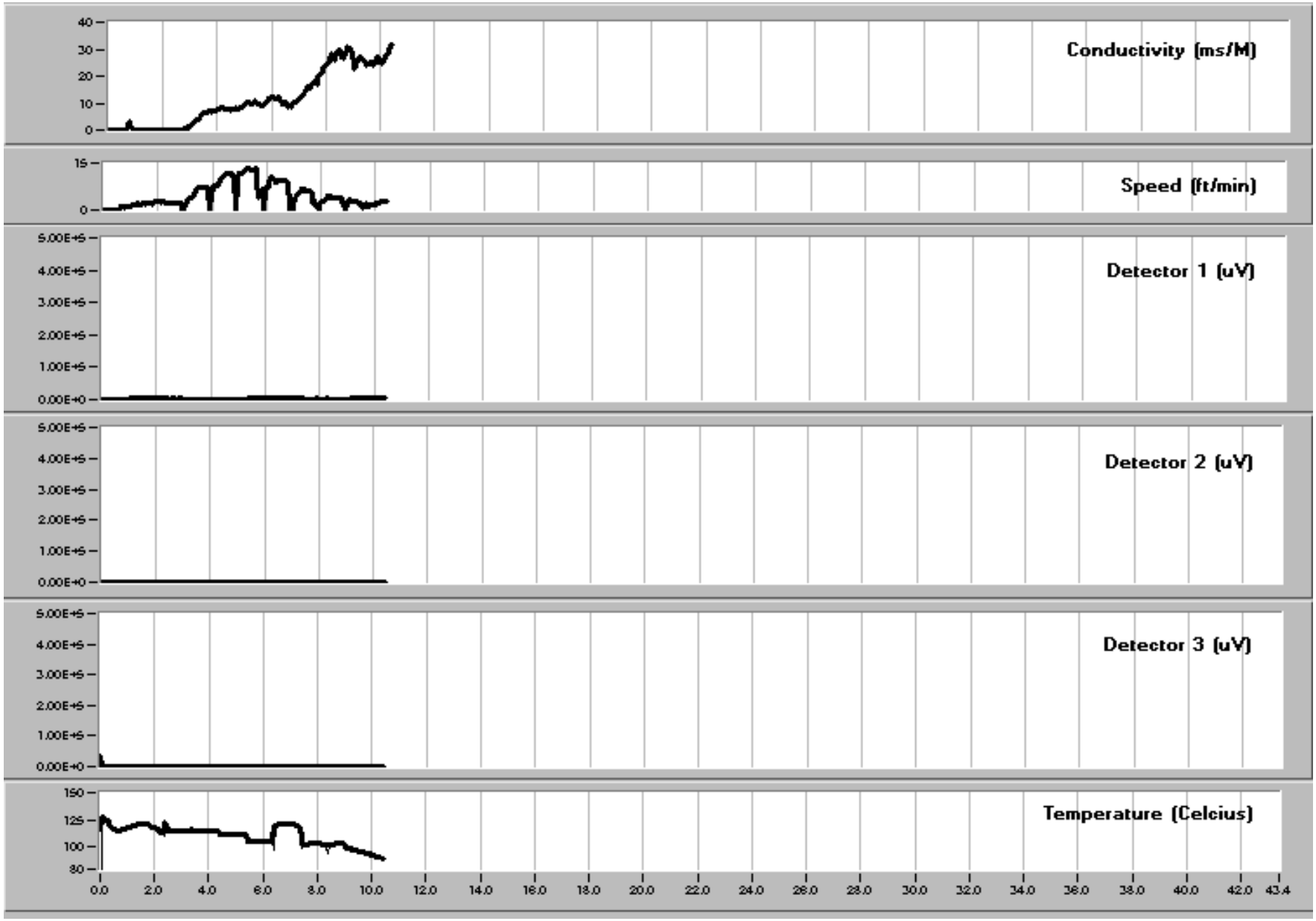

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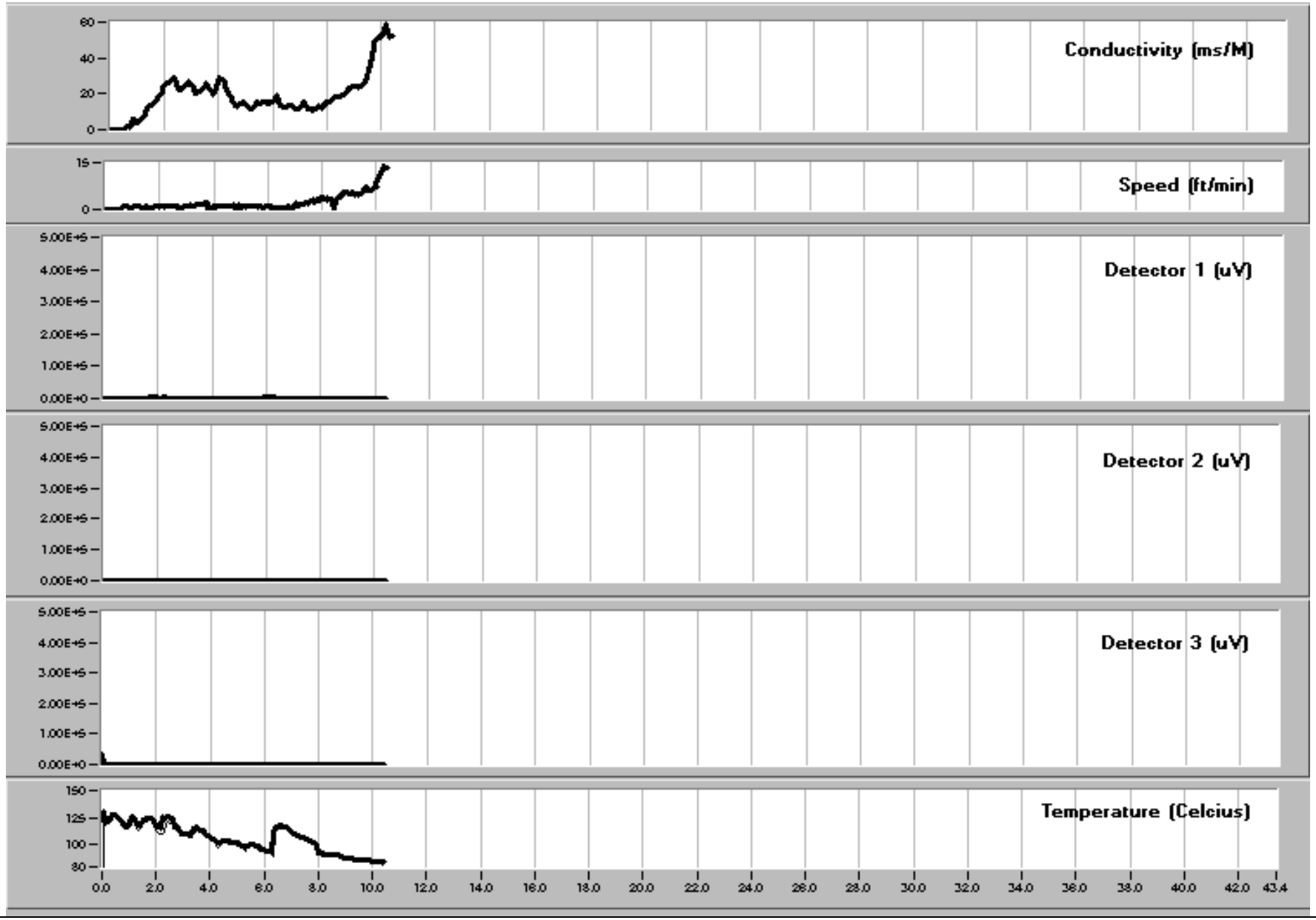
MIP-24



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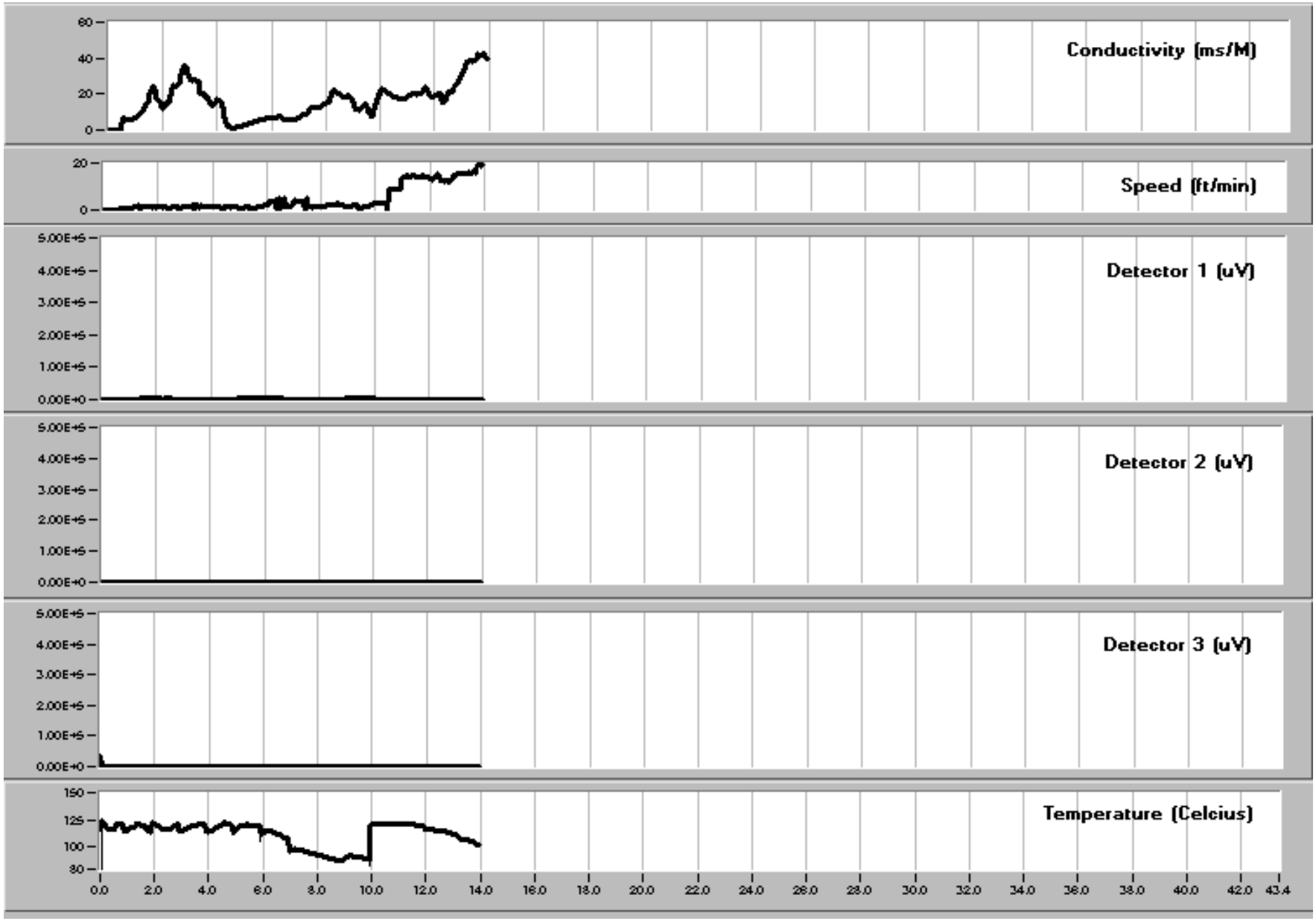
MIP-25



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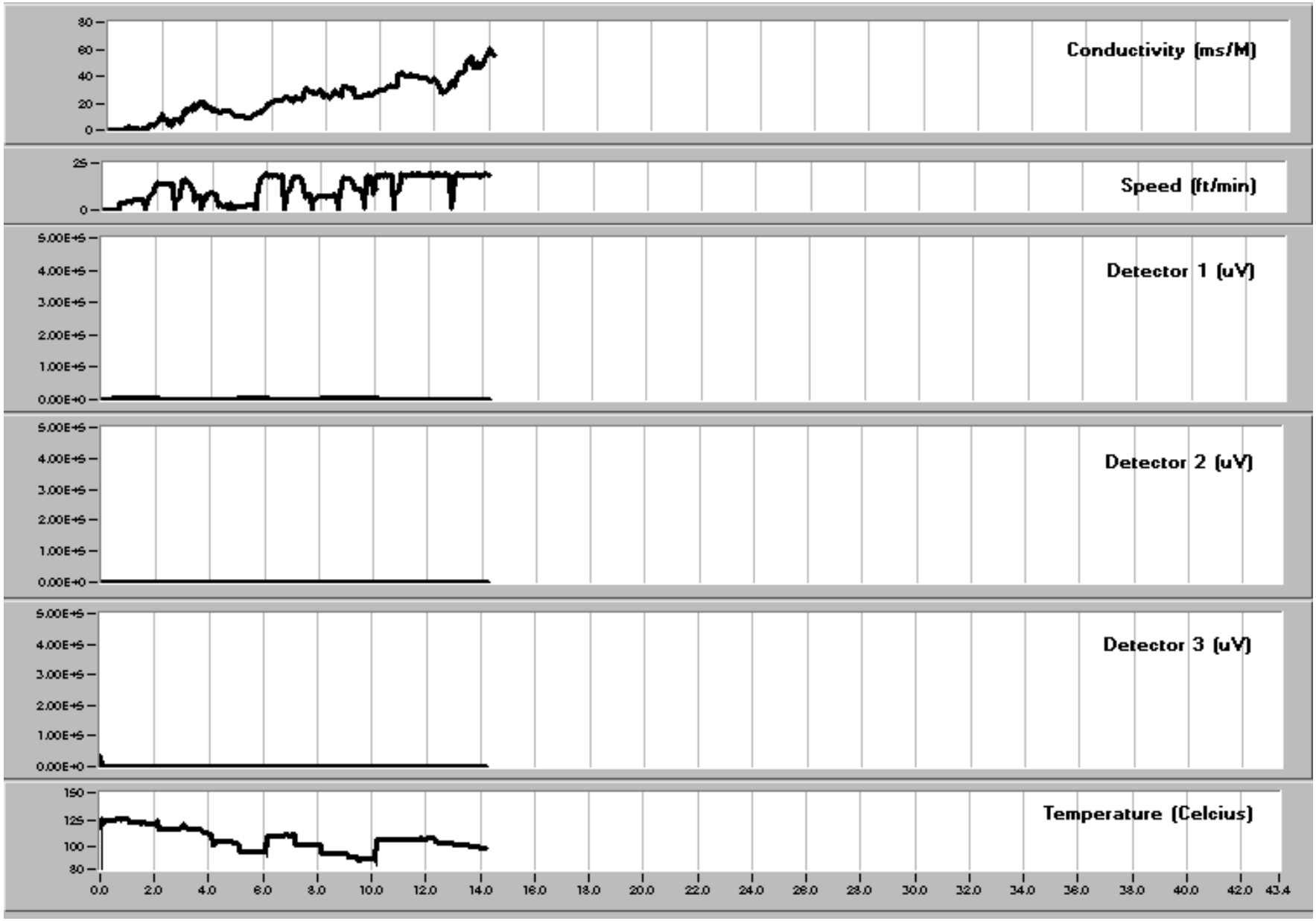
MIP-26



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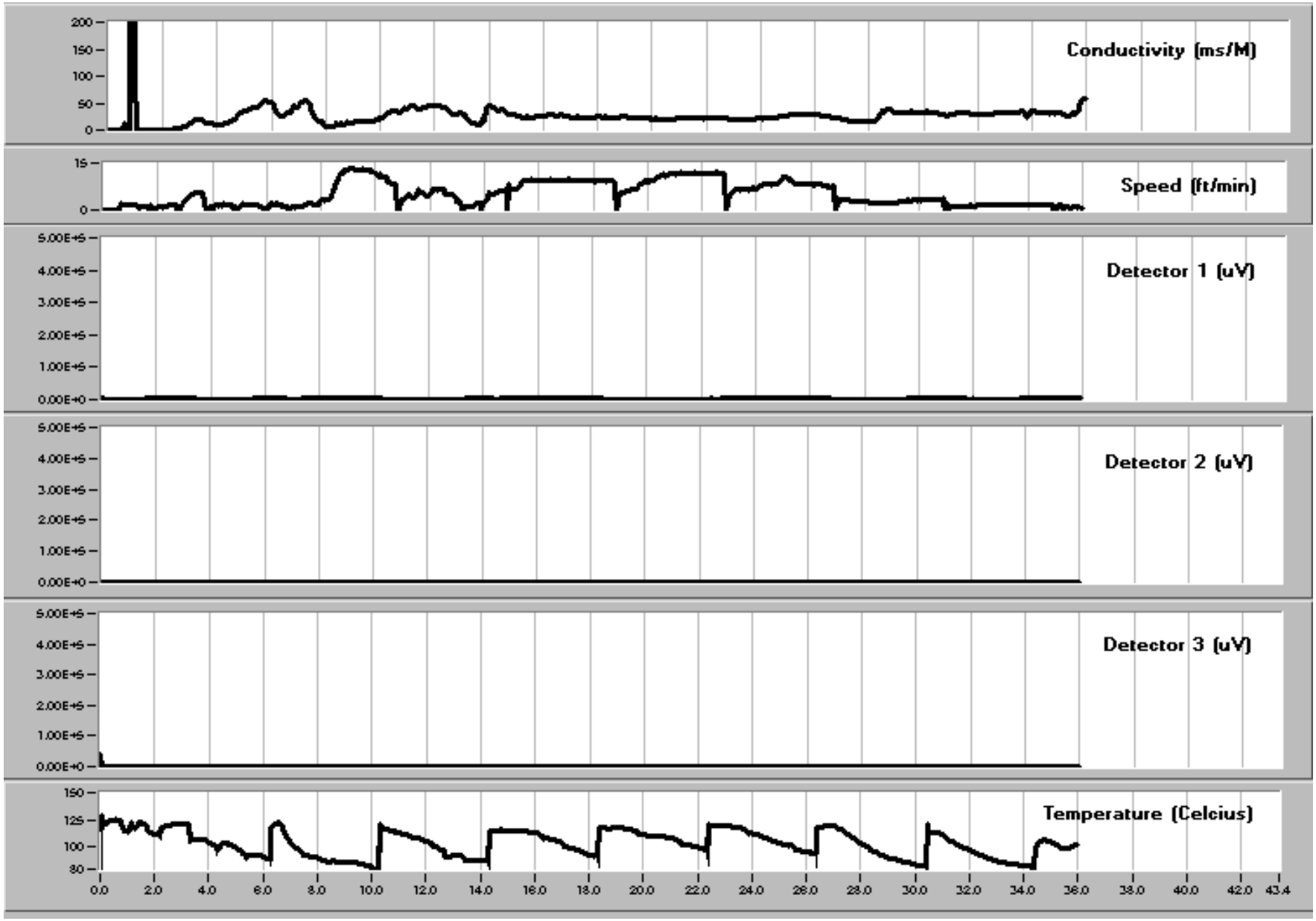
MIP-27



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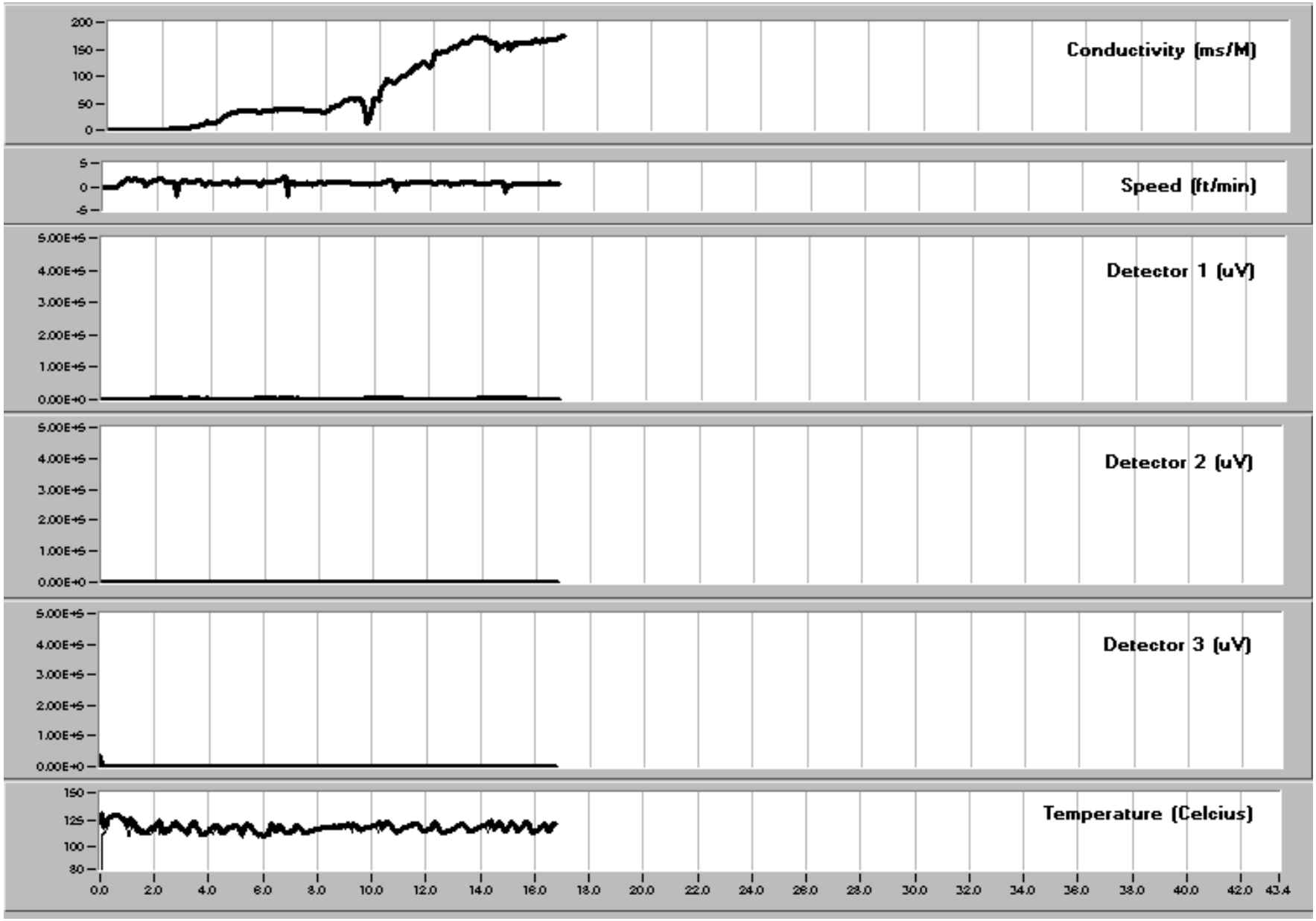
MIP-28



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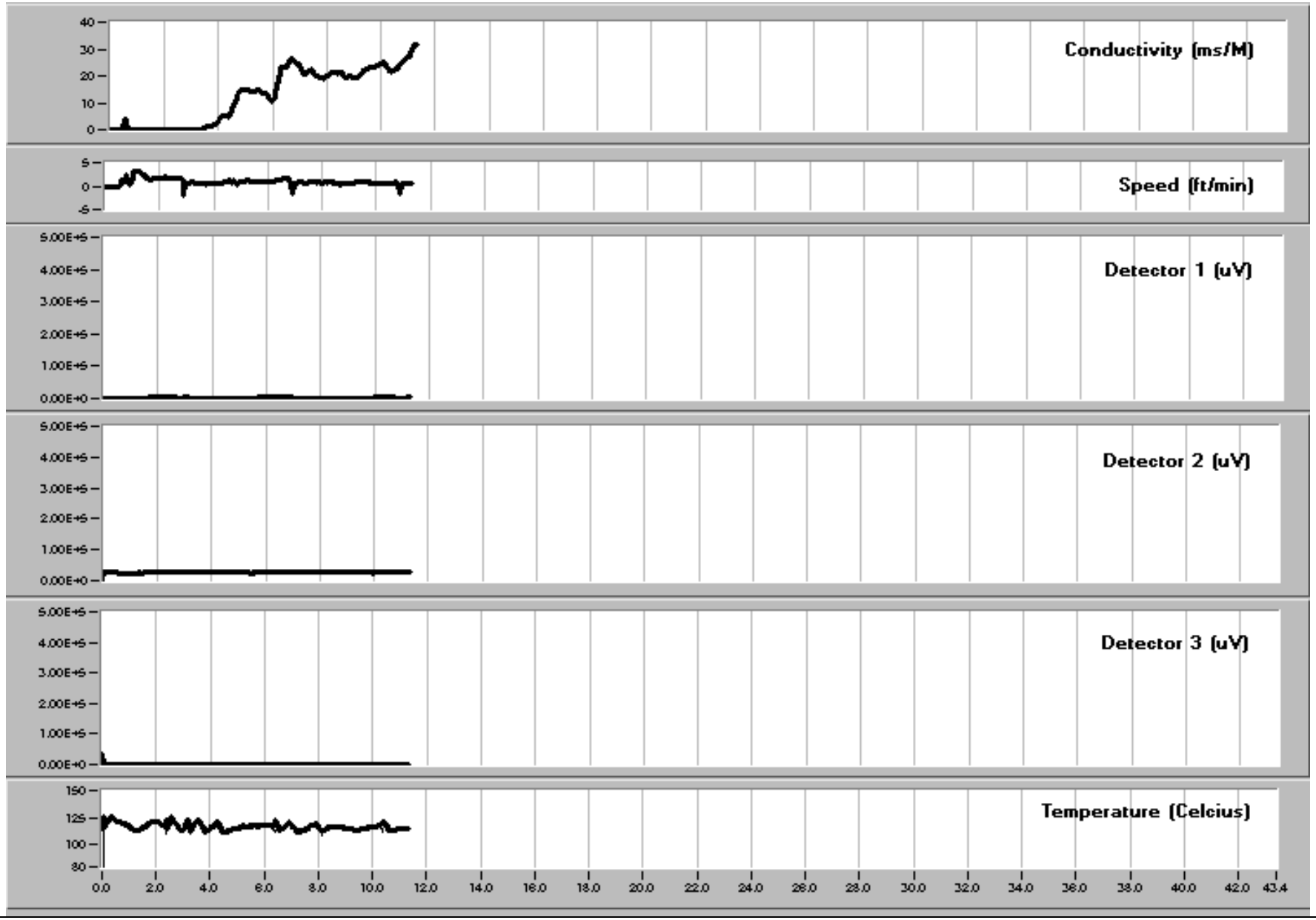
MIP-29



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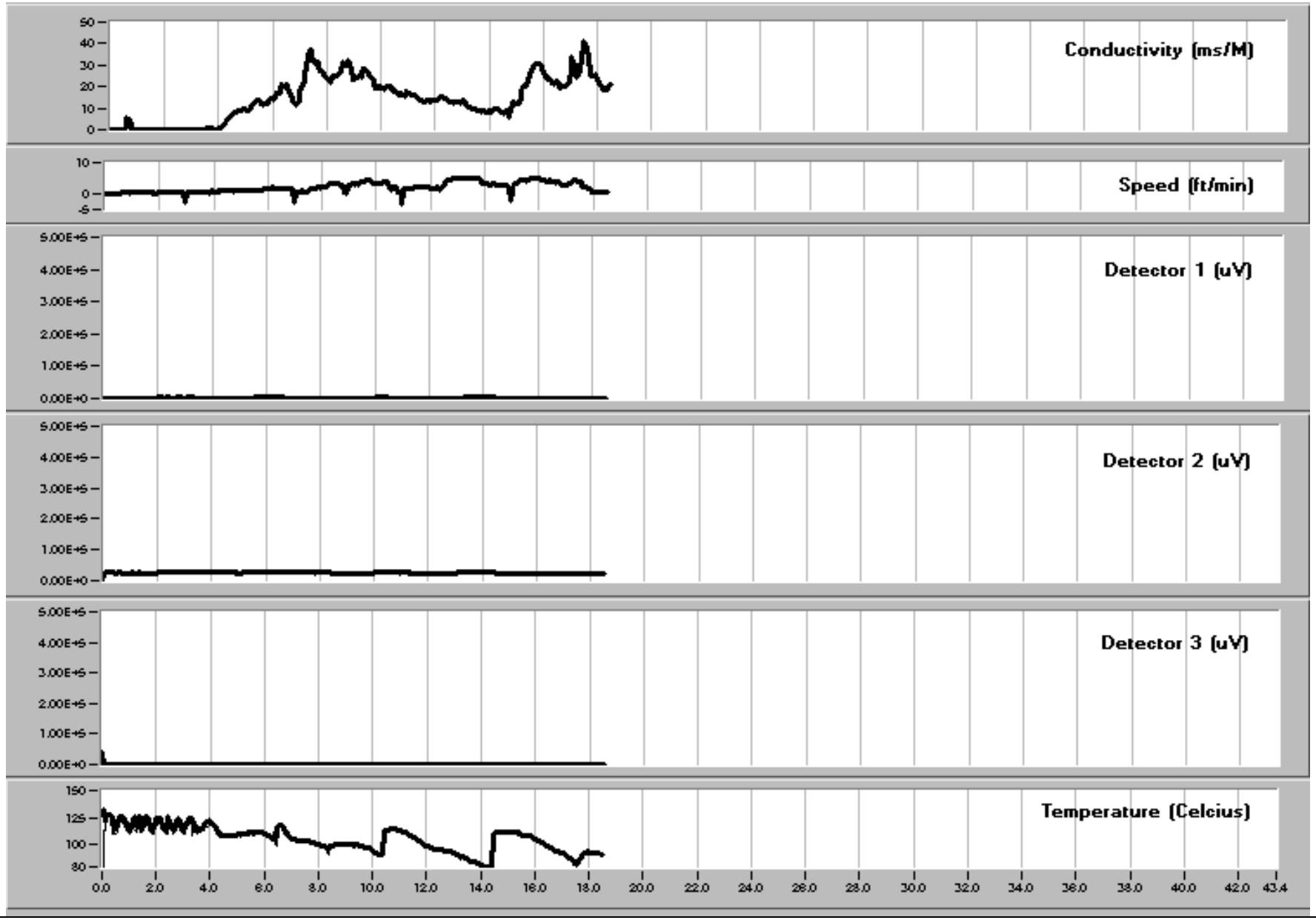
MIP-30



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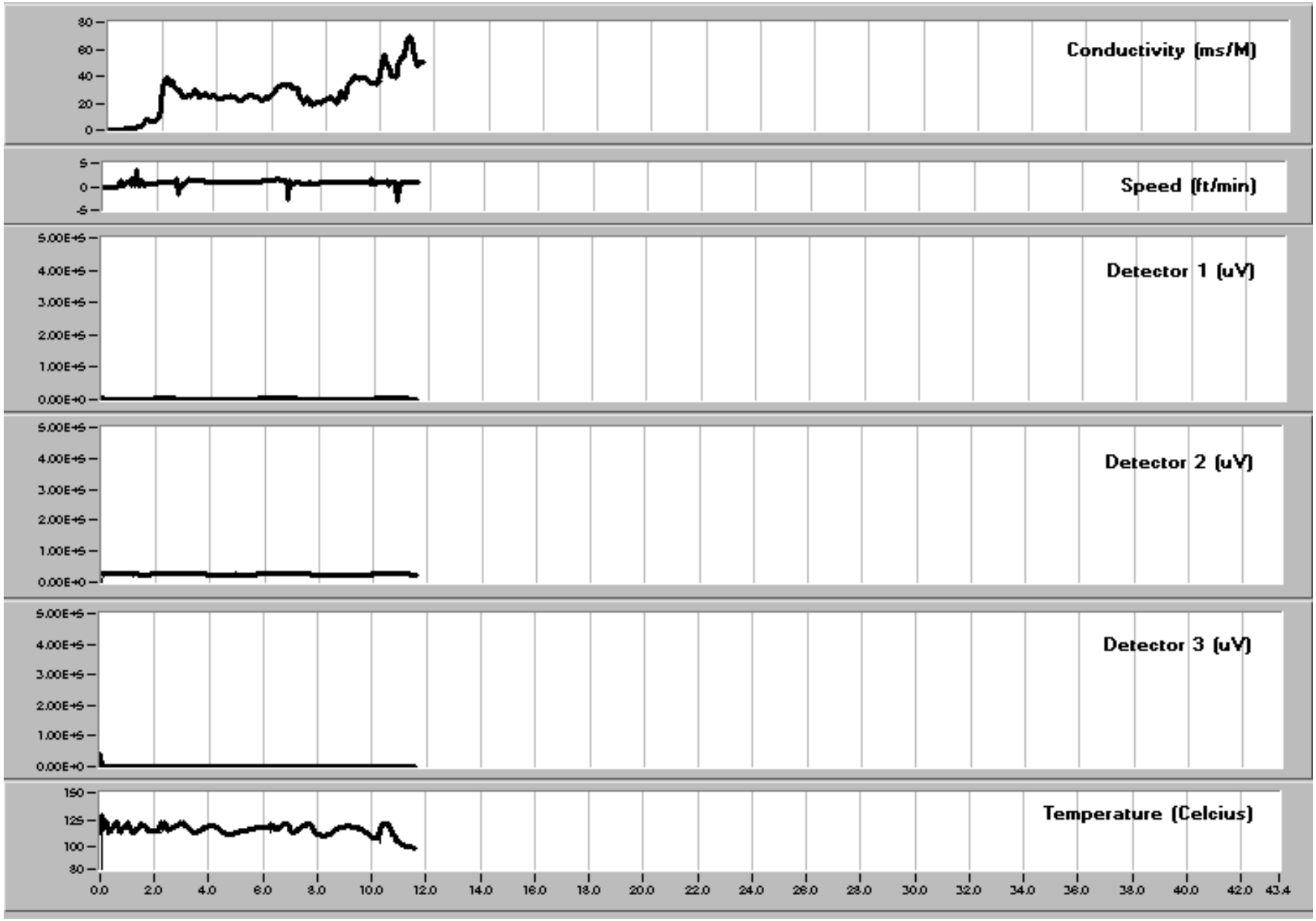
MIP-31



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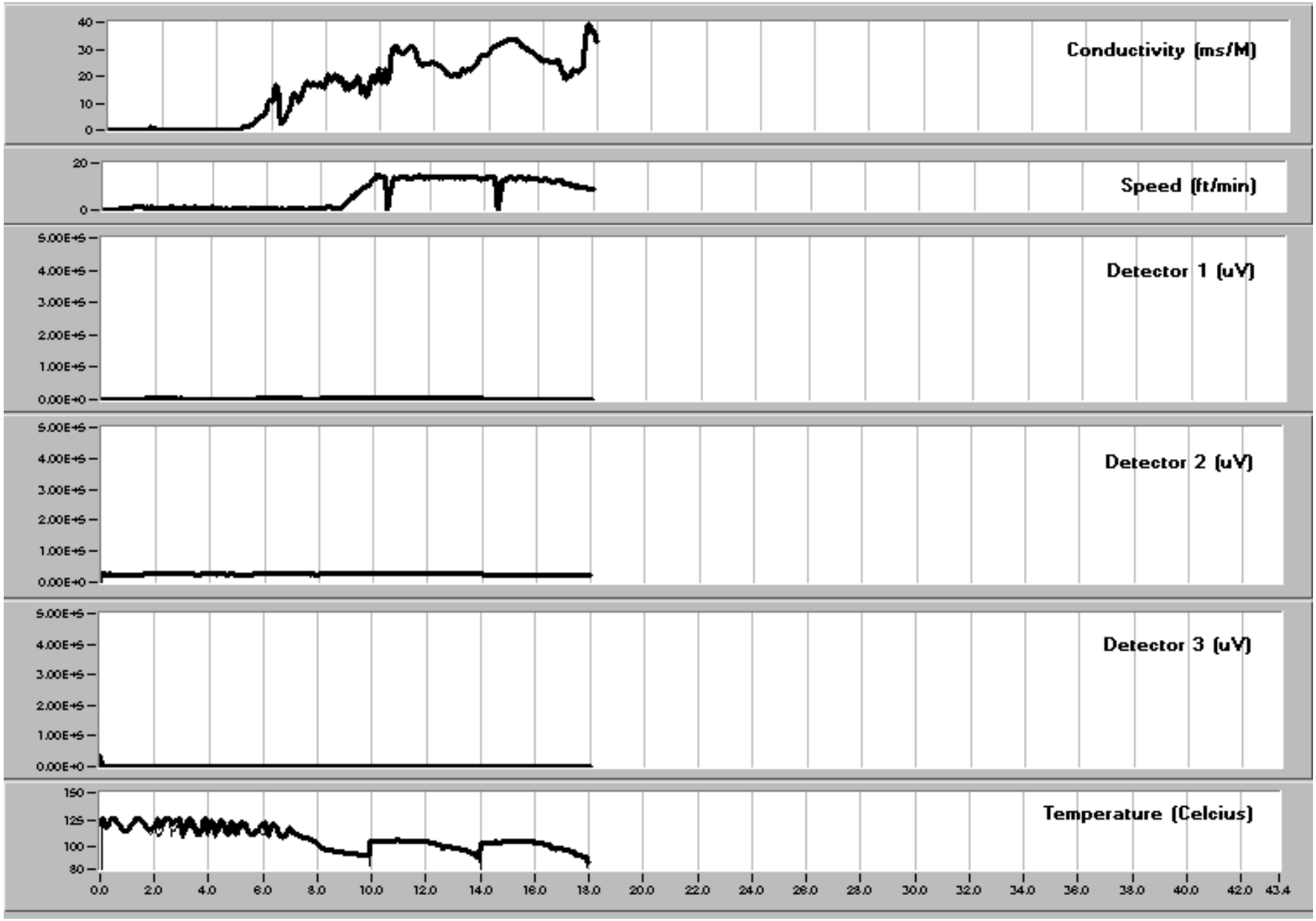
MIP-32



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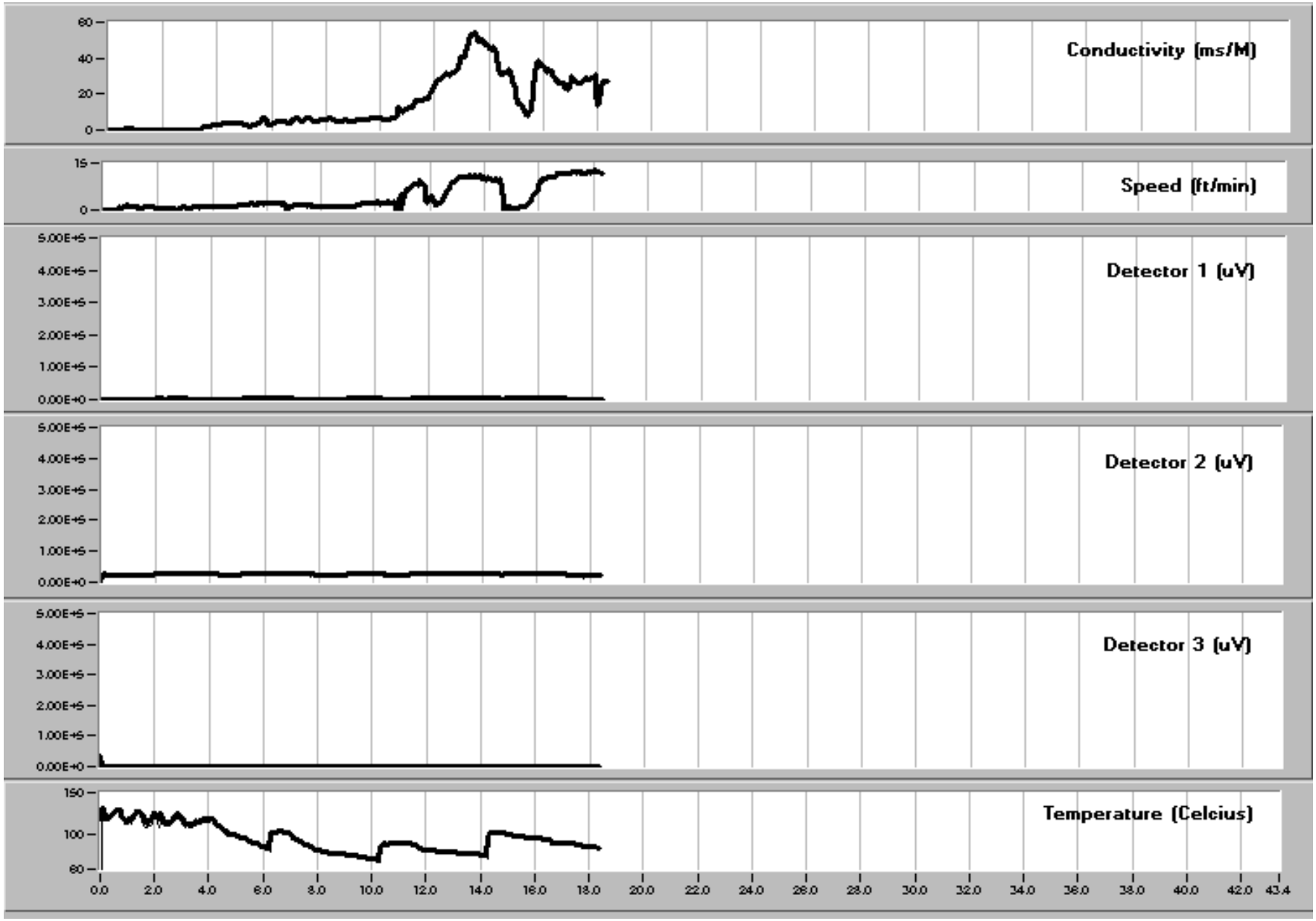

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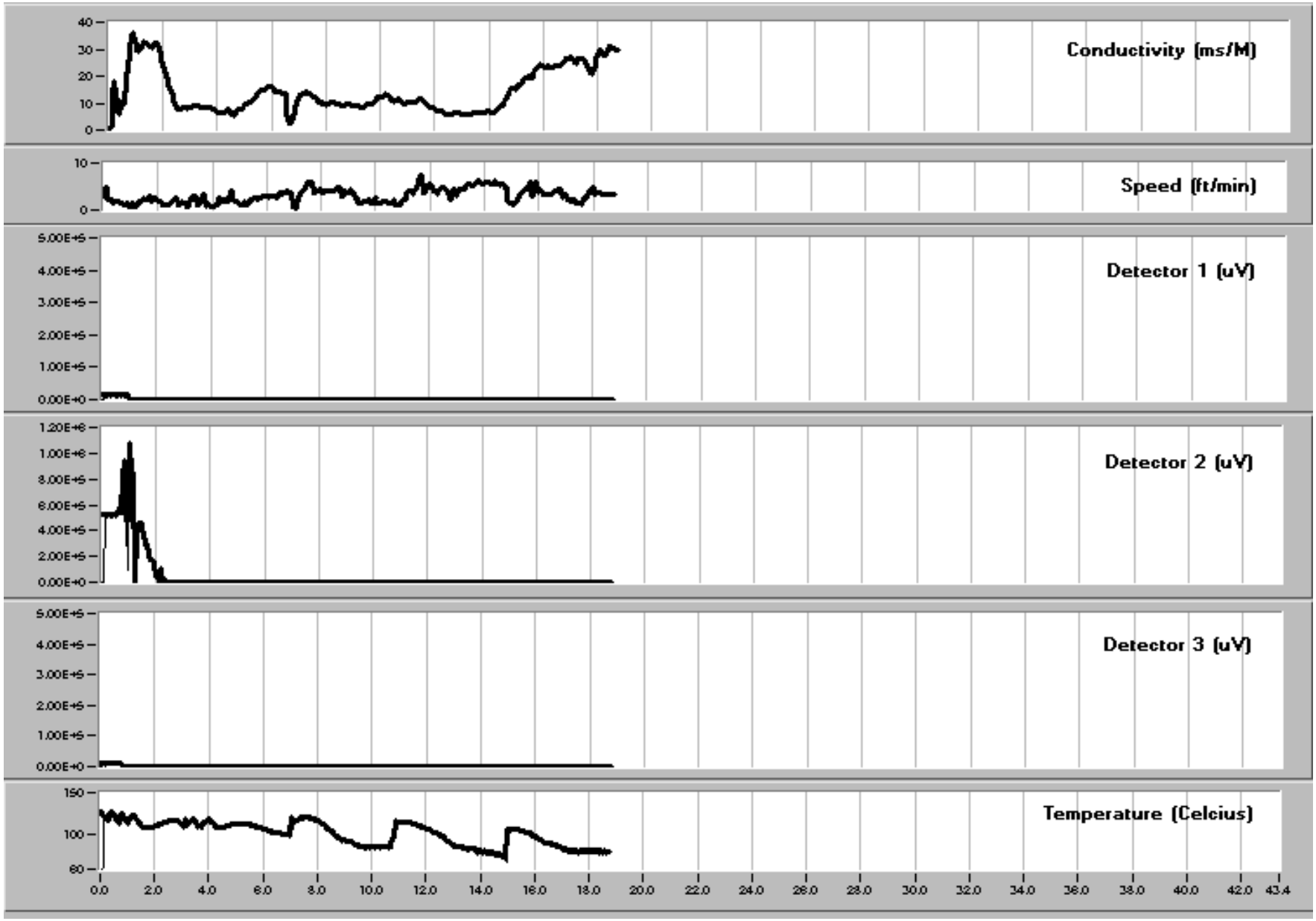
MIP-34



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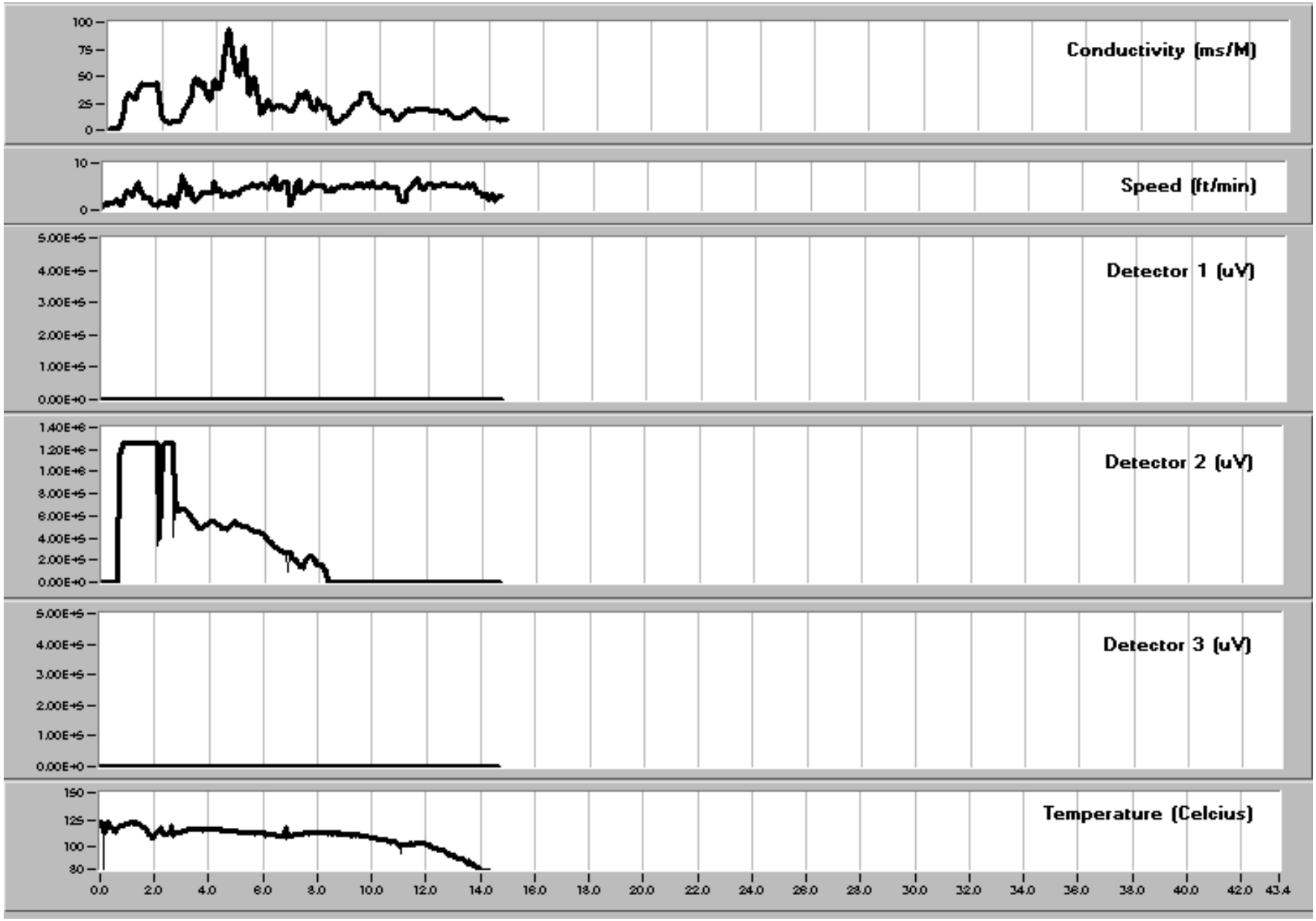
MIP-35



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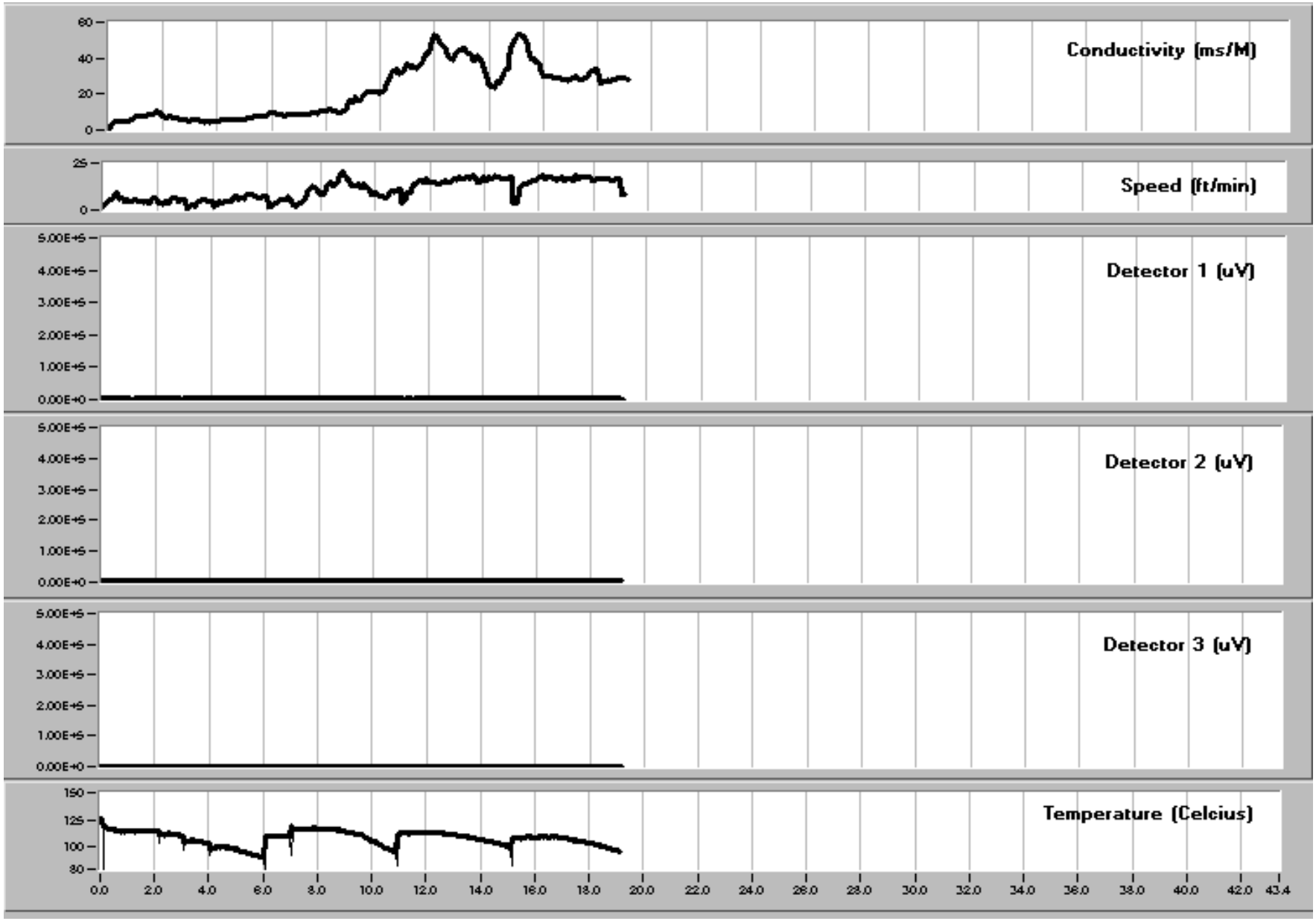

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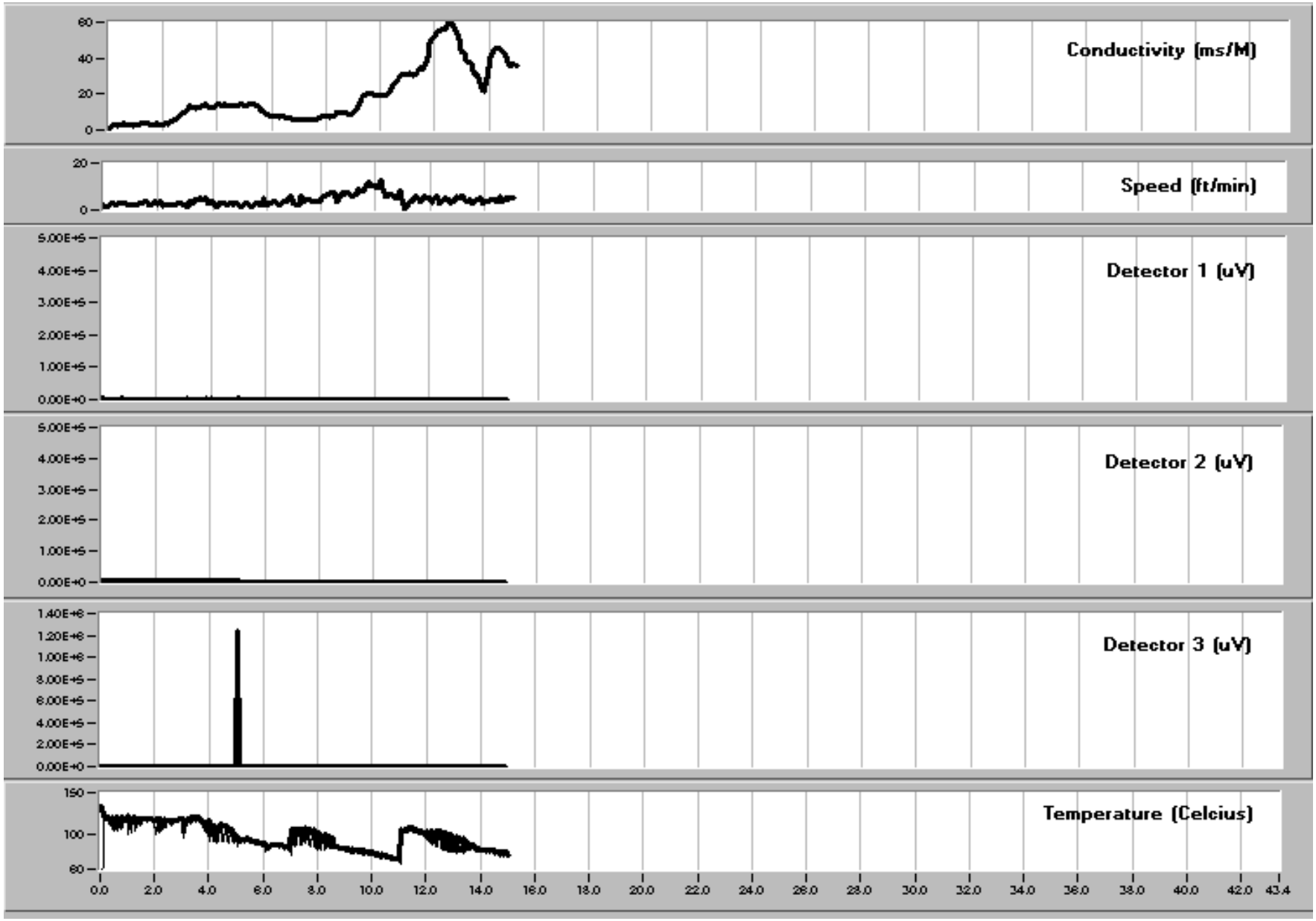
MIP-37



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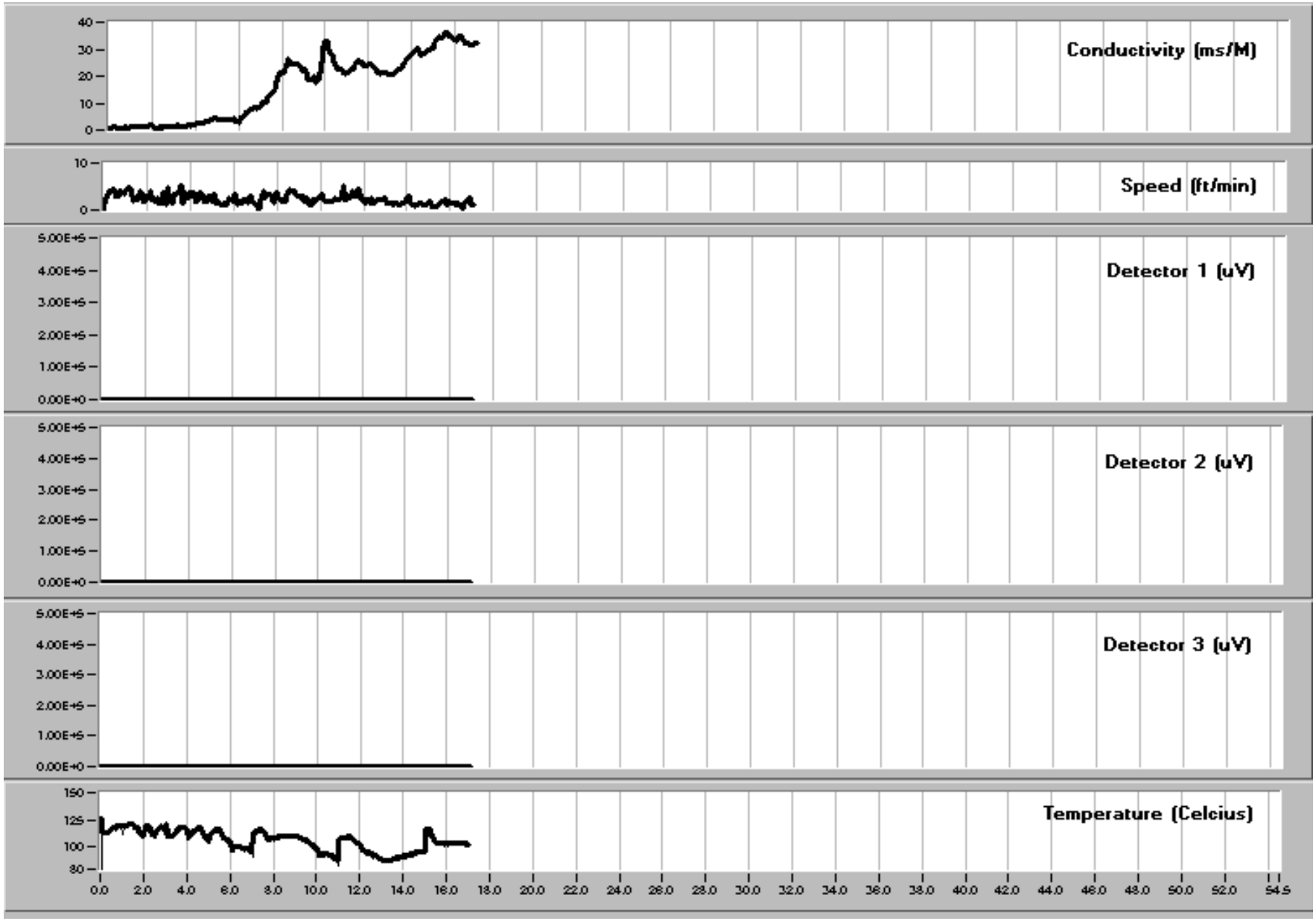

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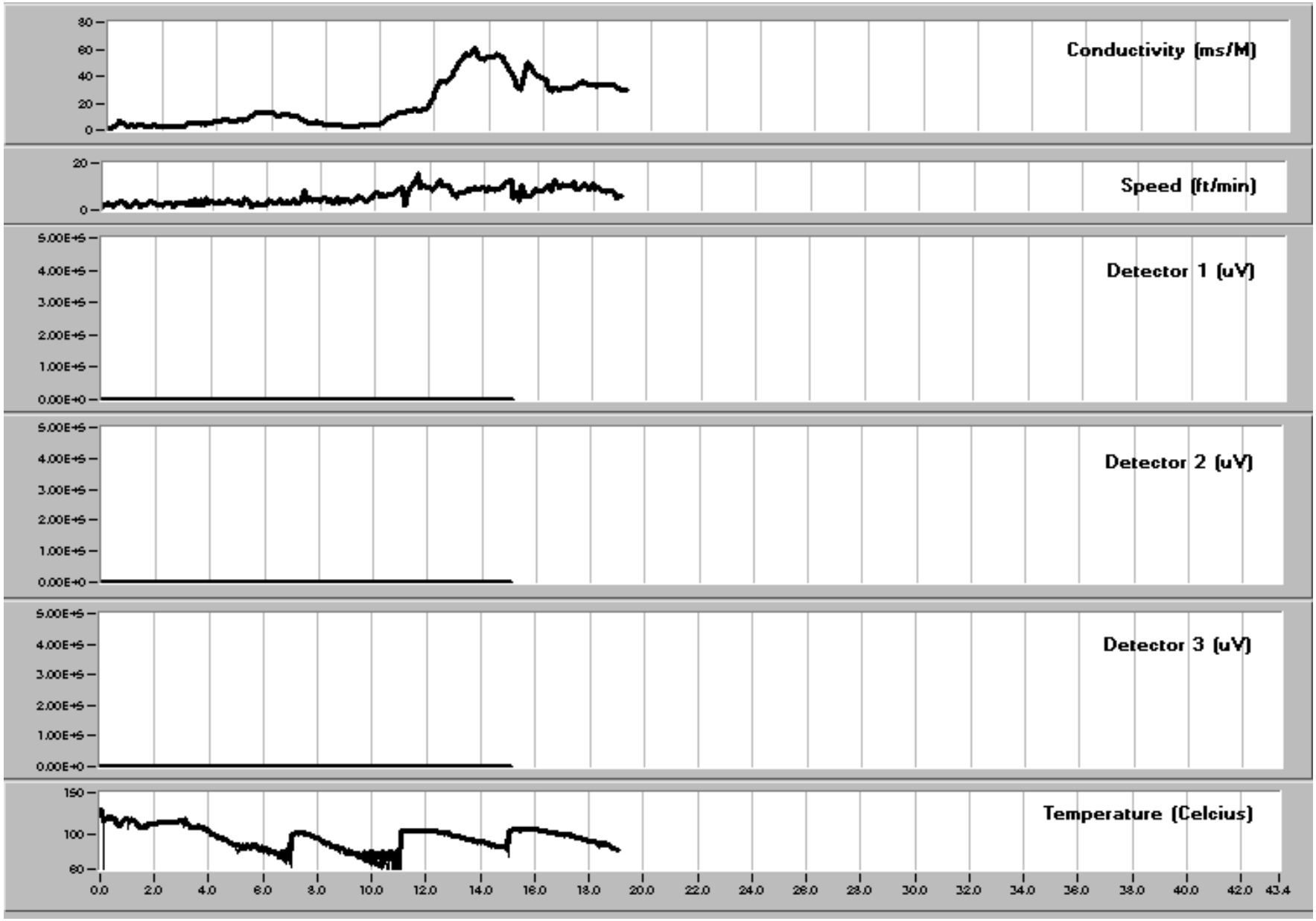
MIP-39



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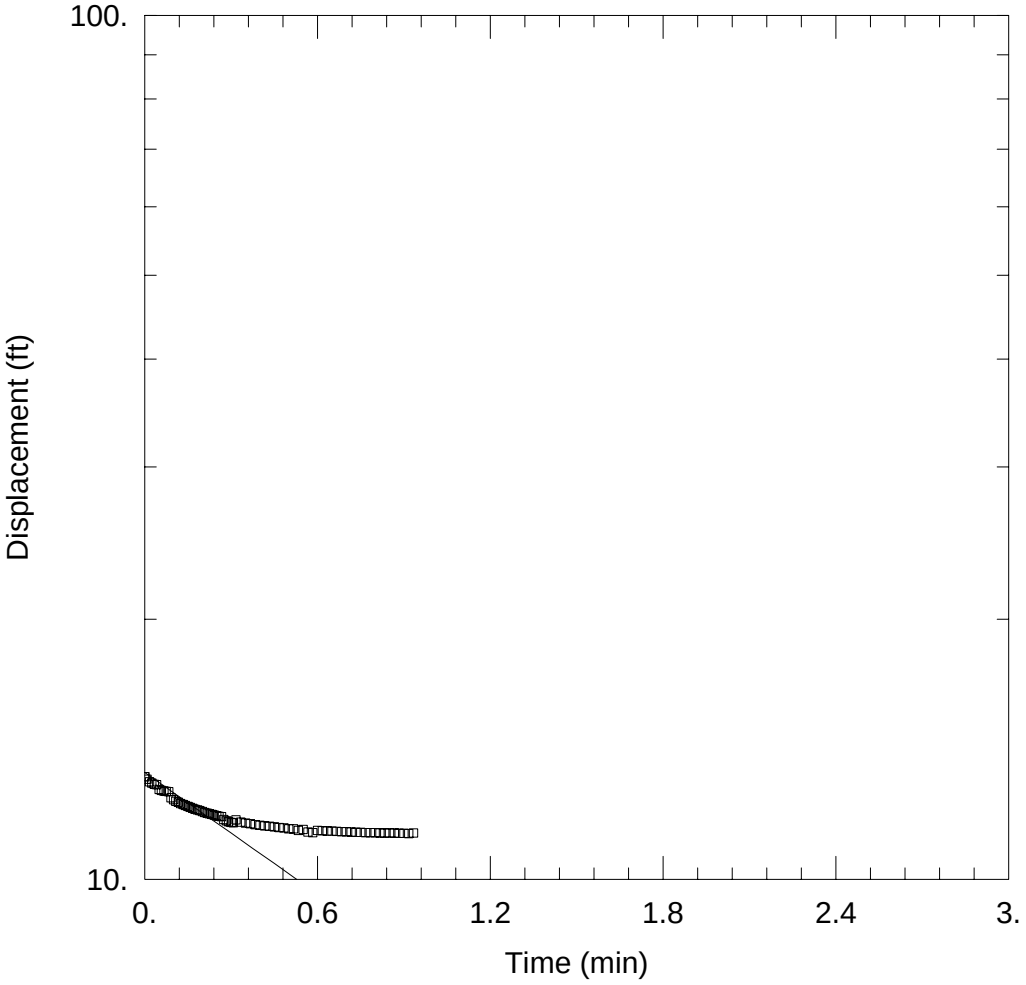
Appendix D
Slug Test Results



WELL TEST ANALYSIS

Data Set: \...\IS47MW01.aqt
Date: 03/14/03 Time: 09:55:27

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 15.71 ft
Anisotropy Ratio (Kz/Kr): 1.

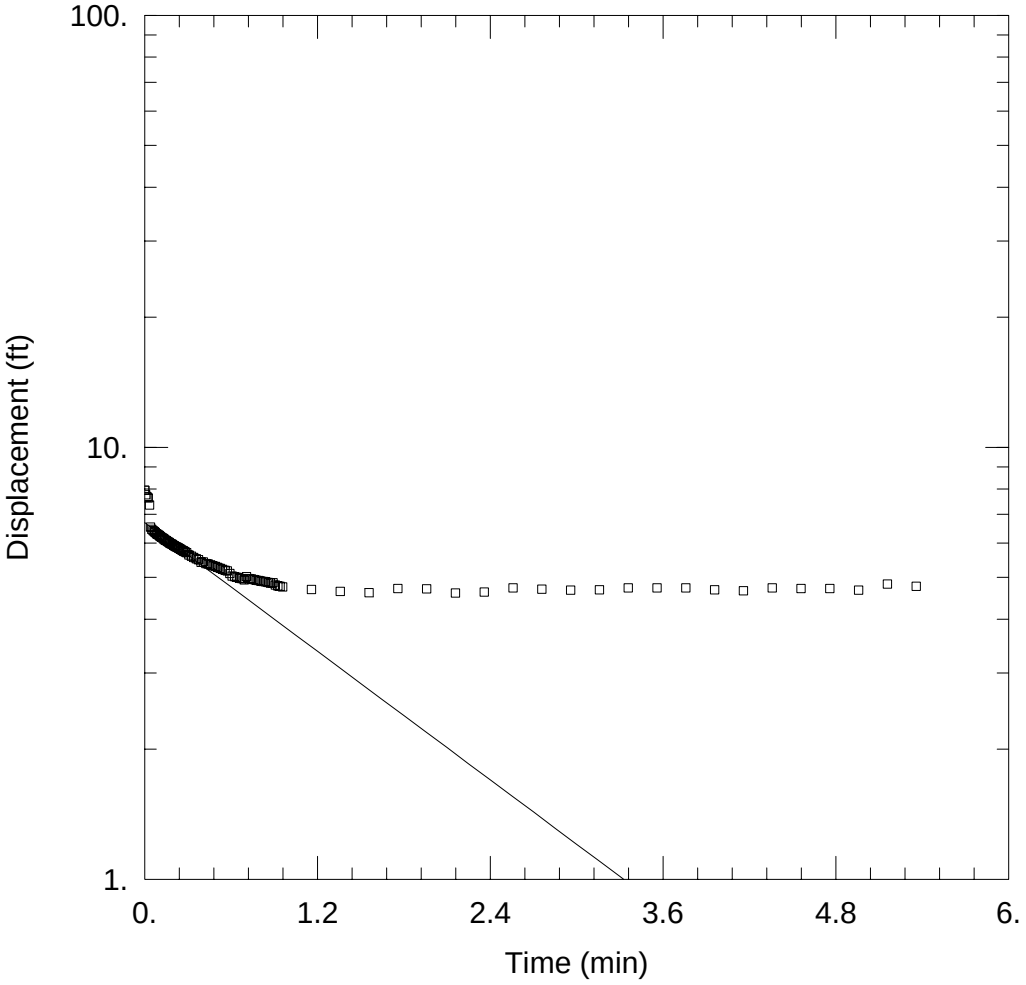
WELL DATA (IS47MW01)

Initial Displacement: 13.15 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.002118 ft/min
y0 = 13.29 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW02.aqt
Date: 03/14/03 Time: 09:57:57

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 12.54 ft
Anisotropy Ratio (Kz/Kr): 1.

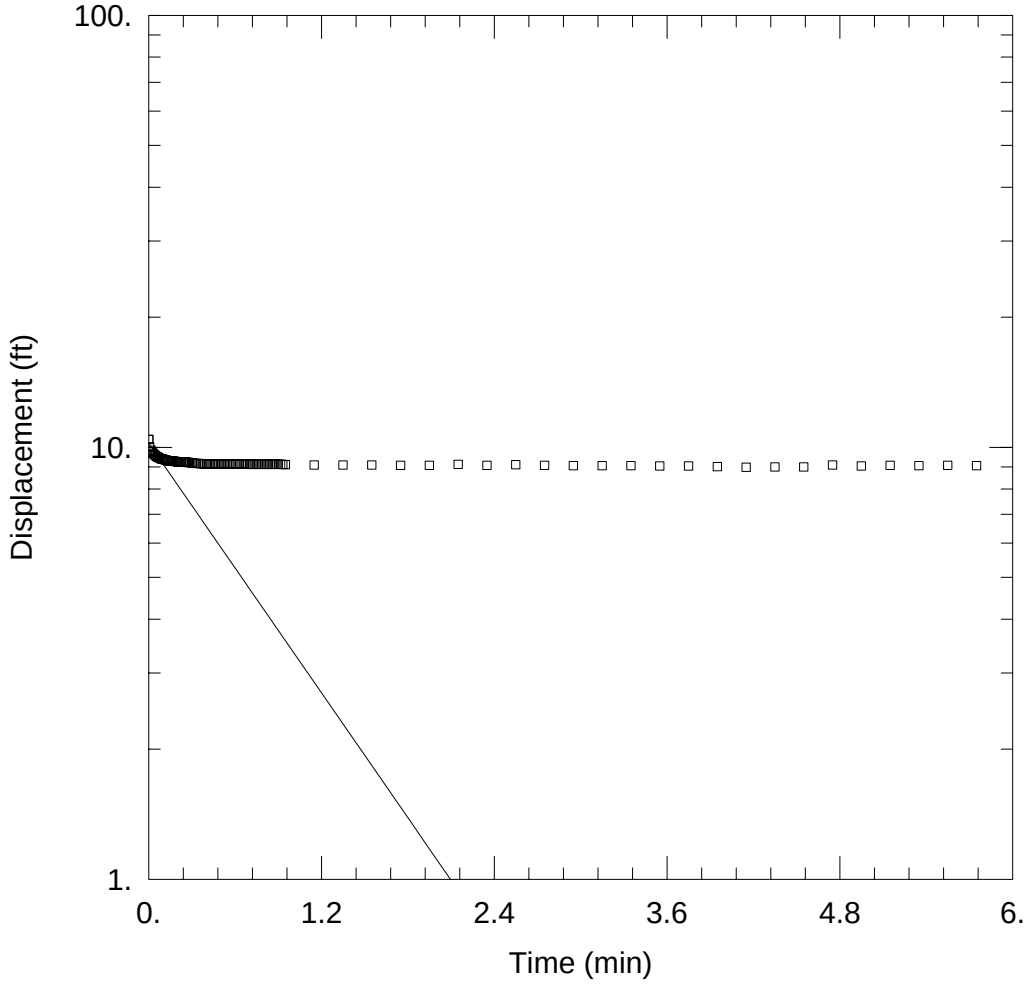
WELL DATA (IS47MW02)

Initial Displacement: 7.946 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.002245 ft/min
y0 = 6.691 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW03.aqt
Date: 03/14/03 Time: 09:57:13

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 9.54 ft
Anisotropy Ratio (Kz/Kr): 1.

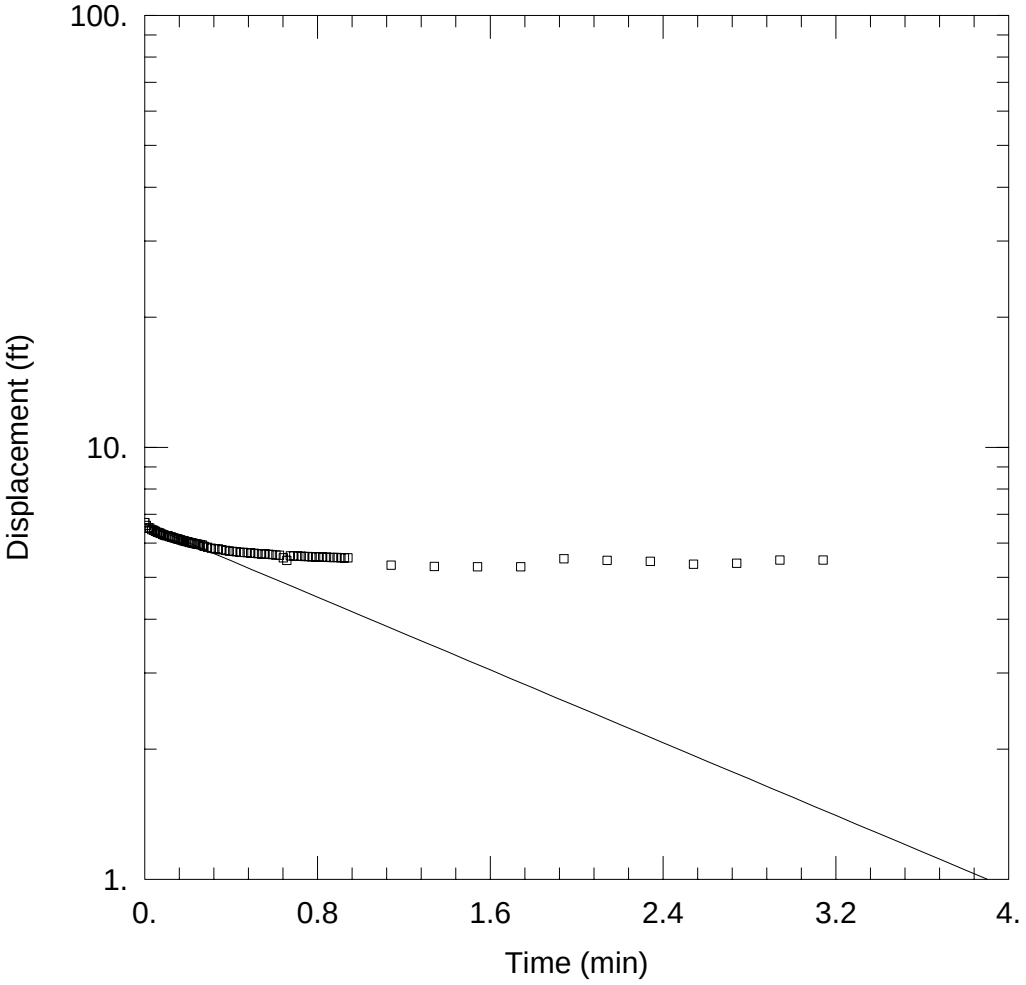
WELL DATA (IS47MW03)

Initial Displacement: 10.43 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.004357 ft/min
y0 = 10.22 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW04.aqt
Date: 03/14/03 Time: 09:56:50

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 9.42 ft
Anisotropy Ratio (Kz/Kr): 1.

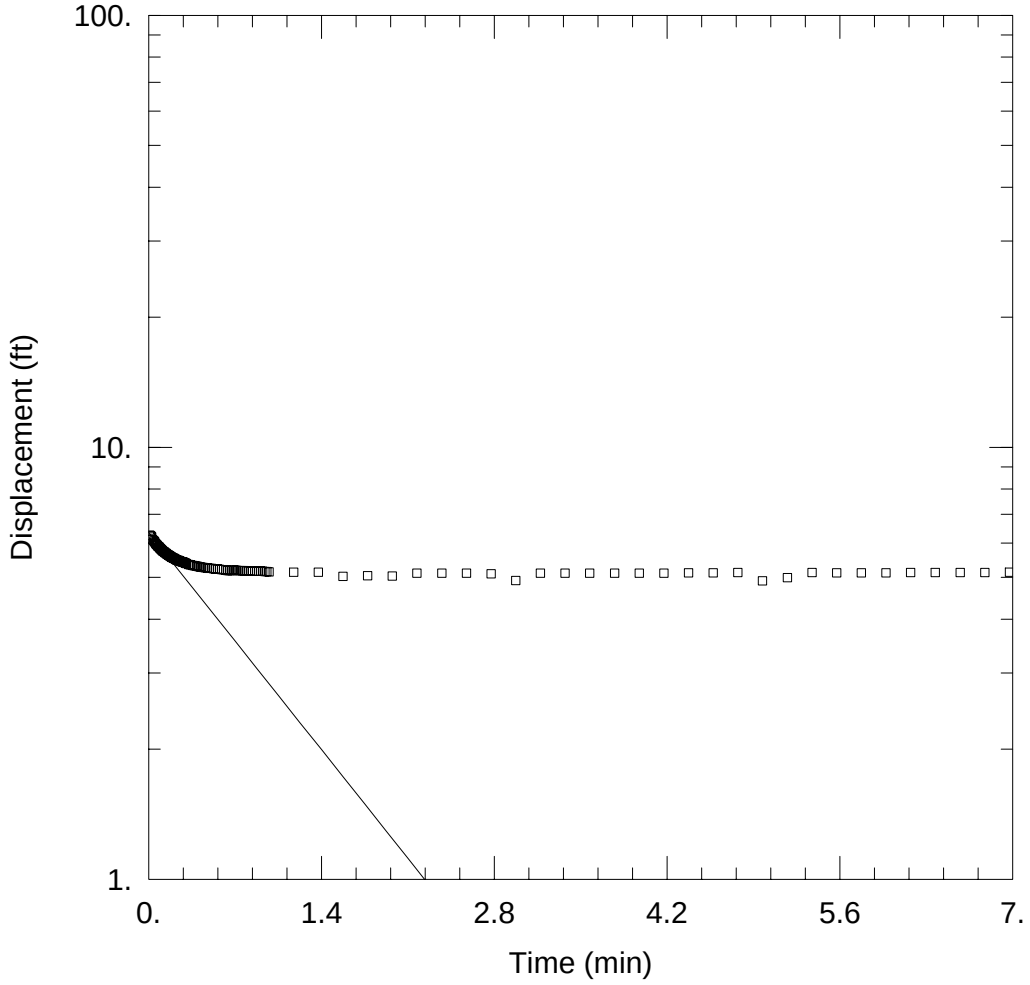
WELL DATA (IS47MW04)

Initial Displacement: 6.691 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.001905 ft/min
y0 = 6.63 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW05.aqt
Date: 03/14/03 Time: 09:56:29

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 10.65 ft
Anisotropy Ratio (Kz/Kr): 1.

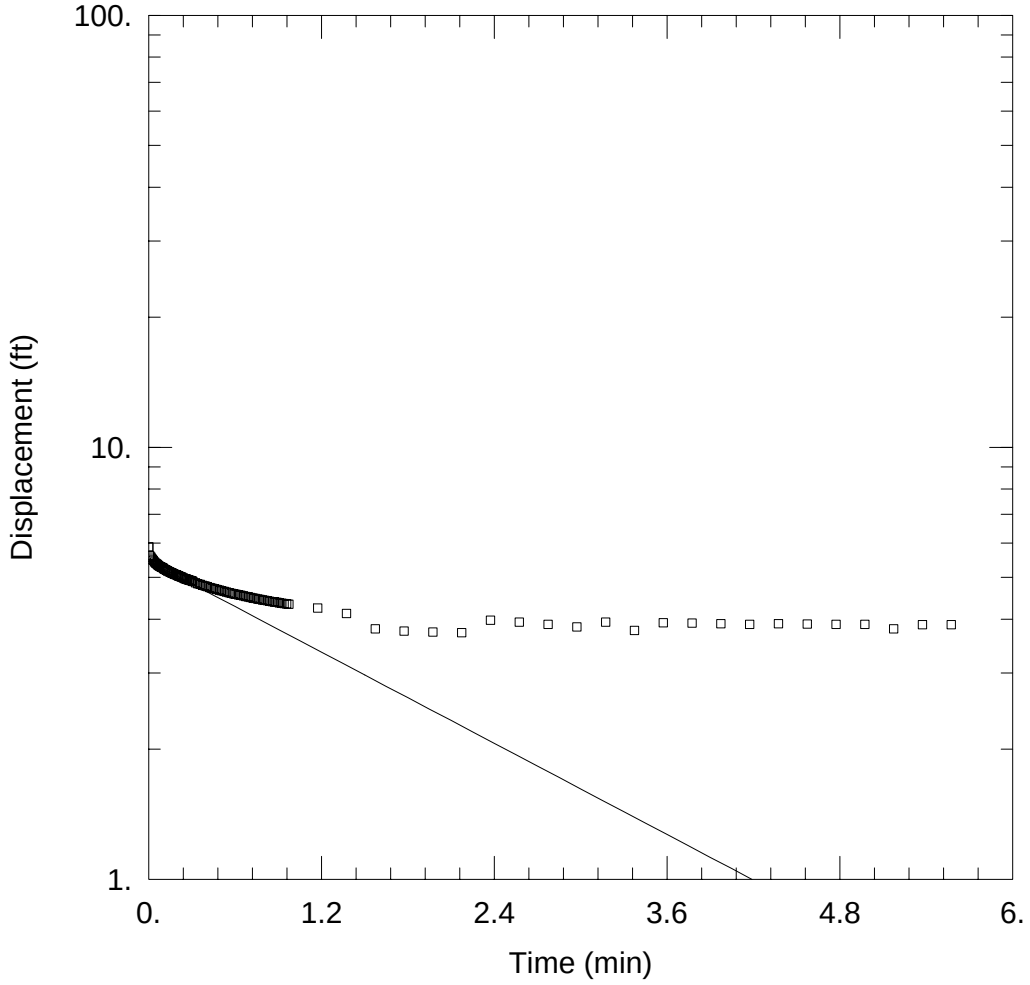
WELL DATA (IS47MW05)

Initial Displacement: 6.126 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.003248 ft/min
y0 = 6.349 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW06.aqt
Date: 03/14/03 Time: 09:56:11

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 13.79 ft
Anisotropy Ratio (Kz/Kr): 1.

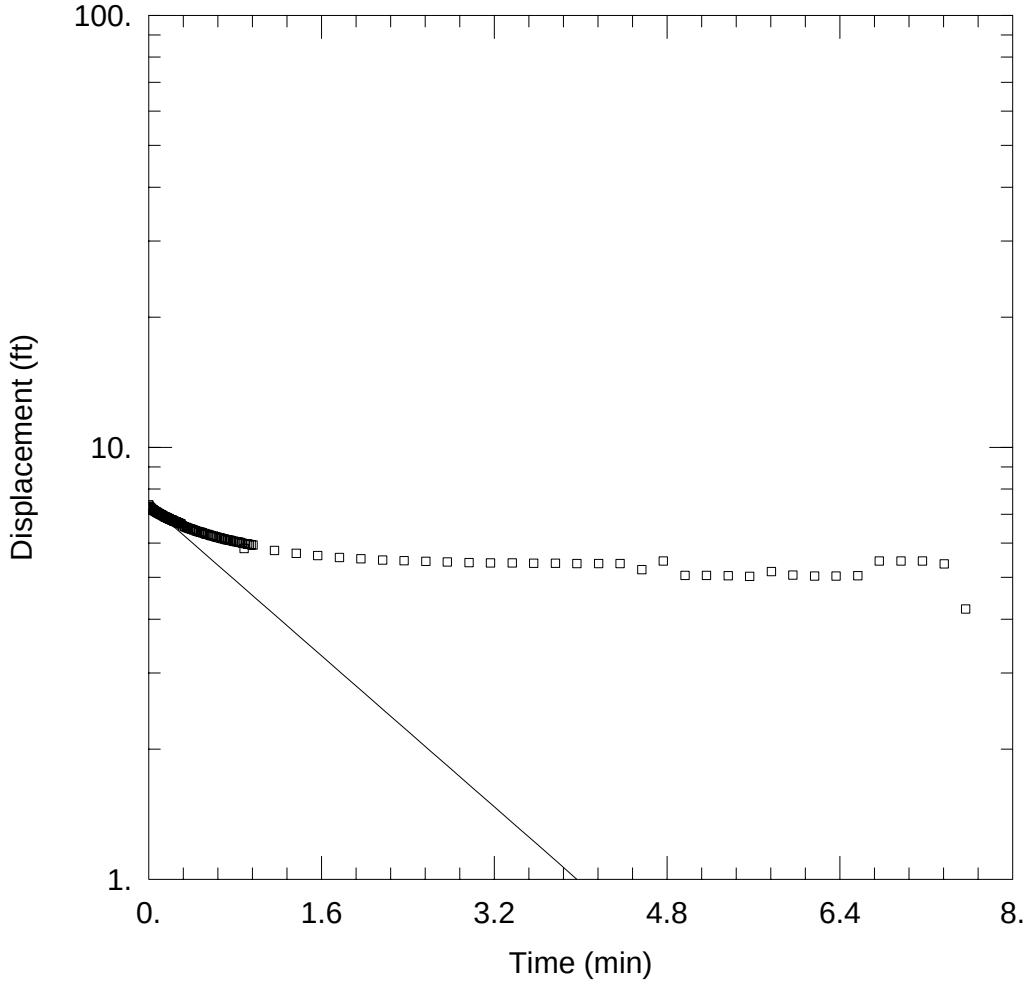
WELL DATA (IS47MW06)

Initial Displacement: 5.878 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.001591 ft/min
y0 = 5.454 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW07.aqt
Date: 03/14/03 Time: 09:55:51

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 11.66 ft
Anisotropy Ratio (Kz/Kr): 1.

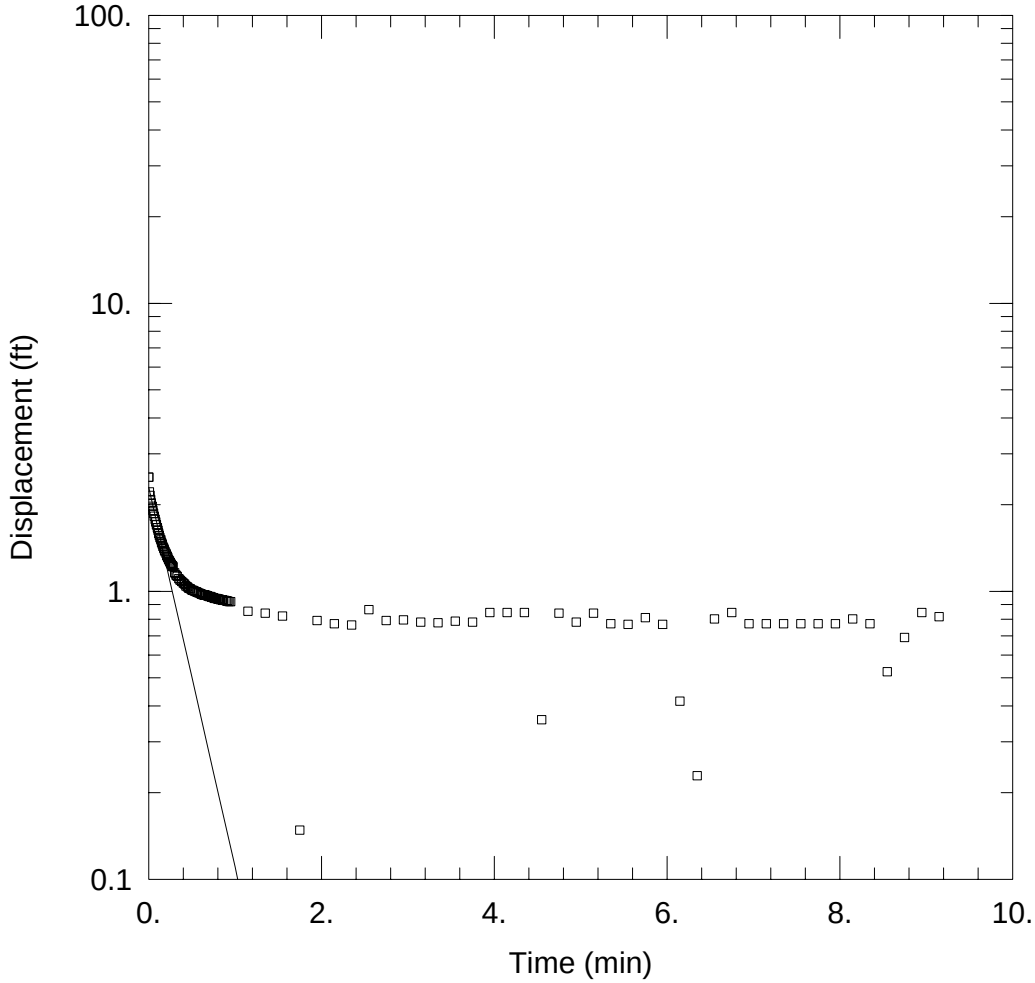
WELL DATA (IS47MW07)

Initial Displacement: 7.344 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.001978 ft/min
y0 = 7.366 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW08.aqt
Date: 03/14/03 Time: 09:58:17

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 11.47 ft
Anisotropy Ratio (Kz/Kr): 1.

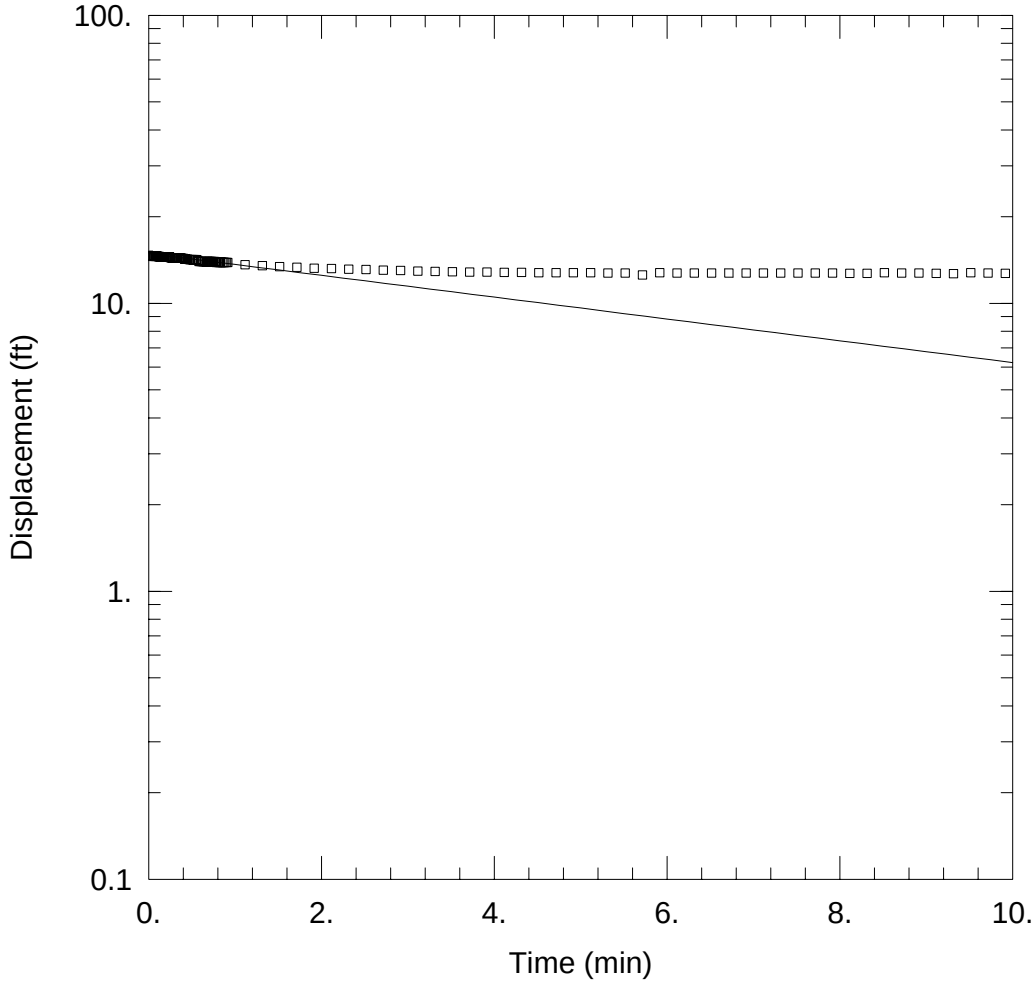
WELL DATA (IS47MW08)

Initial Displacement: 2.487 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.01193 ft/min
y0 = 2.294 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW09.aqt
Date: 03/14/03 Time: 09:54:54

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 16.35 ft
Anisotropy Ratio (Kz/Kr): 1.

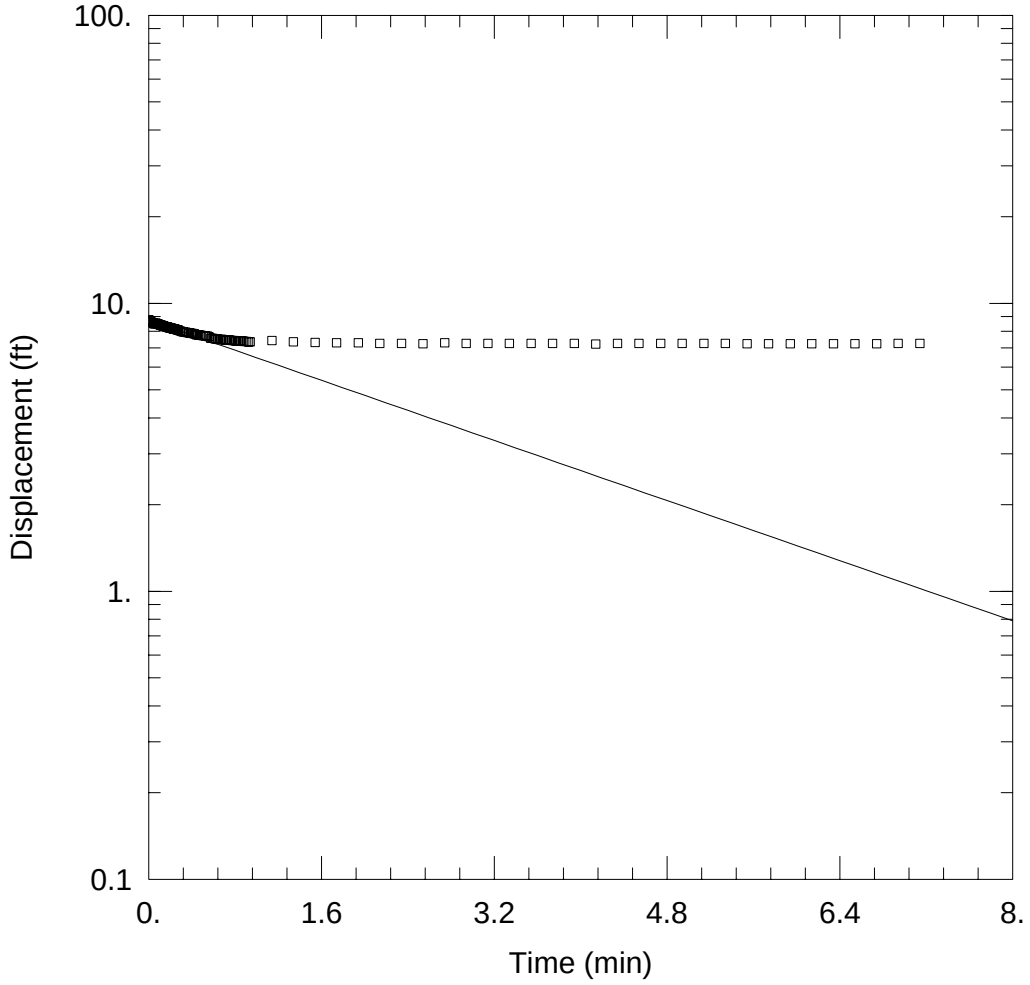
WELL DATA (IS47MW09)

Initial Displacement: 14.64 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003597 ft/min
y0 = 14.88 ft



WELL TEST ANALYSIS

Data Set: \...\IS47MW10.aqt
Date: 03/14/03 Time: 09:54:19

PROJECT INFORMATION

Company: CH2M HILL
Client: Department of the Navy
Project: 145185.FI.MW
Test Location: Site 47 IHDIV-NSWC
Test Well: 01MW01
Test Date: 04/11/01

AQUIFER DATA

Saturated Thickness: 12.15 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (IS47MW10)

Initial Displacement: 8.767 ft
Wellbore Radius: 0.354 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.167 ft
Well Skin Radius: 0.354 ft
Total Well Penetration Depth: 16.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00118 ft/min
y0 = 8.734 ft

Appendix E
Shelby Tube Soil Hydraulic Conductivity Analysis Results

p-w labs

Report Date: April 24, 2001

Test Start Date 4/4/01

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No: L-01045 / Project Title: CTO 66-NSWC Indian Head, Maryland

ST No: IS 47 / Lab ID#: 14683 / Test Sample Location: BH-1

Depth/Lift/Elev.: 18'-20' / Type of Sample: Undisturbed X Remolded ---

Method of Compaction: --- / Percent Compaction: ---

Dry Unit Weight (PCF): Maximum: --- Initial: 94.5 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 25.2

Initial Height (cm): 13.34 / Initial Diameter (cm): 7.30 / Initial Gradient: 21.1

Initial Degree of Saturation (B Value)(%): 98 / Permeant Liquid Used: Dealred Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree Of Saturation (B Value)(%): 98 / Final Dry Unit Weight (PCF): 95.4 / Final Gradient: 21.1

Final Height (cm): 13.32 / Final Diameter (cm): 7.27 / Final Moisture Content (% of Dry Weight): 30.4

Final Four Determinations k (cm/sec)

6.24×10^{-8}	6.25×10^{-8}	6.26×10^{-8}	6.27×10^{-8}

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): 6.26×10^{-8} Project Specifications: ---

Notes:

p-w labs

Report Date: April 24, 2001

Test Start Date 4/4/01

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No: L-01045 / Project Title: CTO 66-NSWC Indian Head, Maryland

ST No: IS 47 / Lab ID#: 14684 / Test Sample Location: MW-6

Depth/Lift/Elev.: 14'-16' / Type of Sample: Undisturbed X Remolded ---

Method of Compaction: --- / Percent Compaction: ---

Dry Unit Weight (PCF): Maximum: --- Initial: 105.6 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 20.6

Initial Height (cm): 13.53 / Initial Diameter (cm): 7.30 / Initial Gradient: 20.8

Initial Degree of Saturation (B Value)(%): 98 / Permeant Liquid Used: Deaired Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree Of Saturation (B Value)(%): 100 / Final Dry Unit Weight (PCF): 109.3 / Final Gradient: 20.9

Final Height (cm): 13.44 / Final Diameter (cm): 7.20 / Final Moisture Content (% of Dry Weight): 19.4

Final Four Determinations k (cm/sec)

4.73×10^{-8}	4.74×10^{-8}	4.75×10^{-8}	4.76×10^{-8}

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): 4.75×10^{-8} Project Specifications: ---

Notes:

p-w labs

Report Date: April 24, 2001

Test Start Date 4/4/01

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No: L-01045 / Project Title: CTO 66-NSWC Indian Head, Maryland

ST No: IS 47 / Lab ID#: 14686 / Test Sample Location: MW-8

Depth/Lift/Elev.: 20'-22' / Type of Sample: Undisturbed X Remolded ---

Method of Compaction: --- / Percent Compaction: ---

Dry Unit Weight (PCF): Maximum: --- Initial: 95.3 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 25.3

Initial Height (cm): 13.20 / Initial Diameter (cm): 7.30 / Initial Gradient: 21.3

Initial Degree of Saturation (B Value)(%): 98 / Permeant Liquid Used: Deaired Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree Of Saturation (B Value)(%): 98 / Final Dry Unit Weight (PCF): 95.6 / Final Gradient: 21.4

Final Height (cm): 13.15 / Final Diameter (cm): 7.30 / Final Moisture Content (% of Dry Weight): 29.4

Final Four Determinations k (cm/sec)

2.97×10^{-8}	2.97×10^{-8}	2.97×10^{-8}	2.98×10^{-8}

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): 2.97×10^{-8} Project Specifications: ---

Notes:

p-w labs

Report Date: April 24, 2001

Test Start Date 4/4/01

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No: L-01045 / Project Title: CTO 66-NSWC Indian Head, Maryland

ST No: IS 47 / Lab ID#: 14687 / Test Sample Location: MW-9

Depth/Lift/Elev.: 26'-28' / Type of Sample: Undisturbed X Remolded ---

Method of Compaction: --- / Percent Compaction: ---

Dry Unit Weight (PCF): Maximum: --- Initial: 100.5 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 21.4

Initial Height (cm): 13.89 / Initial Diameter (cm): 7.30 / Initial Gradient: 20.3

Initial Degree of Saturation (B Value)(%): 96 / Permeant Liquid Used: Deaired Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree Of Saturation (B Value)(%): 96 / Final Dry Unit Weight (PCF): 104.0 / Final Gradient: 20.4

Final Height (cm): 13.81 / Final Diameter (cm): 7.20 / Final Moisture Content (% of Dry Weight): 24.9

Final Four Determinations k (cm/sec)

4.86×10^{-8}	4.87×10^{-8}	4.88×10^{-8}	4.89×10^{-8}

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): 4.87×10^{-8} Project Specifications: ---

Notes:

p-w labs

Report Date: April 24, 2001

Test Start Date 4/4/01

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No: L-01045 / Project Title: CTO 66-NSWC Indian Head, Maryland

ST No: IS 47 / Lab ID#: 14688 / Test Sample Location: MW-10

Depth/Lift/Elev.: 18'-20' / Type of Sample: Undisturbed X Remolded ---

Method of Compaction: --- / Percent Compaction: ---

Dry Unit Weight (PCF): Maximum: --- Initial: 81.6 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 33.8

Initial Height (cm): 12.89 / Initial Diameter (cm): 7.30 / Initial Gradient: 21.8

Initial Degree of Saturation (B Value)(%): 100 / Permeant Liquid Used: Dearied Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree Of Saturation (B Value)(%): 100 / Final Dry Unit Weight (PCF): 85.0 / Final Gradient: 22.1

Final Height (cm): 12.73 / Final Diameter (cm): 7.20 / Final Moisture Content (% of Dry Weight): 34.0

Final Four Determinations k (cm/sec)

1.97×10^{-8}	1.75×10^{-8}	1.80×10^{-8}	1.75×10^{-8}

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): 1.82×10^{-8} Project Specifications: ---

Notes:

p-w labs

Report Date: April 24, 2001

Test Start Date 4/4/01

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No: L-01045 / Project Title: CTO 66-NSWC Indian Head, Maryland

ST No: IS 47 / Lab ID#: 14685 / Test Sample Location: MW-7

Depth/Lift/Elev.: 18'-20' / Type of Sample: Undisturbed X Remolded ---

Method of Compaction: --- / Percent Compaction: ---

Dry Unit Weight (PCF): Maximum: -- Initial: 103.9 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 22.6

Initial Height (cm): 13.74 / Initial Diameter (cm): 7.25 / Initial Gradient: 20.5

Initial Degree of Saturation (B Value)(%): 98 / Permeant Liquid Used: Deaired Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree Of Saturation (B Value)(%): 98 / Final Dry Unit Weight (PCF): 106.4 / Final Gradient: 20.7

Final Height (cm): 13.60 / Final Diameter (cm): 7.20 / Final Moisture Content (% of Dry Weight): 22.5

Final Four Determinations k (cm/sec)

1.61×10^{-7}	1.62×10^{-7}	1.62×10^{-7}	1.63×10^{-7}

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): 1.62×10^{-7} Project Specifications: ---

Notes:

Appendix F
Statistical Summaries of Analytical Results from Base-Wide Background Study

TABLE A-8

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR NON-TURBID UNFILTERED GROUNDWATER SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Federal Maximum Contaminant Level[1]	Risk-Based Concentration[2]
Volatile Organic Compounds (ug/L)										
Carbon disulfide	1/2	6	6	6	RPLMW001U001	Undefined	6	6	NA	1000
Chloroform	1/2	**2**	**2**	**2**	RPLMW001U001	Undefined	2	2	100/80[3]	0.15
Toluene	1/2	7	7	7	RPLMW001U001	Undefined	7	7	1000	750
Semivolatile Organic Compounds (ug/L)										
Bis(2-Ethylhexyl)phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	6	4.8
Di-N-butyl phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	NA	3700
Diethyl phthalate	1/2	3	3	3	RPLMW001U001	Undefined	3	3	NA	29000
Energetics (ug/L)										
RDX	1/1	**1.2**	**1.2**	**1.2**	RN3MW001U001	Undefined	1.2	1.2	NA	0.61
Inorganics (ug/L)										
Aluminum	3/4	71	**9620**	**3607**	BGDMW004U001	Lognormal	9620	286545198	50-200[3]	37000
Barium	6/6	12.9	139	64	BGDMW004U001	Lognormal	139	254	2000	2600
Cadmium	1/6	2.8	2.8	2.8	BGDMW001U001	Undefined	2.8	2.8	5	18
Calcium	4/4	2340	18100	7402.5	BGDMW001U001	Lognormal	18100	599450	NA	NA
Chromium	3/6	2.5	16.4	7.7	BGDMW004U001	Lognormal	16.4	20.9	100	110
Cobalt	5/6	2.1	15.6	6.48	BGDMW004U001	Lognormal	15.6	39.6	NA	730
Copper	2/6	4.4	22.4	13.4	BGDMW004U001	Undefined	22.4	22.4	1300[4]	1500
Iron	4/4	156	**19900**	**9846.5**	BGDMW004U001	Normal	19900	57199	300[3]	11000
Magnesium	4/4	1250	3980	2157.5	BGDMW002U001	Lognormal	3980	31254	NA	NA
Manganese	4/4	**104**	**824**	**354.5**	BGDMW002U001	Lognormal	824	28160	50[3]	730
Mercury	1/6	0.13	0.13	0.13	RPLMW001U001	Undefined	0.13	0.13	2	11
Nickel	4/6	2.6	16.6	7.65	BGDMW004U001	Lognormal	16.6	39.0	NA	730
Potassium	4/4	1340	6040	2745	BGDMW003U001	Lognormal	6040	83058	NA	NA
Sodium	4/4	3580	33000	16995	BGDMW002U001	Normal	31307	79585	NA	NA
Vanadium	1/6	20.9	20.9	20.9	BGDMW004U001	Lognormal	20.9	24.1	NA	260
Zinc	1/6	45.2	45.2	45.2	BGDMW004U001	Undefined	45.2	45.2	5000[3]	11000
Miscellaneous (mg/l)										
Chloride	4/4	4.3	40.1	19.3	BGDMW002U001	Lognormal	40.1	1863	250[3]	NA
Nitrate (ug/l)	4/4	0.05	0.40	0.158	BGDMW003U001	Lognormal	0.40	11.8	10000	58000
Sulfate	4/4	9.3	23.6	16.8	BGDMW001U001	Normal	23.6	47.0	250[3]	NA
Total Organic Carbon	5/5	1.11	6.9	3.44	BGDMW004U001	Lognormal	6.9	45.0	NA	NA

Notes:
1 - Drinking Water Regulations and Health Advisories, www.epa.gov/sofewater, July, 2002.
2 - EPA Region III Risk-Based Concentrations, October, 2002. Values presented are tap water values.
3 - Secondary Maximum Contaminant Level (SMCL), Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, Summer, 2002.
4 - Action Level, Drinking Water Regulations and Health Advisories, www.epa.gov/safewater, July, 2002.
Value is bolded which exceeds Region III RBCs or MCLs.
NA - Not available

TABLE A-8

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR NON-TURBID UNFILTERED GROUNDWATER SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Federal Maximum Contaminant Level[1]	Risk-Based Concentration[2]
Volatile Organic Compounds (ug/L)										
Carbon disulfide	1/2	6	6	6	RPLMW001U001	Undefined	6	6	NA	1000
Chloroform	1/2	**2**	**2**	**2**	RPLMW001U001	Undefined	2	2	100/80[3]	0.15
Toluene	1/2	7	7	7	RPLMW001U001	Undefined	7	7	1000	750
Semivolatile Organic Compounds (ug/L)										
Bis(2-Ethylhexyl)phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	6	4.8
Di-N-butyl phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	NA	3700
Diethyl phthalate	1/2	3	3	3	RPLMW001U001	Undefined	3	3	NA	29000
Energetics (ug/L)										
RDX	1/1	**1.2**	**1.2**	**1.2**	RN3MW001U001	Undefined	1.2	1.2	NA	0.61
Inorganics (ug/L)										
Aluminum	3/4	71	**9620**	**3607**	BGDMW004U001	Lognormal	9620	286545198	50-200[3]	37000
Barium	6/6	12.9	139	64	BGDMW004U001	Lognormal	139	254	2000	2600
Cadmium	1/6	2.8	2.8	2.8	BGDMW001U001	Undefined	2.8	2.8	5	18
Calcium	4/4	2340	18100	7402.5	BGDMW001U001	Lognormal	18100	599450	NA	NA
Chromium	3/6	2.5	16.4	7.7	BGDMW004U001	Lognormal	16.4	20.9	100	110
Cobalt	5/6	2.1	15.6	6.48	BGDMW004U001	Lognormal	15.6	39.6	NA	730
Copper	2/6	4.4	22.4	13.4	BGDMW004U001	Undefined	22.4	22.4	1300[4]	1500
Iron	4/4	156	**19900**	**9846.5**	BGDMW004U001	Normal	19900	57199	300[3]	11000
Magnesium	4/4	1250	3980	2157.5	BGDMW002U001	Lognormal	3980	31254	NA	NA
Manganese	4/4	**104**	**824**	**354.5**	BGDMW002U001	Lognormal	824	28160	50[3]	730
Mercury	1/6	0.13	0.13	0.13	RPLMW001U001	Undefined	0.13	0.13	2	11
Nickel	4/6	2.6	16.6	7.65	BGDMW004U001	Lognormal	16.6	39.0	NA	730
Potassium	4/4	1340	6040	2745	BGDMW003U001	Lognormal	6040	83058	NA	NA
Sodium	4/4	3580	33000	16995	BGDMW002U001	Normal	31307	79585	NA	NA
Vanadium	1/6	20.9	20.9	20.9	BGDMW004U001	Lognormal	20.9	24.1	NA	260
Zinc	1/6	45.2	45.2	45.2	BGDMW004U001	Undefined	45.2	45.2	5000[3]	11000
Miscellaneous (mg/l)										
Chloride	4/4	4.3	40.1	19.3	BGDMW002U001	Lognormal	40.1	1863	250[3]	NA
Nitrate (ug/l)	4/4	0.05	0.40	0.158	BGDMW003U001	Lognormal	0.40	11.8	10000	58000
Sulfate	4/4	9.3	23.6	16.8	BGDMW001U001	Normal	23.6	47.0	250[3]	NA
Total Organic Carbon	5/5	1.11	6.9	3.44	BGDMW004U001	Lognormal	6.9	45.0	NA	NA

Notes:
1 - Drinking Water Regulations and Health Advisories, www.epa.gov/sofewater, July, 2002.
2 - EPA Region III Risk-Based Concentrations, October, 2002. Values presented are tap water values.
3 - Secondary Maximum Contaminant Level (SMCL), Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, Summer, 2002.
4 - Action Level, Drinking Water Regulations and Health Advisories, www.epa.gov/safewater, July, 2002.
Value is bolded which exceeds Region III RBCs or MCLs.
NA - Not available

TABLE 4-2

SUMMARY OF DESCRIPTIVE STATISTICS FOR SURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper onfidence Lim	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	2/23	2200		13000	L	7600	660	1.9	23	RN6SS0170101	UNDEFINED	13000	13000	NA	NA	7800000	200000000
CYCLOHEXANE	110-82-7	1/14	3.6	J	3.6	J	3.6	5.3	5.4	15	IS11SS420001	UNDEFINED	3.6	3.6	NA	NA	NA	NA
ETHYLBENZENE	100-41-4	1/23	2.4	J	2.4	J	2.4	5.0	1.5	15	IS11SS400001	UNDEFINED	2.4	2.4	NA	NA	7800000	200000000
GASOLINE RANGE ORGANICS	TTNUS005	2/5	0.1225		0.17		0.15	15	0.13	150	IS11SS420001	UNDEFINED	0.17	0.17	NA	NA	NA	NA
METHYL ACETATE	79-20-9	1/14	2.3	J	2.3	J	2.3	5.3	5.4	15	IS11SS390001	UNDEFINED	2.3	2.3	NA	NA	78000000	2000000000
STYRENE	100-42-5	1/23	1.3	J	1.3	J	1.3	5.2	0.34	15	BGDSS0120101-AVG	UNDEFINED	1.3	1.3	NA	NA	16000000	410000000
TOLUENE	108-88-3	3/23	32.5		140	J	81	15	1.9	15	IS11SS400001	UNDEFINED	140	140	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	3/15	1.7	J	9.9	J	5.6	6.4	0.78	17	IS11SS420001	UNDEFINED	9.9	9.9	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	3/23	1.7	J	2.5	J	2.1	5.2	0.33	15	BGDSS0200101	UNDEFINED	2.5	2.5	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
2-METHYLNAPHTHALENE	91-57-6	1/23	73	L	73	L	73	140	42	490	IS21SS200001	UNDEFINED	73	73	NA	NA	1600000	41000000
ACENAPHTHENE	83-32-9	1/23	140		140		140	160	38.7	490	BGDSS0160101	UNDEFINED	140	140	NA	NA	4700000	120000000
ACETOPHENONE	98-86-2	3/23	46	J	64	J	58	140	52	490	IS11SS400001	UNDEFINED	64	64	NA	NA	7800000	200000000
ANTHRACENE	120-12-7	1/23	260		260		260	160	26.2	490	BGDSS0160101	UNDEFINED	260	260	NA	NA	23000000	610000000
BENZALDEHYDE	100-52-7	1/20	59	J	59	J	59	160	130	490	IS25SS190001	UNDEFINED	59	59	NA	NA	7800000	200000000
BENZO(A)ANTHRACENE	56-55-3	1/23	480		480		480	170	13.6	490	BGDSS0160101	UNDEFINED	480	480	NA	NA	870	7800
BENZO(A)PYRENE	50-32-8	1/23	390		**390**		390	170	16.9	490	BGDSS0160101	UNDEFINED	390	390	NA	NA	**87**	780
BENZO(B)FLUORANTHENE	205-99-2	1/23	420		420		420	170	35	490	BGDSS0160101	UNDEFINED	420	420	NA	NA	870	7800
BENZO(G,H,I)PERYLENE[5]	191-24-2	1/23	130		130		130	160	45	490	BGDSS0160101	UNDEFINED	130	130	NA	NA	2300000	61000000
BENZO(K)FLUORANTHENE	207-08-9	1/23	360	J	360	J	360	170	41.6	490	BGDSS0160101	UNDEFINED	360	360	NA	NA	8700	78000
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	8/23	51	J	7500	J	1100	470	58	490	BGDSS0200101	UNDEFINED	7500	7500	NA	NA	46000	410000
CARBAZOLE	86-74-8	1/20	130	J	130	J	130	160	35	490	BGDSS0160101	UNDEFINED	130	130	NA	NA	32000	290000
CHRYSENE	218-01-9	1/23	440		440		440	170	21	490	BGDSS0160101	UNDEFINED	440	440	NA	NA	87000	780000
DIBENZOFURAN	132-64-9	1/23	65	J	65	J	65	150	28.7	490	BGDSS0160101	UNDEFINED	65	65	NA	NA	310000	8200000
FLUORANTHENE	206-44-0	2/23	65	J	1100		580	190	35	490	BGDSS0160101	UNDEFINED	1100	1100	NA	NA	3100000	82000000
FLUORENE	86-73-7	1/23	150		150		150	160	27.1	490	BGDSS0160101	UNDEFINED	150	150	NA	NA	3100000	82000000
INDENO(1,2,3-CD)PYRENE	193-39-5	1/23	100		100		100	160	46.4	490	BGDSS0160101	UNDEFINED	100	100	NA	NA	870	7800
NAPHTHALENE	91-20-3	1/23	110	L	110	L	110	150	34.5	490	IS21SS200001	UNDEFINED	110	110	NA	NA	1600000	41000000
PHENANTHRENE[5]	85-01-8	1/23	1100		1100		1100	200	35	490	BGDSS0160101	UNDEFINED	1100	1100	NA	NA	2300000	61000000
PYRENE	129-00-0	2/23	120	J	880		500	180	35	490	BGDSS0160101	UNDEFINED	880	880	NA	NA	2300000	61000000
Explosives (ug/kg)																		
2-NITROTOLUENE	88-72-2	1/9	150	J	150	J	150	110	81.4	250	IS11SS400001	UNDEFINED	150	150	NA	NA	780000	20000000
4-NITROTOLUENE	99-99-0	1/9	210	J	210	J	210	120	87.2	250	IS11SS400001	UNDEFINED	210	210	NA	NA	780000	20000000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	6/20	0.23	J	10	J	2.2	1.6	1.4	4.1	BGDSS0080101	UNDEFINED	10	10	NA	NA	1900	17000
4,4'-DDT	50-29-3	4/19	0.38	J	9.4	J	3.1	2.2	2.225	4.6	BGDSS0080101	UNDEFINED	9.4	9.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	32/32	2010		15500	J	7540	7540	NA	NA	BGDSS0150101	LOGNORMAL	9000	19700	7000 - > 100000	NA	78000	2000000
ARSENIC	7440-38-2	30/34	0.78		**18.3**		4.3	4.0	1.6	3.8	BGDSS0190101	LOGNORMAL	5.2	14.9	<0.1 - 73	**1.1 - 7.1**	**0.43**	**3.8**
BARIUM	7440-39-3	34/34	12.5		84.8		42.5	42.5	NA	NA	S26-MW03-001	NORMAL	47.6	80.4	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	24/34	0.05	J	1.1		0.44	0.33	0.047	0.53	BGDSS0120101-AVG	UNDEFINED	1.1	1.1	<1 -7	ND - 3	160	4100
CADMIUM	7440-43-9	12/34	0.12	J	2.5		0.4	0.2	0.06	0.57	IS25SS190001	UNDEFINED	2.5	2.5	NA	<0.01 - 5.6	78	2000
CALCIUM	7440-70-2	22/32	83.9	J	2420		504	369	98.8	275	IS13SS100001	LOGNORMAL	573	2060	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	34/34	3.5	K	28.9	L	13.6	13.6	NA	NA	IS13SS100001	LOGNORMAL	15.9	33.4	1 - 1000	15 - 100	230	6100
COBALT	7440-48-4	34/34	0.58		15		5.4	5.4	NA	NA	S26-MW03-001	LOGNORMAL	7.5	22.3	<0.3 - 70	ND -20	1600	41000
COPPER	7440-50-8	32/34	1.8		19.4		6.7	6.5	4.5	4.6	BGDSS0120101-AVG	LOGNORMAL	8.0	20.3	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	4/10	0.59		0.73		0.66	0.42	0.073	1.1	IS21SS190001	UNDEFINED	0.73	0.73	NA	NA	1600	41000
IRON	7439-89-6	32/32	2770		**31800**	J	13000	13000	NA	NA	BGDSS0120101-AVG	LOGNORMAL	16000	38500	100 - > 100000	NA	**23000**	610000
LEAD	7439-92-1	32/34	3.5	J	**149**		18.7	17.9	9.4	10	BGDSS0080101	LOGNORMAL	21.7	62.5	<10 - 300	**10 - 50**	**400[4]**	**750[4]**
MAGNESIUM	7439-95-4	32/32	143	K	1990		604	604	NA	NA	IS13SS100001	LOGNORMAL	722	1620	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	32/32	17.4		882	J	227	227	NA	NA	S26-MW03-001	LOGNORMAL	388	1390	<2 - 7000	NA	1800	41000
MERCURY	7439-97-6	23/34	0.03		0.13	L	0.06	0.05	0.02	0.077	BGDSS0150101	LOGNORMAL	0.060	0.16	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	34/34	1.7		14		5.4	5.4	NA	NA	IS11SS410001-AVG	LOGNORMAL	6.6	15.4	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	32/32	128		2620		497	497	NA	NA	IS13SS100001	LOGNORMAL	597	1470	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	14/34	0.168	L	**1.2**		0.67	0.54	0.16	1.9	IS11SS400001	NORMAL	0.62	1.2	<0.1 - 3.9	**<0.1 - 0.5**	390	10000
SILVER	7440-22-4	9/34	0.27	L	0.84		0.6	0.29	0.06	0.92	IS11SS400001	UNDEFINED	0.84	0.84	NA	NA	390	10000
SODIUM	7440-23-5	15/32	38.5		120		64.2	65.6	19.2	407	IS11SS400001	UNDEFINED	120	120	<500 - 50000	NA	NA	NA
THALLIUM	7440-28-0	7/34	1.2		2.3	L	1.5	0.62	0.22	3	BGDSS0160101	UNDEFINED	2.3	2.3	NA	NA	5.5	140
VANADIUM	7440-62-2	34/34	9.83	L	63.7		23.3	23.3	NA	NA	BGDSS0150101	LOGNORMAL	26.7	53.3	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	34/34	6.2		42.95	J	20.2	20.2	NA	NA	BGDSS0120101-AVG	NORMAL	23.6	37.5	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	2/2	21.9		49.9		35.9	35.9	NA	NA	S26-MW03-001	UNDEFINED	---	---	NA	NA	NA	NA
DIESEL RANGE ORGANICS	TTNUS004	4/5	4.3		47		18.4	15.1	4	4	IS11SS400001	LOGNORMAL	47.0	1350	NA	NA	NA	NA
NITRITE/NITRATE	TTNUS029	1/2	1.9		1.9		1.9	1.3	1.5	1.5	S25-MW03-001	UNDEFINED	---	---	NA	NA	NA	NA
PH (S.U.)	TTNUS002	7/7	4.5		7		5.3	5.3	NA	NA	IS13SS100001	LOGNORMAL	6.0	8.8	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	29/29	1410	J	40100		10900	10900	NA	NA	IS11SS420001	LOGNORMAL	16800	57200	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS	TTNUS001	1/1	33.7	L	33.7	L	33.7	33.7	NA	NA	S26-MW03-001	UNDEFINED	---	---	NA	NA	NA	NA
TOTAL SOLIDS (%)	TTNUS046	7/7	66		79.2		75.4	75.4	NA	NA	IS25SS180001	UNDEFINED	79.2	79.2	NA	NA	NA	NA

TABLE 4-2

SUMMARY OF DESCRIPTIVE STATISTICS FOR SURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, October, 2002.
4 - EPA Regon 9 PRGs Table, October, 2002.
5 - Pyrene is used as a surrogate for Benzo(g,h,i)perylene, and Phenanthrene.
Bolded values represent exceedances of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
--- Upper confidence and tolerance limits cannot be calculated because of the size of the data set.
NA - Not available

TABLE 4-4

SUMMARY OF DESCRIPTIVE STATISTICS FOR NON-CLAY-LIKE SUBSURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	1/10	1800		1800		1800	180	2.6	13	RPLSB0030101	UNDEFINED	1800	1800	NA	NA	7800000	200000000
TOLUENE	108-88-3	1/10	3.3	J	3.3	J	3.3	4.2	5	13	IS11SB230203	UNDEFINED	3.3	3.3	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	1/5	9	J	9	J	9.0	8.0	12	17	IS11SB240203	NORMAL	9.1	13	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	2/10	1.8	J	2	J	1.9	4.5	5	13	BGDSB0200101	UNDEFINED	2.0	2.0	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	3/10	57	J	79	J	69	110	75	390	BGDSB0190101	UNDEFINED	79	79	NA	NA	46000	410000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	4/12	0.24	J	2.9	J	1.1	1.2	1.4	3.9	BGDSB0080101	LOGNORMAL	2.3	7.7	NA	NA	1900	17000
4,4'-DDT	50-29-3	2/12	0.58	J	2.4	J	1.5	1.8	1.8	4.75	BGDSB0080101	UNDEFINED	2.4	2.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	15/15	3070	J	18900		9260	9260	NA	NA	BGDSB0010101	NORMAL	11400	21400	7000 - > 100000	NA	78000	2000000
ARSENIC	7440-38-2	14/17	1.8		**9.2**		4.5	3.8	0.76	1.9	BGDSB0120101	LOGNORMAL	7.9	28.7	<0.1 - 73	**1.1 - 7.1**	**0.43**	**3.8**
BARIUM	7440-39-3	17/17	9.07		56.2	J	30.5	30.5	NA	NA	BGDSB0080101	NORMAL	36.6	66.5	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	15/17	0.12		0.91		0.37	0.34	0.14	0.25	BGDSB0120101	LOGNORMAL	0.51	1.5	<1 -7	ND - 3	160	4100
CADMIUM	7440-43-9	7/17	0.095		0.27	K	0.18	0.13	0.06	0.511	BGDSB0080101	LOGNORMAL	0.20	0.61	NA	<0.01 - 5.6	78	2000
CALCIUM	7440-70-2	9/15	75.4	J	785	J	270	186	81	249.5	BGDSB0140101	LOGNORMAL	353	1270	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	17/17	6.2		44.7	J	18.0	18.0	NA	NA	BGDSB0060101-AVG	LOGNORMAL	23.7	59.1	1 - 1000	15 - 100	230	6100
COBALT	7440-48-4	17/17	0.845	L	7.2		3.2	3.2	NA	NA	BGDSB0120101	LOGNORMAL	4.9	14.7	<0.3 - 70	ND -20	1600	41000
COPPER	7440-50-8	15/17	1.6		23.1		8.3	7.5	1.53	4.5	BGDSB0120101	LOGNORMAL	13.8	47.6	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	2/3	0.59		0.59		0.59	0.56	1.02	1.02	IS11SB240203	UNDEFINED	0.59	0.59	NA	NA	1600	41000
IRON	7439-89-6	15/15	4030	J	**31700**	J	15200	15200	NA	NA	BGDSB0140101	NORMAL	18800	35200	100 - > 100000	NA	**23000**	610000
LEAD	7439-92-1	16/17	3.1		25.5		9.8	9.3	5.3	5.3	BGDSB0080101	LOGNORMAL	13.5	38.6	<10 - 300	10 - 50	400[4]	750[4]
MAGNESIUM	7439-95-4	15/15	215	J	1720	J	741	741	NA	NA	BGDSB0120101	LOGNORMAL	1070	2940	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	15/15	16.2	J	120		62.2	62.2	NA	NA	IS11SB230203	NORMAL	78.7	155	<2 - 7000	NA	1600	41000
MERCURY	7439-97-6	11/17	0.01		0.08	L	0.04	0.03	0.03	0.059	BGDSB0140101	LOGNORMAL	0.048	0.14	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	17/17	1.8		13.2		5.4	5.4	NA	NA	BGDSB0120101	LOGNORMAL	6.9	15.9	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	15/15	237		2845	J	770	770	NA	NA	BGDSB0060101-AVG	LOGNORMAL	1140	3440	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	9/17	0.295	L	**2.7**	L	0.9	0.59	0.153	1	BGDSB0190101	LOGNORMAL	1.1	3.8	<0.1 - 3.9	**<0.1 - 0.5**	390	10000
SILVER	7440-22-4	5/17	0.63		1.1	J	0.79	0.29	0.06	0.4	BGDSB0190101	UNDEFINED	1.1	1.1	NA	NA	390	10000
SODIUM	7440-23-5	9/15	44.5		232.5		90.9	63.9	18.4	80.5	BGDSB0060101-AVG	LOGNORMAL	128	461	<500 - 50000	NA	NA	NA
THALLIUM	7440-28-0	5/17	0.48		2.8	L	1.3	0.57	0.225	1.2	BGDSB0190101	LOGNORMAL	1.1	4.1	NA	NA	5.5	140
VANADIUM	7440-62-2	17/17	9.78	L	61.9		27.9	27.9	NA	NA	BGDSB0140101	LOGNORMAL	38.8	102	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	17/17	7.3	J	45.9	J	17.6	17.6	NA	NA	BGDSB0120101	LOGNORMAL	22.2	49.7	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	1/1	7.8		7.8		7.8	7.8	NA	NA	S25-MW03-002	UNDEFINED	7.8	7.8	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	12/13	354	J	8200		2880	2660	87.5	87.5	BGDSB0190101	LOGNORMAL	17900	64300	NA	NA	NA	NA

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, October, 2002.
4 - EPA Region 9 PRGs Table, October, 2002.
Bolded values represent exceedances of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
NA - Not available

Appendix G
Statistical Comparison of RI Inorganic Analytical Results to Background Results

Table G-1
Inorganic Statistics
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Mean Concentration	Background 95% UCL	Background Mean
Surface Soil	Aluminum	33/33	14,100	3,620	9,000	7,540
	Antimony	6/19	3.7	0.9	ND	ND
	Arsenic	7/29	16.2	3.0	5.2	4.0
	Barium	21/21	90.1	27.7	47.6	42.5
	Beryllium	21/21	1.3	0.29	1.1	0.33
	Cadmium	18/33	3.6	0.7	2.5	0.2
	Calcium	12/12	6,000	1,397	573	369
	Chromium	33/33	32.5	10.4	15.9	13.6
	Cobalt	21/21	9.6	4.0	7.5	5.4
	Copper	25/27	57.1	11.2	8.0	6.5
	Cyanide	5/10	0.34	0.19	0.73	0.42
	Iron	33/33	25,400	7,675	16,000	13,000
	Lead	32/33	1,310	114	21.7	17.9
	Magnesium	21/21	2,510	626	722	604
	Manganese	33/33	418	135	388	227
	Mercury	26/31	47.4	2.9	0.06	0.05
	Nickel	17/28	29.6	5.8	6.6	5.4
	Potassium	21/21	779	307	597	497
	Selenium	0/21	0	0	0.62	0.54
	Silver	23/33	474	36	0.84	0.29
	Sodium	11/21	208	66.0	120	65.6
	Thallium	0/21	0	0	2.3	0.62
	Vanadium	25/25	54.2	17.2	26.7	23.3
	Zinc	20/33	762	86.5	23.6	20.2

Media	Analyte	Number of Detections	Maximum Concentration	Mean Concentration	Background 95% UCL	Background Mean
Subsurface Soil	Aluminum	12/12	6,840	2,901	11,400	9,260
	Antimony	1/8	0.93	0.68	ND	ND
	Arsenic	13/13	5	2.3	7.9	3.8
	Barium	13/13	7.8	20.9	36.6	30.5
	Beryllium	4/4	0.32	0.28	0.51	0.34
	Cadmium	0/13	ND	ND	0.2	0.13
	Calcium	9/9	95,200	10,722	353	186
	Chromium	13/13	16.1	10.1	23.7	18.0
	Cobalt	13/13	12.1	5.3	4.9	3.2
	Copper	13/13	19.7	6.4	13.8	7.5
	Cyanide	3/4	0.27	0.15	0.59	0.56
	Iron	13/13	16,300	8,527	18,800	15,200
	Lead	13/13	13.8	7.1	13.5	9.3
	Magnesium	12/12	34,400	3,249	1,070	741
	Manganese	12/12	502	153	79	62.2
	Mercury	4/13	14	1.39	0.048	0.03
	Nickel	13/13	20	5.2	6.9	5.4
	Potassium	9/9	1,630	426	1,140	770
	Selenium	0/11	ND	ND	1.1	0.59
	Silver	4/13	13.5	1.78	1.1	0.29
	Sodium	5/13	358	66.8	128	63.9
	Thallium	0/13	ND	ND	1.1	0.57
	Vanadium	13/13	25	14.8	38.8	27.9
	Zinc	13/13	50	15.7	22.2	17.6

Notes: All Concentrations reported in milligrams per kilograms (mg/kg)
ND = Not detected
= Exceeds 95% UCL

Table G-1
Inorganic Statistics
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Mean Concentration	Background 95% UCL	Background Mean
Groundwater	Aluminum	9/9	6,740	1,392	9,620	3,607
	Antimony	0/10	ND	ND	ND	ND
	Arsenic	5/10	47.9	10	ND	ND
	Barium	10/10	346	107	139	64
	Beryllium	5/6	1	0.6	ND	ND
	Cadmium	7/10	1.6	0.7	2.8	2.8
	Calcium	10/10	20,500	7,755	18,100	7,403
	Chromium	4/10	13.5	3.2	16.4	7.7
	Cobalt	10/10	50.5	21.6	15.6	6.48
	Copper	6/10	14.5	3.6	22.4	13.4
	Cyanide	5/10	23,200	2,581	ND	ND
	Iron	10/10	16,700	6,295	19,900	9,847
	Lead	2/10	8.1	2.46	ND	ND
	Magnesium	10/10	8,000	3,512	3,980	2,158
	Manganese	10/10	337	190	824	355
	Mercury	2/2	0.3	0.25	0.13	0.13
	Nickel	9/10	36	12.69	16.6	7.65
	Potassium	10/10	4,900	2,060	6,040	2,745
	Selenium	0/10	ND	ND	ND	ND
	Silver	0/10	ND	ND	ND	ND
	Sodium	10/10	102,000	36,607	31,307	16,995
	Thallium	3/10	6.5	3.17	ND	ND
	Vanadium	0/10	ND	ND	20.9	20.9
	Zinc	10/10	120	72.8	45.2	45.2

Notes: All Concentrations reported in milligrams per kilograms (mg/kg)
ND = Not detected
= Exceeds 95% UCL

Appendix H
Human Health Risk Assessment Tables

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Indian Head - Site 47

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Disposal Area	Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Industrial workers could contact surface soil.
						Ingestion	On-site	Quant	Industrial workers could contact surface soil.
		Air	Emissions from exposed soil at disposal area	Industrial Worker	Adult	Inhalation	On-site	Quant	Industrial workers may inhale dust and volatile emissions from site soils.
Current/Future	Sediment	Sediment	Drainage Swales	Other Worker	Adult	Dermal Absorption	On-site	Quant	Maintenance workers may clean out and maintain drainage pipe.
						Ingestion	On-site	Quant	Maintenance workers may clean out and maintain drainage pipe.
				Trespasser/Visitor	Adolescents	Dermal Absorption	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact sediment in drainage swales.
						Ingestion	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact sediment in drainage swales.
	Surface Water	Surface Water	Drainage Swales	Other Worker	Adult	Dermal Absorption	On-site	Quant	Maintenance workers may clean out and maintain drainage pipe.
						Ingestion	On-site	Quant	Maintenance workers may clean out and maintain drainage pipe.
				Trespasser/Visitor	Adolescents	Dermal Absorption	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact surface water t in drainage swales.
						Ingestion	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact surface water t in drainage swales.
	Surface Soil	Surface Soil	Disposal Area	Trespasser/Visitor	Adolescents	Dermal Absorption	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact surface soil.
						Ingestion	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact surface soil.
		Air	Emissions from exposed soil at disposal area	Trespasser/Visitor	Adolescents	Inhalation	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and inhale dust and volatile emissions from soil.
Future	Groundwater	Groundwater	Upper Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
						Ingestion	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
					Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
						Ingestion	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
					Adult/Child	Dermal Absorption	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
						Ingestion	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
			Upper Aquifer - Shallow groundwater beneath disposal area	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Dermal contact with groundwater, if less than 10 feet below ground surface, during construction.
		Air	Upper Aquifer -Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater could be used as a potable water supply in the future.
					Child	Inhalation	On-site	None	Children are assumed not to shower.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Indian Head - Site 47

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future (cont.)	Soil	Soil	Upper Aquifer - Volatilization from open excavation Disposal Area	Construction Worker	Adult	Inhalation	On-site	Quant	Inhalation of volatiles during excavation activities.
				Construction Worker	Adult	Dermal Absorption	On-site	Quant	Exposure to soil during construction activities.
						Ingestion	On-site	Quant	Exposure to soil during construction activities.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Industrial or maintenance workers could contact surface soil.
						Ingestion	On-site	Quant	Industrial or maintenance workers could contact surface soil.
				Resident	Adult	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
					Child	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
					Adult/Child	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
		Air	Emissions from exposed soil at disposal area	Construction Worker	Adult	Inhalation	On-site	Quant	Exposure to emissions from soil during construction activities.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Industrial or maintenance workers may inhale dust and volatile emissions from site soils.
				Resident	Adult	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
					Child	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
					Adult/Child	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
	Concrete	Concrete	Concrete troughs	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Exposure to concrete during demolition activities.
						Ingestion	On-site	Quant	Exposure to concrete during demolition activities.
		Air	Concrete troughs	Construction Worker	Adult	Inhalation	On-site	Quant	Exposure to emissions from concrete during demolition activities.

Quant: will be quantitatively evaluated.

None: Not considered to be a complete pathway, therefore, not evaluated.

Table 2.1
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	5/37	0.01 - 1.3	2.00E-03	NA	2.19E+03 N	NA	NA	NO	BSL
75-34-3	1,1-Dichloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS01 RI47SS04	5/37	0.01 - 1.3	2.00E-03	NA	7.82E+02 N	NA	NA	NO	BSL
75-35-4	1,1-Dichloroethene	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	3/37	0.01 - 1.3	2.00E-03	NA	3.90E+02 N	NA	NA	NO	BSL
107-06-2	1,2-Dichloroethane	1.00E-03	L	1.00E-03	L	MG/KG	RI47SS01 RI47SS10	4/37	0.01 - 1.3	1.00E-03	NA	7.02E+00 C	NA	NA	NO	BSL
540-59-0	1,2-Dichloroethene (total)	2.00E-03	L	7.00E-03	J	MG/KG	47SA12	6/28	0.01 - 1.3	7.00E-03	NA	7.04E+01 N	NA	NA	NO	BSL
78-87-5	1,2-Dichloropropane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/37	0.01 - 1.3	2.00E-03	NA	9.39E+00 C	NA	NA	NO	BSL
67-64-1	Acetone	5.00E-03	J	5.00E-03	J	MG/KG	47SA08	1/37	0.002 - 3.6	5.00E-03	NA	7.00E+03 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.00E-03	L	1.00E-03	L	MG/KG	RI47SS04	1/37	0.01 - 1.3	1.00E-03	NA	1.03E+01 C	NA	NA	NO	BSL
75-15-0	Carbon disulfide	1.00E-03	J	2.00E-03	J	MG/KG	47SA09	2/37	0.01 - 1.3	2.00E-03	NA	7.82E+02 N	NA	NA	NO	BSL
56-23-5	Carbon tetrachloride	1.00E-03	L	9.90E-02		MG/KG	47SA12	7/37	0.01 - 1.3	9.90E-02	NA	4.91E+00 C	NA	NA	NO	BSL
108-90-7	Chlorobenzene	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/37	0.01 - 1.3	2.00E-03	NA	1.56E+02 N	NA	NA	NO	BSL
75-00-3	Chloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/37	0.01 - 1.3	2.00E-03	NA	2.20E+02 C	NA	NA	NO	BSL
67-66-3	Chloroform	6.80E-02		1.80E-01		MG/KG	47SA12	2/37	0.01 - 1.3	1.80E-01	NA	7.80E+01 N	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	6.00E-03	J	3.10E+00		MG/KG	47SA01	3/37	0.01 - 1.6	3.10E+00	NA	1.20E+00 C	NA	NA	YES	ASL
79-01-6	Trichloroethene	1.00E-03	L	3.90E-02		MG/KG	47SA12	8/37	0.01 - 1.3	3.90E-02	NA	1.60E+00 C	NA	NA	NO	BSL
75-01-4	Vinyl chloride	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	5/37	0.01 - 1.3	2.00E-03	NA	9.00E-02 C	NA	NA	NO	BSL
91-57-6	2-Methylnaphthalene	2.00E-02	J	1.20E-01	J	MG/KG	RI47SS03	2/37	0.34 - 0.74	1.20E-01	NA	1.56E+02 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	3.00E-02	J	1.90E+00		MG/KG	IS47SS19	10/37	0.019 - 0.47	1.90E+00	NA	4.69E+02 N	NA	NA	NO	BSL
208-96-8	Acenaphthylene	1.90E-02		1.80E-01	J	MG/KG	47SA01	6/37	0.019 - 0.47	1.80E-01	NA	1.56E+02 N	NA	NA	NO	BSL
98-86-2	Acetophenone	7.00E-02	J	1.20E-01	J	MG/KG	IS47SS14 IS47SS22	8/9	0.37 - 0.74	1.20E-01	NA	7.82E+02 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.90E-02		7.50E-01		MG/KG	RI47SS03	12/37	0.019 - 0.47	7.50E-01	NA	2.35E+03 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	9.40E-02	J	1.80E-01	J	MG/KG	IS47SS19	5/9	0.37 - 0.74	1.80E-01	NA	7.82E+02 N	NA	NA	NO	BSL
56-55-3	Benzo(a)anthracene	1.90E-02	J	2.20E+00		MG/KG	RI47SD02	25/37	0.019 - 0.47	2.20E+00	NA	8.75E-01 C	NA	NA	YES	ASL
50-32-8	Benzo(a)pyrene	1.90E-02	J	1.90E+00		MG/KG	RI47SD02	22/37	0.019 - 0.47	1.90E+00	NA	8.75E-02 C	NA	NA	YES	ASL
205-99-2	Benzo(b)fluoranthene	1.90E-02	J	4.60E+00		MG/KG	RI47SD02	27/37	0.019 - 2	4.60E+00	NA	8.75E-01 C	NA	NA	YES	ASL
191-24-2	Benzo(g,h,i)perylene	1.90E-02		2.80E+00		MG/KG	RI47SD02	21/37	0.019 - 2	2.80E+00	NA	2.35E+02 N	NA	NA	NO	BSL
207-08-9	Benzo(k)fluoranthene	1.90E-02	J	1.20E+00		MG/KG	RI47SD02	25/37	0.019 - 0.47	1.20E+00	NA	8.75E+00 C	NA	NA	NO	BSL
86-74-8	Carbazole	4.30E-02	J	4.50E-01		MG/KG	RI47SS03	11/37	0.088 - 0.74	4.50E-01	NA	3.19E+01 C	NA	NA	NO	BSL
218-01-9	Chrysene	2.20E-02	J	3.10E+00		MG/KG	IS47SS19	27/37	0.019 - 0.47	3.10E+00	NA	8.75E+01 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	3.70E-02	J	4.30E-01	J	MG/KG	IS47SS21	17/37	0.059 - 0.74	4.30E-01	NA	7.82E+02 N	NA	NA	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.90E-02		8.50E-01		MG/KG	RI47SD02	9/37	0.019 - 0.47	8.50E-01	NA	8.75E-02 C	NA	NA	YES	ASL
132-64-9	Dibenzofuran	2.00E-02	J	3.50E-01		MG/KG	RI47SS03	7/37	0.34 - 0.74	3.50E-01	NA	1.60E+01 N	NA	NA	NO	BSL
84-66-2	Diethylphthalate	4.10E-02	J	5.20E-01		MG/KG	IS47SS16	4/37	0.34 - 0.74	5.20E-01	NA	6.26E+03 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	1.00E-01	J	1.00E-01	J	MG/KG	RI47SS07	1/37	0.34 - 0.74	1.00E-01	NA	7.82E+04 N	NA	NA	NO	BSL

Table 2.1
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
206-44-0	Fluoranthene	2.80E-02	J	2.30E+00		MG/KG	RI47SS03	30/37	0.019 - 0.47	2.30E+00	NA	3.13E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	3.60E-02	J	4.50E+00		MG/KG	IS47SS19	10/35	0.019 - 0.47	4.50E+00	NA	3.13E+02 N	NA	NA	NO	BSL
87-68-3	Hexachlorobutadiene	3.50E-01	J	7.10E-01		MG/KG	RI47SD01	2/37	0.34 - 0.74	7.10E-01	NA	1.56E+00 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	4.80E-02	J	4.80E-02	J	MG/KG	RI47SD02	1/37	0.34 - 0.74	4.80E-02	NA	7.80E+00 N	NA	NA	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.90E-02		2.60E+00		MG/KG	RI47SD02	20/37	0.019 - 0.47	2.60E+00	NA	8.75E-01 C	NA	NA	YES	ASL
91-20-3	Naphthalene	1.90E-02		1.10E-01	J	MG/KG	RI47SS03	6/37	0.019 - 0.47	1.10E-01	NA	1.56E+02 N	NA	NA	NO	BSL
87-86-5	Pentachlorophenol	8.60E-02	J	1.80E-01	J	MG/KG	RI47SD02	3/36	0.83 - 1.9	1.80E-01	NA	5.32E+00 C	NA	NA	NO	BSL
85-01-8	Phenanthrene	2.00E-02	J	3.30E+01		MG/KG	IS47SS19	27/37	0.023 - 1.85	3.30E+01	NA	2.35E+02 N	NA	NA	NO	BSL
129-00-0	Pyrene	2.10E-02	J	3.50E+00		MG/KG	IS47SS19	30/37	0.019 - 2	3.50E+00	NA	2.35E+02 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	6.70E-02	J	3.30E+00		MG/KG	IS47SS15	4/37	0.067 - 0.74	3.30E+00	NA	4.56E+01 C	NA	NA	NO	BSL
606-20-2	2,6-Dinitrotoluene	2.50E-01	J	2.50E-01	J	MG/KG	47SA12	1/37	0.23 - 0.74	2.50E-01	NA	7.82E+00 N	NA	NA	NO	BSL
9004-70-0	Nitrocellulose	5.86E+01		5.86E+01		MG/KG	RI47SS06	1/19	2.79 - 50.4	5.86E+01	NA	NA	NA	NA	NO	NTX
55-63-0	Nitroglycerin	9.10E+00		2.30E+01		MG/KG	RI47SS05	5/20	4.5 - 88	2.30E+01	NA	4.56E+01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	1.04E+03		2.28E+04		MG/KG	RI47SD01	37/37	1.83 - 2500	2.28E+04	NA	7.82E+03 N	NA	NA	YES	ASL
7440-36-0	Antimony	4.20E-01	UL	3.70E+00	J	MG/KG	IS47SS22	7/37	0.38 - 606	3.70E+00	NA	3.13E+00 N	NA	NA	YES	ASL
7440-38-2	Arsenic	7.10E-01	J	1.62E+01		MG/KG	IS47SS20P	26/37	0.46 - 2.01	1.62E+01	NA	4.26E-01 C	NA	NA	YES	ASL
7440-39-3	Barium	8.90E+00	J	9.17E+01		MG/KG	RI47SD01	24/37	0.03 - 6	9.17E+01	NA	5.48E+02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	3.00E-02	J	1.30E+00	J	MG/KG	IS47SS17	25/37	0.02 - 0.27	1.30E+00	NA	1.56E+01 N	NA	NA	NO	BSL
7440-43-9	Cadmium	7.00E-02	J	4.60E+00		MG/KG	47SA02D	22/37	0.05 - 1.3	4.60E+00	NA	7.80E+00 N	NA	NA	NO	BSL
7440-70-2	Calcium	7.17E+01	J	6.00E+03		MG/KG	RI47SS02	16/37	0.69 - 8.1	6.00E+03	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.90E+00		4.07E+01		MG/KG	RI47SD01	37/37	0.1 - 6	4.07E+01	NA	2.35E+01 N	NA	NA	YES	ASL
7440-48-4	Cobalt	5.60E-01	J	9.60E+00	J	MG/KG	IS47SS14	25/37	0.09 - 4	9.60E+00	NA	1.60E+02 N	NA	NA	NO	BSL
7440-50-8	Copper	1.90E+00	J	1.13E+02		MG/KG	RI47SD01	29/37	0.1 - 2.6	1.13E+02	NA	3.13E+02 N	NA	NA	NO	BSL
57-12-5	Cyanide	2.60E-01		3.40E-01		MG/KG	RI47SD03 RI47SS06	8/28	0.19 - 1.7	3.40E-01	NA	1.56E+02 N	NA	NA	NO	BSL
7439-89-6	Iron	8.58E+02		3.60E+04		MG/KG	RI47SD01	37/37	3.3 - 9.2	3.60E+04	NA	2.30E+03 N	NA	NA	YES	ASL
7439-92-1	Lead	5.10E+00	J	1.31E+03	K	MG/KG	RI47SS06	35/37	0.27 - 3.7	1.31E+03	NA	4.00E+02	NA	NA	YES	ASL
7439-95-4	Magnesium	1.71E+02	J	2.51E+03		MG/KG	IS47SS14	25/37	1.23 - 7.6	2.51E+03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	3.80E+00	J	4.18E+02		MG/KG	RI47SS02	37/37	0.03 - 6	4.18E+02	NA	1.56E+02 N	NA	NA	YES	ASL
7439-97-6	Mercury	8.00E-02		4.74E+01		MG/KG	RI47SS02	30/37	0.01 - 1.5	4.74E+01	NA	2.35E+00 N	NA	NA	YES	ASL
7440-02-0	Nickel	2.30E+00	J	2.96E+01		MG/KG	IS47SS14	18/37	0.22 - 4.1	2.96E+01	NA	1.56E+02 N	NA	NA	NO	BSL
7440-09-7	Potassium	1.38E+02	J	1.37E+03		MG/KG	RI47SD01	25/37	2.1 - 247	1.37E+03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.90E-01	J	8.14E+02		MG/KG	RI47SD01	27/37	0.12 - 1.3	8.14E+02	NA	3.91E+01 N	NA	NA	YES	ASL
7440-23-5	Sodium	3.25E+01	J	2.75E+02	J	MG/KG	RI47SD01	11/37	12.1 - 128	2.75E+02	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	2.70E+00		5.51E+01		MG/KG	RI47SD01	29/37	0.14 - 6	5.51E+01	NA	2.30E+00 N	NA	NA	YES	ASL
7440-66-6	Zinc	8.20E+00	J	7.62E+02		MG/KG	RI47SS02	21/37	0.19 - 13	7.62E+02	NA	2.35E+03 N	NA	NA	NO	BSL

Table 2.1

Analytical Results of Constituents Detected in Soil Samples at Site 47

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Residential soil , October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for napthalene used as surrogate for acenaphthylene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.57E-04	L	9.14E-04	L	ug/m3	RI47SS04	5/37	0.01 - 1.3	9.14E-04	NA	2.30E+02 N	NA	NA	NO	BSL
75-34-3	1,1-Dichloroethane	4.17E-04	L	8.34E-04	L	ug/m3	RI47SS01 RI47SS04	5/37	0.01 - 1.3	8.34E-04	NA	5.11E+01 N	NA	NA	NO	BSL
75-35-4	1,1-Dichloroethene	7.06E-04	L	1.41E-03	L	ug/m3	RI47SS04	3/37	0.01 - 1.3	1.41E-03	NA	2.20E+01 N	NA	NA	NO	BSL
107-06-2	1,2-Dichloroethane	4.35E-04	L	4.35E-04	L	ug/m3	RI47SS01 RI47SS10	4/37	0.01 - 1.3	4.35E-04	NA	6.88E-02 C	NA	NA	NO	BSL
540-59-0	1,2-Dichloroethene (total)	8.70E-04	L	3.05E-03	J	ug/m3	47SA12	6/28	0.01 - 1.3	3.05E-03	NA	3.29E+00 N	NA	NA	NO	BSL
78-87-5	1,2-Dichloropropane	2.82E-04	L	5.64E-04	L	ug/m3	RI47SS04	4/37	0.01 - 1.3	5.64E-04	NA	9.21E-02 C	NA	NA	NO	BSL
67-64-1	Acetone	4.03E-04	J	4.03E-04	J	ug/m3	47SA08	1/37	0.002 - 3.6	4.03E-04	NA	3.30E+02 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.23E-04	L	1.23E-04	L	ug/m3	RI47SS04	1/37	0.01 - 1.3	1.23E-04	NA	1.01E-01 C	NA	NA	NO	BSL
75-15-0	Carbon disulfide	8.48E-04	J	1.70E-03	J	ug/m3	47SA09	2/37	0.01 - 1.3	1.70E-03	NA	7.30E+01 N	NA	NA	NO	BSL
56-23-5	Carbon tetrachloride	4.90E-04	L	4.85E-02		ug/m3	47SA12	7/37	0.01 - 1.3	4.85E-02	NA	1.18E-01 C	NA	NA	NO	BSL
108-90-7	Chlorobenzene	1.62E-04	L	3.23E-04	L	ug/m3	RI47SS04	4/37	0.01 - 1.3	3.23E-04	NA	6.21E+00 N	NA	NA	NO	BSL
75-00-3	Chloroethane	7.58E-10	L	1.52E-09	L	ug/m3	RI47SS04	4/37	0.01 - 1.3	1.52E-09	NA	2.16E+00 C	NA	NA	NO	BSL
67-66-3	Chloroform	2.58E-02		6.84E-02		ug/m3	47SA12	2/37	0.01 - 1.3	6.84E-02	NA	7.70E-02 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	2.43E-03	J	1.26E+00		ug/m3	47SA01	3/37	0.01 - 1.6	1.26E+00	NA	3.10E-01 C	NA	NA	YES	ASL
79-01-6	Trichloroethene	3.96E-04	L	1.55E-02		ug/m3	47SA12	8/37	0.01 - 1.3	1.55E-02	NA	1.60E-02 C	NA	NA	NO	BSL
75-01-4	Vinyl chloride	3.10E-04	L	6.20E-04	L	ug/m3	RI47SS04	5/37	0.01 - 1.3	6.20E-04	NA	7.20E-02 C	NA	NA	NO	BSL
91-57-6	2-Methylnaphthalene	1.52E-08	J	9.09E-08	J	ug/m3	RI47SS03	2/37	0.34 - 0.74	9.09E-08	NA	7.30E+00 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	1.39E-04	J	8.80E-03		ug/m3	IS47SS19	10/37	0.019 - 0.47	8.80E-03	NA	2.19E+01 N	NA	NA	NO	BSL
208-96-8	Acenaphthylene	1.44E-08		1.36E-07	J	ug/m3	47SA01	6/37	0.019 - 0.47	1.36E-07	NA	3.29E-01	NA	NA	NO	BSL
98-86-2	Acetophenone	9.07E-05	J	1.55E-04	J	ug/m3	IS47SS14 IS47SS22	8/9	0.37 - 0.74	1.55E-04	NA	3.70E+01 N	NA	NA	NO	BSL
120-12-7	Anthracene	3.76E-05		1.49E-03		ug/m3	RI47SS03	12/37	0.019 - 0.47	1.49E-03	NA	1.10E+02 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	7.12E-08	J	1.36E-07	J	ug/m3	IS47SS19	5/9	0.37 - 0.74	1.36E-07	NA	3.65E+01 N	NA	NA	NO	BSL
56-55-3	Benzo(a)anthracene	1.44E-08	J	1.67E-06		ug/m3	RI47SD02	25/37	0.019 - 0.47	1.67E-06	NA	8.58E-03 C	NA	NA	NO	BSL
50-32-8	Benzo(a)pyrene	1.44E-08	J	1.44E-06		ug/m3	RI47SD02	22/37	0.019 - 0.47	1.44E-06	NA	2.02E-03 C	NA	NA	NO	BSL
205-99-2	Benzo(b)fluoranthene	1.44E-08	J	3.48E-06		ug/m3	RI47SD02	27/37	0.019 - 2	3.48E-06	NA	8.58E-03 C	NA	NA	NO	BSL
191-24-2	Benzo(g,h,i)perylene	1.44E-08		2.12E-06		ug/m3	RI47SD02	21/37	0.019 - 2	2.12E-06	NA	1.10E+01 N	NA	NA	NO	BSL
207-08-9	Benzo(k)fluoranthene	1.44E-08	J	9.09E-07		ug/m3	RI47SD02	25/37	0.019 - 0.47	9.09E-07	NA	8.58E-02 C	NA	NA	NO	BSL
86-74-8	Carbazole	3.26E-08	J	3.41E-07		ug/m3	RI47SS03	11/37	0.088 - 0.74	3.41E-07	NA	3.13E-01 C	NA	NA	NO	BSL
218-01-9	Chrysene	1.67E-08	J	2.35E-06		ug/m3	IS47SS19	27/37	0.019 - 0.47	2.35E-06	NA	8.58E-01 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	2.80E-08	J	3.26E-07	J	ug/m3	IS47SS21	17/37	0.059 - 0.74	3.26E-07	NA	3.65E+01 N	NA	NA	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.44E-08		6.44E-07		ug/m3	RI47SD02	9/37	0.019 - 0.47	6.44E-07	NA	8.58E-04 C	NA	NA	NO	BSL
132-64-9	Dibenzofuran	1.52E-08	J	2.65E-07		ug/m3	RI47SS03	7/37	0.34 - 0.74	2.65E-07	NA	7.30E-01 N	NA	NA	NO	BSL
84-66-2	Diethylphthalate	3.11E-08	J	3.94E-07		ug/m3	IS47SS16	4/37	0.34 - 0.74	3.94E-07	NA	2.92E+02 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	7.58E-08	J	7.58E-08	J	ug/m3	RI47SS07	1/37	0.34 - 0.74	7.58E-08	NA	3.65E+03 N	NA	NA	NO	BSL

Table 2.2
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
206-44-0	Fluoranthene	2.12E-08	J	1.74E-06		ug/m3	RI47SS03	30/37	0.019 - 0.47	1.74E-06	NA	1.46E+01 N	NA	NA	NO	BSL
86-73-7	Fluorene	7.13E-05	J	8.91E-03		ug/m3	IS47SS19	10/35	0.019 - 0.47	8.91E-03	NA	1.46E+01 N	NA	NA	NO	BSL
87-68-3	Hexachlorobutadiene	2.65E-07	J	5.38E-07		ug/m3	RI47SD01	2/37	0.34 - 0.74	5.38E-07	NA	7.30E-02 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	3.64E-08	J	3.64E-08	J	ug/m3	RI47SD02	1/37	0.34 - 0.74	3.64E-08	NA	3.65E-01 N	NA	NA	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.44E-08		1.97E-06		ug/m3	RI47SD02	20/37	0.019 - 0.47	1.97E-06	NA	8.58E-03 C	NA	NA	NO	BSL
91-20-3	Naphthalene	3.45E-04		2.00E-03	J	ug/m3	RI47SS03	6/37	0.019 - 0.47	2.00E-03	NA	3.29E-01 N	NA	NA	NO	BSL
87-86-5	Pentachlorophenol	6.52E-08	J	1.36E-07	J	ug/m3	RI47SD02	3/36	0.83 - 1.9	1.36E-07	NA	5.22E-02 C	NA	NA	NO	BSL
85-01-8	Phenanthrene	1.52E-08	J	2.50E-05		ug/m3	IS47SS19	27/37	0.023 - 1.85	2.50E-05	NA	1.10E+01 N	NA	NA	NO	BSL
129-00-0	Pyrene	1.59E-08	J	2.65E-06		ug/m3	IS47SS19	30/37	0.019 - 2	2.65E-06	NA	1.10E+01 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	5.08E-08	J	2.50E-06		ug/m3	IS47SS15	4/37	0.067 - 0.74	2.50E-06	NA	4.47E-01 C	NA	NA	NO	BSL
606-20-2	2,6-Dinitrotoluene	1.89E-07	J	1.89E-07	J	ug/m3	47SA12	1/37	0.23 - 0.74	1.89E-07	NA	3.65E-01 N	NA	NA	NO	BSL
9004-70-0	Nitrocellulose	4.44E-05		4.44E-05		ug/m3	RI47SS06	1/19	2.79 - 50.4	4.44E-05	NA	NA	NA	NA	NO	NTX
55-63-0	Nitroglycerin	6.89E-06		1.74E-05		ug/m3	RI47SS05	5/20	4.5 - 88	1.74E-05	NA	4.47E-01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	7.88E-04		1.73E-02		ug/m3	RI47SD01	37/37	1.83 - 2500	1.73E-02	NA	3.65E-01 N	NA	NA	NO	BSL
7440-36-0	Antimony	3.18E-07	UL	2.80E-06	J	ug/m3	IS47SS22	7/37	0.38 - 606	2.80E-06	NA	1.46E-01 N	NA	NA	NO	BSL
7440-38-2	Arsenic	5.38E-07	J	1.23E-05		ug/m3	IS47SS20P	26/37	0.46 - 2.01	1.23E-05	NA	4.15E-04 C	NA	NA	NO	BSL
7440-39-3	Barium	6.74E-06	J	6.95E-05		ug/m3	RI47SD01	24/37	0.03 - 6	6.95E-05	NA	5.11E-02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	2.27E-08	J	9.85E-07	J	ug/m3	IS47SS17	25/37	0.02 - 0.27	9.85E-07	NA	7.45E-04 C	NA	NA	NO	BSL
7440-43-9	Cadmium	5.30E-08	J	3.48E-06		ug/m3	47SA02D	22/37	0.05 - 1.3	3.48E-06	NA	9.94E-04 C	NA	NA	NO	BSL
7440-70-2	Calcium	5.43E-05	J	4.55E-03		ug/m3	RI47SS02	16/37	0.69 - 8.1	4.55E-03	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.20E-06		3.08E-05		ug/m3	RI47SD01	37/37	0.1 - 6	3.08E-05	NA	1.53E-04 C	NA	NA	NO	BSL
7440-48-4	Cobalt	4.24E-07	J	7.27E-06	J	ug/m3	IS47SS14	25/37	0.09 - 4	7.27E-06	NA	6.40E-04 N	NA	NA	NO	BSL
7440-50-8	Copper	1.44E-06	J	8.56E-05		ug/m3	RI47SD01	29/37	0.1 - 2.6	8.56E-05	NA	1.46E+01 N	NA	NA	NO	BSL
57-12-5	Cyanide	1.97E-07		2.58E-07		ug/m3	RI47SD03 RI47SS06	8/28	0.19 - 1.7	2.58E-07	NA	7.30E+00 N	NA	NA	NO	BSL
7439-89-6	Iron	6.50E-04		2.73E-02		ug/m3	RI47SD01	37/37	3.3 - 9.2	2.73E-02	NA	1.10E+02 N	NA	NA	NO	BSL
7439-92-1	Lead	3.86E-06	J	9.92E-04	K	ug/m3	RI47SS06	35/37	0.27 - 3.7	9.92E-04	NA	NA	NA	NA	NO	NTX
7439-95-4	Magnesium	1.30E-04	J	1.90E-03		ug/m3	IS47SS14	25/37	1.23 - 7.6	1.90E-03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.88E-06	J	3.17E-04		ug/m3	RI47SS02	37/37	0.03 - 6	3.17E-04	NA	5.22E-03 N	NA	NA	NO	BSL
7439-97-6	Mercury	6.06E-08		3.59E-05		ug/m3	RI47SS02	30/37	0.01 - 1.5	3.59E-05	NA	3.14E-02 N	NA	NA	NO	BSL
7440-02-0	Nickel	1.74E-06	J	2.24E-05		ug/m3	IS47SS14	18/37	0.22 - 4.1	2.24E-05	NA	7.30E+00 N	NA	NA	NO	BSL
7440-09-7	Potassium	1.05E-04	J	1.04E-03		ug/m3	RI47SD01	25/37	2.1 - 247	1.04E-03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.20E-07	J	6.17E-04		ug/m3	RI47SD01	27/37	0.12 - 1.3	6.17E-04	NA	1.83E+00 N	NA	NA	NO	BSL
7440-23-5	Sodium	2.46E-05	J	2.08E-04	J	ug/m3	RI47SD01	11/37	12.1 - 128	2.08E-04	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	2.05E-06		4.17E-05		ug/m3	RI47SD01	29/37	0.14 - 6	4.17E-05	NA	1.10E-01 N	NA	NA	NO	BSL
7440-66-6	Zinc	6.21E-06	J	5.77E-04		ug/m3	RI47SS02	21/37	0.19 - 13	5.77E-04	NA	1.10E+02 N	NA	NA	NO	BSL

Table 2.2
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.
Minimum/Maximum detected concentrations in surface soil samples multiplied by 1/PEF for nonvolatiles and 1/VF + 1/PEF (VF found in supplement t2.2A) for volatiles to get minimum and maximum concentration in air.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for ambient air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for napthalene used as surrogate for acenaphthylene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
[5] RBC value for mercuric chloride used as surrogate for mercury.
Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Calculation of Generic Chemical Specific VF Factors
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)
Volatile Organics								
1,1,1-Trichloroethane	7.80E-02	7.05E-01	8.80E-06	1.10E+02	6.60E-01	1.33E+03	3.28E-03	2.19E+03
1,1-Dichloroethane	7.42E-02	2.30E-01	1.05E-05	3.16E+01	1.90E-01	5.06E+03	2.73E-03	2.40E+03
1,1-Dichloroethene	9.00E-02	1.07E+00	1.04E-05	5.89E+01	3.53E-01	2.25E+03	7.82E-03	1.42E+03
1,2-Dichloroethane	7.07E-02	3.85E-01	1.19E-05	5.25E+01	3.15E-01	6.30E+03	2.97E-03	2.30E+03
1,2-Dichloroethene (total)	7.07E-02	3.85E-01	1.19E-05	5.25E+01	3.15E-01	6.30E+03	2.97E-03	2.30E+03
1,2-Dichloropropane	7.82E-02	1.15E-01	8.73E-06	4.37E+01	2.62E-01	2.80E+03	1.25E-03	3.55E+03
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	1.02E-04	1.24E+04
Bromodichloromethane	2.98E-02	6.56E-02	1.06E-05	5.50E+01	3.30E-01	6.74E+03	2.36E-04	8.16E+03
Carbon disulfide	1.04E-01	1.24E+00	1.00E-05	4.57E+01	2.74E-01	1.19E+03	1.13E-02	1.18E+03
Carbon tetrachloride	7.80E-02	1.25E+00	8.80E-06	1.74E+02	1.04E+00	7.93E+02	3.76E-03	2.04E+03
Chlorobenzene	7.30E-02	1.52E-01	8.70E-06	2.19E+02	1.31E+00	4.72E+02	4.10E-04	6.19E+03
Chloroethane	NA	NA	NA	NA		NA		
Chloroform	1.04E-01	1.50E-01	1.00E-05	3.98E+01	2.39E-01	7.92E+03	2.26E-03	2.63E+03
Methylene chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	2.58E-03	2.47E+03
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	2.00E+02	2.47E-03	2.52E+03
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	1.51E-03	3.22E+03
Vinyl chloride	1.06E-01	1.11E+00	1.23E-06	1.86E+01	1.12E-01	2.76E+03	1.49E-02	1.03E+03
2-Methylnaphthalene	NA	NA	NA	NA		NA		
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	2.16E+05
Acetophenone	NA	NA	NA	NA		NA		
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	2.63E-08	7.72E+05
Dibenzofuran	NA	NA	NA	NA		NA		
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	6.15E-08	5.05E+05
Naphthalene	5.90E-02	1.99E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	5.17E-06	5.51E+04
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	3.76E+06

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source (g/m^2-s per kg/m^3)	68.81
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 2.3
Analytical Results of Constituents Detected in Sewer Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
98-86-2	Acetophenone	8.70E-02	J	1.70E-01	J	MG/KG	IS47SD05	2/2	0.68 - 1.5	1.70E-01	NA	7.82E+03 N	NA	NA	NO	BSL
205-99-2	Benzo(b)fluoranthene	9.00E-02	J	9.00E-02	J	MG/KG	RI47IW91	1/3	0.034 - 0.55	9.00E-02	NA	8.75E+00 C	NA	NA	NO	BSL
218-01-9	Chrysene	5.60E-02	J	3.30E-01		MG/KG	IS47SD06	2/3	0.076 - 0.55	3.30E-01	NA	8.75E+02 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	4.20E-01	J	5.60E-01	J	MG/KG	IS47SD06	2/3	0.55 - 1.5	5.60E-01	NA	7.82E+03 N	NA	NA	NO	BSL
206-44-0	Fluoranthene	8.60E-02	J	8.60E-02	J	MG/KG	RI47IW91	1/3	0.034 - 0.55	8.60E-02	NA	3.13E+03 N	NA	NA	NO	BSL
85-01-8	Phenanthrene	1.20E-01		1.20E-01		MG/KG	IS47SD05	1/3	0.034 - 0.55	1.20E-01	NA	2.35E+03 N	NA	NA	NO	BSL
129-00-0	Pyrene	7.40E-02	J	3.50E-01		MG/KG	IS47SD06	2/3	0.076 - 0.55	3.50E-01	NA	2.35E+03 N	NA	NA	NO	BSL
55-63-0	Nitroglycerin	3.70E+03		3.70E+03		MG/KG	RI47IW91	1/1	140 - 140	3.70E+03	NA	4.56E+02 C	NA	NA	YES	ASL
7429-90-5	Aluminum	7.20E+02		1.43E+04		MG/KG	RI47IW91	3/3	3.35 - 7.32	1.43E+04	NA	7.82E+04 N	NA	NA	NO	BSL
7440-36-0	Antimony	9.50E-01	J	9.50E-01	J	MG/KG	RI47IW91	1/3	0.6 - 6.5	9.50E-01	NA	3.13E+01 N	NA	NA	NO	BSL
7440-38-2	Arsenic	2.30E+00	J	1.00E+01		MG/KG	IS47SD05	3/3	0.74 - 4.02	1.00E+01	NA	4.26E+00 C	NA	NA	YES	ASL
7440-39-3	Barium	7.70E+00	J	3.18E+02		MG/KG	RI47IW91	3/3	0.05 - 0.27	3.18E+02	NA	5.48E+03 N	NA	NA	NO	BSL
7440-41-7	Beryllium	1.20E-01	J	3.50E+00	J	MG/KG	IS47SD05	3/3	0.03 - 0.09	3.50E+00	NA	1.56E+02 N	NA	NA	NO	BSL
7440-43-9	Cadmium	2.70E+00		3.00E+00	J	MG/KG	IS47SD05	2/3	0.08 - 0.45	3.00E+00	NA	3.91E+01 N	NA	NA	NO	BSL
7440-70-2	Calcium	3.02E+02	J	4.78E+03		MG/KG	RI47IW91	3/3	1.27 - 8.3	4.78E+03	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.60E+00	J	4.36E+01		MG/KG	RI47IW91	3/3	0.16 - 0.45	4.36E+01	NA	2.35E+02 N	NA	NA	NO	BSL
7440-48-4	Cobalt	4.10E+00	J	3.67E+01	J	MG/KG	IS47SD05	3/3	0.14 - 0.98	3.67E+01	NA	1.60E+03 N	NA	NA	NO	BSL
7440-50-8	Copper	5.10E+00	J	1.09E+02		MG/KG	RI47IW91	3/3	0.16 - 1.07	1.09E+02	NA	3.13E+03 N	NA	NA	NO	BSL
7439-89-6	Iron	2.29E+03		3.89E+04		MG/KG	RI47IW91	3/3	5.2 - 18.39	3.89E+04	NA	2.30E+04 N	NA	NA	YES	ASL
7439-92-1	Lead	2.23E+01		5.76E+03	N	MG/KG	RI47IW91	3/3	0.44 - 1.34	5.76E+03	NA	4.00E+02	NA	NA	YES	ASL
7439-95-4	Magnesium	1.58E+02	J	3.29E+03		MG/KG	RI47IW91	3/3	2.24 - 7.9	3.29E+03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	1.06E+01		1.30E+03		MG/KG	RI47IW91	3/3	0.05 - 0.27	1.30E+03	NA	1.56E+03 N	NA	NA	NO	BSL
7439-97-6	Mercury	7.40E-01		8.02E+01		MG/KG	RI47IW91	2/3	0.18 - 2.5	8.02E+01	NA	2.35E+01 N	NA	NA	YES	ASL
7440-02-0	Nickel	2.60E+00	J	3.05E+01		MG/KG	RI47IW91	3/3	0.36 - 1.43	3.05E+01	NA	1.56E+03 N	NA	NA	NO	BSL
09/07/7440	Potassium	9.31E+01	J	8.76E+03		MG/KG	RI47IW91	3/3	3.4 - 19.91	8.76E+03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.14E+01		4.06E+02		MG/KG	RI47IW91	2/3	0.64 - 1.43	4.06E+02	NA	3.91E+02 N	NA	NA	YES	ASL
7440-23-5	Sodium	2.92E+02	J	1.41E+03		MG/KG	RI47IW91	2/3	44.7 - 258.13	1.41E+03	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	5.50E+00	J	5.07E+01		MG/KG	IS47SD05	3/3	0.22 - 0.71	5.07E+01	NA	2.30E+01 N	NA	NA	YES	ASL
7440-66-6	Zinc	4.50E+01		5.82E+02		MG/KG	RI47IW91	3/3	0.3 - 1.07	5.82E+02	NA	2.35E+04 N	NA	NA	NO	BSL

Table 2.3
Analytical Results of Constituents Detected in Sewer Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for residential soil multiplied by 10, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
C values are multiplied by 10
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.4
Analytical Results of Constituents Detected in Sewer Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
98-86-2	Acetophenone	8.70E-02	J	1.70E-01	J	MG/KG	IS47SD05	2/2	0.68 - 1.5	1.70E-01	NA	7.82E+03 N	NA	NA	NO	BSL
218-01-9	Chrysene	3.30E-01		3.30E-01		MG/KG	IS47SD06	1/2	0.076 - 0.17	3.30E-01	NA	8.75E+02 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	4.20E-01	J	5.60E-01	J	MG/KG	IS47SD06	2/2	0.68 - 1.5	5.60E-01	NA	7.82E+03 N	NA	NA	NO	BSL
85-01-8	Phenanthrene	1.20E-01		1.20E-01		MG/KG	IS47SD05	1/2	0.034 - 0.076	1.20E-01	NA	2.35E+03 N	NA	NA	NO	BSL
129-00-0	Pyrene	3.50E-01		3.50E-01		MG/KG	IS47SD06	1/2	0.076 - 0.17	3.50E-01	NA	2.35E+03 N	NA	NA	NO	BSL
7429-90-5	Aluminum	7.20E+02		1.08E+04		MG/KG	IS47SD05	2/2	3.35 - 7.32	1.08E+04	NA	7.82E+04 N	NA	NA	NO	BSL
7440-38-2	Arsenic	2.30E+00	J	1.00E+01		MG/KG	IS47SD05	2/2	1.84 - 4.02	1.00E+01	NA	4.26E+00 C	NA	NA	YES	ASL
7440-39-3	Barium	7.70E+00	J	9.63E+01	J	MG/KG	IS47SD05	2/2	0.12 - 0.27	9.63E+01	NA	5.48E+03 N	NA	NA	NO	BSL
7440-41-7	Beryllium	1.20E-01	J	3.50E+00	J	MG/KG	IS47SD05	2/2	0.04 - 0.09	3.50E+00	NA	1.56E+02 N	NA	NA	NO	BSL
7440-43-9	Cadmium	3.00E+00	J	3.00E+00	J	MG/KG	IS47SD05	1/2	0.2 - 0.45	3.00E+00	NA	7.80E+01 N	NA	NA	NO	BSL
7440-70-2	Calcium	3.02E+02	J	1.88E+03	J	MG/KG	IS47SD05	2/2	1.27 - 2.77	1.88E+03	NA	N/A	NA	NA	NO	NUT
7440-47-3	Chromium	2.60E+00	J	2.15E+01		MG/KG	IS47SD05	2/2	0.2 - 0.45	2.15E+01	NA	2.35E+02 N	NA	NA	NO	BSL
7440-48-4	Cobalt	4.10E+00	J	3.67E+01	J	MG/KG	IS47SD05	2/2	0.45 - 0.98	3.67E+01	NA	1.60E+03 N	NA	NA	NO	BSL
7440-50-8	Copper	5.10E+00	J	3.45E+01		MG/KG	IS47SD05	2/2	0.49 - 1.07	3.45E+01	NA	3.13E+03 N	NA	NA	NO	BSL
7439-89-6	Iron	2.29E+03		2.49E+04		MG/KG	IS47SD05	2/2	8.41 - 18.39	2.49E+04	NA	2.30E+04 N	NA	NA	YES	ASL
7439-92-1	Lead	2.23E+01		5.54E+01		MG/KG	IS47SD05	2/2	0.61 - 1.34	5.54E+01	NA	4.00E+02	NA	NA	NO	BSL
7439-95-4	Magnesium	1.58E+02	J	1.04E+03	J	MG/KG	IS47SD05	2/2	2.24 - 4.91	1.04E+03	NA	N/A	NA	NA	NO	NUT
7439-96-5	Manganese	1.06E+01		1.43E+02		MG/KG	IS47SD05	2/2	0.12 - 0.27	1.43E+02	NA	1.56E+03 N	NA	NA	NO	BSL
7439-97-6	Mercury	7.40E-01		7.40E-01		MG/KG	IS47SD05	1/2	0.18 - 0.2	7.40E-01	NA	2.35E+01 N	NA	NA	NO	BSL
7440-02-0	Nickel	2.60E+00	J	2.71E+01	J	MG/KG	IS47SD05	2/2	0.65 - 1.43	2.71E+01	NA	1.56E+03 N	NA	NA	NO	BSL
7440-09-7	Potassium	9.31E+01	J	4.41E+02	J	MG/KG	IS47SD05	2/2	9.1 - 19.91	4.41E+02	NA	N/A	NA	NA	NO	NUT
7440-22-4	Silver	2.14E+01		2.14E+01		MG/KG	IS47SD05	1/2	0.64 - 1.43	2.14E+01	NA	3.91E+02 N	NA	NA	NO	BSL
7440-23-5	Sodium	2.92E+02	J	2.92E+02	J	MG/KG	IS47SD05	1/2	116 - 258.13	2.92E+02	NA	N/A	NA	NA	NO	NUT
7440-62-2	Vanadium	5.50E+00	J	5.07E+01		MG/KG	IS47SD05	2/2	0.33 - 0.71	5.07E+01	NA	2.30E+01 N	NA	NA	YES	ASL
7440-66-6	Zinc	4.50E+01		2.87E+02		MG/KG	IS47SD05	2/2	0.49 - 1.07	2.87E+02	NA	2.35E+04 N	NA	NA	NO	BSL

Table 2.4
Analytical Results of Constituents Detected in Sewer Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations. Samples from drainage swales only, does not include sample from manhole.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for residential soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Indian Head, Site 47

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
67-64-1	Acetone	3.10E+00	J	3.40E+00	J	UG/L	IS47SW100902P	2/4	5 - 10	3.40E+00	NA	5.50E+03 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.00E-01	J	1.00E-01	J	UG/L	IS47SW120902	1/11	0.5 - 10	1.00E-01	NA	1.70E+00 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	2.50E+00	J	2.50E+00	J	UG/L	IS47SW01 IS47SW02	2/2	10 - 10	2.50E+00	NA	3.65E+03 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.40E+00	J	2.30E+00	J	UG/L	IS47SW02	2/2	10 - 10	2.30E+00	NA	4.78E+01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	2.26E+02		3.33E+02		UG/L	IS47SW01	2/2	8.2 - 8.2	3.33E+02	NA	3.65E+04 N	NA	NA	NO	BSL
7440-38-2	Arsenic	5.20E+00	J	5.20E+00	J	UG/L	IS47SW02	1/2	4.5 - 4.5	5.20E+00	NA	4.46E-01 C	NA	NA	YES	ASL
7440-39-3	Barium	2.16E+01	J	4.39E+01	J	UG/L	IS47SW01	2/2	0.3 - 0.3	4.39E+01	NA	2.56E+03 N	NA	NA	NO	BSL
7440-41-7	Beryllium	2.30E-01	J	2.30E-01	J	UG/L	IS47SW01	1/2	0.1 - 0.1	2.30E-01	NA	7.30E+01 N	NA	NA	NO	BSL
7440-70-2	Calcium	5.62E+03		7.28E+03		UG/L	IS47SW01	2/2	3.1 - 3.1	7.28E+03	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	8.80E-01	J	8.80E-01	J	UG/L	IS47SW01	1/2	0.5 - 0.5	8.80E-01	NA	1.10E+02 N	NA	NA	NO	BSL
7440-48-4	Cobalt	3.80E+00	J	1.42E+01	J	UG/L	IS47SW01	2/2	1.1 - 1.1	1.42E+01	NA	7.30E+02 N	NA	NA	NO	BSL
7440-50-8	Copper	5.00E+00	J	5.00E+00	J	UG/L	IS47SW02	1/2	1.2 - 1.2	5.00E+00	NA	1.46E+03 N	NA	NA	NO	BSL
7439-89-6	Iron	2.86E+03	J	2.96E+03	J	UG/L	IS47SW02	2/2	20.6 - 20.6	2.96E+03	NA	1.10E+04 N	NA	NA	NO	BSL
7439-95-4	Magnesium	1.89E+03	J	2.65E+03	J	UG/L	IS47SW01	2/2	5.5 - 5.5	2.65E+03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.22E+02		2.59E+02		UG/L	IS47SW01	2/2	0.3 - 0.3	2.59E+02	NA	7.30E+02 N	NA	NA	NO	BSL
7440-02-0	Nickel	3.60E+00	J	6.80E+00	J	UG/L	IS47SW01	2/2	1.6 - 1.6	6.80E+00	NA	7.30E+02 N	NA	NA	NO	BSL
09/07/7440	Potassium	1.52E+03	J	2.94E+03	J	UG/L	IS47SW02	2/2	22.3 - 22.3	2.94E+03	NA	NA	NA	NA	NO	NUT
7440-23-5	Sodium	2.33E+04	J	5.86E+04	J	UG/L	IS47SW02	2/2	289.1 - 289.1	5.86E+04	NA	NA	NA	NA	NO	NUT
7440-66-6	Zinc	5.36E+01	J	1.23E+02	J	UG/L	IS47SW02	2/2	1.2 - 1.2	1.23E+02	NA	1.10E+04 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for tap water multiplied by 10, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
C values are multiplied by 10
RBC value for Chromium VI used for total chromium.
RBC value for manganese-nonfood used as surrogate for manganese.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.6
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	5/37	0.01 - 1.3	2.00E-03	NA	2.19E+03 N	NA	NA	NO	BSL
75-34-3	1,1-Dichloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS01 RI47SS04	5/37	0.01 - 1.3	2.00E-03	NA	7.82E+02 N	NA	NA	NO	BSL
75-35-4	1,1-Dichloroethene	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	3/37	0.01 - 1.3	2.00E-03	NA	3.90E+02 N	NA	NA	NO	BSL
107-06-2	1,2-Dichloroethane	1.00E-03	L	1.00E-03	L	MG/KG	RI47SS01 RI47SS10	4/37	0.01 - 1.3	1.00E-03	NA	7.02E+00 C	NA	NA	NO	BSL
540-59-0	1,2-Dichloroethene (total)	2.00E-03	L	7.00E-03	J	MG/KG	47SA12	6/28	0.01 - 1.3	7.00E-03	NA	7.04E+01 N	NA	NA	NO	BSL
78-87-5	1,2-Dichloropropane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/37	0.01 - 1.3	2.00E-03	NA	9.39E+00 C	NA	NA	NO	BSL
67-64-1	Acetone	5.00E-03	J	5.00E-03	J	MG/KG	47SA08	1/37	0.002 - 3.6	5.00E-03	NA	7.00E+03 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.00E-03	L	1.00E-03	L	MG/KG	RI47SS04	1/37	0.01 - 1.3	1.00E-03	NA	1.03E+01 C	NA	NA	NO	BSL
75-15-0	Carbon disulfide	1.00E-03	J	2.00E-03	J	MG/KG	47SA09	2/37	0.01 - 1.3	2.00E-03	NA	7.82E+02 N	NA	NA	NO	BSL
56-23-5	Carbon tetrachloride	1.00E-03	L	9.90E-02		MG/KG	47SA12	7/37	0.01 - 1.3	9.90E-02	NA	4.91E+00 C	NA	NA	NO	BSL
108-90-7	Chlorobenzene	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/37	0.01 - 1.3	2.00E-03	NA	1.56E+02 N	NA	NA	NO	BSL
75-00-3	Chloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/37	0.01 - 1.3	2.00E-03	NA	2.20E+02 C	NA	NA	NO	BSL
67-66-3	Chloroform	6.80E-02		1.80E-01		MG/KG	47SA12	2/37	0.01 - 1.3	1.80E-01	NA	7.80E+01 N	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	6.00E-03	J	3.10E+00		MG/KG	47SA01	3/37	0.01 - 1.6	3.10E+00	NA	1.20E+00 C	NA	NA	YES	ASL
79-01-6	Trichloroethene	1.00E-03	L	3.90E-02		MG/KG	47SA12	8/37	0.01 - 1.3	3.90E-02	NA	1.60E+00 C	NA	NA	NO	BSL
75-01-4	Vinyl chloride	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	5/37	0.01 - 1.3	2.00E-03	NA	9.00E-02 C	NA	NA	NO	BSL
91-57-6	2-Methylnaphthalene	2.00E-02	J	1.20E-01	J	MG/KG	RI47SS03	2/37	0.34 - 0.74	1.20E-01	NA	1.56E+02 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	3.00E-02	J	1.90E+00		MG/KG	IS47SS19	10/37	0.019 - 0.47	1.90E+00	NA	4.69E+02 N	NA	NA	NO	BSL
208-96-8	Acenaphthylene	1.90E-02		1.80E-01	J	MG/KG	47SA01	6/37	0.019 - 0.47	1.80E-01	NA	1.56E+02 N	NA	NA	NO	BSL
98-86-2	Acetophenone	7.00E-02	J	1.20E-01	J	MG/KG	IS47SS14 IS47SS22	8/9	0.37 - 0.74	1.20E-01	NA	7.82E+02 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.90E-02		7.50E-01		MG/KG	RI47SS03	12/37	0.019 - 0.47	7.50E-01	NA	2.35E+03 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	9.40E-02	J	1.80E-01	J	MG/KG	IS47SS19	5/9	0.37 - 0.74	1.80E-01	NA	7.82E+02 N	NA	NA	NO	BSL
56-55-3	Benzo(a)anthracene	1.90E-02	J	2.20E+00		MG/KG	RI47SD02	25/37	0.019 - 0.47	2.20E+00	NA	8.75E-01 C	NA	NA	YES	ASL
50-32-8	Benzo(a)pyrene	1.90E-02	J	1.90E+00		MG/KG	RI47SD02	22/37	0.019 - 0.47	1.90E+00	NA	8.75E-02 C	NA	NA	YES	ASL
205-99-2	Benzo(b)fluoranthene	1.90E-02	J	4.60E+00		MG/KG	RI47SD02	27/37	0.019 - 2	4.60E+00	NA	8.75E-01 C	NA	NA	YES	ASL
191-24-2	Benzo(g,h,i)perylene	1.90E-02		2.80E+00		MG/KG	RI47SD02	21/37	0.019 - 2	2.80E+00	NA	2.35E+02 N	NA	NA	NO	BSL
207-08-9	Benzo(k)fluoranthene	1.90E-02	J	1.20E+00		MG/KG	RI47SD02	25/37	0.019 - 0.47	1.20E+00	NA	8.75E+00 C	NA	NA	NO	BSL
86-74-8	Carbazole	4.30E-02	J	4.50E-01		MG/KG	RI47SS03	11/37	0.088 - 0.74	4.50E-01	NA	3.19E+01 C	NA	NA	NO	BSL
218-01-9	Chrysene	2.20E-02	J	3.10E+00		MG/KG	IS47SS19	27/37	0.019 - 0.47	3.10E+00	NA	8.75E+01 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	3.70E-02	J	4.30E-01	J	MG/KG	IS47SS21	17/37	0.059 - 0.74	4.30E-01	NA	7.82E+02 N	NA	NA	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.90E-02		8.50E-01		MG/KG	RI47SD02	9/37	0.019 - 0.47	8.50E-01	NA	8.75E-02 C	NA	NA	YES	ASL
132-64-9	Dibenzofuran	2.00E-02	J	3.50E-01		MG/KG	RI47SS03	7/37	0.34 - 0.74	3.50E-01	NA	1.60E+01 N	NA	NA	NO	BSL
84-66-2	Diethylphthalate	4.10E-02	J	5.20E-01		MG/KG	IS47SS16	4/37	0.34 - 0.74	5.20E-01	NA	6.26E+03 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	1.00E-01	J	1.00E-01	J	MG/KG	RI47SS07	1/37	0.34 - 0.74	1.00E-01	NA	7.82E+04 N	NA	NA	NO	BSL

Table 2.6
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
206-44-0	Fluoranthene	2.80E-02	J	2.30E+00		MG/KG	RI47SS03	30/37	0.019 - 0.47	2.30E+00	NA	3.13E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	3.60E-02	J	4.50E+00		MG/KG	IS47SS19	10/35	0.019 - 0.47	4.50E+00	NA	3.13E+02 N	NA	NA	NO	BSL
87-68-3	Hexachlorobutadiene	3.50E-01	J	7.10E-01		MG/KG	RI47SD01	2/37	0.34 - 0.74	7.10E-01	NA	1.56E+00 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	4.80E-02	J	4.80E-02	J	MG/KG	RI47SD02	1/37	0.34 - 0.74	4.80E-02	NA	7.80E+00 N	NA	NA	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.90E-02		2.60E+00		MG/KG	RI47SD02	20/37	0.019 - 0.47	2.60E+00	NA	8.75E-01 C	NA	NA	YES	ASL
91-20-3	Naphthalene	1.90E-02		1.10E-01	J	MG/KG	RI47SS03	6/37	0.019 - 0.47	1.10E-01	NA	1.56E+02 N	NA	NA	NO	BSL
87-86-5	Pentachlorophenol	8.60E-02	J	1.80E-01	J	MG/KG	RI47SD02	3/36	0.83 - 1.9	1.80E-01	NA	5.32E+00 C	NA	NA	NO	BSL
85-01-8	Phenanthrene	2.00E-02	J	3.30E+01		MG/KG	IS47SS19	27/37	0.023 - 1.85	3.30E+01	NA	2.35E+02 N	NA	NA	NO	BSL
129-00-0	Pyrene	2.10E-02	J	3.50E+00		MG/KG	IS47SS19	30/37	0.019 - 2	3.50E+00	NA	2.35E+02 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	6.70E-02	J	3.30E+00		MG/KG	IS47SS15	4/37	0.067 - 0.74	3.30E+00	NA	4.56E+01 C	NA	NA	NO	BSL
606-20-2	2,6-Dinitrotoluene	2.50E-01	J	2.50E-01	J	MG/KG	47SA12	1/37	0.23 - 0.74	2.50E-01	NA	7.82E+00 N	NA	NA	NO	BSL
9004-70-0	Nitrocellulose	5.86E+01		5.86E+01		MG/KG	RI47SS06	1/19	2.79 - 50.4	5.86E+01	NA	NA	NA	NA	NO	NTX
55-63-0	Nitroglycerin	9.10E+00		2.30E+01		MG/KG	RI47SS05	5/20	4.5 - 88	2.30E+01	NA	4.56E+01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	1.04E+03		2.28E+04		MG/KG	RI47SD01	37/37	1.83 - 2500	2.28E+04	NA	7.82E+03 N	NA	NA	YES	ASL
7440-36-0	Antimony	4.20E-01	UL	3.70E+00	J	MG/KG	IS47SS22	7/37	0.38 - 606	3.70E+00	NA	3.13E+00 N	NA	NA	YES	ASL
7440-38-2	Arsenic	7.10E-01	J	1.62E+01		MG/KG	IS47SS20P	26/37	0.46 - 2.01	1.62E+01	NA	4.26E-01 C	NA	NA	YES	ASL
7440-39-3	Barium	8.90E+00	J	9.17E+01		MG/KG	RI47SD01	24/37	0.03 - 6	9.17E+01	NA	5.48E+02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	3.00E-02	J	1.30E+00	J	MG/KG	IS47SS17	25/37	0.02 - 0.27	1.30E+00	NA	1.56E+01 N	NA	NA	NO	BSL
7440-43-9	Cadmium	7.00E-02	J	4.60E+00		MG/KG	47SA02D	22/37	0.05 - 1.3	4.60E+00	NA	7.80E+00 N	NA	NA	NO	BSL
7440-70-2	Calcium	7.17E+01	J	6.00E+03		MG/KG	RI47SS02	16/37	0.69 - 8.1	6.00E+03	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.90E+00		4.07E+01		MG/KG	RI47SD01	37/37	0.1 - 6	4.07E+01	NA	2.35E+01 N	NA	NA	YES	ASL
7440-48-4	Cobalt	5.60E-01	J	9.60E+00	J	MG/KG	IS47SS14	25/37	0.09 - 4	9.60E+00	NA	1.60E+02 N	NA	NA	NO	BSL
7440-50-8	Copper	1.90E+00	J	1.13E+02		MG/KG	RI47SD01	29/37	0.1 - 2.6	1.13E+02	NA	3.13E+02 N	NA	NA	NO	BSL
57-12-5	Cyanide	2.60E-01		3.40E-01		MG/KG	RI47SD03 RI47SS06	8/28	0.19 - 1.7	3.40E-01	NA	1.56E+02 N	NA	NA	NO	BSL
7439-89-6	Iron	8.58E+02		3.60E+04		MG/KG	RI47SD01	37/37	3.3 - 9.2	3.60E+04	NA	2.30E+03 N	NA	NA	YES	ASL
7439-92-1	Lead	5.10E+00	J	1.31E+03	K	MG/KG	RI47SS06	35/37	0.27 - 3.7	1.31E+03	NA	4.00E+02	NA	NA	YES	ASL
7439-95-4	Magnesium	1.71E+02	J	2.51E+03		MG/KG	IS47SS14	25/37	1.23 - 7.6	2.51E+03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	3.80E+00	J	4.18E+02		MG/KG	RI47SS02	37/37	0.03 - 6	4.18E+02	NA	1.56E+02 N	NA	NA	YES	ASL
7439-97-6	Mercury	8.00E-02		4.74E+01		MG/KG	RI47SS02	30/37	0.01 - 1.5	4.74E+01	NA	2.35E+00 N	NA	NA	YES	ASL
7440-02-0	Nickel	2.30E+00	J	2.96E+01		MG/KG	IS47SS14	18/37	0.22 - 4.1	2.96E+01	NA	1.56E+02 N	NA	NA	NO	BSL
7440-09-7	Potassium	1.38E+02	J	1.37E+03		MG/KG	RI47SD01	25/37	2.1 - 247	1.37E+03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.90E-01	J	8.14E+02		MG/KG	RI47SD01	27/37	0.12 - 1.3	8.14E+02	NA	3.91E+01 N	NA	NA	YES	ASL
7440-23-5	Sodium	3.25E+01	J	2.75E+02	J	MG/KG	RI47SD01	11/37	12.1 - 128	2.75E+02	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	2.70E+00		5.51E+01		MG/KG	RI47SD01	29/37	0.14 - 6	5.51E+01	NA	2.30E+01 N	NA	NA	YES	ASL
7440-66-6	Zinc	8.20E+00	J	7.62E+02		MG/KG	RI47SS02	21/37	0.19 - 13	7.62E+02	NA	2.35E+03 N	NA	NA	NO	BSL

Table 2.6

Analytical Results of Constituents Detected in Soil Samples at Site 47

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Residential soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for napthalene used as surrogate for acenaphthylene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.7
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.57E-04	L	9.14E-04	L	ug/m3	RI47SS04	5/37	0.01 - 1.3	9.14E-04	NA	2.30E+02 N	NA	NA	NO	BSL
75-34-3	1,1-Dichloroethane	4.17E-04	L	8.34E-04	L	ug/m3	RI47SS01 RI47SS04	5/37	0.01 - 1.3	8.34E-04	NA	5.11E+01 N	NA	NA	NO	BSL
75-35-4	1,1-Dichloroethene	7.06E-04	L	1.41E-03	L	ug/m3	RI47SS04	3/37	0.01 - 1.3	1.41E-03	NA	2.20E+01 N	NA	NA	NO	BSL
107-06-2	1,2-Dichloroethane	4.35E-04	L	4.35E-04	L	ug/m3	RI47SS01 RI47SS10	4/37	0.01 - 1.3	4.35E-04	NA	6.88E-02 C	NA	NA	NO	BSL
540-59-0	1,2-Dichloroethene (total)	8.70E-04	L	3.05E-03	J	ug/m3	47SA12	6/28	0.01 - 1.3	3.05E-03	NA	3.29E+00 N	NA	NA	NO	BSL
78-87-5	1,2-Dichloropropane	2.82E-04	L	5.64E-04	L	ug/m3	RI47SS04	4/37	0.01 - 1.3	5.64E-04	NA	9.21E-02 C	NA	NA	NO	BSL
67-64-1	Acetone	4.03E-04	J	4.03E-04	J	ug/m3	47SA08	1/37	0.002 - 3.6	4.03E-04	NA	3.30E+02 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.23E-04	L	1.23E-04	L	ug/m3	RI47SS04	1/37	0.01 - 1.3	1.23E-04	NA	1.01E-01 C	NA	NA	NO	BSL
75-15-0	Carbon disulfide	8.48E-04	J	1.70E-03	J	ug/m3	47SA09	2/37	0.01 - 1.3	1.70E-03	NA	7.30E+01 N	NA	NA	NO	BSL
56-23-5	Carbon tetrachloride	4.90E-04	L	4.85E-02		ug/m3	47SA12	7/37	0.01 - 1.3	4.85E-02	NA	1.18E-01 C	NA	NA	NO	BSL
108-90-7	Chlorobenzene	1.62E-04	L	3.23E-04	L	ug/m3	RI47SS04	4/37	0.01 - 1.3	3.23E-04	NA	6.21E+00 N	NA	NA	NO	BSL
75-00-3	Chloroethane	7.58E-10	L	1.52E-09	L	ug/m3	RI47SS04	4/37	0.01 - 1.3	1.52E-09	NA	2.16E+00 C	NA	NA	NO	BSL
67-66-3	Chloroform	2.58E-02		6.84E-02		ug/m3	47SA12	2/37	0.01 - 1.3	6.84E-02	NA	7.70E-02 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	2.43E-03	J	1.26E+00		ug/m3	47SA01	3/37	0.01 - 1.6	1.26E+00	NA	3.10E-01 C	NA	NA	YES	ASL
79-01-6	Trichloroethene	3.96E-04	L	1.55E-02		ug/m3	47SA12	8/37	0.01 - 1.3	1.55E-02	NA	1.60E-02 C	NA	NA	NO	BSL
75-01-4	Vinyl chloride	3.10E-04	L	6.20E-04	L	ug/m3	RI47SS04	5/37	0.01 - 1.3	6.20E-04	NA	7.20E-02 C	NA	NA	NO	BSL
91-57-6	2-Methylnaphthalene	1.52E-08	J	9.09E-08	J	ug/m3	RI47SS03	2/37	0.34 - 0.74	9.09E-08	NA	7.30E+00 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	1.39E-04	J	8.80E-03		ug/m3	IS47SS19	10/37	0.019 - 0.47	8.80E-03	NA	2.19E+01 N	NA	NA	NO	BSL
208-96-8	Acenaphthylene	1.44E-08		1.36E-07	J	ug/m3	47SA01	6/37	0.019 - 0.47	1.36E-07	NA	NA	NA	NA	NO	NTX
98-86-2	Acetophenone	9.07E-05	J	1.55E-04	J	ug/m3	IS47SS14 IS47SS22	8/9	0.37 - 0.74	1.55E-04	NA	7.82E+02 N	NA	NA	NO	BSL
120-12-7	Anthracene	3.76E-05		1.49E-03		ug/m3	RI47SS03	12/37	0.019 - 0.47	1.49E-03	NA	1.10E+02 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	7.12E-08	J	1.36E-07	J	ug/m3	IS47SS19	5/9	0.37 - 0.74	1.36E-07	NA	3.65E+01 N	NA	NA	NO	BSL
56-55-3	Benzo(a)anthracene	1.44E-08	J	1.67E-06		ug/m3	RI47SD02	25/37	0.019 - 0.47	1.67E-06	NA	8.58E-03 C	NA	NA	NO	BSL
50-32-8	Benzo(a)pyrene	1.44E-08	J	1.44E-06		ug/m3	RI47SD02	22/37	0.019 - 0.47	1.44E-06	NA	2.02E-03 C	NA	NA	NO	BSL
205-99-2	Benzo(b)fluoranthene	1.44E-08	J	3.48E-06		ug/m3	RI47SD02	27/37	0.019 - 2	3.48E-06	NA	8.58E-03 C	NA	NA	NO	BSL
191-24-2	Benzo(g,h,i)perylene	1.44E-08		2.12E-06		ug/m3	RI47SD02	21/37	0.019 - 2	2.12E-06	NA	1.10E+01 N	NA	NA	NO	BSL
207-08-9	Benzo(k)fluoranthene	1.44E-08	J	9.09E-07		ug/m3	RI47SD02	25/37	0.019 - 0.47	9.09E-07	NA	8.58E-02 C	NA	NA	NO	BSL
86-74-8	Carbazole	3.26E-08	J	3.41E-07		ug/m3	RI47SS03	11/37	0.088 - 0.74	3.41E-07	NA	3.13E-01 C	NA	NA	NO	BSL
218-01-9	Chrysene	1.67E-08	J	2.35E-06		ug/m3	IS47SS19	27/37	0.019 - 0.47	2.35E-06	NA	8.58E-01 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	2.80E-08	J	3.26E-07	J	ug/m3	IS47SS21	17/37	0.059 - 0.74	3.26E-07	NA	3.65E+01 N	NA	NA	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.44E-08		6.44E-07		ug/m3	RI47SD02	9/37	0.019 - 0.47	6.44E-07	NA	8.58E-04 C	NA	NA	NO	BSL
132-64-9	Dibenzofuran	1.52E-08	J	2.65E-07		ug/m3	RI47SS03	7/37	0.34 - 0.74	2.65E-07	NA	7.30E-01 N	NA	NA	NO	BSL
84-66-2	Diethylphthalate	3.11E-08	J	3.94E-07		ug/m3	IS47SS16	4/37	0.34 - 0.74	3.94E-07	NA	2.92E+02 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	7.58E-08	J	7.58E-08	J	ug/m3	RI47SS07	1/37	0.34 - 0.74	7.58E-08	NA	3.65E+03 N	NA	NA	NO	BSL

Table 2.7
Analytical Results of Constituents Detected in Soil Samples at Site 47
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
206-44-0	Fluoranthene	2.12E-08	J	1.74E-06		ug/m3	RI47SS03	30/37	0.019 - 0.47	1.74E-06	NA	1.46E+01 N	NA	NA	NO	BSL
86-73-7	Fluorene	7.13E-05	J	8.91E-03		ug/m3	IS47SS19	10/35	0.019 - 0.47	8.91E-03	NA	1.46E+01 N	NA	NA	NO	BSL
87-68-3	Hexachlorobutadiene	2.65E-07	J	5.38E-07		ug/m3	RI47SD01	2/37	0.34 - 0.74	5.38E-07	NA	7.30E-02 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	3.64E-08	J	3.64E-08	J	ug/m3	RI47SD02	1/37	0.34 - 0.74	3.64E-08	NA	3.65E-01 N	NA	NA	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.44E-08		1.97E-06		ug/m3	RI47SD02	20/37	0.019 - 0.47	1.97E-06	NA	8.58E-03 C	NA	NA	NO	BSL
91-20-3	Naphthalene	3.45E-04		2.00E-03	J	ug/m3	RI47SS03	6/37	0.019 - 0.47	2.00E-03	NA	3.29E-01 N	NA	NA	NO	BSL
87-86-5	Pentachlorophenol	6.52E-08	J	1.36E-07	J	ug/m3	RI47SD02	3/36	0.83 - 1.9	1.36E-07	NA	5.22E-02 C	NA	NA	NO	BSL
85-01-8	Phenanthrene	1.52E-08	J	2.50E-05		ug/m3	IS47SS19	27/37	0.023 - 1.85	2.50E-05	NA	1.10E+01 N	NA	NA	NO	BSL
129-00-0	Pyrene	1.59E-08	J	2.65E-06		ug/m3	IS47SS19	30/37	0.019 - 2	2.65E-06	NA	1.10E+01 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	5.08E-08	J	2.50E-06		ug/m3	IS47SS15	4/37	0.067 - 0.74	2.50E-06	NA	4.47E-01 C	NA	NA	NO	BSL
606-20-2	2,6-Dinitrotoluene	1.89E-07	J	1.89E-07	J	ug/m3	47SA12	1/37	0.23 - 0.74	1.89E-07	NA	3.65E-01 N	NA	NA	NO	BSL
9004-70-0	Nitrocellulose	4.44E-05		4.44E-05		ug/m3	RI47SS06	1/19	2.79 - 50.4	4.44E-05	NA	NA	NA	NA	NO	NTX
55-63-0	Nitroglycerin	6.89E-06		1.74E-05		ug/m3	RI47SS05	5/20	4.5 - 88	1.74E-05	NA	4.47E-01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	7.88E-04		1.73E-02		ug/m3	RI47SD01	37/37	1.83 - 2500	1.73E-02	NA	3.65E-01 N	NA	NA	NO	BSL
7440-36-0	Antimony	3.18E-07	UL	2.80E-06	J	ug/m3	IS47SS22	7/37	0.38 - 606	2.80E-06	NA	1.46E-01 N	NA	NA	NO	BSL
7440-38-2	Arsenic	5.38E-07	J	1.23E-05		ug/m3	IS47SS20P	26/37	0.46 - 2.01	1.23E-05	NA	4.15E-04 C	NA	NA	NO	BSL
7440-39-3	Barium	6.74E-06	J	6.95E-05		ug/m3	RI47SD01	24/37	0.03 - 6	6.95E-05	NA	5.11E-02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	2.27E-08	J	9.85E-07	J	ug/m3	IS47SS17	25/37	0.02 - 0.27	9.85E-07	NA	7.45E-04 C	NA	NA	NO	BSL
7440-43-9	Cadmium	5.30E-08	J	3.48E-06		ug/m3	47SA02D	22/37	0.05 - 1.3	3.48E-06	NA	9.94E-04 C	NA	NA	NO	BSL
7440-70-2	Calcium	5.43E-05	J	4.55E-03		ug/m3	RI47SS02	16/37	0.69 - 8.1	4.55E-03	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.20E-06		3.08E-05		ug/m3	RI47SD01	37/37	0.1 - 6	3.08E-05	NA	1.53E-04 C	NA	NA	NO	BSL
7440-48-4	Cobalt	4.24E-07	J	7.27E-06	J	ug/m3	IS47SS14	25/37	0.09 - 4	7.27E-06	NA	6.40E-04 N	NA	NA	NO	BSL
7440-50-8	Copper	1.44E-06	J	8.56E-05		ug/m3	RI47SD01	29/37	0.1 - 2.6	8.56E-05	NA	1.46E+01 N	NA	NA	NO	BSL
57-12-5	Cyanide	1.97E-07		2.58E-07		ug/m3	RI47SD03 RI47SS06	8/28	0.19 - 1.7	2.58E-07	NA	7.30E+00 N	NA	NA	NO	BSL
7439-89-6	Iron	6.50E-04		2.73E-02		ug/m3	RI47SD01	37/37	3.3 - 9.2	2.73E-02	NA	1.10E+02 N	NA	NA	NO	BSL
7439-92-1	Lead	3.86E-06	J	9.92E-04	K	ug/m3	RI47SS06	35/37	0.27 - 3.7	9.92E-04	NA	NA	NA	NA	NO	BSL
7439-95-4	Magnesium	1.30E-04	J	1.90E-03		ug/m3	IS47SS14	25/37	1.23 - 7.6	1.90E-03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.88E-06	J	3.17E-04		ug/m3	RI47SS02	37/37	0.03 - 6	3.17E-04	NA	5.22E-03 N	NA	NA	NO	BSL
7439-97-6	Mercury	6.06E-08		3.59E-05		ug/m3	RI47SS02	30/37	0.01 - 1.5	3.59E-05	NA	3.14E-02 N	NA	NA	NO	BSL
7440-02-0	Nickel	1.74E-06	J	2.24E-05		ug/m3	IS47SS14	18/37	0.22 - 4.1	2.24E-05	NA	7.30E+00 N	NA	NA	NO	BSL
7440-09-7	Potassium	1.05E-04	J	1.04E-03		ug/m3	RI47SD01	25/37	2.1 - 247	1.04E-03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.20E-07	J	6.17E-04		ug/m3	RI47SD01	27/37	0.12 - 1.3	6.17E-04	NA	1.83E+00 N	NA	NA	NO	BSL
7440-23-5	Sodium	2.46E-05	J	2.08E-04	J	ug/m3	RI47SD01	11/37	12.1 - 128	2.08E-04	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	2.05E-06		4.17E-05		ug/m3	RI47SD01	29/37	0.14 - 6	4.17E-05	NA	1.10E-01 N	NA	NA	NO	BSL
7440-66-6	Zinc	6.21E-06	J	5.77E-04		ug/m3	RI47SS02	21/37	0.19 - 13	5.77E-04	NA	1.10E+02 N	NA	NA	NO	BSL

Table 2.7

Analytical Results of Constituents Detected in Soil Samples at Site 47

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.
Minimum/Maximum detected concentrations in surface soil samples multiplied by 1/PEF for nonvolatiles
and 1/VF + 1/PEF (VF found in supplement t2.2A) for volatiles to get minimum and maximum concentration in air.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for ambient air, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.8
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	7.00E-01	J	6.30E+00		UG/L	RI47GW04	2/23	0.5 - 6300	6.30E+00	NA	3.17E+02 N	NA	NA	NO	BSL
79-34-5	1,1,2,2-Tetrachloroethane	5.00E-01	J	3.00E+00		UG/L	IS47MW040401	3/22	0.5 - 6300	3.00E+00	NA	5.27E-02 C	NA	NA	YES	ASL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	3.90E+00	J	3.90E+00	J	UG/L	IS47MW020401	1/8	0.5 - 6300	3.90E+00	NA	5.94E+03 N	NA	NA	NO	BSL
79-00-5	1,1,2-Trichloroethane	3.00E-01	J	3.40E+00		UG/L	RI47GW03 RI47GW99	2/23	0.5 - 6300	3.40E+00	NA	1.88E-01 C	NA	NA	YES	ASL
75-34-3	1,1-Dichloroethane	9.00E-01	J	1.68E+02	J	UG/L	RI47GW03	3/23	0.5 - 6300	1.68E+02	NA	7.98E+01 N	NA	NA	YES	ASL
75-35-4	1,1-Dichloroethene	1.00E-01	J	7.43E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.43E+02	NA	3.50E+01 N	NA	NA	YES	ASL
96-12-8	1,2-Dibromo-3-chloropropane	6.60E+00		6.60E+00		UG/L	RI47GW03	1/11	0.5 - 6300	6.60E+00	NA	4.16E-02 N	NA	NA	YES	ASL
107-06-2	1,2-Dichloroethane	1.50E+00		7.16E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.16E+02	NA	1.16E-01 C	NA	NA	YES	ASL
78-87-5	1,2-Dichloropropane	1.30E+00		1.30E+00		UG/L	RI47GW03	1/23	0.5 - 6300	1.30E+00	NA	1.55E-01 C	NA	NA	YES	ASL
78-93-3	2-Butanone	1.80E+00	J	2.10E+00	J	UG/L	IS47MW130902	2/8	5 - 6300	2.10E+00	NA	1.91E+02 N	NA	NA	NO	BSL
591-78-6	2-Hexanone	8.20E-01	J	2.10E+00	J	UG/L	RI47GW03	2/22	5 - 6300	2.10E+00	NA	1.46E+02 N	NA	NA	NO	BSL
108-10-1	4-Methyl-2-pentanone	1.08E+01		1.08E+01		UG/L	RI47GW03	1/22	5 - 6300	1.08E+01	NA	6.30E+02 N	NA	NA	NO	BSL
67-64-1	Acetone	2.30E+00	J	6.06E+03	L	UG/L	RI47GW03	7/13	5 - 6300	6.06E+03	NA	5.50E+02 N	NA	NA	YES	ASL
74-97-5	Bromochloromethane	1.80E-01	J	1.80E-01	J	UG/L	IS47MW120902	1/20	0.5 - 1	1.80E-01	NA	NA	NA	NA	NO	NTX
75-27-4	Bromodichloromethane	7.00E-01		4.30E+00		UG/L	RI47GW03	3/23	0.5 - 6300	4.30E+00	NA	1.70E-01 C	NA	NA	YES	ASL
74-83-9	Bromomethane	9.37E+02	J	9.37E+02	J	UG/L	RI47GW03	1/23	0.5 - 6300	9.37E+02	NA	8.52E-01 N	NA	NA	YES	ASL
75-15-0	Carbon disulfide	1.10E-01	J	6.62E+03	L	UG/L	RI47GW03	7/22	0.5 - 6300	6.62E+03	NA	1.04E+02 N	NA	NA	YES	ASL
56-23-5	Carbon tetrachloride	6.00E-01	J	2.86E+05	L	UG/L	RI47GW03	9/23	0.5 - 6300	2.86E+05	NA	1.62E-01 C	NA	NA	YES	ASL
75-00-3	Chloroethane	3.80E-01	J	2.62E+01	J	UG/L	RI47GW03	2/23	0.5 - 6300	2.62E+01	NA	3.64E+00 C	NA	NA	YES	ASL
67-66-3	Chloroform	4.30E-01	J	5.76E+04	L	UG/L	RI47GW03	10/23	0.5 - 6300	5.76E+04	NA	1.50E-01 C	NA	NA	YES	ASL
74-87-3	Chloromethane	1.10E+00		5.93E+04	J	UG/L	RI47GW03	2/23	0.5 - 6300	5.93E+04	NA	1.90E+01 C	NA	NA	YES	ASL
110-82-7	Cyclohexane	1.00E-01	J	1.00E-01	J	UG/L	IS47MW140902	1/7	0.5 - 6300	1.00E-01	NA	1.20E+03	NA	NA	NO	BSL
124-48-1	Dibromochloromethane	8.66E+01	J	8.66E+01	J	UG/L	RI47GW03	1/23	0.5 - 6300	8.66E+01	NA	1.26E-01 C	NA	NA	YES	ASL
74-84-0	Ethane	4.00E-02	J	7.00E-01	J	UG/L	IS47MW130902P	3/5	2 - 15	7.00E-01	NA	NA	NA	NA	NO	NTX
74-85-1	Ethene	6.00E-02	J	9.00E-01	J	UG/L	IS47MW130902P	2/5	2 - 15	9.00E-01	NA	NA	NA	NA	NO	NTX
74-82-8	Methane	4.00E-01	J	4.80E+01		UG/L	IS47MW150902	5/5	1 - 10	4.80E+01	NA	NA	NA	NA	NO	NTX
1634-04-4	Methyl-tert-butyl ether (MTBE)	2.10E+00		2.10E+00		UG/L	IS47MW150902	1/7	0.5 - 6300	2.10E+00	NA	2.60E+00 C	NA	NA	NO	BSL
75-09-2	Methylene chloride	1.50E+00	J	1.50E+00	J	UG/L	IS47MW050401	1/22	0.5 - 6300	1.50E+00	NA	4.10E+00 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	1.30E+00		1.40E+03		UG/L	IS47MW040401	10/23	0.5 - 6300	1.40E+03	NA	1.00E-01 C	NA	NA	YES	ASL
108-88-3	Toluene	2.50E+01		2.37E+02	J	UG/L	RI47GW99	2/22	0.5 - 6300	2.37E+02	NA	7.47E+01 N	NA	NA	YES	ASL
79-01-6	Trichloroethene	2.60E-01	J	3.39E+02		UG/L	RI47GW04	12/23	0.5 - 6300	3.39E+02	NA	2.60E-02 C	NA	NA	YES	ASL
75-01-4	Vinyl chloride	8.00E-01	J	2.82E+01	J	UG/L	RI47GW03	3/23	0.5 - 6300	2.82E+01	NA	1.50E-02 C	NA	NA	YES	ASL
1330-20-7	Xylene, total	3.00E-01	J	1.00E+00	J	UG/L	IS47MW090401	2/22	0.5 - 6300	1.00E+00	NA	2.10E+01 N	NA	NA	NO	BSL
156-59-2	cis-1,2-Dichloroethene	1.60E-01	J	1.45E+03	J	UG/L	RI47GW03	10/23	0.5 - 6300	1.45E+03	NA	6.08E+00 N	NA	NA	YES	ASL

Table 2.8
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
156-60-5	trans-1,2-Dichloroethene	6.00E-01	J	3.82E+02	J	UG/L	RI47GW03	5/23	0.5 - 6300	3.82E+02	NA	1.22E+01 N	NA	NA	YES	ASL
10061-02-6	trans-1,3-Dichloropropene	4.80E+00		4.80E+00		UG/L	RI47GW03	1/23	0.5 - 6300	4.80E+00	NA	4.36E-01 C	NA	NA	YES	ASL
91-57-6	2-Methylnaphthalene	1.50E+00	J	2.20E+00	J	UG/L	IS47MW410401	2/15	10 - 11	2.20E+00	NA	1.22E+01 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	1.30E+00	J	1.30E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.30E+00	NA	3.65E+01 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.20E+00	J	1.20E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.20E+00	NA	1.83E+02 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	1.90E+00	J	1.90E+00	J	UG/L	IS47MW040401	1/11	10 - 10	1.90E+00	NA	3.65E+02 N	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	3.70E+00	J	3.70E+00	J	UG/L	IS47MW060401	1/15	10 - 11	3.70E+00	NA	3.65E+02 N	NA	NA	NO	BSL
84-66-2	Diethylphthalate	2.00E+00	J	2.00E+00	J	UG/L	RI47GW03 RI47GW99	1/15	10 - 11	2.00E+00	NA	2.92E+03 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	3.00E+00	J	3.00E+00	J	UG/L	RI47GW03 RI47GW99	1/15	10 - 11	3.00E+00	NA	3.65E+04 N	NA	NA	NO	BSL
206-44-0	Fluoranthene	1.40E+00	J	1.40E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.40E+00	NA	1.46E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	1.40E+00	J	1.40E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.40E+00	NA	2.43E+01 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	5.80E+01		5.80E+01		UG/L	RI47GW03	1/15	10 - 11	5.80E+01	NA	3.65E+00 N	NA	NA	YES	ASL
91-20-3	Naphthalene	2.50E+00	J	5.50E+00	J	UG/L	IS47MW410401	3/15	10 - 11	5.50E+00	NA	6.51E-01 N	NA	NA	YES	ASL
87-86-5	Pentachlorophenol	4.00E+00	J	4.00E+00	J	UG/L	RI47GW03	1/15	25 - 29	4.00E+00	NA	5.58E-01 C	NA	NA	YES	ASL
85-01-8	Phenanthrene	1.10E+00	J	4.30E+00	J	UG/L	IS47MW070401	3/15	10 - 11	4.30E+00	NA	1.83E+01 N	NA	NA	NO	BSL
108-95-2	Phenol	1.30E+01		2.10E+01		UG/L	RI47GW04	2/15	10 - 11	2.10E+01	NA	2.19E+03 N	NA	NA	NO	BSL
129-00-0	Pyrene	1.30E+00	J	1.90E+00	J	UG/L	IS47MW070401	2/15	10 - 11	1.90E+00	NA	1.83E+01 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.20E+00	J	5.10E+00	J	UG/L	IS47MW070401	4/15	10 - 11	5.10E+00	NA	4.78E+00 C	NA	NA	YES	ASL
556-88-7	Nitroguanidine	3.74E+01		3.74E+01		UG/L	RI47GW03	1/15	5 - 240	3.74E+01	NA	3.65E+02 N	NA	NA	NO	BSL
57-12-5	Cyanide	1.37E+02		2.32E+04		UG/L	IS47MW070401	6/11	10 - 10	2.32E+04	NA	7.30E+01 N	NA	NA	YES	ASL
7429-90-5	Aluminum	4.91E+01	J	2.70E+04		UG/L	RI47GW03	13/15	32.2 - 38.2	2.70E+04	NA	3.65E+03 N	NA	NA	YES	ASL
7440-36-0	Antimony	5.30E+00	J	1.00E+01	J	UG/L	IS47MW060401	4/15	2.07 - 2.7	1.00E+01	NA	1.46E+00 N	NA	NA	YES	ASL
7440-38-2	Arsenic	3.70E+00	J	1.06E+02		UG/L	RI47GW99	8/15	2 - 3.33	1.06E+02	NA	4.46E-02 C	NA	NA	YES	ASL
7440-39-3	Barium	4.80E+00	J	3.31E+02		UG/L	RI47GW03	15/15	0.2 - 1.7	3.31E+02	NA	2.56E+02 N	NA	NA	YES	ASL
7440-41-7	Beryllium	1.60E-01	J	1.45E+01		UG/L	RI47GW99	8/15	0.1 - 0.1	1.45E+01	NA	7.30E+00 N	NA	NA	YES	ASL
7440-43-9	Cadmium	4.40E-01	J	5.70E+00		UG/L	RI47GW03 RI47GW99	6/15	0.3 - 0.3	5.70E+00	NA	1.83E+00 N	NA	NA	YES	ASL
7440-70-2	Calcium	2.79E+03	J	3.63E+04		UG/L	RI47GW02	15/15	41.6 - 57.9	3.63E+04	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	9.00E-01	J	2.25E+01		UG/L	IS47MW020401	11/15	0.46 - 1.1	2.25E+01	NA	1.10E+01 N	NA	NA	YES	ASL
7440-48-4	Cobalt	3.60E+00	J	2.83E+02		UG/L	RI47GW99	13/15	0.5 - 1.6	2.83E+02	NA	7.30E+01 N	NA	NA	YES	ASL
7440-50-8	Copper	8.40E-01	J	7.99E+01		UG/L	IS47MW410401	8/15	1.1 - 1.79	7.99E+01	NA	1.46E+02 N	NA	NA	NO	BSL
7439-89-6	Iron	3.92E+01	J	9.92E+04		UG/L	RI47GW99	15/15	17.7 - 30.8	9.92E+04	NA	1.10E+03 N	NA	NA	YES	ASL
7439-92-1	Lead	1.40E+00	J	3.49E+01		UG/L	RI47GW99	5/15	1 - 2.5	3.49E+01	NA	1.50E+01	NA	NA	YES	ASL
7439-95-4	Magnesium	1.32E+03	J	1.73E+04		UG/L	RI47GW99	15/15	24.3 - 28.47	1.73E+04	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.46E+01		8.70E+02		UG/L	RI47GW99	15/15	0.2 - 0.3	8.70E+02	NA	7.30E+01 N	NA	NA	YES	ASL
7440-02-0	Nickel	2.20E+00	J	2.46E+02		UG/L	RI47GW99	14/15	0.9 - 1.32	2.46E+02	NA	7.30E+01 N	NA	NA	YES	ASL
09/07/7440	Potassium	1.18E+03	J	5.27E+03		UG/L	IS47MW010401	15/15	13.5 - 22.36	5.27E+03	NA	NA	NA	NA	NO	NUT

Table 2.8

Analytical Results of Constituents Detected in Groundwater Samples

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-23-5	Sodium	4.11E+03	J	7.86E+04		UG/L	IS47MW060401	15/15	17.17 - 148	7.86E+04	NA	NA	NA	NA	NO	NUT
7440-28-0	Thallium	3.00E+00	J	3.70E+00	J	UG/L	RI47GW04	3/15	3.2 - 9.47	3.70E+00	NA	2.56E-01 N	NA	NA	YES	ASL
7440-62-2	Vanadium	1.10E+00	J	3.27E+02		UG/L	RI47GW99	12/15	0.6 - 1.01	3.27E+02	NA	1.10E+00 N	NA	NA	YES	ASL
7440-66-6	Zinc	2.34E+01		6.73E+02		UG/L	RI47GW03	14/15	1.7 - 1.9	6.73E+02	NA	1.10E+03 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations. Filtered groundwater data.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for tap water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for 1,3-dichloropropene used for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/l, the safe drinking water act action level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.9
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer-Shallow groundwater beneath disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	7.00E-01	J	6.30E+00		UG/L	RI47GW04	2/23	0.5 - 6300	6.30E+00	NA	3.17E+02 N	NA	NA	NO	BSL
79-34-5	1,1,2,2-Tetrachloroethane	5.00E-01	J	3.00E+00		UG/L	IS47MW040401	3/22	0.5 - 6300	3.00E+00	NA	5.27E-02 C	NA	NA	YES	ASL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroetha	3.90E+00	J	3.90E+00	J	UG/L	IS47MW020401	1/8	0.5 - 6300	3.90E+00	NA	5.94E+03 N	NA	NA	NO	BSL
79-00-5	1,1,2-Trichloroethane	3.00E-01	J	3.40E+00		UG/L	RI47GW03 RI47GW99	2/23	0.5 - 6300	3.40E+00	NA	1.88E-01 C	NA	NA	YES	ASL
75-34-3	1,1-Dichloroethane	9.00E-01	J	1.68E+02	J	UG/L	RI47GW03	3/23	0.5 - 6300	1.68E+02	NA	7.98E+01 N	NA	NA	YES	ASL
75-35-4	1,1-Dichloroethene	1.00E-01	J	7.43E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.43E+02	NA	3.50E+01 N	NA	NA	YES	ASL
96-12-8	1,2-Dibromo-3-chloropropane	6.60E+00		6.60E+00		UG/L	RI47GW03	1/11	0.5 - 6300	6.60E+00	NA	4.16E-02 N	NA	NA	YES	ASL
107-06-2	1,2-Dichloroethane	1.50E+00		7.16E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.16E+02	NA	1.16E-01 C	NA	NA	YES	ASL
78-87-5	1,2-Dichloropropane	1.30E+00		1.30E+00		UG/L	RI47GW03	1/23	0.5 - 6300	1.30E+00	NA	1.55E-01 C	NA	NA	YES	ASL
78-93-3	2-Butanone	1.80E+00	J	2.10E+00	J	UG/L	IS47MW130902	2/8	5 - 6300	2.10E+00	NA	1.91E+02 N	NA	NA	NO	BSL
591-78-6	2-Hexanone	8.20E-01	J	2.10E+00	J	UG/L	RI47GW03	2/22	5 - 6300	2.10E+00	NA	1.46E+02 N	NA	NA	NO	BSL
108-10-1	4-Methyl-2-pentanone	1.08E+01		1.08E+01		UG/L	RI47GW03	1/22	5 - 6300	1.08E+01	NA	6.30E+02 N	NA	NA	NO	BSL
67-64-1	Acetone	2.30E+00	J	6.06E+03	L	UG/L	RI47GW03	7/13	5 - 6300	6.06E+03	NA	5.50E+02 N	NA	NA	YES	ASL
74-97-5	Bromochloromethane	1.80E-01	J	1.80E-01	J	UG/L	IS47MW120902	1/20	0.5 - 1	1.80E-01	NA	NA	NA	NA	NO	NTX
75-27-4	Bromodichloromethane	7.00E-01		4.30E+00		UG/L	RI47GW03	3/23	0.5 - 6300	4.30E+00	NA	1.70E-01 C	NA	NA	YES	ASL
74-83-9	Bromomethane	9.37E+02	J	9.37E+02	J	UG/L	RI47GW03	1/23	0.5 - 6300	9.37E+02	NA	8.52E-01 N	NA	NA	YES	ASL
75-15-0	Carbon disulfide	1.10E-01	J	6.62E+03	L	UG/L	RI47GW03	7/22	0.5 - 6300	6.62E+03	NA	1.04E+02 N	NA	NA	YES	ASL
56-23-5	Carbon tetrachloride	6.00E-01	J	2.86E+05	L	UG/L	RI47GW03	9/23	0.5 - 6300	2.86E+05	NA	1.62E-01 C	NA	NA	YES	ASL
75-00-3	Chloroethane	3.80E-01	J	2.62E+01	J	UG/L	RI47GW03	2/23	0.5 - 6300	2.62E+01	NA	3.64E+00 C	NA	NA	YES	ASL
67-66-3	Chloroform	4.30E-01	J	5.76E+04	L	UG/L	RI47GW03	10/23	0.5 - 6300	5.76E+04	NA	1.50E-01 C	NA	NA	YES	ASL
74-87-3	Chloromethane	1.10E+00		5.93E+04	J	UG/L	RI47GW03	2/23	0.5 - 6300	5.93E+04	NA	1.90E+01 N	NA	NA	YES	ASL
110-82-7	Cyclohexane	1.00E-01	J	1.00E-01	J	UG/L	IS47MW140902	1/7	0.5 - 6300	1.00E-01	NA	1.20E+03	NA	NA	NO	BSL
124-48-1	Dibromochloromethane	8.66E+01	J	8.66E+01	J	UG/L	RI47GW03	1/23	0.5 - 6300	8.66E+01	NA	1.26E-01 C	NA	NA	YES	ASL
74-84-0	Ethane	4.00E-02	J	7.00E-01	J	UG/L	IS47MW130902P	3/5	2 - 15	7.00E-01	NA	NA	NA	NA	NO	NTX
74-85-1	Ethene	6.00E-02	J	9.00E-01	J	UG/L	IS47MW130902P	2/5	2 - 15	9.00E-01	NA	NA	NA	NA	NO	NTX
74-82-8	Methane	4.00E-01	J	4.80E+01		UG/L	IS47MW150902	5/5	1 - 10	4.80E+01	NA	NA	NA	NA	NO	NTX
1634-04-4	Methyl-tert-butyl ether (MTBE)	2.10E+00		2.10E+00		UG/L	IS47MW150902	1/7	0.5 - 6300	2.10E+00	NA	2.60E+00 C	NA	NA	NO	BSL
75-09-2	Methylene chloride	1.50E+00	J	1.50E+00	J	UG/L	IS47MW050401	1/22	0.5 - 6300	1.50E+00	NA	4.10E+00 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	1.30E+00		1.40E+03		UG/L	IS47MW040401	10/23	0.5 - 6300	1.40E+03	NA	1.00E-01 C	NA	NA	YES	ASL
108-88-3	Toluene	2.50E+01		2.37E+02	J	UG/L	RI47GW99	2/22	0.5 - 6300	2.37E+02	NA	7.47E+01 N	NA	NA	YES	ASL
79-01-6	Trichloroethene	2.60E-01	J	3.39E+02		UG/L	RI47GW04	12/23	0.5 - 6300	3.39E+02	NA	2.60E-02 C	NA	NA	YES	ASL
75-01-4	Vinyl chloride	8.00E-01	J	2.82E+01	J	UG/L	RI47GW03	3/23	0.5 - 6300	2.82E+01	NA	1.50E-02 C	NA	NA	YES	ASL
1330-20-7	Xylene, total	3.00E-01	J	1.00E+00	J	UG/L	IS47MW090401	2/22	0.5 - 6300	1.00E+00	NA	2.10E+01 N	NA	NA	NO	BSL
156-59-2	cis-1,2-Dichloroethene	1.60E-01	J	1.45E+03	J	UG/L	RI47GW03	10/23	0.5 - 6300	1.45E+03	NA	6.08E+00 N	NA	NA	YES	ASL

Table 2.9
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer-Shallow groundwater beneath disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
156-60-5	trans-1,2-Dichloroethene	6.00E-01	J	3.82E+02	J	UG/L	RI47GW03	5/23	0.5 - 6300	3.82E+02	NA	1.22E+01 N	NA	NA	YES	ASL
10061-02-6	trans-1,3-Dichloropropene	4.80E+00		4.80E+00		UG/L	RI47GW03	1/23	0.5 - 6300	4.80E+00	NA	4.36E-01 C	NA	NA	YES	ASL
91-57-6	2-Methylnaphthalene	1.50E+00	J	2.20E+00	J	UG/L	IS47MW410401	2/15	10 - 11	2.20E+00	NA	1.22E+01 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	1.30E+00	J	1.30E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.30E+00	NA	3.65E+01 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.20E+00	J	1.20E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.20E+00	NA	1.83E+02 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	1.90E+00	J	1.90E+00	J	UG/L	IS47MW040401	1/11	10 - 10	1.90E+00	NA	3.65E+02 N	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	3.70E+00	J	3.70E+00	J	UG/L	IS47MW060401	1/15	10 - 11	3.70E+00	NA	3.65E+02 N	NA	NA	NO	BSL
84-66-2	Diethylphthalate	2.00E+00	J	2.00E+00	J	UG/L	RI47GW03 RI47GW99	1/15	10 - 11	2.00E+00	NA	2.92E+03 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	3.00E+00	J	3.00E+00	J	UG/L	RI47GW03 RI47GW99	1/15	10 - 11	3.00E+00	NA	3.65E+04 N	NA	NA	NO	BSL
206-44-0	Fluoranthene	1.40E+00	J	1.40E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.40E+00	NA	1.46E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	1.40E+00	J	1.40E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.40E+00	NA	2.43E+01 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	5.80E+01		5.80E+01		UG/L	RI47GW03	1/15	10 - 11	5.80E+01	NA	3.65E+00 N	NA	NA	YES	ASL
91-20-3	Naphthalene	2.50E+00	J	5.50E+00	J	UG/L	IS47MW410401	3/15	10 - 11	5.50E+00	NA	6.51E-01 N	NA	NA	YES	ASL
87-86-5	Pentachlorophenol	4.00E+00	J	4.00E+00	J	UG/L	RI47GW03	1/15	25 - 29	4.00E+00	NA	5.58E-01 C	NA	NA	YES	ASL
85-01-8	Phenanthrene	1.10E+00	J	4.30E+00	J	UG/L	IS47MW070401	3/15	10 - 11	4.30E+00	NA	1.83E+01 N	NA	NA	NO	BSL
108-95-2	Phenol	1.30E+01		2.10E+01		UG/L	RI47GW04	2/15	10 - 11	2.10E+01	NA	2.19E+03 N	NA	NA	NO	BSL
129-00-0	Pyrene	1.30E+00	J	1.90E+00	J	UG/L	IS47MW070401	2/15	10 - 11	1.90E+00	NA	1.83E+01 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.20E+00	J	5.10E+00	J	UG/L	IS47MW070401	4/15	10 - 11	5.10E+00	NA	4.78E+00 C	NA	NA	YES	ASL
556-88-7	Nitroguanidine	3.74E+01		3.74E+01		UG/L	RI47GW03	1/15	5 - 240	3.74E+01	NA	3.65E+02 N	NA	NA	NO	BSL
7429-90-5	Aluminum	7.76E+01		2.71E+04		UG/L	RI47GW03	13/15	32.2 - 38.2	2.71E+04	NA	3.65E+03 N	NA	NA	YES	ASL
7440-38-2	Arsenic	3.00E+00		1.08E+02		UG/L	RI47GW03	8/15	2 - 3.33	1.08E+02	NA	4.46E-02 C	NA	NA	YES	ASL
7440-39-3	Barium	3.50E+00		3.46E+02		UG/L	IS47MW060401	15/15	0.2 - 1.7	3.46E+02	NA	2.56E+02 N	NA	NA	YES	ASL
7440-41-7	Beryllium	2.50E-01		1.45E+01		UG/L	RI47GW99	9/15	0.1 - 0.1	1.45E+01	NA	7.30E+00 N	NA	NA	YES	ASL
7440-43-9	Cadmium	4.10E-01		5.60E+00		UG/L	RI47GW03	12/15	0.3 - 0.3	5.60E+00	NA	1.83E+00 N	NA	NA	YES	ASL
7440-70-2	Calcium	2.57E+03		3.64E+04		UG/L	RI47GW02	15/15	41.6 - 57.9	3.64E+04	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	1.50E+00		2.84E+01		UG/L	RI47GW04	8/15	0.46 - 1.1	2.84E+01	NA	1.10E+01 N	NA	NA	YES	ASL
7440-48-4	Cobalt	2.30E+00		2.82E+02		UG/L	RI47GW03	14/15	0.5 - 1.6	2.82E+02	NA	7.30E+01 N	NA	NA	YES	ASL
7440-50-8	Copper	1.40E+00		3.89E+01		UG/L	RI47GW03	9/15	1.1 - 1.79	3.89E+01	NA	1.46E+02 N	NA	NA	NO	BSL
57-12-5	Cyanide	1.37E+02		2.32E+04		UG/L	IS47MW070401	6/11	10 - 10	2.32E+04	NA	7.30E+01 N	NA	NA	YES	ASL
7439-89-6	Iron	5.48E+02		9.93E+04		UG/L	RI47GW03	15/15	17.7 - 30.8	9.93E+04	NA	1.10E+03 N	NA	NA	YES	ASL
7439-92-1	Lead	6.50E+00		3.50E+01		UG/L	RI47GW03	5/15	1 - 2.5	3.50E+01	NA	1.50E+01	NA	NA	YES	ASL
7439-95-4	Magnesium	1.18E+03		1.73E+04		UG/L	RI47GW99	15/15	24.3 - 28.47	1.73E+04	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.50E+01		8.69E+02		UG/L	RI47GW03	15/15	0.2 - 0.3	8.69E+02	NA	7.30E+01 N	NA	NA	YES	ASL
7439-97-6	Mercury	2.00E-01	L	2.90E-01	L	UG/L	IS47MW020401	3/6	0.1 - 0.2	2.90E-01	NA	1.10E+00 N	NA	NA	NO	BSL
7440-02-0	Nickel	2.10E+00	L	2.49E+02	L	UG/L	RI47GW03	14/15	0.9 - 1.32	2.49E+02	NA	7.30E+01 N	NA	NA	YES	ASL

Table 2.9
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer-Shallow groundwater beneath disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
09/07/7440	Potassium	8.36E+02	L	5.07E+03	L	UG/L	RI47GW01	15/15	13.5 - 22.36	5.07E+03	NA	NA	NA	NA	NO	NUT
7440-23-5	Sodium	3.27E+03	L	1.02E+05	L	UG/L	IS47MW060401	15/15	17.17 - 148	1.02E+05	NA	NA	NA	NA	NO	NUT
7440-28-0	Thallium	3.60E+00	L	6.50E+00	L	UG/L	IS47MW040401	4/15	3.2 - 9.47	6.50E+00	NA	2.56E-01 N	NA	NA	YES	ASL
7440-62-2	Vanadium	1.20E+00	L	3.26E+02	L	UG/L	RI47GW03	4/15	0.6 - 1.01	3.26E+02	NA	2.56E+01 N	NA	NA	YES	ASL
7440-66-6	Zinc	3.06E+01	L	6.55E+02	L	UG/L	RI47GW03	14/15	1.7 - 1.9	6.55E+02	NA	1.10E+03 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations. Unfiltered groundwater data.
[2] Maximum concentration is used for screening.
[3] 7
[4] Risk-Based Concentration Table for tap water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for 1,3-dichloropropene used for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
RBC value for pyrene used as surrogate for phenanthrene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 15 ug/l, the safe drinking water act action level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.10
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Water Vapors at Showerhead

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	7.00E-01	J	6.30E+00		UG/L	RI47GW04	2/23	0.5 - 6300	6.30E+00	NA	3.17E+02 N	NA	NA	NO	BSL
79-34-5	1,1,2,2-Tetrachloroethane	5.00E-01	J	3.00E+00		UG/L	IS47MW040401	3/22	0.5 - 6300	3.00E+00	NA	5.27E-02 C	NA	NA	YES	ASL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethan	3.90E+00	J	3.90E+00	J	UG/L	IS47MW020401	1/8	0.5 - 6300	3.90E+00	NA	5.94E+03 N	NA	NA	NO	BSL
79-00-5	1,1,2-Trichloroethane	3.00E-01	J	3.40E+00		UG/L	RI47GW03 RI47GW99	2/23	0.5 - 6300	3.40E+00	NA	1.88E-01 C	NA	NA	YES	ASL
75-34-3	1,1-Dichloroethane	9.00E-01	J	1.68E+02	J	UG/L	RI47GW03	3/23	0.5 - 6300	1.68E+02	NA	7.98E+01 N	NA	NA	YES	ASL
75-35-4	1,1-Dichloroethene	1.00E-01	J	7.43E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.43E+02	NA	3.50E+01 N	NA	NA	YES	ASL
96-12-8	1,2-Dibromo-3-chloropropane	6.60E+00		6.60E+00		UG/L	RI47GW03	1/11	0.5 - 6300	6.60E+00	NA	4.16E-02 N	NA	NA	YES	ASL
107-06-2	1,2-Dichloroethane	1.50E+00		7.16E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.16E+02	NA	1.16E-01 C	NA	NA	YES	ASL
78-87-5	1,2-Dichloropropane	1.30E+00		1.30E+00		UG/L	RI47GW03	1/23	0.5 - 6300	1.30E+00	NA	1.55E-01 C	NA	NA	YES	ASL
78-93-3	2-Butanone	1.80E+00	J	2.10E+00	J	UG/L	IS47MW130902	2/8	5 - 6300	2.10E+00	NA	1.91E+02 N	NA	NA	NO	BSL
591-78-6	2-Hexanone	8.20E-01	J	2.10E+00	J	UG/L	RI47GW03	2/22	5 - 6300	2.10E+00	NA	1.46E+02 N	NA	NA	NO	BSL
108-10-1	4-Methyl-2-pentanone	1.08E+01		1.08E+01		UG/L	RI47GW03	1/22	5 - 6300	1.08E+01	NA	6.30E+02 N	NA	NA	NO	BSL
67-64-1	Acetone	2.30E+00	J	6.06E+03	L	UG/L	RI47GW03	7/13	5 - 6300	6.06E+03	NA	5.50E+02 N	NA	NA	YES	ASL
74-97-5	Bromochloromethane	1.80E-01	J	1.80E-01	J	UG/L	IS47MW120902	1/20	0.5 - 1	1.80E-01	NA	NA	NA	NA	NO	NTX
75-27-4	Bromodichloromethane	7.00E-01		4.30E+00		UG/L	RI47GW03	3/23	0.5 - 6300	4.30E+00	NA	1.70E-01 C	NA	NA	YES	ASL
74-83-9	Bromomethane	9.37E+02	J	9.37E+02	J	UG/L	RI47GW03	1/23	0.5 - 6300	9.37E+02	NA	8.52E-01 N	NA	NA	YES	ASL
75-15-0	Carbon disulfide	1.10E-01	J	6.62E+03	L	UG/L	RI47GW03	7/22	0.5 - 6300	6.62E+03	NA	1.04E+02 N	NA	NA	YES	ASL
56-23-5	Carbon tetrachloride	6.00E-01	J	2.86E+05	L	UG/L	RI47GW03	9/23	0.5 - 6300	2.86E+05	NA	1.62E-01 C	NA	NA	YES	ASL
75-00-3	Chloroethane	3.80E-01	J	2.62E+01	J	UG/L	RI47GW03	2/23	0.5 - 6300	2.62E+01	NA	3.64E+00 C	NA	NA	YES	ASL
67-66-3	Chloroform	4.30E-01	J	5.76E+04	L	UG/L	RI47GW03	10/23	0.5 - 6300	5.76E+04	NA	1.50E-01 C	NA	NA	YES	ASL
74-87-3	Chloromethane	1.10E+00		5.93E+04	J	UG/L	RI47GW03	2/23	0.5 - 6300	5.93E+04	NA	1.90E+01 C	NA	NA	YES	ASL
110-82-7	Cyclohexane	1.00E-01	J	1.00E-01	J	UG/L	IS47MW140902	1/7	0.5 - 6300	1.00E-01	NA	1.20E+03	NA	NA	NO	BSL
124-48-1	Dibromochloromethane	8.66E+01	J	8.66E+01	J	UG/L	RI47GW03	1/23	0.5 - 6300	8.66E+01	NA	1.26E-01 C	NA	NA	YES	ASL
74-84-0	Ethane	4.00E-02	J	7.00E-01	J	UG/L	IS47MW130902P	3/5	2 - 15	7.00E-01	NA	NA	NA	NA	NO	NTX
74-85-1	Ethene	6.00E-02	J	9.00E-01	J	UG/L	IS47MW130902P	2/5	2 - 15	9.00E-01	NA	NA	NA	NA	NO	NTX
74-82-8	Methane	4.00E-01	J	4.80E+01		UG/L	IS47MW150902	5/5	1 - 10	4.80E+01	NA	NA	NA	NA	NO	NTX
1634-04-4	Methyl-tert-butyl ether (MTBE)	2.10E+00		2.10E+00		UG/L	IS47MW150902	1/7	0.5 - 6300	2.10E+00	NA	2.60E+00 C	NA	NA	NO	BSL
75-09-2	Methylene chloride	1.50E+00	J	1.50E+00	J	UG/L	IS47MW050401	1/22	0.5 - 6300	1.50E+00	NA	4.10E+00 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	1.30E+00		1.40E+03		UG/L	IS47MW040401	10/23	0.5 - 6300	1.40E+03	NA	1.00E-01 C	NA	NA	YES	ASL
108-88-3	Toluene	2.50E+01		2.37E+02	J	UG/L	RI47GW99	2/22	0.5 - 6300	2.37E+02	NA	7.47E+01 N	NA	NA	YES	ASL
79-01-6	Trichloroethene	2.60E-01	J	3.39E+02		UG/L	RI47GW04	12/23	0.5 - 6300	3.39E+02	NA	2.60E-02 C	NA	NA	YES	ASL
75-01-4	Vinyl chloride	8.00E-01	J	2.82E+01	J	UG/L	RI47GW03	3/23	0.5 - 6300	2.82E+01	NA	1.50E-02 C	NA	NA	YES	ASL
1330-20-7	Xylene, total	3.00E-01	J	1.00E+00	J	UG/L	IS47MW090401	2/22	0.5 - 6300	1.00E+00	NA	1.22E+03 N	NA	NA	NO	BSL
156-59-2	cis-1,2-Dichloroethene	1.60E-01	J	1.45E+03	J	UG/L	RI47GW03	10/23	0.5 - 6300	1.45E+03	NA	6.08E+00 N	NA	NA	YES	ASL

Table 2.10
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Water Vapors at Showerhead

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
156-60-5	trans-1,2-Dichloroethene	6.00E-01	J	3.82E+02	J	UG/L	RI47GW03	5/23	0.5 - 6300	3.82E+02	NA	1.22E+01 N	NA	NA	YES	ASL
10061-02-6	trans-1,3-Dichloropropene	4.80E+00		4.80E+00		UG/L	RI47GW03	1/23	0.5 - 6300	4.80E+00	NA	4.36E-01 C	NA	NA	YES	ASL
91-57-6	2-Methylnaphthalene	1.50E+00	J	2.20E+00	J	UG/L	IS47MW410401	2/15	10 - 11	2.20E+00	NA	1.22E+01 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	1.30E+00	J	1.30E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.30E+00	NA	3.65E+01 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.20E+00	J	1.20E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.20E+00	NA	1.83E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	1.40E+00	J	1.40E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.40E+00	NA	2.43E+01 N	NA	NA	NO	BSL
91-20-3	Naphthalene	2.50E+00	J	5.50E+00	J	UG/L	IS47MW410401	3/15	10 - 11	5.50E+00	NA	6.51E-01 N	NA	NA	YES	ASL
129-00-0	Pyrene	1.30E+00	J	1.90E+00	J	UG/L	IS47MW070401	2/15	10 - 11	1.90E+00	NA	1.83E+01 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for tap water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for 1,3-dichloropropene used for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.11
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Volatilization from open excavation

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	7.00E-01	J	6.30E+00		UG/L	RI47GW04	2/23	0.5 - 6300	6.30E+00	NA	3.17E+02 N	NA	NA	NO	BSL
79-34-5	1,1,2,2-Tetrachloroethane	5.00E-01	J	3.00E+00		UG/L	IS47MW040401	3/22	0.5 - 6300	3.00E+00	NA	5.27E-02 C	NA	NA	YES	ASL
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroeth	3.90E+00	J	3.90E+00	J	UG/L	IS47MW020401	1/8	0.5 - 6300	3.90E+00	NA	5.94E+03 N	NA	NA	NO	BSL
79-00-5	1,1,2-Trichloroethane	3.00E-01	J	3.40E+00		UG/L	RI47GW03 RI47GW99	2/23	0.5 - 6300	3.40E+00	NA	1.88E-01 C	NA	NA	YES	ASL
75-34-3	1,1-Dichloroethane	9.00E-01	J	1.68E+02	J	UG/L	RI47GW03	3/23	0.5 - 6300	1.68E+02	NA	7.98E+01 N	NA	NA	YES	ASL
75-35-4	1,1-Dichloroethene	1.00E-01	J	7.43E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.43E+02	NA	3.50E+01 N	NA	NA	YES	ASL
96-12-8	1,2-Dibromo-3-chloropropane	6.60E+00		6.60E+00		UG/L	RI47GW03	1/11	0.5 - 6300	6.60E+00	NA	4.16E-02 N	NA	NA	YES	ASL
107-06-2	1,2-Dichloroethane	1.50E+00		7.16E+02	J	UG/L	RI47GW03	7/23	0.5 - 6300	7.16E+02	NA	1.16E-01 C	NA	NA	YES	ASL
78-87-5	1,2-Dichloropropane	1.30E+00		1.30E+00		UG/L	RI47GW03	1/23	0.5 - 6300	1.30E+00	NA	1.55E-01 C	NA	NA	YES	ASL
78-93-3	2-Butanone	1.80E+00	J	2.10E+00	J	UG/L	IS47MW130902	2/8	5 - 6300	2.10E+00	NA	1.91E+02 N	NA	NA	NO	BSL
591-78-6	2-Hexanone	8.20E-01	J	2.10E+00	J	UG/L	RI47GW03	2/22	5 - 6300	2.10E+00	NA	1.46E+02 N	NA	NA	NO	BSL
108-10-1	4-Methyl-2-pentanone	1.08E+01		1.08E+01		UG/L	RI47GW03	1/22	5 - 6300	1.08E+01	NA	1.39E+01 N	NA	NA	NO	BSL
67-64-1	Acetone	2.30E+00	J	6.06E+03	L	UG/L	RI47GW03	7/13	5 - 6300	6.06E+03	NA	5.50E+02 N	NA	NA	YES	ASL
74-97-5	Bromochloromethane	1.80E-01	J	1.80E-01	J	UG/L	IS47MW120902	1/20	0.5 - 1	1.80E-01	NA	NA	NA	NA	NO	NTX
75-27-4	Bromodichloromethane	7.00E-01		4.30E+00		UG/L	RI47GW03	3/23	0.5 - 6300	4.30E+00	NA	1.70E-01 C	NA	NA	YES	ASL
74-83-9	Bromomethane	9.37E+02	J	9.37E+02	J	UG/L	RI47GW03	1/23	0.5 - 6300	9.37E+02	NA	8.52E-01 N	NA	NA	YES	ASL
75-15-0	Carbon disulfide	1.10E-01	J	6.62E+03	L	UG/L	RI47GW03	7/22	0.5 - 6300	6.62E+03	NA	1.04E+02 N	NA	NA	YES	ASL
56-23-5	Carbon tetrachloride	6.00E-01	J	2.86E+05	L	UG/L	RI47GW03	9/23	0.5 - 6300	2.86E+05	NA	1.62E-01 C	NA	NA	YES	ASL
75-00-3	Chloroethane	3.80E-01	J	2.62E+01	J	UG/L	RI47GW03	2/23	0.5 - 6300	2.62E+01	NA	3.64E+00 C	NA	NA	YES	ASL
67-66-3	Chloroform	4.30E-01	J	5.76E+04	L	UG/L	RI47GW03	10/23	0.5 - 6300	5.76E+04	NA	1.50E-01 C	NA	NA	YES	ASL
74-87-3	Chloromethane	1.10E+00		5.93E+04	J	UG/L	RI47GW03	2/23	0.5 - 6300	5.93E+04	NA	1.90E+01 N	NA	NA	YES	ASL
110-82-7	Cyclohexane	1.00E-01	J	1.00E-01	J	UG/L	IS47MW140902	1/7	0.5 - 6300	1.00E-01	NA	1.20E+03	NA	NA	NO	BSL
124-48-1	Dibromochloromethane	8.66E+01	J	8.66E+01	J	UG/L	RI47GW03	1/23	0.5 - 6300	8.66E+01	NA	1.26E-01 C	NA	NA	YES	ASL
74-84-0	Ethane	4.00E-02	J	7.00E-01	J	UG/L	IS47MW130902P	3/5	2 - 15	7.00E-01	NA	NA	NA	NA	NO	NTX
74-85-1	Ethene	6.00E-02	J	9.00E-01	J	UG/L	IS47MW130902P	2/5	2 - 15	9.00E-01	NA	NA	NA	NA	NO	NTX
74-82-8	Methane	4.00E-01	J	4.80E+01		UG/L	IS47MW150902	5/5	1 - 10	4.80E+01	NA	NA	NA	NA	NO	NTX
1634-04-4	Methyl-tert-butyl ether (MTBE)	2.10E+00		2.10E+00		UG/L	IS47MW150902	1/7	0.5 - 6300	2.10E+00	NA	2.60E+00 C	NA	NA	NO	BSL
75-09-2	Methylene chloride	1.50E+00	J	1.50E+00	J	UG/L	IS47MW050401	1/22	0.5 - 6300	1.50E+00	NA	4.10E+00 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	1.30E+00		1.40E+03		UG/L	IS47MW040401	10/23	0.5 - 6300	1.40E+03	NA	1.00E-01 C	NA	NA	YES	ASL
108-88-3	Toluene	2.50E+01		2.37E+02	J	UG/L	RI47GW99	2/22	0.5 - 6300	2.37E+02	NA	7.47E+01 N	NA	NA	YES	ASL
79-01-6	Trichloroethene	2.60E-01	J	3.39E+02		UG/L	RI47GW04	12/23	0.5 - 6300	3.39E+02	NA	2.60E-02 C	NA	NA	YES	ASL
75-01-4	Vinyl chloride	8.00E-01	J	2.82E+01	J	UG/L	RI47GW03	3/23	0.5 - 6300	2.82E+01	NA	1.50E-02 C	NA	NA	YES	ASL
1330-20-7	Xylene, total	3.00E-01	J	1.00E+00	J	UG/L	IS47MW090401	2/22	0.5 - 6300	1.00E+00	NA	1.22E+03 N	NA	NA	NO	BSL

Table 2.11

Analytical Results of Constituents Detected in Groundwater Samples

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Volatilization from open excavation

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
156-59-2	cis-1,2-Dichloroethene	1.60E-01	J	1.45E+03	J	UG/L	RI47GW03	10/23	0.5 - 6300	1.45E+03	NA	6.08E+00 N	NA	NA	YES	ASL
156-60-5	trans-1,2-Dichloroethene	6.00E-01	J	3.82E+02	J	UG/L	RI47GW03	5/23	0.5 - 6300	3.82E+02	NA	1.22E+01 N	NA	NA	YES	ASL
10061-02-6	trans-1,3-Dichloropropene	4.80E+00		4.80E+00		UG/L	RI47GW03	1/23	0.5 - 6300	4.80E+00	NA	4.36E-01 C	NA	NA	YES	ASL
91-57-6	2-Methylnaphthalene	1.50E+00	J	2.20E+00	J	UG/L	IS47MW410401	2/15	10 - 11	2.20E+00	NA	1.22E+01 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	1.30E+00	J	1.30E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.30E+00	NA	3.65E+01 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.20E+00	J	1.20E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.20E+00	NA	1.83E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	1.40E+00	J	1.40E+00	J	UG/L	IS47MW070401	1/15	10 - 11	1.40E+00	NA	2.43E+01 N	NA	NA	NO	BSL
91-20-3	Naphthalene	2.50E+00	J	5.50E+00	J	UG/L	IS47MW410401	3/15	10 - 11	5.50E+00	NA	6.51E-01 N	NA	NA	YES	ASL
129-00-0	Pyrene	1.30E+00	J	1.90E+00	J	UG/L	IS47MW070401	2/15	10 - 11	1.90E+00	NA	1.83E+01 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for tap water, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for 1,3-dichloropropene used for cis-1,3-dichloropropene and trans-1,3-dichloropropene.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.12
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	5/45	0.01 - 1.3	2.00E-03	NA	2.19E+03 N	NA	NA	NO	BSL
75-34-3	1,1-Dichloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS01 RI47SS04	5/45	0.01 - 1.3	2.00E-03	NA	7.82E+02 N	NA	NA	NO	BSL
75-35-4	1,1-Dichloroethene	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	3/45	0.01 - 1.3	2.00E-03	NA	3.90E+02 N	NA	NA	NO	BSL
107-06-2	1,2-Dichloroethane	1.00E-03	L	1.00E-03	L	MG/KG	RI47SS01 RI47SS10	4/45	0.01 - 1.3	1.00E-03	NA	7.02E+00 C	NA	NA	NO	BSL
540-59-0	1,2-Dichloroethene (total)	2.00E-03	L	7.00E-03	J	MG/KG	47SA12	6/29	0.01 - 1.3	7.00E-03	NA	7.04E+01 N	NA	NA	NO	BSL
78-87-5	1,2-Dichloropropane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/45	0.01 - 1.3	2.00E-03	NA	9.39E+00 C	NA	NA	NO	BSL
67-64-1	Acetone	5.00E-03	J	5.00E-03	J	MG/KG	47SA08	1/45	0.002 - 3.6	5.00E-03	NA	7.00E+03 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.00E-03	L	1.00E-03	L	MG/KG	RI47SS04	1/45	0.01 - 1.3	1.00E-03	NA	1.03E+01 C	NA	NA	NO	BSL
75-15-0	Carbon disulfide	1.00E-03	J	2.00E-03	J	MG/KG	47SA09	2/45	0.01 - 1.3	2.00E-03	NA	7.82E+02 N	NA	NA	NO	BSL
56-23-5	Carbon tetrachloride	1.00E-03	L	9.90E-02		MG/KG	47SA12	7/45	0.01 - 1.3	9.90E-02	NA	4.91E+00 C	NA	NA	NO	BSL
108-90-7	Chlorobenzene	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/45	0.01 - 1.3	2.00E-03	NA	1.56E+02 N	NA	NA	NO	BSL
75-00-3	Chloroethane	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	4/45	0.01 - 1.3	2.00E-03	NA	2.20E+02 C	NA	NA	NO	BSL
67-66-3	Chloroform	6.80E-02		1.80E-01		MG/KG	47SA12	2/45	0.01 - 1.3	1.80E-01	NA	7.80E+01 N	NA	NA	NO	BSL
75-09-2	Methylene chloride	1.20E-02		1.20E-02		MG/KG	IS47SB080304 IS47SB100304	2/45	0.001 - 1.3	1.20E-02	NA	8.52E+01 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	2.30E-03	J	3.10E+00		MG/KG	47SA01	4/45	0.01 - 1.6	3.10E+00	NA	1.20E+00 C	NA	NA	YES	ASL
79-01-6	Trichloroethene	1.00E-03	L	3.90E-02		MG/KG	47SA12	9/45	0.01 - 1.3	3.90E-02	NA	1.60E+00 C	NA	NA	NO	BSL
75-01-4	Vinyl chloride	1.00E-03	L	2.00E-03	L	MG/KG	RI47SS04	5/45	0.01 - 1.3	2.00E-03	NA	9.00E-02 C	NA	NA	NO	BSL
91-57-6	2-Methylnaphthalene	2.00E-02	J	1.20E-01	J	MG/KG	RI47SS03	2/45	0.34 - 0.74	1.20E-01	NA	1.56E+02 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	3.00E-02	J	1.90E+00		MG/KG	IS47SS19	10/45	0.019 - 0.47	1.90E+00	NA	4.69E+02 N	NA	NA	NO	BSL
208-96-8	Acenaphthylene	1.90E-02		1.80E-01	J	MG/KG	47SA01	6/45	0.019 - 0.47	1.80E-01	NA	NA	NA	NA	NO	NTX
98-86-2	Acetophenone	4.50E-02	J	1.20E-01	J	MG/KG	IS47SS14 IS47SS22	12/17	0.35 - 0.74	1.20E-01	NA	7.82E+02 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.90E-02		7.50E-01		MG/KG	RI47SS03	12/45	0.019 - 0.47	7.50E-01	NA	2.35E+03 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	9.40E-02	J	1.80E-01	J	MG/KG	IS47SS19	5/17	0.35 - 0.74	1.80E-01	NA	7.82E+02 N	NA	NA	NO	BSL
56-55-3	Benzo(a)anthracene	1.90E-02	J	2.20E+00		MG/KG	RI47SD02	26/45	0.019 - 0.47	2.20E+00	NA	8.75E-01 C	NA	NA	YES	ASL
50-32-8	Benzo(a)pyrene	1.90E-02	J	1.90E+00		MG/KG	RI47SD02	22/45	0.019 - 0.47	1.90E+00	NA	8.75E-02 C	NA	NA	YES	ASL
205-99-2	Benzo(b)fluoranthene	1.90E-02	J	4.60E+00		MG/KG	RI47SD02	28/45	0.019 - 2	4.60E+00	NA	8.75E-01 C	NA	NA	YES	ASL
191-24-2	Benzo(g,h,i)perylene	1.90E-02	J	2.80E+00		MG/KG	RI47SD02	21/45	0.019 - 2	2.80E+00	NA	2.35E+02 N	NA	NA	NO	BSL
207-08-9	Benzo(k)fluoranthene	1.90E-02	J	1.20E+00		MG/KG	RI47SD02	26/45	0.019 - 0.47	1.20E+00	NA	8.75E+00 C	NA	NA	NO	BSL
85-68-7	Butylbenzylphthalate	6.70E-02	J	6.70E-02	J	MG/KG	IS47SB070304	1/45	0.34 - 0.74	6.70E-02	NA	1.56E+03 N	NA	NA	NO	BSL
86-74-8	Carbazole	4.30E-02	J	4.50E-01		MG/KG	RI47SS03	11/45	0.088 - 0.74	4.50E-01	NA	3.19E+01 C	NA	NA	NO	BSL
218-01-9	Chrysene	2.20E-02	J	3.10E+00		MG/KG	IS47SS19	28/45	0.019 - 0.47	3.10E+00	NA	8.75E+01 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	3.70E-02	J	5.70E-01		MG/KG	IS47SB070304	21/45	0.059 - 0.74	5.70E-01	NA	7.82E+02 N	NA	NA	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.90E-02	J	8.50E-01		MG/KG	RI47SD02	9/45	0.019 - 0.47	8.50E-01	NA	8.75E-02 C	NA	NA	YES	ASL
132-64-9	Dibenzofuran	2.00E-02	J	3.50E-01		MG/KG	RI47SS03	7/45	0.34 - 0.74	3.50E-01	NA	1.60E+01 N	NA	NA	NO	BSL

Table 2.12
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
84-66-2	Diethylphthalate	4.10E-02	J	5.20E-01		MG/KG	IS47SS16	7/45	0.34 - 0.74	5.20E-01	NA	6.26E+03 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	1.00E-01	J	1.00E-01	J	MG/KG	RI47SS07	1/45	0.34 - 0.74	1.00E-01	NA	7.82E+04 N	NA	NA	NO	BSL
206-44-0	Fluoranthene	2.80E-02	J	2.30E+00		MG/KG	RI47SS03	31/45	0.019 - 0.47	2.30E+00	NA	3.13E+02 N	NA	NA	NO	BSL
86-73-7	Fluorene	3.60E-02	J	4.50E+00		MG/KG	IS47SS19	10/43	0.019 - 0.47	4.50E+00	NA	3.13E+02 N	NA	NA	NO	BSL
87-68-3	Hexachlorobutadiene	3.50E-01	J	7.10E-01		MG/KG	RI47SD01	2/45	0.34 - 0.74	7.10E-01	NA	1.56E+00 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	4.80E-02	J	4.80E-02	J	MG/KG	RI47SD02	1/45	0.34 - 0.74	4.80E-02	NA	7.80E+00 N	NA	NA	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.90E-02		2.60E+00		MG/KG	RI47SD02	20/45	0.019 - 0.47	2.60E+00	NA	8.75E-01 C	NA	NA	YES	ASL
91-20-3	Naphthalene	1.90E-02	J	1.10E-01	J	MG/KG	RI47SS03	6/45	0.019 - 0.47	1.10E-01	NA	1.56E+02 N	NA	NA	NO	BSL
87-86-5	Pentachlorophenol	8.60E-02	J	1.80E-01	J	MG/KG	RI47SD02	3/44	0.83 - 1.9	1.80E-01	NA	5.32E+00 C	NA	NA	NO	BSL
85-01-8	Phenanthrene	2.00E-02	J	3.30E+01		MG/KG	IS47SS19	28/45	0.023 - 1.85	3.30E+01	NA	2.35E+02 N	NA	NA	NO	BSL
129-00-0	Pyrene	2.10E-02	J	3.50E+00		MG/KG	IS47SS19	32/45	0.019 - 2	3.50E+00	NA	2.35E+02 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	6.70E-02	J	3.30E+00		MG/KG	IS47SS15	4/45	0.067 - 0.74	3.30E+00	NA	4.56E+01 C	NA	NA	NO	BSL
606-20-2	2,6-Dinitrotoluene	2.50E-01	J	2.50E-01	J	MG/KG	47SA12	1/41	0.23 - 0.74	2.50E-01	NA	7.82E+00 N	NA	NA	NO	BSL
9004-70-0	Nitrocellulose	5.86E+01		5.86E+01		MG/KG	RI47SS06	1/23	2.79 - 50.4	5.86E+01	NA	NA	NA	NA	NO	NTX
55-63-0	Nitroglycerin	9.10E+00		2.30E+01		MG/KG	RI47SS05	5/24	4.5 - 88	2.30E+01	NA	4.56E+01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	1.04E+03		2.28E+04		MG/KG	RI47SD01	50/50	1.83 - 2500	2.28E+04	NA	7.82E+03 N	NA	NA	YES	ASL
7440-36-0	Antimony	4.20E-01	UL	3.70E+00	J	MG/KG	IS47SS22	8/50	0.38 - 606	3.70E+00	NA	3.13E+00 N	NA	NA	YES	ASL
7440-38-2	Arsenic	7.10E-01	J	1.62E+01		MG/KG	IS47SS20P	39/50	0.46 - 2.3	1.62E+01	NA	4.26E-01 C	NA	NA	YES	ASL
7440-39-3	Barium	8.90E+00	J	9.17E+01		MG/KG	RI47SD01	37/50	0.03 - 46.3	9.17E+01	NA	5.48E+02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	3.00E-02	J	1.30E+00	J	MG/KG	IS47SS17	29/50	0.017 - 1.2	1.30E+00	NA	1.56E+01 N	NA	NA	NO	BSL
7440-43-9	Cadmium	7.00E-02	J	4.60E+00		MG/KG	47SA02D	22/50	0.05 - 1.3	4.60E+00	NA	7.80E+00 N	NA	NA	NO	BSL
7440-70-2	Calcium	2.34E+01	L	9.52E+04		MG/KG	IS47SB140602	25/50	0.69 - 1160	9.52E+04	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.90E+00		4.07E+01		MG/KG	RI47SD01	50/50	0.1 - 6	4.07E+01	NA	2.35E+01 N	NA	NA	YES	ASL
7440-48-4	Cobalt	5.60E-01	J	1.21E+01		MG/KG	IS47SB100304	38/50	0.09 - 11.6	1.21E+01	NA	1.60E+02 N	NA	NA	NO	BSL
7440-50-8	Copper	1.90E+00	J	1.13E+02		MG/KG	RI47SD01	42/50	0.1 - 5.8	1.13E+02	NA	3.13E+02 N	NA	NA	NO	BSL
57-12-5	Cyanide	6.90E-02	J	3.40E-01		MG/KG	RI47SD03 RI47SS06	11/32	0.19 - 1.7	3.40E-01	NA	1.56E+02 N	NA	NA	NO	BSL
7439-89-6	Iron	8.58E+02		3.60E+04		MG/KG	RI47SD01	50/50	3.3 - 23.1	3.60E+04	NA	2.30E+03 N	NA	NA	YES	ASL
7439-92-1	Lead	3.10E+00		1.31E+03	K	MG/KG	RI47SS06	48/50	0.27 - 3.7	1.31E+03	NA	4.00E+02	NA	NA	YES	ASL
7439-95-4	Magnesium	1.71E+02	J	3.44E+04		MG/KG	IS47SB140602	37/50	1.23 - 1160	3.44E+04	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	3.80E+00	J	5.02E+02	L	MG/KG	IS47SB140602	49/50	0.03 - 6	5.02E+02	NA	1.56E+02 N	NA	NA	YES	ASL
7439-97-6	Mercury	8.00E-02		4.74E+01		MG/KG	RI47SS02	34/50	0.01 - 1.5	4.74E+01	NA	2.35E+00 N	NA	NA	YES	ASL
7440-02-0	Nickel	2.30E+00	J	2.96E+01		MG/KG	IS47SS14	31/50	0.22 - 9.3	2.96E+01	NA	1.56E+02 N	NA	NA	NO	BSL
7440-09-7	Potassium	1.38E+02	J	1.63E+03		MG/KG	IS47SB140602	34/50	2.1 - 1160	1.63E+03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.90E-01	J	8.14E+02		MG/KG	RI47SD01	31/50	0.12 - 2.3	8.14E+02	NA	3.91E+01 N	NA	NA	YES	ASL
7440-23-5	Sodium	3.25E+01	J	3.58E+02	J	MG/KG	IS47SB140602	16/50	12.1 - 1160	3.58E+02	NA	NA	NA	NA	NO	NUT

Table 2.12
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-62-2	Vanadium	2.70E+00		5.51E+01		MG/KG	RI47SD01	42/50	0.14 - 11.6	5.51E+01	NA	2.30E+00 N	NA	NA	YES	ASL
7440-66-6	Zinc	7.10E+00		7.62E+02		MG/KG	RI47SS02	34/50	0.19 - 13	7.62E+02	NA	2.35E+03 N	NA	NA	NO	BSL

* Surface soil & subsurface soil combined
[1] Minimum/Maximum detected concentrations.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Residential soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.13
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
71-55-6	1,1,1-Trichloroethane	4.57E-04	L	9.14E-04	L	µg/m^3	RI47SS04	5/45	0.01 - 1.3	9.14E-04	NA	2.30E+02 N	NA	NA	NO	BSL
75-34-3	1,1-Dichloroethane	4.17E-04	L	8.34E-04	L	µg/m^3	RI47SS01 RI47SS04	5/45	0.01 - 1.3	8.34E-04	NA	5.11E+01 N	NA	NA	NO	BSL
75-35-4	1,1-Dichloroethene	7.06E-04	L	1.41E-03	L	µg/m^3	RI47SS04	3/45	0.01 - 1.3	1.41E-03	NA	2.20E+01 N	NA	NA	NO	BSL
107-06-2	1,2-Dichloroethane	4.35E-04	L	4.35E-04	L	µg/m^3	RI47SS01 RI47SS10	4/45	0.01 - 1.3	4.35E-04	NA	6.88E-02 C	NA	NA	NO	BSL
540-59-0	1,2-Dichloroethene (total)	8.70E-04	L	3.05E-03	J	µg/m^3	47SA12	6/29	0.01 - 1.3	3.05E-03	NA	3.29E+00 N	NA	NA	NO	BSL
78-87-5	1,2-Dichloropropane	2.82E-04	L	5.64E-04	L	µg/m^3	RI47SS04	4/45	0.01 - 1.3	5.64E-04	NA	9.21E-02 C	NA	NA	NO	BSL
67-64-1	Acetone	4.03E-04	J	4.03E-04	J	µg/m^3	47SA08	1/45	0.002 - 3.6	4.03E-04	NA	3.30E+02 N	NA	NA	NO	BSL
75-27-4	Bromodichloromethane	1.23E-04	L	1.23E-04	L	µg/m^3	RI47SS04	1/45	0.01 - 1.3	1.23E-04	NA	1.01E-01 C	NA	NA	NO	BSL
75-15-0	Carbon disulfide	8.48E-04	J	1.70E-03	J	µg/m^3	47SA09	2/45	0.01 - 1.3	1.70E-03	NA	7.30E+01 N	NA	NA	NO	BSL
56-23-5	Carbon tetrachloride	4.90E-04	L	4.85E-02		µg/m^3	47SA12	7/45	0.01 - 1.3	4.85E-02	NA	1.18E-01 C	NA	NA	NO	BSL
108-90-7	Chlorobenzene	1.62E-04	L	3.23E-04	L	µg/m^3	RI47SS04	4/45	0.01 - 1.3	3.23E-04	NA	6.21E+00 N	NA	NA	NO	BSL
75-00-3	Chloroethane	7.58E-10	L	1.52E-09	L	µg/m^3	RI47SS04	4/45	0.01 - 1.3	1.52E-09	NA	2.16E+00 C	NA	NA	NO	BSL
67-66-3	Chloroform	2.58E-02		6.84E-02		µg/m^3	47SA12	2/45	0.01 - 1.3	6.84E-02	NA	7.70E-02 C	NA	NA	NO	BSL
75-09-2	Methylene chloride	4.87E-03		4.87E-03		µg/m^3	IS47SB080304 IS47SB100304	2/45	0.001 - 1.3	4.87E-03	NA	3.79E+00 C	NA	NA	NO	BSL
127-18-4	Tetrachloroethene	9.12E-04	J	1.23E+00		µg/m^3	47SA01	4/45	0.01 - 1.6	1.23E+00	NA	3.10E-01 C	NA	NA	YES	ASL
79-01-6	Trichloroethene	3.10E-04	L	1.21E-02		µg/m^3	47SA12	9/45	0.01 - 1.3	1.21E-02	NA	1.60E-02 C	NA	NA	NO	BSL
75-01-4	Vinyl chloride	9.73E-04	L	1.95E-03	L	µg/m^3	RI47SS04	5/45	0.01 - 1.3	1.95E-03	NA	7.20E-02 C	NA	NA	NO	BSL
91-57-6	2-Methylnaphthalene	1.52E-08	J	9.09E-08	J	µg/m^3	RI47SS03	2/45	0.34 - 0.74	9.09E-08	NA	7.30E+00 N	NA	NA	NO	BSL
83-32-9	Acenaphthene	2.27E-08	J	1.44E-06		µg/m^3	IS47SS19	10/45	0.019 - 0.47	1.44E-06	NA	2.19E+01 N	NA	NA	NO	BSL
208-96-8	Acenaphthylene	1.44E-08		1.36E-07	J	µg/m^3	47SA01	6/45	0.019 - 0.47	1.36E-07	NA	NA	NA	NA	NO	NTX
98-86-2	Acetophenone	3.41E-08	J	9.09E-08	J	µg/m^3	IS47SS14 IS47SS22	12/17	0.35 - 0.74	9.09E-08	NA	3.70E+01 N	NA	NA	NO	BSL
120-12-7	Anthracene	1.44E-08		5.68E-07		µg/m^3	RI47SS03	12/45	0.019 - 0.47	5.68E-07	NA	1.10E+02 N	NA	NA	NO	BSL
100-52-7	Benzaldehyde	7.12E-08	J	1.36E-07	J	µg/m^3	IS47SS19	5/17	0.35 - 0.74	1.36E-07	NA	3.65E+01 N	NA	NA	NO	BSL
56-55-3	Benzo(a)anthracene	1.44E-08	J	1.67E-06		µg/m^3	RI47SD02	26/45	0.019 - 0.47	1.67E-06	NA	8.58E-03 C	NA	NA	NO	BSL
50-32-8	Benzo(a)pyrene	1.44E-08	J	1.44E-06		µg/m^3	RI47SD02	22/45	0.019 - 0.47	1.44E-06	NA	2.02E-03 C	NA	NA	NO	BSL
205-99-2	Benzo(b)fluoranthene	1.44E-08	J	3.48E-06		µg/m^3	RI47SD02	28/45	0.019 - 2	3.48E-06	NA	8.58E-03 C	NA	NA	NO	BSL
191-24-2	Benzo(g,h,i)perylene	1.44E-08	J	2.12E-06		µg/m^3	RI47SD02	21/45	0.019 - 2	2.12E-06	NA	1.10E+01 N	NA	NA	NO	BSL
207-08-9	Benzo(k)fluoranthene	1.44E-08	J	9.09E-07		µg/m^3	RI47SD02	26/45	0.019 - 0.47	9.09E-07	NA	8.58E-02 C	NA	NA	NO	BSL
85-68-7	Butylbenzylphthalate	5.08E-08	J	5.08E-08	J	µg/m^3	IS47SB070304	1/45	0.34 - 0.74	5.08E-08	NA	7.30E+01 N	NA	NA	NO	BSL
86-74-8	Carbazole	3.26E-08	J	3.41E-07		µg/m^3	RI47SS03	11/45	0.088 - 0.74	3.41E-07	NA	3.13E-01 C	NA	NA	NO	BSL
218-01-9	Chrysene	1.67E-08	J	2.35E-06		µg/m^3	IS47SS19	28/45	0.019 - 0.47	2.35E-06	NA	8.58E-01 C	NA	NA	NO	BSL
84-74-2	Di-n-butylphthalate	2.80E-08	J	4.32E-07		µg/m^3	IS47SB070304	21/45	0.059 - 0.74	4.32E-07	NA	3.65E+01 N	NA	NA	NO	BSL
53-70-3	Dibenz(a,h)anthracene	1.44E-08	J	6.44E-07		µg/m^3	RI47SD02	9/45	0.019 - 0.47	6.44E-07	NA	8.58E-04 C	NA	NA	NO	BSL
132-64-9	Dibenzofuran	1.52E-08	J	2.65E-07		µg/m^3	RI47SS03	7/45	0.34 - 0.74	2.65E-07	NA	7.30E-01 N	NA	NA	NO	BSL

Table 2.13
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
84-66-2	Diethylphthalate	3.11E-08	J	3.94E-07		µg/m^3	IS47SS16	7/45	0.34 - 0.74	3.94E-07	NA	2.92E+02 N	NA	NA	NO	BSL
131-11-3	Dimethyl phthalate	7.58E-08	J	7.58E-08	J	µg/m^3	RI47SS07	1/45	0.34 - 0.74	7.58E-08	NA	3.65E+03 N	NA	NA	NO	BSL
206-44-0	Fluoranthene	2.12E-08	J	1.74E-06		µg/m^3	RI47SS03	31/45	0.019 - 0.47	1.74E-06	NA	1.46E+01 N	NA	NA	NO	BSL
86-73-7	Fluorene	2.73E-08	J	3.41E-06		µg/m^3	IS47SS19	10/43	0.019 - 0.47	3.41E-06	NA	1.46E+01 N	NA	NA	NO	BSL
87-68-3	Hexachlorobutadiene	2.65E-07	J	5.38E-07		µg/m^3	RI47SD01	2/45	0.34 - 0.74	5.38E-07	NA	7.30E-02 N	NA	NA	NO	BSL
67-72-1	Hexachloroethane	3.64E-08	J	3.64E-08	J	µg/m^3	RI47SD02	1/45	0.34 - 0.74	3.64E-08	NA	3.65E-01 N	NA	NA	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.44E-08		1.97E-06		µg/m^3	RI47SD02	20/45	0.019 - 0.47	1.97E-06	NA	8.58E-03 C	NA	NA	NO	BSL
91-20-3	Naphthalene	1.44E-08	J	8.33E-08	J	µg/m^3	RI47SS03	6/45	0.019 - 0.47	8.33E-08	NA	3.29E-01 N	NA	NA	NO	BSL
87-86-5	Pentachlorophenol	6.52E-08	J	1.36E-07	J	µg/m^3	RI47SD02	3/44	0.83 - 1.9	1.36E-07	NA	5.22E-02 C	NA	NA	NO	BSL
85-01-8	Phenanthrene	1.52E-08	J	2.50E-05		µg/m^3	IS47SS19	28/45	0.023 - 1.85	2.50E-05	NA	1.10E+01 N	NA	NA	NO	BSL
129-00-0	Pyrene	1.59E-08	J	2.65E-06		µg/m^3	IS47SS19	32/45	0.019 - 2	2.65E-06	NA	1.10E+01 N	NA	NA	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	5.08E-08	J	2.50E-06		µg/m^3	IS47SS15	4/45	0.067 - 0.74	2.50E-06	NA	4.47E-01 C	NA	NA	NO	BSL
606-20-2	2,6-Dinitrotoluene	1.89E-07	J	1.89E-07	J	µg/m^3	47SA12	1/41	0.23 - 0.74	1.89E-07	NA	3.65E-01 N	NA	NA	NO	BSL
9004-70-0	Nitrocellulose	4.44E-05		4.44E-05		µg/m^3	RI47SS06	1/23	2.79 - 50.4	4.44E-05	NA	NA	NA	NA	NO	NTX
55-63-0	Nitroglycerin	6.89E-06		1.74E-05		µg/m^3	RI47SS05	5/24	4.5 - 88	1.74E-05	NA	4.47E-01 C	NA	NA	NO	BSL
7429-90-5	Aluminum	7.88E-04		1.73E-02		µg/m^3	RI47SD01	50/50	1.83 - 2500	1.73E-02	NA	3.65E-01 N	NA	NA	NO	BSL
7440-36-0	Antimony	3.18E-07	UL	2.80E-06	J	µg/m^3	IS47SS22	8/50	0.38 - 606	2.80E-06	NA	1.46E-01 N	NA	NA	NO	BSL
7440-38-2	Arsenic	5.38E-07	J	1.23E-05		µg/m^3	IS47SS20P	39/50	0.46 - 2.3	1.23E-05	NA	4.15E-04 C	NA	NA	NO	BSL
7440-39-3	Barium	6.74E-06	J	6.95E-05		µg/m^3	RI47SD01	37/50	0.03 - 46.3	6.95E-05	NA	5.11E-02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	2.27E-08	J	9.85E-07	J	µg/m^3	IS47SS17	29/50	0.017 - 1.2	9.85E-07	NA	7.45E-04 C	NA	NA	NO	BSL
7440-43-9	Cadmium	5.30E-08	J	3.48E-06		µg/m^3	47SA02D	22/50	0.05 - 1.3	3.48E-06	NA	9.94E-04 C	NA	NA	NO	BSL
7440-70-2	Calcium	1.77E-05	L	7.21E-02		µg/m^3	IS47SB140602	25/50	0.69 - 1160	7.21E-02	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	2.20E-06		3.08E-05		µg/m^3	RI47SD01	50/50	0.1 - 6	3.08E-05	NA	1.53E-04 C	NA	NA	NO	BSL
7440-48-4	Cobalt	4.24E-07	J	9.17E-06		µg/m^3	IS47SB100304	38/50	0.09 - 11.6	9.17E-06	NA	6.40E-04 C	NA	NA	NO	BSL
7440-50-8	Copper	1.44E-06	J	8.56E-05		µg/m^3	RI47SD01	42/50	0.1 - 5.8	8.56E-05	NA	1.46E+01 N	NA	NA	NO	BSL
57-12-5	Cyanide	5.23E-08	J	2.58E-07		µg/m^3	RI47SD03 RI47SS06	11/32	0.19 - 1.7	2.58E-07	NA	7.30E+00 N	NA	NA	NO	BSL
7439-89-6	Iron	6.50E-04		2.73E-02		µg/m^3	RI47SD01	50/50	3.3 - 23.1	2.73E-02	NA	1.10E+02 N	NA	NA	NO	BSL
7439-92-1	Lead	2.35E-06		9.92E-04	K	µg/m^3	RI47SS06	48/50	0.27 - 3.7	9.92E-04	NA	NA	NA	NA	NO	NTX
7439-95-4	Magnesium	1.30E-04	J	2.61E-02		µg/m^3	IS47SB140602	37/50	1.23 - 1160	2.61E-02	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.88E-06	J	3.80E-04	L	µg/m^3	IS47SB140602	49/50	0.03 - 6	3.80E-04	NA	5.22E-03 N	NA	NA	NO	BSL
7439-97-6	Mercury	6.06E-08		3.59E-05		µg/m^3	RI47SS02	34/50	0.01 - 1.5	3.59E-05	NA	3.14E-02 N	NA	NA	NO	BSL
7440-02-0	Nickel	1.74E-06	J	2.24E-05		µg/m^3	IS47SS14	31/50	0.22 - 9.3	2.24E-05	NA	7.30E+00 N	NA	NA	NO	BSL
7440-09-7	Potassium	1.05E-04	J	1.23E-03		µg/m^3	IS47SB140602	34/50	2.1 - 1160	1.23E-03	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	2.20E-07	J	6.17E-04		µg/m^3	RI47SD01	31/50	0.12 - 2.3	6.17E-04	NA	1.83E+00 N	NA	NA	NO	BSL
7440-23-5	Sodium	2.46E-05	J	2.71E-04	J	µg/m^3	IS47SB140602	16/50	12.1 - 1160	2.71E-04	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	2.05E-06		4.17E-05		µg/m^3	RI47SD01	42/50	0.14 - 11.6	4.17E-05	NA	1.10E-01 N	NA	NA	NO	BSL
7440-66-6	Zinc	5.38E-06		5.77E-04		µg/m^3	RI47SS02	34/50	0.19 - 13	5.77E-04	NA	1.10E+02 N	NA	NA	NO	BSL

Table 2.13
Analytical Results of Constituents Detected in Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

* Surface soil & subsurface soil combined
[1] Minimum/Maximum detected concentrations.
Minimum/Maximum detected concentrations in surface soil samples multiplied by 1/PEF for nonvolatiles
and 1/VF + 1/PEF (VF found in supplement t2.2A) for volatiles to get minimum and maximum concentration in air.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for ambient air,April 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
N values are divided by 10
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.
[5] Rationale Codes
Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/
To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.14
Analytical Results of Constituents Detected in Concrete Samples at Site 47
Indian Head, Site 47
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Concrete
Exposure Point: Concrete Troughs

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7429-90-5	Aluminum	5660		5730		MG/KG	RI47CO01	2/2		5.73E+03	NA	1.00E+05 N	NA	NA	NO	BSL
7440-38-2	Arsenic	1.8	J	2.1		MG/KG	RI47CO02	2/2		2.10E+00	NA	1.90E+00 C	NA	NA	YES	ASL
7440-39-3	Barium	53.3		59.2		MG/KG	RI47CO02	2/2		5.92E+01	NA	7.20E+03 N	NA	NA	NO	BSL
7440-41-7	Beryllium	0.15	J	0.16	J	MG/KG	RI47CO02	2/2		1.60E-01	NA	2.00E+02 N	NA	NA	NO	BSL
7440-43-9	Cadmium	0.25	J	0.48	J	MG/KG	RI47CO02	2/2		4.80E-01	NA	1.00E+02 N	NA	NA	NO	BSL
7440-70-2	Calcium	66500		66800		MG/KG	RI47CO01	2/2		6.68E+04	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	5.6		6		MG/KG	RI47CO02	2/2		6.00E+00	NA	3.10E+02 N	NA	NA	NO	BSL
7440-48-4	Cobalt	1.5	J	1.9	J	MG/KG	RI47CO01	2/2		1.90E+00	NA	2.00E+03 N	NA	NA	NO	BSL
7440-50-8	Copper	4.9	J	14.2		MG/KG	RI47CO02	2/2		1.42E+01	NA	4.10E+03 N	NA	NA	NO	BSL
7439-89-6	Iron	3550		3680		MG/KG	RI47CO02	2/2		3.68E+03	NA	3.10E+04 N	NA	NA	NO	BSL
7439-92-1	Lead	1220		2110		MG/KG	RI47CO01	2/2		2.11E+03	NA	4.00E+02	NA	NA	YES	ASL
7439-95-4	Magnesium	1140		1370		MG/KG	RI47CO02	2/2		1.37E+03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	36.3		40.3		MG/KG	RI47CO02	2/2		4.03E+01	NA	2.00E+03 N	NA	NA	NO	BSL
7439-97-6	Mercury	0.21		4.4		MG/KG	RI47CO02	2/2		4.40E+00	NA	3.10E+01 N	NA	NA	NO	BSL
7440-02-0	Nickel	3.2	J	3.3	J	MG/KG	RI47CO01	2/2		3.30E+00	NA	2.00E+03 N	NA	NA	NO	BSL
7440-09-7	Potassium	294	J	385	J	MG/KG	RI47CO02	2/2		3.85E+02	NA	NA	NA	NA	NO	NUT
7440-22-4	Silver	0.42	J	2.5		MG/KG	RI47CO02	2/2		2.50E+00	NA	5.10E+02 N	NA	NA	NO	BSL
7440-23-5	Sodium	67.5	J	83.8	J	MG/KG	RI47CO02	2/2		8.38E+01	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	8.8	J	8.8	J	MG/KG	RI47CO01/RI47CO02	2/2		8.80E+00	NA	3.10E+01 N	NA	NA	NO	BSL
7440-66-6	Zinc	19.6	J	63.2	J	MG/KG	RI47CO02	2/2		6.32E+01	NA	3.10E+04 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations in concrete.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Industrial Soil, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard.
RBC value for mercuric chloride used as surrogate for mercury.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.15

Analytical Results of Constituents Detected in Concrete Samples at Site 47

Indian Head, Site 47

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Air
Exposure Point: Concrete Troughs

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7429-90-5	Aluminum	4.29E-03		4.34E-03		µg/m^3	RI47CO01	2/2		4.34E-03	NA	3.70E-01 N	NA	NA	NO	BSL
7440-38-2	Arsenic	1.36E-06	J	1.59E-06		µg/m^3	RI47CO02	2/2		1.59E-06	NA	4.10E-04 C	NA	NA	NO	BSL
7440-39-3	Barium	4.04E-05		4.48E-05		µg/m^3	RI47CO02	2/2		4.48E-05	NA	5.10E-02 N	NA	NA	NO	BSL
7440-41-7	Beryllium	1.14E-07	J	1.21E-07	J	µg/m^3	RI47CO02	2/2		1.21E-07	NA	7.50E-04 N	NA	NA	NO	BSL
7440-43-9	Cadmium	1.89E-07	J	3.64E-07	J	µg/m^3	RI47CO02	2/2		3.64E-07	NA	9.90E-04 C	NA	NA	NO	BSL
7440-70-2	Calcium	5.04E-02		5.06E-02		µg/m^3	RI47CO01	2/2		5.06E-02	NA	NA	NA	NA	NO	NUT
7440-47-3	Chromium	4.24E-06		4.55E-06		µg/m^3	RI47CO02	2/2		4.55E-06	NA	1.50E-04 C	NA	NA	NO	BSL
7440-48-4	Cobalt	1.14E-06	J	1.44E-06	J	µg/m^3	RI47CO01	2/2		1.44E-06	NA	6.40E-04 N	NA	NA	NO	BSL
7440-50-8	Copper	3.71E-06	J	1.08E-05		µg/m^3	RI47CO02	2/2		1.08E-05	NA	1.50E+01 N	NA	NA	NO	BSL
7439-89-6	Iron	2.69E-03		2.79E-03		µg/m^3	RI47CO02	2/2		2.79E-03	NA	1.10E+02 N	NA	NA	NO	BSL
7439-92-1	Lead	9.24E-04		1.60E-03		µg/m^3	RI47CO01	2/2		1.60E-03	NA	NA	NA	NA	NO	NTX
7439-95-4	Magnesium	8.64E-04		1.04E-03		µg/m^3	RI47CO02	2/2		1.04E-03	NA	NA	NA	NA	NO	NUT
7439-96-5	Manganese	2.75E-05		3.05E-05		µg/m^3	RI47CO02	2/2		3.05E-05	NA	5.20E-03 N	NA	NA	NO	BSL
7439-97-6	Mercury	1.59E-07		3.33E-06		µg/m^3	RI47CO02	2/2		3.33E-06	NA	3.10E-02 N	NA	NA	NO	BSL
7440-02-0	Nickel	2.42E-06	J	2.50E-06	J	µg/m^3	RI47CO01	2/2		2.50E-06	NA	7.30E+00 N	NA	NA	NO	BSL
7440-09-7	Potassium	2.23E-04	J	2.92E-04	J	µg/m^3	RI47CO02	2/2		2.92E-04	NA	NA	NA	NA	NO	BSL
7440-22-4	Silver	3.18E-07	J	1.89E-06		µg/m^3	RI47CO02	2/2		1.89E-06	NA	1.80E+00 N	NA	NA	NO	BSL
7440-23-5	Sodium	5.11E-05	J	6.35E-05	J	µg/m^3	RI47CO02	2/2		6.35E-05	NA	NA	NA	NA	NO	NUT
7440-62-2	Vanadium	6.67E-06	J	6.67E-06	J	µg/m^3	RI47CO01/RI47CO02	2/2		6.67E-06	NA	1.10E-01 N	NA	NA	NO	BSL
7440-66-6	Zinc	1.48E-05	J	4.79E-05	J	µg/m^3	RI47CO02	2/2		4.79E-05	NA	1.10E+02 N	NA	NA	NO	BSL

[1] Minimum/Maximum detected concentrations in concrete samples multiplied by fugitive dust concentration (1.32E+09 m^3/kg) to get minimum and maximum concentration in air.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table for Ambient Air, October 15, 2003, U.S. EPA Region III, Je Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for mercuric chloride used as surrogate for mercury.
RBC value for Chromium VI used for total chromium.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Tetrachloroethene	MG/KG	1.10E-01	2.53E-01	3.10E+00		MG/KG	5.24E-02	95%UCL-T	(4)	6.48E-03	Mean-T	(4)
Benzo(a)anthracene	MG/KG	3.29E-01	4.78E-01	2.20E+00		MG/KG	8.34E-01	95%UCL-T	(1)	1.19E-01	Mean-T	(1)
Benzo(a)pyrene	MG/KG	2.66E-01	3.80E-01	1.90E+00		MG/KG	6.23E-01	95%UCL-T	(1)	1.08E-01	Mean-T	(1)
Benzo(b)fluoranthene	MG/KG	4.54E-01	6.92E-01	4.60E+00		MG/KG	1.60E+00	95%UCL-T	(4)	1.20E-01	Mean-T	(4)
Dibenz(a,h)anthracene	MG/KG	1.48E-01	1.87E-01	8.50E-01		MG/KG	3.06E-01	95%UCL-T	(4)	9.01E-02	Mean-T	(4)
Indeno(1,2,3-cd)pyrene	MG/KG	2.05E-01	3.23E-01	2.60E+00		MG/KG	3.94E-01	95%UCL-T	(4)	8.82E-02	Mean-T	(4)
Aluminum	MG/KG	4.05E+03	5.12E+03	2.28E+04		MG/KG	4.70E+03	95%UCL-T	(4)	3.27E+03	Mean-T	(4)
Antimony	MG/KG	9.56E+00	2.33E+01	3.70E+00	J	MG/KG	3.70E+00	Max	(4,2)	1.02E+00	Mean-T	(1)
Arsenic	MG/KG	2.67E+00	3.50E+00	1.62E+01		MG/KG	4.24E+00	95%UCL-T	(1)	1.65E+00	Mean-T	(1)
Chromium	MG/KG	1.10E+01	1.34E+01	4.07E+01		MG/KG	1.33E+01	95%UCL-T	(1)	8.97E+00	Mean-T	(1)
Iron	MG/KG	8.05E+03	9.91E+03	3.60E+04		MG/KG	1.11E+04	95%UCL-T	(1)	6.11E+03	Mean-T	(1)
Lead	MG/KG	1.11E+02	1.87E+02	1.31E+03	K	MG/KG	1.11E+02	Mean-N	(5)	1.11E+02	Mean-N	(5)
Manganese	MG/KG	1.24E+02	1.50E+02	4.18E+02		MG/KG	1.50E+02	95%UCL-N	(3)	1.24E+02	Mean-N	(3)
Mercury	MG/KG	2.73E+00	4.96E+00	4.74E+01		MG/KG	5.71E+00	95%UCL-T	(1)	5.31E-01	Mean-T	(1)
Silver	MG/KG	5.54E+01	9.92E+01	8.14E+02		MG/KG	3.05E+02	95%UCL-T	(4)	3.94E+00	Mean-T	(4)
Vanadium	MG/KG	1.46E+01	1.79E+01	5.51E+01		MG/KG	2.04E+01	95%UCL-T	(1)	1.10E+01	Mean-T	(1)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Tetrachloroethene	MG/KG	1.10E-01	2.53E-01	3.10E+00		MG/KG	5.24E-02	95%UCL-T	(4)	6.48E-03	Mean-T	(4)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Nitroglycerin	MG/KG	3.70E+03	NA	3.70E+03		MG/KG	3.70E+03	Max	(5)	3.70E+03	Mean	(6)
Arsenic	MG/KG	7.03E+00	1.40E+01	1.00E+01		MG/KG	1.00E+01	Max	(5)	7.03E+00	Mean	(6)
Iron	MG/KG	2.20E+04	5.32E+04	3.89E+04		MG/KG	3.89E+04	Max	(5)	2.20E+04	Mean	(6)
Lead	MG/KG	1.95E+03	7.51E+03	5.76E+03	N	MG/KG	1.95E+03	Mean	(7)	1.95E+03	Mean	(6)
Mercury	MG/KG	2.70E+01	1.05E+02	8.02E+01		MG/KG	8.02E+01	Max	(5)	2.70E+01	Mean	(6)
Silver	MG/KG	1.43E+02	5.28E+02	4.06E+02		MG/KG	4.06E+02	Max	(5)	1.43E+02	Mean	(6)
Vanadium	MG/KG	3.30E+01	7.36E+01	5.07E+01		MG/KG	5.07E+01	Max	(5)	3.30E+01	Mean	(6)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.
(7) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales (SD5&6only)

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	MG/KG	6.15E+00	3.05E+01	1.00E+01		MG/KG	1.00E+01	Max	(5)	6.15E+00	Mean	(6)
Iron	MG/KG	1.36E+04	8.50E+04	2.49E+04		MG/KG	2.49E+04	Max	(5)	1.36E+04	Mean	(6)
Vanadium	MG/KG	2.81E+01	1.71E+02	5.07E+01		MG/KG	5.07E+01	Max	(5)	2.81E+01	Mean	(6)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Indian Head, Site 47

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	UG/L	3.73E+00	1.30E+01	5.20E+00	J	UG/L	5.20E+00	Max	(5)	5.2	Max	(5)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Tetrachloroethene	MG/KG	1.10E-01	2.53E-01	3.10E+00		MG/KG	5.24E-02	95%UCL-T	(4)	6.48E-03	Mean-T	(4)
Benzo(a)anthracene	MG/KG	3.29E-01	4.78E-01	2.20E+00		MG/KG	8.34E-01	95%UCL-T	(1)	1.19E-01	Mean-T	(1)
Benzo(a)pyrene	MG/KG	2.66E-01	3.80E-01	1.90E+00		MG/KG	6.23E-01	95%UCL-T	(1)	1.08E-01	Mean-T	(1)
Benzo(b)fluoranthene	MG/KG	4.54E-01	6.92E-01	4.60E+00		MG/KG	1.60E+00	95%UCL-T	(4)	1.20E-01	Mean-T	(4)
Dibenz(a,h)anthracene	MG/KG	1.48E-01	1.87E-01	8.50E-01		MG/KG	3.06E-01	95%UCL-T	(4)	9.01E-02	Mean-T	(4)
Indeno(1,2,3-cd)pyrene	MG/KG	2.05E-01	3.23E-01	2.60E+00		MG/KG	3.94E-01	95%UCL-T	(4)	8.82E-02	Mean-T	(4)
Aluminum	MG/KG	4.05E+03	5.12E+03	2.28E+04		MG/KG	4.70E+03	95%UCL-T	(4)	3.27E+03	Mean-T	(4)
Antimony	MG/KG	9.56E+00	2.33E+01	3.70E+00	J	MG/KG	3.70E+00	Max	(4,2)	1.02E+00	Mean-T	(1)
Arsenic	MG/KG	2.67E+00	3.50E+00	1.62E+01		MG/KG	4.24E+00	95%UCL-T	(1)	1.65E+00	Mean-T	(1)
Chromium	MG/KG	1.10E+01	1.34E+01	4.07E+01		MG/KG	1.33E+01	95%UCL-T	(1)	8.97E+00	Mean-T	(1)
Iron	MG/KG	8.05E+03	9.91E+03	3.60E+04		MG/KG	1.11E+04	95%UCL-T	(1)	6.11E+03	Mean-T	(1)
Lead	MG/KG	1.11E+02	1.87E+02	1.31E+03	K	MG/KG	1.11E+02	Mean-N	(5)	1.11E+02	Mean-N	(5)
Manganese	MG/KG	1.24E+02	1.50E+02	4.18E+02		MG/KG	1.50E+02	95%UCL-N	(3)	1.24E+02	Mean-N	(3)
Mercury	MG/KG	2.73E+00	4.96E+00	4.74E+01		MG/KG	5.71E+00	95%UCL-T	(1)	5.31E-01	Mean-T	(1)
Silver	MG/KG	5.54E+01	9.92E+01	8.14E+02		MG/KG	3.05E+02	95%UCL-T	(4)	3.94E+00	Mean-T	(4)
Vanadium	MG/KG	1.46E+01	1.79E+01	5.51E+01		MG/KG	2.04E+01	95%UCL-T	(1)	1.10E+01	Mean-T	(1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Tetrachloroethene	MG/KG	1.10E-01	2.53E-01	3.10E+00		MG/KG	5.24E-02	95%UCL-T	(4)	6.48E-03	Mean-T	(4)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.8
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1,2,2-Tetrachloroethane	UG/L	2.19E+02	4.91E+02	3.00E+00		UG/L	3.00E+00	Max	(4,2)	1.04E+00	Mean-T	(4)
1,1,2-Trichloroethane	UG/L	2.09E+02	4.70E+02	3.40E+00		UG/L	3.40E+00	Max	(4,2)	9.98E-01	Mean-T	(4)
1,1-Dichloroethane	UG/L	2.16E+02	4.76E+02	1.68E+02	J	UG/L	1.68E+02	Max	(4,2)	1.27E+00	Mean-T	(4)
1,1-Dichloroethene	UG/L	2.42E+02	5.05E+02	7.43E+02	J	UG/L	7.43E+02	Max	(4,2)	1.64E+00	Mean-T	(4)
1,2-Dibromo-3-chloropropane	UG/L	4.37E+02	9.98E+02	6.60E+00		UG/L	6.60E+00	Max	(4,2)	2.75E+00	Mean-T	(4)
1,2-Dichloroethane	UG/L	2.44E+02	5.06E+02	7.16E+02	J	UG/L	7.16E+02	Max	(4,2)	2.62E+00	Mean-T	(4)
1,2-Dichloropropane	UG/L	2.09E+02	4.70E+02	1.30E+00		UG/L	1.30E+00	Max	(4,2)	9.61E-01	Mean-T	(4)
Acetone	UG/L	8.39E+02	1.74E+03	6.06E+03	L	UG/L	6.06E+03	Max	(4,2)	1.71E+01	Mean-T	(4)
Bromodichloromethane	UG/L	2.09E+02	4.70E+02	4.30E+00		UG/L	4.30E+00	Max	(4,2)	4.14E-01	Mean-T	(4)
Bromomethane	UG/L	2.50E+02	5.15E+02	9.37E+02	J	UG/L	9.37E+02	Max	(4,2)	1.28E+00	Mean-T	(4)
Carbon disulfide	UG/L	6.96E+02	1.29E+03	6.62E+03	L	UG/L	6.62E+03	Max	(4,2)	2.79E+00	Mean-T	(4)
Carbon tetrachloride	UG/L	2.01E+04	4.23E+04	2.86E+05	L	UG/L	2.86E+05	Max	(4,2)	1.10E+01	Mean-T	(4)
Chloroethane	UG/L	2.10E+02	4.71E+02	2.62E+01	J	UG/L	2.62E+01	Max	(4,2)	1.12E+00	Mean-T	(4)
Chloroform	UG/L	6.55E+03	1.19E+04	5.76E+04	L	UG/L	5.76E+04	Max	(4,2)	1.14E+01	Mean-T	(4)
Chloromethane	UG/L	2.79E+03	7.20E+03	5.93E+04	J	UG/L	5.93E+04	Max	(4,2)	1.24E+00	Mean-T	(4)
Dibromochloromethane	UG/L	2.13E+02	4.73E+02	8.66E+01	J	UG/L	8.66E+01	Max	(4,2)	1.15E+00	Mean-T	(4)
Tetrachloroethene	UG/L	2.80E+02	5.43E+02	1.40E+03		UG/L	1.40E+03	Max	(4,2)	3.96E+00	Mean-T	(4)
Toluene	UG/L	4.96E+01	9.89E+01	2.37E+02	J	UG/L	2.37E+02	Max	(4,2)	1.26E+00	Mean-T	(4)
Trichloroethene	UG/L	2.49E+02	5.07E+02	3.39E+02		UG/L	3.39E+02	Max	(4,2)	4.35E+00	Mean-T	(4)
Vinyl chloride	UG/L	2.10E+02	4.71E+02	2.82E+01	J	UG/L	2.82E+01	Max	(4,2)	1.19E+00	Mean-T	(4)
cis-1,2-Dichloroethene	UG/L	2.76E+02	5.51E+02	1.45E+03	J	UG/L	1.45E+03	Max	(4,2)	3.40E+00	Mean-T	(4)
trans-1,2-Dichloroethene	UG/L	2.26E+02	4.86E+02	3.82E+02	J	UG/L	3.82E+02	Max	(4,2)	1.40E+00	Mean-T	(4)
trans-1,3-Dichloropropene	UG/L	2.09E+02	4.70E+02	4.80E+00		UG/L	4.80E+00	Max	(4,2)	1.02E+00	Mean-T	(4)
Hexachloroethane	UG/L	8.63E+00	1.48E+01	5.80E+01		UG/L	1.06E+01	95% UCL-T	(4)	6.00E+00	Mean-T	(4)
Naphthalene	UG/L	4.86E+00	5.27E+00	5.50E+00	J	UG/L	5.27E+00	95% UCL-N	(4)	4.86E+00	Mean-N	(4)
Pentachlorophenol	UG/L	1.22E+01	1.33E+01	4.00E+00	J	UG/L	4.00E+00	Max	(4,2)	4.00E+00	Max	(4)
bis(2-Ethylhexyl)phthalate	UG/L	4.25E+00	4.98E+00	5.10E+00	J	UG/L	4.98E+00	95% UCL-N	(4)	4.25E+00	Mean-N	(4)

Table 3.8

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Cyanide	UG/L	2.36E+03	6.15E+03	2.32E+04		UG/L	2.32E+04	Max	(4,2)	7.24E+01	Mean-T	(4)
Aluminum	UG/L	2.95E+03	6.07E+03	2.70E+04		UG/L	2.70E+04	Max	(4,2)	5.19E+02	Mean-T	(4)
Antimony	UG/L	3.31E+00	4.42E+00	1.00E+01	J	UG/L	4.74E+00	95% UCL-T	(4)	2.72E+00	Mean-T	(4)
Arsenic	UG/L	2.26E+01	3.90E+01	1.06E+02		UG/L	1.06E+02	Max	(4,2)	7.00E+00	Mean-T	(4)
Barium	UG/L	1.21E+02	1.64E+02	3.31E+02		UG/L	3.31E+02	Max	(4,2)	7.94E+01	Mean-T	(4)
Beryllium	UG/L	1.49E+00	3.17E+00	1.45E+01		UG/L	6.88E+00	95% UCL-T	(1)	3.18E-01	Mean-T	(1)
Cadmium	UG/L	8.30E-01	1.47E+00	5.70E+00		UG/L	1.67E+00	95% UCL-T	(4)	4.07E-01	Mean-T	(4)
Chromium	UG/L	5.29E+00	8.44E+00	2.25E+01		UG/L	2.25E+01	Max	(2)	2.10E+00	Mean-T	(1)
Cobalt	UG/L	4.46E+01	7.68E+01	2.83E+02		UG/L	1.71E+02	95% UCL-T	(1)	1.93E+01	Mean-T	(1)
Iron	UG/L	1.37E+04	2.52E+04	9.92E+04		UG/L	9.92E+04	Max	(2)	3.39E+03	Mean-T	(1)
Lead	UG/L	6.25E+00	1.16E+01	3.49E+01		UG/L	2.02E+00	Mean-T	(5,4)	2.02E+00	Mean-T	(4)
Manganese	UG/L	2.61E+02	3.60E+02	8.70E+02		UG/L	7.16E+02	95% UCL-T	(1)	1.72E+02	Mean-T	(1)
Nickel	UG/L	3.66E+01	6.53E+01	2.46E+02		UG/L	1.85E+02	95% UCL-T	(1)	1.28E+01	Mean-T	(1)
Thallium	UG/L	1.69E+00	3.60E+00	3.70E+00	J	UG/L	2.12E+00	95% UCL-T	(4)	1.52E+00	Mean-T	(4)
Vanadium	UG/L	3.43E+01	7.66E+01	3.27E+02		UG/L	3.27E+02	Max	(2)	4.94E+00	Mean-T	(1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.9
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Indian Head-Site 47
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer-Shallow groundwater beneath disposal area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1,2,2-Tetrachloroethane	UG/L	2.19E+02	4.91E+02	3.00E+00		UG/L	3.00E+00	Max	(4,2)	1.04E+00	Mean-T	(4)
1,1,2-Trichloroethane	UG/L	2.09E+02	4.70E+02	3.40E+00		UG/L	3.40E+00	Max	(4,2)	9.98E-01	Mean-T	(4)
1,1-Dichloroethane	UG/L	2.16E+02	4.76E+02	1.68E+02	J	UG/L	1.68E+02	Max	(4,2)	1.27E+00	Mean-T	(4)
1,1-Dichloroethene	UG/L	2.42E+02	5.05E+02	7.43E+02	J	UG/L	7.43E+02	Max	(4,2)	1.64E+00	Mean-T	(4)
1,2-Dibromo-3-chloropropane	UG/L	4.37E+02	9.98E+02	6.60E+00		UG/L	6.60E+00	Max	(4,2)	2.75E+00	Mean-T	(4)
1,2-Dichloroethane	UG/L	2.44E+02	5.06E+02	7.16E+02	J	UG/L	7.16E+02	Max	(4,2)	2.62E+00	Mean-T	(4)
1,2-Dichloropropane	UG/L	2.09E+02	4.70E+02	1.30E+00		UG/L	1.30E+00	Max	(4,2)	9.61E-01	Mean-T	(4)
Acetone	UG/L	8.39E+02	1.74E+03	6.06E+03	L	UG/L	6.06E+03	Max	(4,2)	1.71E+01	Mean-T	(4)
Bromodichloromethane	UG/L	2.09E+02	4.70E+02	4.30E+00		UG/L	4.30E+00	Max	(4,2)	4.14E-01	Mean-T	(4)
Bromomethane	UG/L	2.50E+02	5.15E+02	9.37E+02	J	UG/L	9.37E+02	Max	(4,2)	1.28E+00	Mean-T	(4)
Carbon disulfide	UG/L	6.96E+02	1.29E+03	6.62E+03	L	UG/L	6.62E+03	Max	(4,2)	2.79E+00	Mean-T	(4)
Carbon tetrachloride	UG/L	2.01E+04	4.23E+04	2.86E+05	L	UG/L	2.86E+05	Max	(4,2)	1.10E+01	Mean-T	(4)
Chloroethane	UG/L	2.10E+02	4.71E+02	2.62E+01	J	UG/L	2.62E+01	Max	(4,2)	1.12E+00	Mean-T	(4)
Chloroform	UG/L	6.55E+03	1.19E+04	5.76E+04	L	UG/L	5.76E+04	Max	(4,2)	1.14E+01	Mean-T	(4)
Chloromethane	UG/L	2.79E+03	7.20E+03	5.93E+04	J	UG/L	5.93E+04	Max	(4,2)	1.24E+00	Mean-T	(4)
Dibromochloromethane	UG/L	2.13E+02	4.73E+02	8.66E+01	J	UG/L	8.66E+01	Max	(4,2)	1.15E+00	Mean-T	(4)
Tetrachloroethene	UG/L	2.80E+02	5.43E+02	1.40E+03		UG/L	1.40E+03	Max	(4,2)	3.96E+00	Mean-T	(4)
Toluene	UG/L	4.96E+01	9.89E+01	2.37E+02	J	UG/L	2.37E+02	Max	(4,2)	1.26E+00	Mean-T	(4)
Trichloroethene	UG/L	2.49E+02	5.07E+02	3.39E+02		UG/L	3.39E+02	Max	(4,2)	4.35E+00	Mean-T	(4)
Vinyl chloride	UG/L	2.10E+02	4.71E+02	2.82E+01	J	UG/L	2.82E+01	Max	(4,2)	1.19E+00	Mean-T	(4)
cis-1,2-Dichloroethene	UG/L	2.76E+02	5.51E+02	1.45E+03	J	UG/L	1.45E+03	Max	(4,2)	3.40E+00	Mean-T	(4)
trans-1,2-Dichloroethene	UG/L	2.26E+02	4.86E+02	3.82E+02	J	UG/L	3.82E+02	Max	(4,2)	1.40E+00	Mean-T	(4)
trans-1,3-Dichloropropene	UG/L	2.09E+02	4.70E+02	4.80E+00		UG/L	4.80E+00	Max	(4,2)	1.02E+00	Mean-T	(4)
Hexachloroethane	UG/L	8.63E+00	1.48E+01	5.80E+01		UG/L	1.06E+01	95% UCL-T	(4)	6.00E+00	Mean-T	(4)
Naphthalene	UG/L	4.86E+00	5.27E+00	5.50E+00	J	UG/L	5.27E+00	95% UCL-N	(4)	4.86E+00	Mean-N	(4)
Pentachlorophenol	UG/L	1.22E+01	1.33E+01	4.00E+00	J	UG/L	4.00E+00	Max	(4,2)	4.00E+00	Max	(4,2)
bis(2-Ethylhexyl)phthalate	UG/L	4.25E+00	4.98E+00	5.10E+00	J	UG/L	4.98E+00	95% UCL-N	(4)	4.25E+00	Mean-N	(4)

Table 3.9

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Indian Head-Site 47

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer-Shallow groundwater beneath disposal area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	UG/L	3.08E+03	6.20E+03	2.71E+04		UG/L	2.52E+04	95% UCL-T	(1)	7.52E+02	Mean-T	(1)
Arsenic	UG/L	2.16E+01	3.83E+01	1.08E+02		UG/L	1.08E+02	Max	(4,2)	5.21E+00	Mean-T	(4)
Barium	UG/L	1.26E+02	1.75E+02	3.46E+02		UG/L	3.46E+02	Max	(4,2)	8.02E+01	Mean-T	(4)
Beryllium	UG/L	1.64E+00	3.32E+00	1.45E+01		UG/L	6.11E+00	95% UCL-T	(1)	4.98E-01	Mean-T	(1)
Cadmium	UG/L	1.04E+00	1.65E+00	5.60E+00		UG/L	1.87E+00	95% UCL-T	(1)	6.70E-01	Mean-T	(1)
Chromium	UG/L	6.02E+00	9.73E+00	2.84E+01		UG/L	2.84E+01	Max	(4,2)	2.00E+00	Mean-T	(4)
Cobalt	UG/L	4.24E+01	7.48E+01	2.82E+02		UG/L	1.64E+02	95% UCL-T	(1)	1.71E+01	Mean-T	(1)
Cyanide	UG/L	2.36E+03	6.15E+03	2.32E+04		UG/L	2.32E+04	Max	(4,2)	7.24E+01	Mean-T	(4)
Iron	UG/L	1.38E+04	2.53E+04	9.93E+04		UG/L	5.21E+04	95% UCL-T	(1)	5.05E+03	Mean-T	(1)
Lead	UG/L	5.49E+00	9.57E+00	3.50E+01		UG/L	2.46E+00	Mean-T	(5,4)	2.46E+00	Mean-T	(4)
Manganese	UG/L	2.43E+02	3.38E+02	8.69E+02		UG/L	5.88E+02	95% UCL-T	(1)	1.64E+02	Mean-T	(1)
Nickel	UG/L	3.25E+01	6.15E+01	2.49E+02	L	UG/L	1.35E+02	95% UCL-T	(1)	1.07E+01	Mean-T	(1)
Thallium	UG/L	2.81E+00	3.60E+00	6.50E+00	L	UG/L	3.67E+00	95% UCL-T	(4)	2.45E+00	Mean-T	(4)
Vanadium	UG/L	4.01E+01	7.66E+01	3.26E+02	L	UG/L	8.63E+01	95% UCL-T	(4)	1.92E+01	Mean-T	(4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.10
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Indian Head-Site 47
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Water Vapors at Showerhead

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1,2,2-Tetrachloroethane	UG/L	2.19E+02	4.91E+02	3.00E+00		UG/L	3.00E+00	Max	(4,2)	1.04E+00	Mean-T	(4)
1,1,2-Trichloroethane	UG/L	2.09E+02	4.70E+02	3.40E+00		UG/L	3.40E+00	Max	(4,2)	9.98E-01	Mean-T	(4)
1,1-Dichloroethane	UG/L	2.16E+02	4.76E+02	1.68E+02	J	UG/L	1.68E+02	Max	(4,2)	1.27E+00	Mean-T	(4)
1,1-Dichloroethene	UG/L	2.42E+02	5.05E+02	7.43E+02	J	UG/L	7.43E+02	Max	(4,2)	1.64E+00	Mean-T	(4)
1,2-Dibromo-3-chloropropane	UG/L	4.37E+02	9.98E+02	6.60E+00		UG/L	6.60E+00	Max	(4,2)	2.75E+00	Mean-T	(4)
1,2-Dichloroethane	UG/L	2.44E+02	5.06E+02	7.16E+02	J	UG/L	7.16E+02	Max	(4,2)	2.62E+00	Mean-T	(4)
1,2-Dichloropropane	UG/L	2.09E+02	4.70E+02	1.30E+00		UG/L	1.30E+00	Max	(4,2)	9.61E-01	Mean-T	(4)
Acetone	UG/L	8.39E+02	1.74E+03	6.06E+03	L	UG/L	6.06E+03	Max	(4,2)	1.71E+01	Mean-T	(4)
Bromodichloromethane	UG/L	2.09E+02	4.70E+02	4.30E+00		UG/L	4.30E+00	Max	(4,2)	4.14E-01	Mean-T	(4)
Bromomethane	UG/L	2.50E+02	5.15E+02	9.37E+02	J	UG/L	9.37E+02	Max	(4,2)	1.28E+00	Mean-T	(4)
Carbon disulfide	UG/L	6.96E+02	1.29E+03	6.62E+03	L	UG/L	6.62E+03	Max	(4,2)	2.79E+00	Mean-T	(4)
Carbon tetrachloride	UG/L	2.01E+04	4.23E+04	2.86E+05	L	UG/L	2.86E+05	Max	(4,2)	1.10E+01	Mean-T	(4)
Chloroethane	UG/L	2.10E+02	4.71E+02	2.62E+01	J	UG/L	2.62E+01	Max	(4,2)	1.12E+00	Mean-T	(4)
Chloroform	UG/L	6.55E+03	1.19E+04	5.76E+04	L	UG/L	5.76E+04	Max	(4,2)	1.14E+01	Mean-T	(4)
Chloromethane	UG/L	2.79E+03	7.20E+03	5.93E+04	J	UG/L	5.93E+04	Max	(4,2)	1.24E+00	Mean-T	(4)
Dibromochloromethane	UG/L	2.13E+02	4.73E+02	8.66E+01	J	UG/L	8.66E+01	Max	(4,2)	1.15E+00	Mean-T	(4)
Tetrachloroethene	UG/L	2.80E+02	5.43E+02	1.40E+03		UG/L	1.40E+03	Max	(4,2)	3.96E+00	Mean-T	(4)
Toluene	UG/L	4.96E+01	9.89E+01	2.37E+02	J	UG/L	2.37E+02	Max	(4,2)	1.26E+00	Mean-T	(4)
Trichloroethene	UG/L	2.49E+02	5.07E+02	3.39E+02		UG/L	3.39E+02	Max	(4,2)	4.35E+00	Mean-T	(4)
Vinyl chloride	UG/L	2.10E+02	4.71E+02	2.82E+01	J	UG/L	2.82E+01	Max	(4,2)	1.19E+00	Mean-T	(4)
cis-1,2-Dichloroethene	UG/L	2.76E+02	5.51E+02	1.45E+03	J	UG/L	1.45E+03	Max	(4,2)	3.40E+00	Mean-T	(4)
trans-1,2-Dichloroethene	UG/L	2.26E+02	4.86E+02	3.82E+02	J	UG/L	3.82E+02	Max	(4,2)	1.40E+00	Mean-T	(4)
trans-1,3-Dichloropropene	UG/L	2.09E+02	4.70E+02	4.80E+00		UG/L	4.80E+00	Max	(4,2)	1.02E+00	Mean-T	(4)
Naphthalene	UG/L	4.86E+00	5.27E+00	5.50E+00	J	UG/L	5.27E+00	95% UCL-N	(4)	4.86E+00	Mean-N	(4)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

Table 3.10

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Indian Head-Site 47

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Water Vapors at Showerhead

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.11
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Indian Head-Site 47
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer-Volatilization from open excavation

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
1,1,2,2-Tetrachloroethane	UG/L	2.19E+02	4.91E+02	3.00E+00		UG/L	3.00E+00	Max	(4,2)	1.04E+00	Mean-T	(4)
1,1,2-Trichloroethane	UG/L	2.09E+02	4.70E+02	3.40E+00		UG/L	3.40E+00	Max	(4,2)	9.98E-01	Mean-T	(4)
1,1-Dichloroethane	UG/L	2.16E+02	4.76E+02	1.68E+02	J	UG/L	1.68E+02	Max	(4,2)	1.27E+00	Mean-T	(4)
1,1-Dichloroethene	UG/L	2.42E+02	5.05E+02	7.43E+02	J	UG/L	7.43E+02	Max	(4,2)	1.64E+00	Mean-T	(4)
1,2-Dibromo-3-chloropropane	UG/L	4.37E+02	9.98E+02	6.60E+00		UG/L	6.60E+00	Max	(4,2)	2.75E+00	Mean-T	(4)
1,2-Dichloroethane	UG/L	2.44E+02	5.06E+02	7.16E+02	J	UG/L	7.16E+02	Max	(4,2)	2.62E+00	Mean-T	(4)
1,2-Dichloropropane	UG/L	2.09E+02	4.70E+02	1.30E+00		UG/L	1.30E+00	Max	(4,2)	9.61E-01	Mean-T	(4)
Acetone	UG/L	8.39E+02	1.74E+03	6.06E+03	L	UG/L	6.06E+03	Max	(4,2)	1.71E+01	Mean-T	(4)
Bromodichloromethane	UG/L	2.09E+02	4.70E+02	4.30E+00		UG/L	4.30E+00	Max	(4,2)	4.14E-01	Mean-T	(4)
Bromomethane	UG/L	2.50E+02	5.15E+02	9.37E+02	J	UG/L	9.37E+02	Max	(4,2)	1.28E+00	Mean-T	(4)
Carbon disulfide	UG/L	6.96E+02	1.29E+03	6.62E+03	L	UG/L	6.62E+03	Max	(4,2)	2.79E+00	Mean-T	(4)
Carbon tetrachloride	UG/L	2.01E+04	4.23E+04	2.86E+05	L	UG/L	2.86E+05	Max	(4,2)	1.10E+01	Mean-T	(4)
Chloroethane	UG/L	2.10E+02	4.71E+02	2.62E+01	J	UG/L	2.62E+01	Max	(4,2)	1.12E+00	Mean-T	(4)
Chloroform	UG/L	6.55E+03	1.19E+04	5.76E+04	L	UG/L	5.76E+04	Max	(4,2)	1.14E+01	Mean-T	(4)
Chloromethane	UG/L	2.79E+03	7.20E+03	5.93E+04	J	UG/L	5.93E+04	Max	(4,2)	1.24E+00	Mean-T	(4)
Dibromochloromethane	UG/L	2.13E+02	4.73E+02	8.66E+01	J	UG/L	8.66E+01	Max	(4,2)	1.15E+00	Mean-T	(4)
Tetrachloroethene	UG/L	2.80E+02	5.43E+02	1.40E+03		UG/L	1.40E+03	Max	(4,2)	3.96E+00	Mean-T	(4)
Toluene	UG/L	4.96E+01	9.89E+01	2.37E+02	J	UG/L	2.37E+02	Max	(4,2)	1.26E+00	Mean-T	(4)
Trichloroethene	UG/L	2.49E+02	5.07E+02	3.39E+02		UG/L	3.39E+02	Max	(4,2)	4.35E+00	Mean-T	(4)
Vinyl chloride	UG/L	2.10E+02	4.71E+02	2.82E+01	J	UG/L	2.82E+01	Max	(4,2)	1.19E+00	Mean-T	(4)
cis-1,2-Dichloroethene	UG/L	2.76E+02	5.51E+02	1.45E+03	J	UG/L	1.45E+03	Max	(4,2)	3.40E+00	Mean-T	(4)
trans-1,2-Dichloroethene	UG/L	2.26E+02	4.86E+02	3.82E+02	J	UG/L	3.82E+02	Max	(4,2)	1.40E+00	Mean-T	(4)
trans-1,3-Dichloropropene	UG/L	2.09E+02	4.70E+02	4.80E+00		UG/L	4.80E+00	Max	(4,2)	1.02E+00	Mean-T	(4)
Naphthalene	UG/L	4.86E+00	5.27E+00	5.50E+00	J	UG/L	5.27E+00	95% UCL-N	(4)	4.86E+00	Mean-N	(4)

Table 3.11

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Indian Head-Site 47

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Air

Exposure Point: Upper Aquifer-Volatilization from open excavation

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

(5) Maximum detected concentration used because sample size is less than 5.

(6) Mean value used because sample size is less than 5.

Table 3.12
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Indian Head-Site 47
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Tetrachloroethene	MG/KG	9.13E-02	2.09E-01	3.10E+00		MG/KG	3.29E-02	95% UCL-T	(4)	6.22E-03	Mean-T	(4)
Benzo(a)anthracene	MG/KG	3.02E-01	4.25E-01	2.20E+00		MG/KG	6.04E-01	95% UCL-T	(4)	1.27E-01	Mean-T	(4)
Benzo(a)pyrene	MG/KG	2.52E-01	3.45E-01	1.90E+00		MG/KG	4.92E-01	95% UCL-T	(4)	1.19E-01	Mean-T	(4)
Benzo(b)fluoranthene	MG/KG	4.06E-01	6.01E-01	4.60E+00		MG/KG	1.01E+00	95% UCL-T	(4)	1.29E-01	Mean-T	(4)
Dibenz(a,h)anthracene	MG/KG	1.55E-01	1.87E-01	8.50E-01		MG/KG	2.87E-01	95% UCL-T	(4)	1.02E-01	Mean-T	(4)
Indeno(1,2,3-cd)pyrene	MG/KG	2.02E-01	2.98E-01	2.60E+00		MG/KG	3.50E-01	95% UCL-T	(4)	1.01E-01	Mean-T	(4)
Aluminum	MG/KG	3.75E+03	4.56E+03	2.28E+04		MG/KG	4.16E+03	95% UCL-T	(4)	3.11E+03	Mean-T	(4)
Antimony	MG/KG	7.20E+00	1.73E+01	3.70E+00	J	MG/KG	3.29E+00	95% UCL-T	(4)	8.12E-01	Mean-T	(4)
Arsenic	MG/KG	2.58E+00	3.20E+00	1.62E+01		MG/KG	3.58E+00	95%UCL-T	(4)	1.77E+00	Mean-T	(4)
Chromium	MG/KG	1.08E+01	1.25E+01	4.07E+01		MG/KG	1.24E+01	95%UCL-T	(4)	9.12E+00	Mean-T	(4)
Iron	MG/KG	8.17E+03	9.59E+03	3.60E+04		MG/KG	1.04E+04	95%UCL-T	(4)	6.54E+03	Mean-T	(4)
Lead	MG/KG	8.43E+01	1.41E+02	1.31E+03	K	MG/KG	8.43E+01	Mean-N	(5)	8.43E+01	Mean-N	(5)
Manganese	MG/KG	1.29E+02	1.54E+02	5.02E+02	L	MG/KG	2.42E+02	95%UCL-T	(4)	8.31E+01	Mean-T	(4)
Mercury	MG/KG	2.38E+00	4.09E+00	4.74E+01		MG/KG	5.64E+00	95%UCL-T	(1)	3.55E-01	Mean-T	(1)
Silver	MG/KG	4.14E+01	7.40E+01	8.14E+02		MG/KG	1.78E+02	95%UCL-T	(1)	2.04E+00	Mean-T	(1)
Vanadium	MG/KG	1.47E+01	1.71E+01	5.51E+01		MG/KG	1.87E+01	95%UCL-T	(1)	1.17E+01	Mean-T	(1)

* Surface soil & subsurface soil combined.
Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.13
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Disposal Area

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Tetrachloroethene	MG/KG	9.13E-02	2.09E-01	3.10E+00		MG/KG	3.29E-02	95%UCL-T	(4)	6.22E-03	Mean-T	(4)

* Surface soil & subsurface soil combined.
Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Lead evaluated using the adult lead model. Per comments from EPA (April 12, 2000), the mean value is used for the EPC.

Table 3.14
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Indian Head, Site 47
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Concrete
Exposure Point: Concrete Troughs

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	MG/KG	1.95E+00	-	2.10E+00		MG/KG	2.10E+00	Max	(2)	1.95E+00	Mean	(3)
Lead	MG/KG	1.67E+03	-	2.11E+03		MG/KG	1.67E+03	Mean	(4)	1.67E+03	Mean	(4)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.
Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

[1] Only two concrete samples were collected from concrete trough. Therefore, no statistics were calculated. Full data included in Appendix.
(2) Maximum detected concentration used because sample size is less than 5.
(3) Mean value used because sample size is less than 5.
(4) Lead evaluated using the adult lead model. Per comments from EPA, the mean value is used for the EPC.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	- -	see Table 3.1	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	60	(1)	60	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	- -	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	- -	see Table 3.1	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992	2,000	EPA, 1992	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	60	(1)	60	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) Professional judgement based on current use information of 5 days per month for 12 months.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	FDC	Fugivite Dust Concentration in Air	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.5	EPA, 1991	2.5	EPA, 1991	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/FDC + 1/VF)
	EF	Exposure Frequency	days/year	60	PJ	60	PJ	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA., 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	- -	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Professional judgement based on current use information of 5 days per month for 12 months.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

PJ: Professional judgement based on current use information of 5 days per month for 12 months.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3	- -	see Table 3.3	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-Sed	Ingestion Rate of Sediment	mg/day	100	EPA, 1991	50	EPA, 1993	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	15	(1)	15	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	5,475	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3	--	see Table 3.3	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,000	EPA, 1997	5,400	EPA, 1997	CSed x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1.0	EPA, 1992	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001; EPA, 1995	chem specific	EPA, 2001; EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	15	(1)	15	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	5,475	EPA, 1989	1,825	EPA, 1989	

(1): Professional judgement assuming 15 days per year exposure frequency for the RME and CT and 8 hours exposure time for RME and 1/2 the RME value for the CT.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.4	- -	see Table 3.4	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-Sed	Ingestion Rate of Sediment	mg/day	100	EPA, 1991	50	EPA, 1993	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	104	(1)	52	(1)	
	ED	Exposure Duration	years	9	(2)	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.4	- -	see Table 3.4	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,140	EPA, 1997	1,960	EPA, 1997	CSed x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1.0	EPA, 1992	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	104	(1)	52	(1)	
	ED	Exposure Duration	years	9	(2)	9	EPA, 1993	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming 2 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) RME SA is the sum of the mean surface areas (for a male) of the head, hands, and feet while wading. CT SA is the sum of the mean surface areas (for a male) of the feet and hands.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

Skin surface area in contact with sediment based on contact while wading. Assumed 30 percent of total surface area (hands, forearms, lower legs, and feet).

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	l/hour	0.025	EPA, 1989, (1)	0.025	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
	ET	Exposure Time	hr/day	8	(1)	4	(1)	1/BW x 1/AT
	EF	Exposure Frequency	days/year	15	(1)	15	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	6.6	EPA, 1997	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	2,409	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.5	- -	see Table 3.5	--	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	8	EPA, 1995	0.2	(1)	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	6,000	EPA, 1992	18,000	EPA, 1992	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	15	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	25	EPA, 1991	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm^2, with a mean of 20,000 cm^2; the mean is used.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	l/hour	0.025	EPA, 1989, (1)	0.025	EPA, 1989, (1)	CSW x IR-SW x ET x EF x ED x CF1 x
	ET	Exposure Time	hr/day	1.8	(2)	1.8	(2)	1/BW x 1/AT
	EF	Exposure Frequency	days/year	104	(3)	52	(3)	
	ED	Exposure Duration	years	9	(4)	9	EPA, 1993	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	37	EPA, 1991	37	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.5	- -	see Table 3.5	--	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	1.8	(2)	1.8	(2)	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	5,500	EPA, 1997, (5)	4,500	EPA, 1997, (5)	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	104	(3)	52	(3)	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	9	(4)	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	37	EPA, 1991	37	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement assuming trespasser would spend a maximum of 1.8 hours at the site.

(3) Professional Judgement assuming 2 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(4) Professional Judgement assuming adolescents from 9 to 18 years of age.

(5) Skin surface area in contact with surface water based on contact while wading. Assumed 30 percent of total surface area (hands, forearms, lower legs, and feet).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm^2, with a mean of 20,000 cm^2; the mean is used.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	--	see Table 3.6	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	104	(1)	52	(1)	
	ED	Exposure Duration	years	9	(2)	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	--	see Table 3.6	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1997	3,700	EPA, 1997	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	104	(1)	52	(1)	
	ED	Exposure Duration	years	9	(2)	9	EPA, 1993	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming 2 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

SA: assumed 25 % of total skin surface area for 12-15 year old male. Total is 1.49 m2 for 50th percentile and 1.85 m2 for 95th percentile.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.7	--	see Table 3.7	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	FDC	Fugivite Dust Concentration in Air	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1991	0.83	EPA, 1991	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/FDC + 1/VF)
	EF	Exposure Frequency	days/year	104	(2)	52	(2)	
	ED	Exposure Duration	years	9	(3)	9	EPA, 1993	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgement assuming 2 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.8	--	see Table 3.8	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	2	EPA, 1997	1.4	EPA, 1993	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.8	--	see Table 3.8	--	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.2	EPA, 1995	0.2	(1)	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	20,000	EPA, 1992	18,000	EPA, 1992	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	x CF1 x CF2
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Skin surface area in contact with groundwater are based on ranges. For total adult male surface area ranges from 17,000 to 23,000 cm^2, with a mean of 20,000 cm^2; the mean is used.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.8	--	see Table 3.8	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	liters/day	1	EPA, 1997	1	(1)	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	(1)	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.8	--	see Table 3.8	--	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	ET	Exposure Time	hr/day	0.33	EPA, 1992	0.33	(1)	PC x CW x ET x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	
	SA	Skin Surface Area Available for Contact	cm^2	7,500	EPA, 1997	6,500	EPA, 1997	Organics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	x CF1 x CF2
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	(1)	

(1) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Water	µg/l	see Table 3.8	--	see Table 3.8	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W-A	Ingestion Rate of Water, Adult	liters/day	2	EPA, 1997a	1.4	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
	IR-W-C	Ingestion Rate of Water, Child	liters/day	1	EPA, 1997a	1	(1)	
	IR-W-Adj	Ingestion Rate of Water, Age-adjusted	liter-year/kg-day	1.09	calculated	0.58	calculated	IR-W-Adj (liter-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-W-C / BW-C) + (ED-A x IR-W-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.8	--	see Table 3.8	--	CDI (mg/kg-day) =
	DAevent-A	Dermally Absorbed Dose per Event, Adult	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x EF x 1/AT
	DAevent-C	Dermally Absorbed Dose per Event, Child	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	
	DA-Adj	Dermally Absorbed Dose, Age-adjusted	mg-year/event-kg	calculated		calculated		DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	Inorganics:
	ET-A	Exposure Time, Adult	hr/day	0.2	EPA, 1992	0.2	(1)	DAevent-A (mg/cm2-event) =
	ET-C	Exposure Time, Child	hr/day	0.33	EPA, 1992	0.33	(1)	PC x CW x ET-A x CF1 x CF2
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	DAevent-C (mg/cm2-event) =
	SA-A	Skin Surface Area, Adult	cm^2	20,000	EPA, 1992	18,000	EPA, 1997b	PC x CW x ET-C x CF1 x CF2
	SA-C	Skin Surface Area, Child	cm^2	7,500	EPA, 1997b	6,500	EPA, 1997b	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	Organics:
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	DAevent-A (mg/cm2-event) =
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	2 x PC x CW x (sqrt((6 x t x ET-A)/3.1415)) x CF1 x CF2
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	DAevent-C (mg/cm2-event) =
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	2 x PC x CW x (sqrt((6 x t x ET-C)/3.1415)) x CF1 x CF2
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CW	Chemical Concentration in Water	µg/l	see Table 3.9	--	see Table 3.9	--	CDI (mg/kg-day) =
	DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 1992	calculated	EPA, 1992	DAevent x SA x EF x ED x 1/BW x 1/AT
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	Inorganics: DAevent (mg/cm2-event) =
	t	Lag Time	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	PC x CW x ET x CF1 x CF2
	t*	Time to Reach Steady-state	hours	chem specific	EPA, 1992	chem specific	EPA, 1992	
	B	Ratio of Permeability of Stratum Corneum to Epidermis	dimensionless	chem specific	EPA, 1992	chem specific	EPA, 1992	Organics :
	ET	Exposure Time	hr/day	8	(1)	4	(1)	ET<t*: DAevent (mg/cm2-event) =
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
	SA	Skin Surface Area Available for Contact	cm^2	6,000	EPA, 1997	5,400	EPA, 1997	x CF1 x CF2
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	ET>t*: DAevent (mg/cm2-event) =
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgement based on construction activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Skin surface area in contact with groundwater based on contact during construction activities. Assumed 30 percent of total surface area (hands, forearms, lower legs, and feet).

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	InhExp	Inhalation Exposure per Shower	mg/kg-shower	see Table 3.10	--	see Table 3.10	--	Foster & Chrostowski Shower Inhalation Model for InhExp
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	InhExp x EF x ED x 1/AT
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA. 1989	3,285	EPA. 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Air

Exposure Point: Upper Aquifer - Volatilization from open excavation

Receptor Population: Construction Worker

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air concentration	mg/m^3	see Table 3.11	--	see Table 3.11	--	Two-Film Volatilization Model for CA
	IN	Inhalation Rate	m^3/hour	2.5	EPA, 1997 (3)	1.5	EPA, 1997 (3)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	EF	Exposure Frequency	days/year	250	(2)	219	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	CA x IN x ET x EF x ED x 1/BW x 1/AT
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Professional Judgement assuming that the construction would be open for 3 months (20 days per month) for the RME based on similar size excavations that have occurred at the WNY. It was assumed the duration of the open construction would be 1/2 the RME for the CT.

(3) Inhalation rates are based on values for the outdoor worker assuming heavy activity for the RME and moderate activity for the CT (EPA, 1997, page 5-24).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12	--	see Table 3.12	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	480	(1)	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	125	(2)	125	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	(1)	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12	--	see Table 3.12	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992	2,000	EPA, 1992	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	125	(2)	125	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	(1)	

(1) Not available, used RME value.

(2) Assumed duration of construction project may be 1/2 a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.16

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12	--	see Table 3.12	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12	--	see Table 3.12	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992	2,000	EPA, 1992	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.17

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal area
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12		see Table 3.12		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12		see Table 3.12		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	6,600	EPA, 1997, (3)	5,700	EPA, 1997, (3)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997, (4)	0.2	EPA, 1997, (4)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	8,760	EPA, 1989	

(1) Not available, used RME value.

(2) Assumed duration of construction project may be 1/2 a year.

(3) SSAF based on maximum adherence factor for utility workers.

(4) Surface area based on resident wearing shorts and short sleever shirt. CT value is 50th percentile.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.18

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal area
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12		see Table 3.12		Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12		see Table 3.12		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,400	EPA, 1997, (3)	2,900	EPA, 1997, (3)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (4)	0.11	EPA, 1997, (4)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Not available, used RME value.

(2) Assumed duration of construction project may be 1/2 a year.

(3) SSAF based on maximum adherence factor for utility workers.

(4) Surface area based on resident wearing shorts and short sleever shirt. CT value is 50th percentile.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.19

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal area
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12		see Table 3.12	mg/kg	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	mg/day	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	mg/day	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	calculated	46.43	mg-year/kg-day	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	days/year	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	years	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	years	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	kg/mg	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	kg	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	kg	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	days	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.12		see Table 3.12		CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, A	cm^2	6,600	EPA, 1997	5,700	EPA, 1997	CS x SA x SSAF x DABS x CF3 x EF x
	SA-C	Skin Surface Area Available for Contact, C	cm^2	3,400	EPA, 1997	2,900	EPA, 1997	ED x 1/BW x 1/AT
	SSAF-A	Soil to Skin Adherence Factor, Adult	mg/cm^2-day	0.2	EPA, 1997	0.2	EPA, 1997	
	SSAF-C	Soil to Skin Adherence Factor, Child	mg/cm^2-day	0.11	EPA, 1997	0.11	EPA, 1997	
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	602	calculated	368.3	calculated	
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 2001, EPA, 1995	chem specific	EPA, 2001, EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	EPA, 1991	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

(2) Assumed duration of construction project may be 1/2 a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part E. OERR. EPA/540/R/99/005.

TABLE 4.20

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.13	--	see Table 3.13	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	FDC	Fugivite Dust Concentration in Air	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	1.7	EPA, 1997	1.7	EPA, 1997	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/FDC + 1/VF)
	EF	Exposure Frequency	days/year	125	(2)	125	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	(3)	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	NA	- -	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Assumed duration of construction project may be 1/2 a year.

(3) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

TABLE 4.21

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.13	--	see Table 3.13	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	FDC	Fugivite Dust Concentration in Air	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.5	EPA, 1991	2.5	EPA, 1991	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/FDC + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA., 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1825	- -	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

TABLE 4.22

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future

Medium: Soil

Exposure Medium: Air

Exposure Point: Emissions from exposed soil at disposal area

Receptor Population: Resident

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.83	EPA, 1999	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA,1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 4.23

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future

Medium: Soil

Exposure Medium: Air

Exposure Point: Emissions from exposed soil at disposal area

Receptor Population: Resident

Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.5	EPA, 1999	0.5	EPA, 1999	
	ET	Exposure Time	hr/day	24	(2)	24	(2)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 4.24

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future

Medium: Soil

Exposure Medium: Air

Exposure Point: Emissions from exposed soil at disposal area

Receptor Population: Resident

Receptor Age: Adult/Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ---	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table ----	- -	see Table ---	- -	CA x IN-S-Adj x ET x EF x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	IN-S-Adj (m^3-year/kg-hour) =
	IN-S-A	Inhalation Rate, Adult	$m^3/hour$	0.83	EPA, 1999	0.83	EPA, 1999	(ED-C x IN-S-C / BW-C) + (ED-A x IN-S-A / BW-A)
	IN-S-C	Inhalation Rate, Child	$m^3/hour$	0.5	EPA, 1999	0.5	EPA, 1999	
	IN-S-Adj	Inhalation Rate, Age-adjusted	m^3-year/kg-hour	0.49	calculated	0.31	calculated	
	ET	Exposure Time	hr/day	24	(2)	24	(2)	CA (mg/m^3) = CS (1/FDC + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	BW-A	Body Weight, Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

Workbook: Copy of Site 47 Table 4.xls
Worksheet: t424

12/31/2003

TABLE 4.25

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Concrete
Exposure Point: Concrete troughs
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Concrete	mg/kg	see Table 3.14	--	see Table 3.14	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	480	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	30	(2)	30	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.14	--	see Table 3.14	--	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992	2,000	EPA, 1992	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	1	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	30	(2)	30	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Not available, used RME value.

(2) Assumed duration of concrete work in a construction project to be 30 days in a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.26

VALUES USED FOR DAILY INTAKE CALCULATIONS

Indian Head - Site 47

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Concrete
Exposure Point: Concrete troughs
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Concrete	mg/kg	see Table 3.13	--	see Table 3.13	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	calc	EPA, 1996	calc	EPA, 1996	CA x IN x ET x EF x ED x 1/BW x 1/AT
	FDC	Fugivite Dust Concentration in Air	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	1.7	EPA, 1997	1.7	EPA, 1997	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/FDC + 1/VF)
	EF	Exposure Frequency	days/year	30	(2)	30	(2)	
	ED	Exposure Duration	years	1	EPA, 1991	1	(3)	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Assumed duration of concrete work in a construction project to be 30 days in a year.

(3) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Indian Head, Site 47

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	100%	1.0E+00	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Antimony	Chronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	02/07/2002
	Subchronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Blood	1000	HEAST	07/08/1998
Arsenic	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Skin	3	IRIS	06/17/1998
	Subchronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Skin	3	HEAST	07/08/1998
Barium	Chronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	Cardiovascular	3	IRIS	06/17/1998
	Subchronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	Cardiovascular	3	HEAST	07/08/1998
Beryllium	Chronic	2.0E-03	mg/kg-day	0.7%	1.4E-05	mg/kg-day	GI	100	IRIS	06/17/1998
	Subchronic	5.0E-03	mg/kg-day	0.7%	3.5E-05	mg/kg-day	GI	100	HEAST	07/08/1998
Cadmium (Food)	Chronic	1.0E-03	mg/kg-day	2.5%	2.5E-05	mg/kg-day	Kidney	10	IRIS	06/17/1998
	Subchronic	N/A								
Cadmium (Water)	Chronic	5.0E-04	mg/kg-day	2.5%	1.3E-05	mg/kg-day	Kidney	10	IRIS	06/17/1998
	Subchronic	N/A								
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	NOAEL	500	IRIS	06/17/1998
	Subchronic	2.0E-02	mg/kg-day	2.5%	5.0E-04	mg/kg-day	NOAEL	100	HEAST	07/08/1998
Cobalt	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Sensitizer	N/A	NCEA	11/18/1991
	Subchronic	N/A								
Cyanide	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Whole body	100/5	IRIS	02/07/2002
	Subchronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Whole body	500	HEAST	07/08/1998
Iron	Chronic	3.0E-01	mg/kg-day	100%	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
	Subchronic	N/A								
Lead	Chronic	N/A								
	Subchronic	N/A								
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	CNS	1	IRIS	06/17/1998
	Subchronic	N/A								
Mercury	Chronic	N/A								
	Subchronic	N/A								
Mercury (mercuric chloride)	Chronic	3.0E-04	mg/kg-day	7%	2.1E-05	mg/kg-day	Nervous System	100	IRIS	06/17/1998
	Subchronic	NA	mg/kg-day			mg/kg-day				
Nickel	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Whole body	300	IRIS	06/22/1998
	Subchronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Whole body	300	HEAST	07/08/1998
Silver	Chronic	5.0E-03	mg/kg-day	4%	2.0E-04	mg/kg-day	Skin	3	IRIS	06/22/1998
	Subchronic	5.0E-03	mg/kg-day	4%	2.0E-04	mg/kg-day	Skin	3	HEAST	07/08/1998

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Indian Head, Site 47

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Liver & Blood		O	
	Subchronic	N/A								
Vanadium	Chronic	1.0E-03	mg/kg-day	2.6%	2.6E-05	mg/kg-day	Kidney	300	NCEA	05/01/2000
	Subchronic	N/A								
Nitroglycerin	Chronic	N/A								
	Subchronic	N/A								
Benzo(a)pyrene	Chronic	N/A								
	Subchronic	N/A								
Benzo(b)fluoranthene	Chronic	N/A								
	Subchronic	N/A								
bis(2-Ethylhexyl)phthalate)	Chronic	2.0E-02	mg/kg-day	55%	1.1E-02	mg/kg-day	Liver	1000	IRIS	07/09/1998
	Subchronic	2.0E-02	mg/kg-day	55%	1.1E-02	mg/kg-day	Reproductive	3000	NCEA	03/28/96
bis(2-Ethylhexyl)phthalate	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Liver/	1000/1	IRIS	02/07/2002
	Subchronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Reproductive	3000	NCEA	03/28/1996
Dibenz(a,h)anthracene	Chronic	N/A								
	Subchronic	N/A								
Indeno(1,2,3-cd)pyrene	Chronic	N/A								
	Subchronic	N/A								
Hexachloroethane	Chronic	1.0E-03	mg/kg-day	100%	1.0E-03	mg/kg-day	Kidney	1000	IRIS	02/28/2000
	Subchronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Kidney	100	HEAST	07/08/1998
Naphthalene	Chronic	2.0E-02	mg/kg-day	89%	2.0E-02	mg/kg-day	Decreased Body Weight	3000/1	IRIS	02/07/2002
Pentachlorophenol	Chronic	3.0E-02	mg/kg-day	100%	3.0E-02	mg/kg-day	Fetus	100	IRIS	02/28/2000
	Subchronic	3.0E-02	mg/kg-day	100%	3.0E-02	mg/kg-day	Fetus	100	HEAST	07/08/1998
1,1,2, 2-Tetrachloroethane	Chronic	6.0E-02	mg/kg-day	100%	6.0E-02	mg/kg-day	Liver and Kidney		NCEA	03/30/2000
	Subchronic	N/A								
1,1,2-Trichloroethane	Chronic	4.0E-03	mg/kg-day	100%	4.0E-03	mg/kg-day	Blood	1000	IRIS	07/02/1998
	Subchronic	4.0E-02	mg/kg-day	100%	4.0E-02	mg/kg-day	Blood	100	HEAST	07/08/1998
1,2-Dibromo-3-chloropropane	Chronic	N/A								
	Subchronic	N/A								
1,1-Dichloroethane	Chronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	NOAEL	1000	HEAST	07/08/1998
	Subchronic	1.0E+00	mg/kg-day	100%	1.0E+00	mg/kg-day	NOAEL	100	HEAST	07/08/1998
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg-day	100%	5.0E-02	mg/kg-day	Liver	1000	IRIS	07/02/1998
	Subchronic	5.0E-02	mg/kg-day	100%	5.0E-02	mg/kg-day	Liver	1000	HEAST	07/08/1998
1,2-Dichloroethane	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Liver	1000	NCEA	04/05/1993
	Subchronic	N/A								
cis-1,2-Dichloroethene	Chronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Blood	3000	HEAST	07/08/1998
	Subchronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Blood	300	HEAST	07/08/1998
trans-1,2-Dichloroethene	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Blood	1000	IRIS	02/28/2000
	Subchronic	2.0E-01	mg/kg-day	100%	2.0E-01	mg/kg-day	Blood	100	HEAST	02/28/2000
trans-1,3-Dichloropropene	Chronic	3.0E-02	mg/kg-day	100%	3.0E-02	mg/kg-day	Organs	10000	IRIS	02/28/2000
	Subchronic	3.0E-01	mg/kg-day	100%	3.0E-01	mg/kg-day	Organs	1000	HEAST	02/28/2000
1,2-Dichloropropane	Chronic	N/A								
	Subchronic	N/A								

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Indian Head, Site 47

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Acetone	Chronic	9.0E-01	mg/kg-day	100%	9.0E-01	mg/kg-day	Liver, Kidney	1000/1	IRIS	07/31/2003
	Subchronic	1.0E+00	mg/kg-day	100%	1.0E+00	mg/kg-day	Liver, Kidney	100	HEAST	07/08/1998
Bromodichloromethane	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Kidney	1000	IRIS	01/00
	Subchronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Kidney	1000	HEAST	07/08/1998
Bromomethane	Chronic	1.4E-03	mg/kg-day	100%	1.4E-03	mg/kg-day	NOAEL	1000	IRIS	01/08/2003
	Subchronic									
Carbon disulfide	Chronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Fetus	100	IRIS	02/28/2000
	Subchronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Fetus	100	HEAST	07/08/1998
Carbon tetrachloride	Chronic	7.0E-04	mg/kg-day	100%	7.0E-04	mg/kg-day	Liver	1000	IRIS	02/28/2000
	Subchronic	N/A								
Chloroethane	Chronic	4.0E-01	mg/kg-day	100%	4.0E-01	mg/kg-day	Fetus	10	NCEA	08/30/1996
	Subchronic	N/A								
Chloroform	Chronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Liver	1000	IRIS	07/02/1998
	Subchronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Liver	1000	HEAST	07/08/1998
Chloromethane	Chronic	N/A								
	Subchronic	N/A								
Dibromochloromethane	Chronic	2.0E-02	mg/kg-day	100%	2.0E-02	mg/kg-day	Liver	1000	IRIS	08/01/1991
	Subchronic	2.0E-01	mg/kg-day	100%	2.0E-01	mg/kg-day	Liver	100	HEAST	07/08/1998
Tetrachloroethene	Chronic	1.0E-02	mg/kg-day	100%	1.0E-02	mg/kg-day	Liver	1000	IRIS	02/28/2000
	Subchronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Liver	100	HEAST	07/08/1998
Toluene	Chronic	2.0E-01	mg/kg-day	100%	2.0E-01	mg/kg-day	Liver, Kidney	1000	IRIS	02/28/2000
	Subchronic	2.0E+00	mg/kg-day	100%	2.0E+00	mg/kg-day	Liver, Kidney	100	HEAST	07/08/1998
Trichloroethene	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Liver, Kidney	3000	EPA	08/01/2001
	Subchronic	N/A				mg/kg-day				
Vinyl chloride	Chronic	3.0E-03	mg/kg-day	100%	3.0E-03	mg/kg-day	Liver	30/1	IRIS	01/30/2003

N/A = Not Applicable or Not Available. IRIS indicates that calculations of dermal risks may not be appropriate for this chemical.

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemental Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

EPA for Trichloroethene = Trichloroethene Health Risk Assessment: Synthesis and Charaterization. EPA/600/P-01/002A. August 2001.

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.

RESP = Respiratory System

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Indian Head, Site 47

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Naphthalene	Chronic	3.15E-03	mg/m^3	9.0E-04	mg/kg-day	Respiratory System	3000/1	IRIS	02/07/2002
1,1,2,2-Tetrachloroethane	Chronic	N/A							
	Subchronic	N/A							
1,1,2-Trichloroethane	Chronic	N/A							
	Subchronic	N/A							
1,2-Dibromo-3-chloropropane	Chronic	2.00E-04	mg/m^3	5.70E-05	mg/kg-day	Respiratory System	1000	IRIS	02/28/2000
	Subchronic	N/A							
1,1-Dichloroethane	Chronic	4.90E-01	mg/m^3	1.40E-01	mg/kg-day	Kidney	100	A	07/02/1998
	Subchronic	5.00E+00	mg/m^3	1.43E+00	mg/kg-day	Kidney	100	HEAST	07/08/1998
1,1-Dichloroethene	Chronic	2.10E-01	mg/m^3	6.00E-02	mg/kg-day	Liver	30/1	IRIS	01/30/2003
	Subchronic	N/A							
1,2-Dichloroethane	Chronic	4.90E-03	mg/m^3	1.40E-03	mg/kg-day	Liver & Kidney	10	NCEA	04/05/1993
	Subchronic	N/A							
cis-1,2-Dichloroethene	Chronic	N/A							
	Subchronic	N/A							
trans-1,2-Dichloroethene	Chronic	N/A							
	Subchronic	N/A							
trans-1,3-Dichloropropene	Chronic	2.00E-02	mg/m^3	5.71E-03	mg/kg-day	Nose	30	IRIS	02/28/2000
	Subchronic	N/A							
1,2-Dichloropropane	Chronic	3.99E-03	mg/m^3	1.14E-03	mg/kg-day			IRIS	
	Subchronic	1.30E-02	mg/m^3	3.70E-03	mg/kg-day	Nasal Mucosa	100	HEAST	02/28/2000
Acetone	N/A								
	N/A								
Bromodichloromethane	N/A								
	N/A								
Bromomethane	Chronic	4.90E-03	mg/m^3	1.40E-03	mg/kg-day	LOAEL	100	IRIS	01/08/2003
	Subchronic	N/A							
Carbon disulfide	Chronic	7.00E-01	mg/m^3	2.00E-01	mg/kg-day	Nervous System	30	IRIS	02/28/2000
	Subchronic	7.00E-01	mg/m^3	2.00E-01	mg/kg-day	Nervous System	30	HEAST	02/28/2000
Carbon tetrachloride	Chronic	2.00E-03	mg/m^3	5.71E-04	mg/kg-day	Liver		NCEA	
	Subchronic	N/A							
Chloroethane	Chronic	1.00E+01	mg/m^3	2.90E+00	mg/kg-day	Fetus	300	IRIS	07/02/1998
	Subchronic	N/A							
Chloroform	Chronic	4.90E-02	mg/m^3	1.40E-02	mg/kg-day	Liver	10	NCEA	12/01/1997
	Subchronic	N/A							

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Indian Head, Site 47

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Chloromethane	Chronic	9.00E-02	mg/m^3	2.60E-02	mg/kg-day	CNS	1000	IRIS	10/16/2003
	Subchronic	N/A							
Dibromochloromethane	Chronic	N/A							
	Subchronic	N/A							
Tetrachloroethene	Chronic	4.90E-01	mg/m^3	1.40E-01	mg/kg-day	Liver		NCEA	
	Subchronic	N/A							
Toluene	Chronic	3.99E-01	mg/m^3	1.14E-01	mg/kg-day	Nervous System	300	IRIS	02/28/2000
	Subchronic	N/A							
Trichloroethene	Chronic	3.50E-02	mg/m^3	1.00E-02	mg/kg-day	CNS, Liver, Endocrine system	1000	NCEA	08/01/2001
	Subchronic	N/A							
Vinyl chloride	Chronic	9.80E-02	mg/m^3	2.80E-02	mg/kg-day	Liver	30	IRIS	01/30/2003
	Subchronic	N/A							

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

HEAST(3) = Health Effects Assessment Summary Tables, Alternate Methods

HEAST(4)= Health Effects Assessment Summary Tables, Withdrawn

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Indian Head, Site 47

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	N/A						
Antimony	N/A						
Arsenic	1.5E+00	100%	1.5E+00	(mg/kg-day) $^{-1}$	A	IRIS	07/08/1998
Barium	N/A						
Beryllium	N/A						
Cadmium-Water	N/A						
Cadmium-Food	N/A						
Chromium (hexavalent)	N/A						
Cobalt	N/A						
Cyanide	N/A						
Iron	N/A						
Lead	N/A						
Manganese (nonfood)	N/A						
Manganese (food)	N/A						
Mercury	N/A						
Nickel	N/A						
Silver	N/A						
Thallium	N/A						
Vanadium	N/A						
Benzo(a)anthracene	7.3E-01	89%	7.3E-01	(mg/kg-day) $^{-1}$	B2	NCEA	07/01/1993
Benzo(a)pyrene	7.3E+00	89%	7.3E+00	(mg/kg-day) $^{-1}$	B2	IRIS	07/08/1998
Benzo(b)fluoranthene	7.3E-01	89%	7.3E-01	(mg/kg-day) $^{-1}$	B2	NCEA	07/01/1993
bis(2-Ethylhexyl)phthalate)	1.4E-02	100%	1.4E-02	(mg/kg-day) $^{-1}$	B2	IRIS	07/08/1998
Dibenz(a,h)anthracene	7.3E+00	89%	7.3E+00	(mg/kg-day) $^{-1}$	B2	NCEA	07/01/1993
Indeno(1,2,3-cd)pyrene	7.3E-01	89%	7.3E-01	(mg/kg-day) $^{-1}$	B2	NCEA	07/01/1993
Napthalene	N/A						
Nitroglycerin	1.4E-02	100%	1.4E-02	(mg/kg-day) $^{-1}$		NCEA	
Hexachloroethane	1.4E-02	100%	1.4E-02	(mg/kg-day) $^{-1}$	C	IRIS	02/28/2000
Pentachlorophenol	1.2E-01	100%	1.2E-01	(mg/kg-day) $^{-1}$	B2	IRIS	02/28/2000
1,1,2,2-Tetrachloroethane	2.0E-01	100%	2.0E-01	(mg/kg-day) $^{-1}$	C	IRIS	02/01/1994
1,1,2-Trichloroethane	5.7E-02	100%	5.7E-02	(mg/kg-day) $^{-1}$	C	IRIS	07/08/1998
1,2-Dibromo-3-chloropropane	1.4E+00	100%	1.4E+00	(mg/kg-day) $^{-1}$	B2	HEAST	02/29/2000
1,1-Dichloroethane	N/A						
1,1-Dichloroethene	N/A						
1,2-Dichloroethane	9.1E-02	100%	9.1E-02	(mg/kg-day) $^{-1}$	B2	IRIS	07/08/1998
cis-1,2-Dichloroethene	N/A						
trans-1,2-Dichloroethene	N/A						

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Indian Head, Site 47

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
1,2-Dichloropropane	6.8E-02	100%	6.8E-02	(mg/kg-day) $^{-1}$	B2	HEAST	02/29/2000
trans-1,3-Dichloropropene	1.0E-01	100%	1.0E-01	(mg/kg-day) $^{-1}$	B2	HEAST	02/29/2000
Acetone	N/A						
Bromodichloromethane	6.2E-02	100%	6.2E-02	(mg/kg-day)	C	IRIS	07/08/1998
Bromomethane	N/A						
Carbon disulfide	N/A						
Carbon tetrachloride	1.3E-01	100%	1.3E-01	(mg/kg-day) $^{-1}$	B2	IRIS	02/28/2000
Chloroethane	2.9E-03	100%	2.9E-03	(mg/kg-day) $^{-1}$	B2	NCEA	05/06/1996
Chloroform	N/A						
Chloromethane	1.3E-02	100%	1.3E-02	(mg/kg-day) $^{-1}$	C	HEAST	07/08/1998
Dibromochloromethane	8.4E-02	100%	8.4E-02	(mg/kg-day) $^{-1}$	C	IRIS	08/01/1991
Tetrachloroethene	5.2E-02	100%	5.2E-02	(mg/kg-day) $^{-1}$		NCEA	
Toluene	N/A						
Trichloroethene	4.0E-01	100%	4.0E-01	(mg/kg-day) $^{-1}$		NCEA	
Vinyl chloride	1.4E+00	100%	1.4E+00	(mg/kg-day) $^{-1}$	A	HEAST	02/29/2000

N/A-Not available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1, EPA 2001). Only perform adjustment if adjustment factor > 50%.

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide article date provided by NCEA.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Indian Head, Site 47

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Naphthalene	N/A							
1,1,2,2-Tetrachloroethane	1.6E-05	(ug/m3) $^{-1}$	3500	2.0E-01	(mg/kg-day) $^{-1}$	C	IRIS	02/01/1994
1,1,2-Trichloroethane	1.6E-05	(ug/m3) $^{-1}$	3500	5.6E-02	(mg/kg-day) $^{-1}$	C	IRIS	06/13/1998
1,1-Dichloroethane	N/A							
1,1-Dichloroethene	N/A							
1,2-Dibromo-3-chloropropane	6.9E-07	(ug/m3) $^{-1}$	3500	2.4E-03	(mg/kg-day) $^{-1}$	B2	HEAST	02/29/2000
1,2-Dichloroethane	2.6E-05	(ug/m3) $^{-1}$	3500	9.1E-02	(mg/kg-day) $^{-1}$	B2	IRIS	06/13/1998
1,2-Dichloropropane	N/A							
cis-1,2-Dichloroethene	N/A							
trans-1,2-Dichloroethene	N/A							
trans-1,3-Dichloropropene	2.9E-06	(ug/m3) $^{-1}$	3500	1.0E-02	(mg/kg-day) $^{-1}$	B2	HEAST	02/29/2000
Acetone	N/A							
Bromodichloromethane	N/A							

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Indian Head, Site 47

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Bromomethane	N/A							
Carbon disulfide	N/A							
Carbon tetrachloride	1.5E-05	(ug/m3) $^{-1}$	3500	5.3E-02	(mg/kg-day) $^{-1}$	B2	IRIS	02/28/2000
Chloroethane	N/A							
Chloroform	2.3E-05	(ug/m3) $^{-1}$	3500	8.1E-02	(mg/kg-day) $^{-1}$	B2	IRIS	06/13/1998
Chloromethane	1.0E-06	(ug/m3) $^{-1}$	3500	3.5E-03	(mg/kg-day) $^{-1}$		NCEA	
Dibromochloromethane	N/A							
Tetrachloroethene	2.9E-06	(ug/m3) $^{-1}$	3500	1.0E-02	(mg/kg-day) $^{-1}$		NCEA	
Toluene	N/A							
Trichloroethene	1.1E-04	(ug/m3) $^{-1}$	3500	4.0E-01	(mg/kg-day) $^{-1}$		NCEA	
Vinyl chloride	8.6E-06	(ug/m3) $^{-1}$	3500	3.0E-02	(mg/kg-day) $^{-1}$	A	HEAST	02/29/2000

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

N/A = Not Available

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	1.2E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.2E-06
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	1.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	3.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	7.2E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	9.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	1.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-03
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	8.7E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.2E-03
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	1.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.3E-03
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	3.1E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.0E-03
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	2.6E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.7E-03
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	2.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	3.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-03
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	1.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.5E-03
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	7.2E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.4E-02
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	4.8E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.8E-03
	(Total)												4.2E-02
Dermal Absorption													
	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	2.0E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.0E-06
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	1.3E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	2.6E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	4.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	6.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	5.8E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.8E-04
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	4.6E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	7.7E-03
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.3E-03
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	1.7E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	2.2E-02
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	1.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.6E-03
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	1.4E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	1.9E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.3E-02
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	7.1E-07	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	3.4E-02
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	3.8E-05	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	1.9E-01
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	2.5E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	9.8E-02
	(Total)												3.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Tetrachloroethene	5.24E-02	mg/kg	2.08E-05	mg/m^3	R	9.8E-07	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	7.0E-06
	(Total)												7.0E-06
												Total Hazard Index Across All Exposure Routes/Pathways	7.0E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 7.3. RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Nitroglycerin	3.70E+03	mg/kg	3.70E+03	mg/kg	M	3.6E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	9.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.3E-03
	Iron	3.89E+04	mg/kg	3.89E+04	mg/kg	M	3.8E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.3E-02
	Lead	5.76E+03	mg/kg	5.76E+03	mg/kg	M	5.6E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Mercury (mercuric chloride)	8.02E+01	mg/kg	8.02E+01	mg/kg	M	7.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Silver	4.06E+02	mg/kg	4.06E+02	mg/kg	M	4.0E-05	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	7.9E-03
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	5.0E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.0E-03
	(Total)												5.5E-02
Dermal Absorption	Nitroglycerin	3.70E+03	mg/kg	3.70E+03	mg/kg	M	2.2E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.9E-03
	Iron	3.89E+04	mg/kg	3.89E+04	mg/kg	M	2.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.6E-03
	Lead	5.76E+03	mg/kg	5.76E+03	mg/kg	M	3.4E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Mercury (mercuric chloride)	8.02E+01	mg/kg	8.02E+01	mg/kg	M	4.7E-06	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	2.2E-01
	Silver	4.06E+02	mg/kg	4.06E+02	mg/kg	M	2.4E-05	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	1.2E-01
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	3.0E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.1E-01
	(Total)												4.7E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 1% for inorganics.

N/A - not applicable.

TABLE 7.4. RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	7.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Iron	2.49E+04	mg/kg	2.49E+04	mg/kg	M	1.9E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.4E-02
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	3.9E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.9E-02
	(Total)												1.3E-01
Dermal Absorption	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	7.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.4E-02
	Iron	2.49E+04	mg/kg	2.49E+04	mg/kg	M	6.0E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.0E-02
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	1.2E-05	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	4.7E-01
	(Total)												5.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.4E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 1% for inorganics.
N/A - not applicable.

TABLE 7.5. RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	6.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.0E-03
	(Total)												2.0E-03
Dermal Absorption	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.9E-04
	(Total)												4.9E-04
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 1% for inorganics.
N/A - not applicable.

Table 7.5a.RME Supplement
Calculation of DAevent
Drainage Swales, Other Worker
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	t* (hr)	B (dimensionless)	DAevent (mg/cm^2-event)	Eq
Arsenic	5.20E+00	µg/L	1.0E-03	N/A	8.0E+00	N/A	N/A	4.2E-08	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.

TABLE 7.6. RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.0E-03
	(Total)												6.0E-03
Dermal Absorption	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	4.0E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.4E-03
	(Total)												1.4E-03
												Total Hazard Index Across All Exposure Routes/Pathways	7.4E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 1% for inorganics.
N/A - not applicable.

Table 7.6a.RME Supplement
Calculation of DAevent
Drainage Swales, Trespasser/Visitor
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	t* (hr)	B (dimensionless)	DAevent (mg/cm^2-event)	Eq
Arsenic	5.20E+00	µg/L	1.0E-03	N/A	1.8E+00	N/A	N/A	9.4E-09	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	4.0E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.0E-06
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	6.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	4.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	1.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	2.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	3.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	3.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.6E-03
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	2.8E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	7.1E-03
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	3.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	1.0E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.4E-03
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	8.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.8E-02
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	8.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.8E-03
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	4.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	2.4E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	4.7E-02
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	1.6E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.6E-02
	(Total)												1.4E-01
Dermal Absorption													
	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	5.6E-08	mg/kg-day	1.00E-02	mg/kg-day	N/A	N/A	5.6E-06
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	3.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	2.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	7.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	1.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	1.7E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.7E-03
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.3E-06	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	2.2E-02
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	4.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	4.7E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	6.3E-02
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	3.9E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.3E-02
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	3.9E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	5.3E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	6.6E-02
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	2.0E-06	mg/kg-day	2.10E-05	mg/kg-day	N/A	N/A	9.6E-02
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	1.1E-04	mg/kg-day	2.00E-04	mg/kg-day	N/A	N/A	5.4E-01
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	7.2E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.8E-01
	(Total)												1.1E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A Not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	4.0E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.0E-06
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	6.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	4.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	1.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	2.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	3.0E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	3.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	3.6E-03
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	2.8E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	7.1E-03
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	3.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	1.0E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.4E-03
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	8.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.8E-02
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	8.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.8E-03
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	4.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	2.4E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	4.7E-02
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	1.6E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.6E-02
	(Total)												1.4E-01
Dermal Absorption													
	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	5.6E-08	mg/kg-day	1.00E-02	mg/kg-day	N/A	N/A	5.6E-06
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	3.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	2.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	7.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	1.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	1.7E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.7E-03
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.3E-06	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	2.2E-02
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	4.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-02
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	4.7E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	6.3E-02
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	3.9E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.3E-02
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	3.9E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	5.3E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	6.6E-02
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	2.0E-06	mg/kg-day	2.10E-05	mg/kg-day	N/A	N/A	9.6E-02
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	1.1E-04	mg/kg-day	2.00E-04	mg/kg-day	N/A	N/A	5.4E-01
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	7.2E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.8E-01
	(Total)												1.1E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A Not applicable.

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Tetrachloroethene	5.24E-02	mg/kg	2.08E-05	mg/m^3	R	2.4E-07	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	1.7E-06
	(Total)												1.7E-06
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	8.2E-05	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	9.3E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	2.3E-02
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	4.6E-03	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	4.6E-02
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	2.0E-02	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	4.1E-01
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	1.8E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.8E-01
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	3.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	1.7E-01	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	1.8E-01
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.9E-03
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	2.6E-02	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	1.8E+01
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	1.8E-01	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.8E+00
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	7.8E+00	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	1.1E+04
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	7.2E-04	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.8E-03
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	1.6E+00	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.6E+02
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	1.6E+00	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	2.4E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E-01
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	3.8E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.8E+00
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	6.5E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	3.2E-02
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	9.3E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.1E+01
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	7.7E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.6E-01
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	4.0E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.0E+00
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	1.0E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.2E-01
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	1.3E-04	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	4.4E-03
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	2.9E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.9E-01
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	1.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.2E-03
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.1E-04	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	3.7E-03
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	1.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.8E-03
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	6.4E-01	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.2E+01
	Aluminum	2.70E+04	µg/l	2.70E+04	µg/l	M	7.4E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	7.4E-01
	Antimony	4.74E+00	µg/l	4.74E+00	µg/l	M	1.3E-04	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	3.2E-01
	Arsenic	1.06E+02	µg/l	1.06E+02	µg/l	M	2.9E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.7E+00
	Barium	3.31E+02	µg/l	3.31E+02	µg/l	M	9.1E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.3E-01
	Beryllium	6.88E+00	µg/l	6.88E+00	µg/l	M	1.9E-04	mg/kg-day	2.0E-03	mg/kg-day	N/A	N/A	9.4E-02
	Cadmium	1.67E+00	µg/l	1.67E+00	µg/l	M	4.6E-05	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	9.2E-02
	Chromium	2.25E+01	µg/l	2.25E+01	µg/l	M	6.2E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.1E-01
	Cobalt	1.71E+02	µg/l	1.71E+02	µg/l	M	4.7E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E-01
	Iron	9.92E+04	µg/l	9.92E+04	µg/l	M	2.7E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.1E+00
	Lead	1.68E+01	µg/l	1.68E+01	µg/l	M	4.6E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	7.16E+02	µg/l	7.16E+02	µg/l	M	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.8E-01
	Nickel	1.85E+02	µg/l	1.85E+02	µg/l	M	5.1E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.5E-01
	Thallium	2.12E+00	µg/l	2.12E+00	µg/l	M	5.8E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	8.3E-01
	Vanadium	3.27E+02	µg/l	3.27E+02	µg/l	M	9.0E-03	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	9.0E+00
	(Total)												1.1E+04

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	8.8E-06	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.5E-04
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	7.3E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	1.8E-03
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	3.0E-04	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	3.0E-03
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	2.3E-03	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	4.7E-02
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	1.8E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	7.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.8E-02
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	2.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	5.2E-04	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	5.8E-04
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	7.9E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.9E-04
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	6.4E-04	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	4.6E-01
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	2.8E-02	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	2.8E-01
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	1.9E+00	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	2.7E+03
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	3.3E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	8.3E-05
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	1.2E-01	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.2E+01
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	3.6E-02	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.8E-03
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	2.2E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.2E+00
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	2.0E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	1.0E-02
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	1.4E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.5E+00
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	3.2E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.1E-02
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	2.9E-03	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.9E-01
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	7.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.8E-02
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	5.8E-06	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.9E-04
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	2.3E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.3E-01
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	9.0E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.5E-03
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.7E-03	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	5.6E-02
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	2.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.3E-02
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	1.3E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.4E-02
	Aluminum	2.70E+04	µg/l	2.70E+04	µg/l	M	1.5E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.5E-03
	Antimony	4.74E+00	µg/l	4.74E+00	µg/l	M	2.6E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	6.5E-04
	Arsenic	1.06E+02	µg/l	1.06E+02	µg/l	M	5.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.9E-02
	Barium	3.31E+02	µg/l	3.31E+02	µg/l	M	1.8E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	3.7E-03
	Beryllium	6.88E+00	µg/l	6.88E+00	µg/l	M	3.8E-07	mg/kg-day	1.4E-05	mg/kg-day	N/A	N/A	2.7E-02
	Cadmium	1.67E+00	µg/l	1.67E+00	µg/l	M	9.2E-08	mg/kg-day	1.3E-05	mg/kg-day	N/A	N/A	7.3E-03
	Chromium	2.25E+01	µg/l	2.25E+01	µg/l	M	1.2E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	1.6E-02
	Cobalt	1.71E+02	µg/l	1.71E+02	µg/l	M	9.4E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.7E-04
	Iron	9.92E+04	µg/l	9.92E+04	µg/l	M	5.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E-02
	Lead	1.68E+01	µg/l	1.68E+01	µg/l	M	9.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	7.16E+02	µg/l	7.16E+02	µg/l	M	3.9E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	4.9E-02
	Nickel	1.85E+02	µg/l	1.85E+02	µg/l	M	1.0E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.3E-02
	Thallium	2.12E+00	µg/l	2.12E+00	µg/l	M	1.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.7E-03
	Vanadium	3.27E+02	µg/l	3.27E+02	µg/l	M	1.8E-05	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	6.9E-01
	(Total)												2.7E+03
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E+04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic value used.

Table 7.9a.RME Supplement
Calculation of DAevent (Adult)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	9.00E-03	9.2E-01	0.2	3.20E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	3.40E+00	µg/l	8.40E-03	5.7E-01	0.2	2.67E-08	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.68E+02	µg/l	8.90E-03	3.5E-01	0.2	1.09E-06	8.4E-01	6.2E-03	2
1,1-Dichloroethene	7.43E+02	µg/l	1.60E-02	3.4E-01	0.2	8.57E-06	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
1,2-Dichloroethane	7.16E+02	µg/l	5.30E-03	3.5E-01	0.2	2.77E-06	8.4E-01	3.0E-03	2
1,2-Dichloropropane	1.30E+00	µg/l	1.00E-02	4.3E-01	0.2	1.05E-08	1.0E+00	1.0E-02	2
Acetone	6.06E+03	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Bromodichloromethane	4.30E+00	µg/l	5.80E-03	8.7E-01	0.2	2.88E-08	2.1E+00	1.2E-02	2
Bromomethane	9.37E+02	µg/l	3.50E-03	3.3E-01	0.2	2.33E-06	8.0E-01	1.5E-03	2
Carbon disulfide	6.62E+03	µg/l	2.40E-02	2.7E-01	0.2	1.02E-04	6.5E-01	1.7E-02	2
Carbon tetrachloride	2.86E+05	µg/l	2.20E-02	7.6E-01	0.2	6.79E-03	1.8E+00	6.8E-02	2
Chloroethane	2.62E+01	µg/l	8.00E-03	2.2E-01	0.2	1.22E-07	5.2E-01	2.7E-03	2
Chloroform	5.76E+04	µg/l	8.90E-03	4.7E-01	0.2	4.34E-04	1.1E+00	9.3E-03	2
Chloromethane	5.93E+04	µg/l	4.20E-03	1.8E-01	0.2	1.31E-04	4.3E-01	8.1E-04	2
Dibromochloromethane	8.66E+01	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Tetrachloroethene	1.40E+03	µg/l	4.80E-02	9.0E-01	0.2	7.88E-05	4.3E+00	2.5E-01	2
Toluene	2.37E+02	µg/l	4.50E-02	3.2E-01	0.2	7.46E-06	7.7E-01	5.4E-02	2
Trichloroethene	3.39E+02	µg/l	1.60E-02	5.5E-01	0.2	4.97E-06	1.3E+00	2.6E-02	2
Vinyl chloride	2.82E+01	µg/l	7.30E-03	2.1E-01	0.2	1.17E-07	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	1.45E+03	µg/l	1.00E-02	3.4E-01	0.2	1.05E-05	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	3.82E+02	µg/l	1.00E-02	3.4E-01	0.2	2.75E-06	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	4.80E+00	µg/l	5.50E-03	4.2E-01	0.2	2.11E-08	1.0E+00	4.0E-03	2
Hexachloroethane	1.06E+01	µg/l	4.20E-02	2.4E+00	0.2	8.53E-07	1.9E+01	8.5E-01	2
Naphthalene	5.27E+00	µg/l	6.90E-02	5.3E-01	0.2	3.27E-07	2.20E+00	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.2	6.18E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Cyanide	2.32E+04	µg/l	1.00E-03	N/A	0.2	4.64E-06	N/A	N/A	2
Aluminum	2.70E+04	µg/l	1.00E-03	N/A	0.2	5.40E-06	N/A	N/A	2
Antimony	4.74E+00	µg/l	1.00E-03	N/A	0.2	9.48E-10	N/A	N/A	2
Arsenic	1.06E+02	µg/l	1.00E-03	N/A	0.2	2.12E-08	N/A	N/A	1
Barium	3.31E+02	µg/l	1.00E-03	N/A	0.2	6.62E-08	N/A	N/A	1
Beryllium	6.88E+00	µg/l	1.00E-03	N/A	0.2	1.38E-09	N/A	N/A	1
Cadmium	1.67E+00	µg/l	1.00E-03	N/A	0.2	3.34E-10	N/A	N/A	1
Chromium	2.25E+01	µg/l	1.00E-03	N/A	0.2	4.50E-09	N/A	N/A	1
Cobalt	1.71E+02	µg/l	1.00E-03	N/A	0.2	3.42E-08	N/A	N/A	1
Iron	9.92E+04	µg/l	1.00E-03	N/A	0.2	1.98E-05	N/A	N/A	1
Lead	1.68E+01	µg/l	1.00E-03	N/A	0.2	3.36E-09	N/A	N/A	1
Manganese	7.16E+02	µg/l	1.00E-03	N/A	0.2	1.43E-07	N/A	N/A	1
Nickel	1.85E+02	µg/l	1.00E-03	N/A	0.2	3.70E-08	N/A	N/A	1
Thallium	2.12E+00	µg/l	1.00E-03	N/A	0.2	4.24E-10	N/A	N/A	1
Vanadium	3.27E+02	µg/l	1.00E-03	N/A	0.2	6.54E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 7.9b.RME Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.2	6.60E+00	6.44E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.2	6.06E+03	1.90E-06
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.2	8.66E+01	4.26E-07
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.2	4.98E+00	9.49E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	1.9E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.2E-03
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	2.2E-04	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	5.4E-02
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	1.1E-02	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.1E-01
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	4.8E-02	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	9.5E-01
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	4.2E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	4.6E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E+00
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	8.3E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	3.9E-01	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	4.3E-01
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	2.7E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.4E-02
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	6.0E-02	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	4.3E+01
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	4.2E-01	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	4.2E+00
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	1.8E+01	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	2.6E+04
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	1.7E-03	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	4.2E-03
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	3.7E+00	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.7E+02
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	3.8E+00	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	5.5E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.8E-01
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	8.9E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	8.9E+00
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	1.5E-02	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	7.6E-02
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	2.2E-02	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.2E+01
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	1.8E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	6.0E-01
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	9.3E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	9.3E+00
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	2.4E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E+00
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	3.1E-04	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	6.8E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.8E-01
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	3.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.7E-02
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	2.6E-04	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	8.5E-03
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	3.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.6E-02
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	1.5E+00	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.4E+01
	Aluminum	2.70E+04	µg/l	2.70E+04	µg/l	M	1.7E+00	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E+00
	Antimony	4.74E+00	µg/l	4.74E+00	µg/l	M	3.0E-04	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	7.6E-01
	Arsenic	1.06E+02	µg/l	1.06E+02	µg/l	M	6.8E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.3E+01
	Barium	3.31E+02	µg/l	3.31E+02	µg/l	M	2.1E-02	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	3.0E-01
	Beryllium	6.88E+00	µg/l	6.88E+00	µg/l	M	4.4E-04	mg/kg-day	2.0E-03	mg/kg-day	N/A	N/A	2.2E-01
	Cadmium	1.67E+00	µg/l	1.67E+00	µg/l	M	1.1E-04	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	2.1E-01
	Chromium	2.25E+01	µg/l	2.25E+01	µg/l	M	1.4E-03	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.8E-01
	Cobalt	1.71E+02	µg/l	1.71E+02	µg/l	M	1.1E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.5E-01
	Iron	9.92E+04	µg/l	9.92E+04	µg/l	M	6.3E+00	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.1E+01
	Lead	1.68E+01	µg/l	1.68E+01	µg/l	M	1.1E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	7.16E+02	µg/l	7.16E+02	µg/l	M	4.6E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E+00
	Nickel	1.85E+02	µg/l	1.85E+02	µg/l	M	1.2E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.9E-01
	Thallium	2.12E+00	µg/l	2.12E+00	µg/l	M	1.4E-04	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.9E+00
	Vanadium	3.27E+02	µg/l	3.27E+02	µg/l	M	2.1E-02	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.1E+01
	(Total)												2.7E+04

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	2.0E-05	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.3E-04
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	1.6E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	4.1E-03
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	6.7E-04	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	6.7E-03
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	5.3E-03	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	1.1E-01
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	4.0E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	1.7E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.5E-02
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	6.5E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	1.2E-03	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	1.3E-03
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	1.8E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.9E-04
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	1.4E-03	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	1.0E+00
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	6.3E-02	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	6.3E-01
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	4.2E+00	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	6.0E+03
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	7.5E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.9E-04
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	2.7E-01	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.7E+01
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	8.0E-02	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	5.8E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.9E-02
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	4.9E-02	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.9E+00
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	4.6E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	2.3E-02
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	3.1E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E+01
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	7.2E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.4E-02
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	6.4E-03	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	6.4E-01
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	1.7E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.5E-02
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	1.3E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	4.3E-04
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	5.3E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.3E-01
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	2.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	3.8E-03	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.3E-01
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	5.8E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.9E-02
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	3.7E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-01
	Aluminum	2.70E+04	µg/l	2.70E+04	µg/l	M	4.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.3E-03
	Antimony	4.74E+00	µg/l	4.74E+00	µg/l	M	7.5E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.9E-03
	Arsenic	1.06E+02	µg/l	1.06E+02	µg/l	M	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.6E-02
	Barium	3.31E+02	µg/l	3.31E+02	µg/l	M	5.2E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	1.1E-02
	Beryllium	6.88E+00	µg/l	6.88E+00	µg/l	M	1.1E-06	mg/kg-day	1.4E-05	mg/kg-day	N/A	N/A	7.8E-02
	Cadmium	1.67E+00	µg/l	1.67E+00	µg/l	M	2.6E-07	mg/kg-day	1.3E-05	mg/kg-day	N/A	N/A	2.1E-02
	Chromium	2.25E+01	µg/l	2.25E+01	µg/l	M	3.6E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	4.7E-02
	Cobalt	1.71E+02	µg/l	1.71E+02	µg/l	M	2.7E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	Iron	9.92E+04	µg/l	9.92E+04	µg/l	M	1.6E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.2E-02
	Lead	1.68E+01	µg/l	1.68E+01	µg/l	M	2.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	7.16E+02	µg/l	7.16E+02	µg/l	M	1.1E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.4E-01
	Nickel	1.85E+02	µg/l	1.85E+02	µg/l	M	2.9E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.7E-02
	Thallium	2.12E+00	µg/l	2.12E+00	µg/l	M	3.4E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.8E-03
	Vanadium	3.27E+02	µg/l	3.27E+02	µg/l	M	5.2E-05	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	2.0E+00
	(Total)												6.0E+03
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E+04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic value used.

Table 7.10a.RME Supplement
Calculation of DAevent (Child)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	9.00E-03	9.2E-01	0.33	4.11E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	3.40E+00	µg/l	8.40E-03	5.7E-01	0.33	3.42E-08	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.68E+02	µg/l	8.90E-03	3.5E-01	0.33	1.40E-06	8.4E-01	6.2E-03	2
1,1-Dichloroethene	7.43E+02	µg/l	1.60E-02	3.4E-01	0.33	1.10E-05	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
1,2-Dichloroethane	7.16E+02	µg/l	5.30E-03	3.5E-01	0.33	3.56E-06	8.4E-01	3.0E-03	2
1,2-Dichloropropane	1.30E+00	µg/l	1.00E-02	4.3E-01	0.33	1.35E-08	1.0E+00	1.0E-02	2
Acetone	6.06E+03	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Bromodichloromethane	4.30E+00	µg/l	5.80E-03	8.7E-01	0.33	3.69E-08	2.1E+00	1.2E-02	2
Bromomethane	9.37E+02	µg/l	3.50E-03	3.3E-01	0.33	2.99E-06	8.0E-01	1.5E-03	2
Carbon disulfide	6.62E+03	µg/l	2.40E-02	2.7E-01	0.33	1.31E-04	6.5E-01	1.7E-02	2
Carbon tetrachloride	2.86E+05	µg/l	2.20E-02	7.6E-01	0.33	8.72E-03	1.8E+00	6.8E-02	2
Chloroethane	2.62E+01	µg/l	8.00E-03	2.2E-01	0.33	1.56E-07	5.2E-01	2.7E-03	2
Chloroform	5.76E+04	µg/l	8.90E-03	4.7E-01	0.33	5.58E-04	1.1E+00	9.3E-03	2
Chloromethane	5.93E+04	µg/l	4.20E-03	1.8E-01	0.33	1.68E-04	4.3E-01	8.1E-04	2
Dibromochloromethane	8.66E+01	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Tetrachloroethene	1.40E+03	µg/l	4.80E-02	9.0E-01	0.33	1.01E-04	4.3E+00	2.5E-01	2
Toluene	2.37E+02	µg/l	4.50E-02	3.2E-01	0.33	9.58E-06	7.7E-01	5.4E-02	2
Trichloroethene	3.39E+02	µg/l	1.60E-02	5.5E-01	0.33	6.39E-06	1.3E+00	2.6E-02	2
Vinyl chloride	2.82E+01	µg/l	7.30E-03	2.1E-01	0.33	1.50E-07	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	1.45E+03	µg/l	1.00E-02	3.4E-01	0.33	1.34E-05	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	3.82E+02	µg/l	1.00E-02	3.4E-01	0.33	3.54E-06	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	4.80E+00	µg/l	5.50E-03	4.2E-01	0.33	2.72E-08	1.0E+00	4.0E-03	2
Hexachloroethane	1.06E+01	µg/l	4.20E-02	2.4E+00	0.33	1.10E-06	1.9E+01	8.5E-01	2
Naphthalene	5.27E+00	µg/l	6.90E-02	5.3E-01	0.33	4.20E-07	2.20E+00	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.33	7.94E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Cyanide	2.32E+04	µg/l	1.00E-03	N/A	0.33	7.66E-06	N/A	N/A	1
Aluminum	2.70E+04	µg/l	1.00E-03	N/A	0.33	8.91E-06	N/A	N/A	1
Antimony	4.74E+00	µg/l	1.00E-03	N/A	0.33	1.56E-09	N/A	N/A	1
Arsenic	1.06E+02	µg/l	1.00E-03	N/A	0.33	3.50E-08	N/A	N/A	1
Barium	3.31E+02	µg/l	1.00E-03	N/A	0.33	1.09E-07	N/A	N/A	1
Beryllium	6.88E+00	µg/l	1.00E-03	N/A	0.33	2.27E-09	N/A	N/A	1
Cadmium	1.67E+00	µg/l	1.00E-03	N/A	0.33	5.51E-10	N/A	N/A	1
Chromium	2.25E+01	µg/l	1.00E-03	N/A	0.33	7.43E-09	N/A	N/A	1
Cobalt	1.71E+02	µg/l	1.00E-03	N/A	0.33	5.65E-08	N/A	N/A	1
Iron	9.92E+04	µg/l	1.00E-03	N/A	0.33	3.27E-05	N/A	N/A	1
Lead	1.68E+01	µg/l	1.00E-03	N/A	0.33	5.54E-09	N/A	N/A	1
Manganese	7.16E+02	µg/l	1.00E-03	N/A	0.33	2.36E-07	N/A	N/A	1
Nickel	1.85E+02	µg/l	1.00E-03	N/A	0.33	6.10E-08	N/A	N/A	1
Thallium	2.12E+00	µg/l	1.00E-03	N/A	0.33	7.00E-10	N/A	N/A	1
Vanadium	3.27E+02	µg/l	1.00E-03	N/A	0.33	1.08E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 7.10b.RME Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.33	6.60E+00	8.27E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.33	6.06E+03	2.44E-06
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.33	5.93E+04	3.74E-04
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.33	4.98E+00	1.22E-06

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	1.5E-05	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	2.6E-04
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	1.5E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	3.8E-04
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	7.6E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	7.6E-04
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	6.0E-03	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	1.2E-01
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	2.5E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	1.9E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.7E-02
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	6.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	1.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-03
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	1.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.1E-04
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	1.7E-03	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	1.2E+00
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	7.9E-02	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	7.9E-01
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	3.4E+00	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	4.9E+03
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	1.0E-04	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	2.6E-04
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	2.7E-01	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.7E+01
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	1.2E-01	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	3.5E-04	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	1.8E-03
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	3.5E-02	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	3.5E-01
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	5.2E-03	mg/kg-day	2.0E+00	mg/kg-day	N/A	N/A	2.6E-03
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	2.9E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.5E+00
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	1.0E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.4E-02
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	7.4E-03	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	7.4E-02
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	1.9E-03	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	9.7E-03
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	1.4E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.6E-05
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	3.2E-04	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.2E-02
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.1E-03
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	2.3E-03	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	7.7E-02
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	3.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-02
	Aluminum	2.52E+04	µg/l	2.52E+04	µg/l	M	1.2E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-02
	Arsenic	1.08E+02	µg/l	1.08E+02	µg/l	M	5.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E-01
	Barium	3.46E+02	µg/l	3.46E+02	µg/l	M	1.6E-04	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	3.3E-02
	Beryllium	6.11E+00	µg/l	6.11E+00	µg/l	M	2.9E-06	mg/kg-day	3.5E-05	mg/kg-day	N/A	N/A	8.2E-02
	Cadmium	1.87E+00	µg/l	1.87E+00	µg/l	M	8.8E-07	mg/kg-day	1.3E-05	mg/kg-day	N/A	N/A	7.0E-02
	Chromium	2.84E+01	µg/l	2.84E+01	µg/l	M	1.3E-05	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	2.7E-02
	Cobalt	1.64E+02	µg/l	1.64E+02	µg/l	M	7.7E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.8E-03
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	1.1E-02	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.4E-01
	Iron	5.21E+04	µg/l	5.21E+04	µg/l	M	2.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.2E-02
	Lead	1.36E+01	µg/l	1.36E+01	µg/l	M	6.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	5.88E+02	µg/l	5.88E+02	µg/l	M	2.8E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.5E-01
	Nickel	1.35E+02	µg/l	1.35E+02	µg/l	M	6.4E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.9E-02
	Thallium	3.67E+00	µg/l	3.67E+00	µg/l	M	1.7E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.5E-02

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
	Vanadium (Total)	8.63E+01	µg/l	8.63E+01	µg/l	M	4.1E-05	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.6E+00
													4.9E+03
												Total Hazard Index Across All Exposure Routes/Pathways	4.9E+03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Table 7.11a.RME Supplement
Calculation of DAevent (Construction Worker)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	9.00E-03	9.2E-01	8	2.63E-07	2.2E+00	2.5E-02	3
1,1,2-Trichloroethane	3.40E+00	µg/l	8.40E-03	5.7E-01	8	2.59E-07	1.4E+00	1.1E-02	3
1,1-Dichloroethane	1.68E+02	µg/l	8.90E-03	3.5E-01	8	1.29E-05	8.4E-01	6.2E-03	3
1,1-Dichloroethene	7.43E+02	µg/l	1.60E-02	3.4E-01	8	1.02E-04	8.2E-01	1.3E-02	3
1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	N/A	N/A	8	N/A	N/A	N/A	
1,2-Dichloroethane	7.16E+02	µg/l	5.30E-03	3.5E-01	8	3.29E-05	8.4E-01	3.0E-03	3
1,2-Dichloropropane	1.30E+00	µg/l	1.00E-02	4.3E-01	8	1.14E-07	1.0E+00	1.0E-02	3
Acetone	6.06E+03	µg/l	N/A	N/A	8	N/A	N/A	N/A	
Bromodichloromethane	4.30E+00	µg/l	5.80E-03	8.7E-01	8	2.42E-07	2.1E+00	1.2E-02	3
Bromomethane	9.37E+02	µg/l	3.50E-03	3.3E-01	8	2.84E-05	8.0E-01	1.5E-03	3
Carbon disulfide	6.62E+03	µg/l	2.40E-02	2.7E-01	8	1.34E-03	6.5E-01	1.7E-02	3
Carbon tetrachloride	2.86E+05	µg/l	2.20E-02	7.6E-01	8	5.80E-02	1.8E+00	6.8E-02	3
Chloroethane	2.62E+01	µg/l	8.00E-03	2.2E-01	8	1.77E-06	5.2E-01	2.7E-03	3
Chloroform	5.76E+04	µg/l	8.90E-03	4.7E-01	8	4.55E-03	1.1E+00	9.3E-03	3
Chloromethane	5.93E+04	µg/l	4.20E-03	1.8E-01	8	2.08E-03	4.3E-01	8.1E-04	3
Dibromochloromethane	8.66E+01	µg/l	N/A	N/A	8	N/A	N/A	N/A	
Tetrachloroethene	1.40E+03	µg/l	4.80E-02	9.0E-01	8	5.99E-04	4.3E+00	2.5E-01	3
Toluene	2.37E+02	µg/l	4.50E-02	3.2E-01	8	8.85E-05	7.7E-01	5.4E-02	3
Trichloroethene	3.39E+02	µg/l	1.60E-02	5.5E-01	8	4.86E-05	1.3E+00	2.6E-02	3
Vinyl chloride	2.82E+01	µg/l	7.30E-03	2.1E-01	8	1.73E-06	5.1E-01	2.3E-03	3
cis-1,2-Dichloroethene	1.45E+03	µg/l	1.00E-02	3.4E-01	8	1.25E-04	8.2E-01	7.2E-03	3
trans-1,2-Dichloroethene	3.82E+02	µg/l	1.00E-02	3.4E-01	8	3.30E-05	8.2E-01	7.2E-03	3
trans-1,3-Dichloropropene	4.80E+00	µg/l	5.50E-03	4.2E-01	8	2.33E-07	1.0E+00	4.0E-03	3
Hexachloroethane	1.06E+01	µg/l	4.20E-02	2.4E+00	8	5.39E-06	1.9E+01	8.5E-01	2
Naphthalene	5.27E+00	µg/l	6.90E-02	5.3E-01	8	2.07E-06	2.20E+00	2.0E-01	3
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	8	3.91E-05	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	N/A	N/A	8	N/A	N/A	N/A	
Aluminum	2.52E+04	µg/l	1.00E-03	N/A	8	2.02E-04	N/A	N/A	1
Arsenic	1.08E+02	µg/l	1.00E-03	N/A	8	8.64E-07	N/A	N/A	1
Barium	3.46E+02	µg/l	1.00E-03	N/A	8	2.77E-06	N/A	N/A	1
Beryllium	6.11E+00	µg/l	1.00E-03	N/A	8	4.88E-08	N/A	N/A	1
Cadmium	1.87E+00	µg/l	1.00E-03	N/A	8	1.50E-08	N/A	N/A	1
Chromium	2.84E+01	µg/l	1.00E-03	N/A	8	2.27E-07	N/A	N/A	1
Cobalt	1.64E+02	µg/l	1.00E-03	N/A	8	1.31E-06	N/A	N/A	1
Cyanide	2.32E+04	µg/l	1.00E-03	N/A	8	1.86E-04	N/A	N/A	1
Iron	5.21E+04	µg/l	1.00E-03	N/A	8	4.17E-04	N/A	N/A	1
Lead	1.36E+01	µg/l	1.00E-03	N/A	8	1.09E-07	N/A	N/A	1
Manganese	5.88E+02	µg/l	1.00E-03	N/A	8	4.71E-06	N/A	N/A	1
Nickel	1.35E+02	µg/l	1.00E-03	N/A	8	1.08E-06	N/A	N/A	1
Thallium	3.67E+00	µg/l	1.00E-03	N/A	8	2.93E-08	N/A	N/A	1
Vanadium	8.63E+01	µg/l	1.00E-03	N/A	8	6.90E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 7.11b.RME Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	8	6.60E+00	4.32E-07
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	8	6.06E+03	2.90E-05
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	8	5.93E+04	2.08E-03
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	8	4.98E+00	6.00E-06

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation													
	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	2.22E-05	mg/kg/shower	R	2.1E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	1,1,2-Trichloroethane	3.40E+00	µg/l	5.98E-05	mg/kg/shower	R	5.7E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	1,1-Dichloroethane	1.68E+02	µg/l	7.75E-03	mg/kg/shower	R	7.4E-03	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	5.3E-02
	1,1-Dichloroethene	7.43E+02	µg/l	4.30E-02	mg/kg/shower	R	4.1E-02	mg/kg-day	6.0E-02	mg/kg-day	2.1E-01	mg/m3	6.9E-01
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	1.20E-04	mg/kg/shower	R	1.2E-04	mg/kg-day	5.7E-05	mg/kg-day	2.0E-04	mg/m3	2.0E+00
	1,2-Dichloroethane	7.16E+02	µg/l	1.51E-02	mg/kg/shower	R	1.5E-02	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m3	1.0E+01
	1,2-Dichloropropane	1.30E+00	µg/l	4.55E-05	mg/kg/shower	R	4.4E-05	mg/kg-day	1.1E-03	mg/kg-day	4.0E-03	mg/m3	3.8E-02
	Acetone	6.06E+03	µg/l	4.86E-02	mg/kg/shower	R	4.7E-02	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Bromodichloromethane	4.30E+00	µg/l	9.75E-05	mg/kg/shower	R	9.3E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Bromomethane	9.37E+02	µg/l	5.68E-02	mg/kg/shower	R	5.4E-02	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m3	3.9E+01
	Carbon disulfide	6.62E+03	µg/l	4.22E-01	mg/kg/shower	R	4.0E-01	mg/kg-day	2.0E-01	mg/kg-day	7.0E-01	mg/m3	2.0E+00
	Carbon tetrachloride	2.86E+05	µg/l	1.40E+01	mg/kg/shower	R	1.3E+01	mg/kg-day	5.7E-04	mg/kg-day	2.0E-03	mg/m3	2.4E+04
	Chloroethane	2.62E+01	µg/l	1.84E-03	mg/kg/shower	R	1.8E-03	mg/kg-day	2.9E+00	mg/kg-day	1.0E+01	mg/m3	6.1E-04
	Chloroform	5.76E+04	µg/l	2.17E+00	mg/kg/shower	R	2.1E+00	mg/kg-day	1.4E-02	mg/kg-day	4.9E-02	mg/m3	1.5E+02
	Chloromethane	5.93E+04	µg/l	4.55E+00	mg/kg/shower	R	4.4E+00	mg/kg-day	2.6E-02	mg/kg-day	9.1E-02	mg/m3	1.7E+02
	Dibromochloromethane	8.66E+01	µg/l	3.17E-03	mg/kg/shower	R	3.0E-03	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Tetrachloroethene	1.40E+03	µg/l	6.39E-02	mg/kg/shower	R	6.1E-02	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	4.4E-01
	Toluene	2.37E+02	µg/l	1.17E-02	mg/kg/shower	R	1.1E-02	mg/kg-day	1.1E-01	mg/kg-day	4.0E-01	mg/m3	9.9E-02
	Trichloroethene	3.39E+02	µg/l	1.58E-02	mg/kg/shower	R	1.5E-02	mg/kg-day	1.0E-02	mg/kg-day	4.0E-02	mg/m3	1.5E+00
	Vinyl chloride	2.82E+01	µg/l	1.91E-03	mg/kg/shower	R	1.8E-03	mg/kg-day	2.8E-02	mg/kg-day	1.0E-01	mg/m3	6.5E-02
	cis-1,2-Dichloroethene	1.45E+03	µg/l	6.19E-02	mg/kg/shower	R	5.9E-02	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	trans-1,2-Dichloroethene	3.82E+02	µg/l	1.98E-02	mg/kg/shower	R	1.9E-02	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	trans-1,3-Dichloropropene	4.80E+00	µg/l	2.57E-04	mg/kg/shower	R	2.5E-04	mg/kg-day	5.7E-03	mg/kg-day	2.0E-02	mg/m3	4.3E-02
	Naphthalene	5.27E+00	µg/l	2.56E-04	mg/kg/shower	R	2.5E-04	mg/kg-day	9.0E-04	mg/kg-day	3.2E-03	mg/m3	2.7E-01
	(Total)												2.4E+04
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E+04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic Inhalation.
N/A - Not applicable; metals are not volatile.

Table 7.12.RME Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario
Site 47 RI Report
Indian Head, Maryland

Chemical	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
1,1,2,2-Tetrachloroethane	3.00E+00	167.9	1.41E-02	3.45E-05	9.82E+02	1.02E+01	1.24E+00	1.67E+00	1.63E-01	1.09E+00	2.22E-05
1,1,2-Trichloroethane	3.40E+00	133.4	3.74E-02	9.14E-05	1.10E+03	1.15E+01	3.07E+00	4.15E+00	4.39E-01	2.93E+00	5.98E-05
1,1-Dichloroethane	1.68E+02	99	2.30E-01	5.62E-04	1.28E+03	1.33E+01	9.23E+00	1.25E+01	5.69E+01	3.80E+02	7.75E-03
1,1-Dichloroethene	7.43E+02	97	1.07E+00	2.61E-03	1.29E+03	1.35E+01	1.23E+01	1.66E+01	3.16E+02	2.11E+03	4.30E-02
1,2-Dibromo-3-chloropropane	6.60E+00	236.36	6.02E-02	1.47E-04	8.28E+02	8.63E+00	3.19E+00	4.31E+00	8.84E-01	5.89E+00	1.20E-04
1,2-Dichloroethane	7.16E+02	99	4.01E-02	9.80E-05	1.28E+03	1.33E+01	3.75E+00	5.07E+00	1.11E+02	7.42E+02	1.51E-02
1,2-Dichloropropane	1.30E+00	112.99	1.15E-01	2.81E-04	1.20E+03	1.25E+01	6.60E+00	8.92E+00	3.34E-01	2.23E+00	4.55E-05
Acetone	6.06E+03	58.09	8.59E-03	2.10E-05	1.67E+03	1.74E+01	1.35E+00	1.82E+00	3.57E+02	2.38E+03	4.86E-02
Bromodichloromethane	4.30E+00	163.83	6.56E-02	1.60E-04	9.94E+02	1.04E+01	4.05E+00	5.47E+00	7.16E-01	4.78E+00	9.75E-05
Bromomethane	9.37E+02	94.95	2.55E+00	6.24E-03	1.31E+03	1.36E+01	1.31E+01	1.77E+01	4.17E+02	2.78E+03	5.68E-02
Carbon disulfide	6.62E+03	76.13	1.24E+00	3.03E-03	1.46E+03	1.52E+01	1.40E+01	1.90E+01	3.10E+03	2.07E+04	4.22E-01
Carbon tetrachloride	2.86E+05	153.84	1.25E+00	3.05E-03	1.03E+03	1.07E+01	9.89E+00	1.34E+01	1.03E+05	6.86E+05	1.40E+01
Chloroethane	2.62E+01	64.2	3.47E+00	8.48E-03	1.59E+03	1.66E+01	1.61E+01	2.17E+01	1.35E+01	9.00E+01	1.84E-03
Chloroform	5.76E+04	119.39	1.50E-01	3.67E-04	1.16E+03	1.21E+01	7.22E+00	9.75E+00	1.60E+04	1.06E+05	2.17E+00
Chloromethane	5.93E+04	50.49	9.82E+00	2.40E-02	1.79E+03	1.87E+01	1.85E+01	2.50E+01	3.35E+04	2.23E+05	4.55E+00
Dibromochloromethane	8.66E+01	208.28	3.20E-01	7.83E-04	8.82E+02	9.19E+00	6.97E+00	9.41E+00	2.33E+01	1.55E+02	3.17E-03
Tetrachloroethene	1.40E+03	165.82	7.54E-01	1.84E-03	9.88E+02	1.03E+01	9.07E+00	1.23E+01	4.69E+02	3.13E+03	6.39E-02
Toluene	2.37E+02	92.13	2.72E-01	6.65E-04	1.33E+03	1.38E+01	1.00E+01	1.36E+01	8.62E+01	5.75E+02	1.17E-02
Trichloroethene	3.39E+02	131.4	4.22E-01	1.03E-03	1.11E+03	1.16E+01	9.31E+00	1.26E+01	1.16E+02	7.74E+02	1.58E-02
Vinyl chloride	2.82E+01	63	1.1E+00	2.71E-03	1.60E+03	1.67E+01	1.53E+01	2.07E+01	1.40E+01	9.36E+01	1.91E-03
cis-1,2-Dichloroethene	1.45E+03	97	1.67E-01	4.08E-04	1.29E+03	1.35E+01	8.35E+00	1.13E+01	4.55E+02	3.03E+03	6.19E-02
trans-1,2-Dichloroethene	3.82E+02	97	3.85E-01	9.41E-04	1.29E+03	1.35E+01	1.06E+01	1.44E+01	1.45E+02	9.70E+02	1.98E-02
trans-1,3-Dichloropropene	4.80E+00	110	7.26E-01	1.77E-03	1.21E+03	1.26E+01	1.11E+01	1.50E+01	1.89E+00	1.26E+01	2.57E-04
Naphthalene	5.27E+00	128.16	1.98E-02	1.30E-03	1.12E+03	1.17E+01	9.83E+00	1.33E+01	1.88E+00	1.26E+01	2.56E-04

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	2
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	20
SV = shower room air volume	m^3	3
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	12
Dt = total duration in shower room	min	15
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Table 7.12.RME Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario
Site 47 RI Report
Indian Head, Maryland

Equation 1:	Kg(VOC) =	3000 * (18 / HH)$^{0.5}$	
Equation 2:	Kl(VOC) =	20 * (44 / HH)$^{0.5}$	
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$	
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

TABLE 7.13.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Volatilization from open excavation
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	2.28E-08	mg/m^3	R	4.5E-09	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	1,1,2-Trichloroethane	3.40E+00	µg/l	2.93E-08	mg/m3	R	5.7E-09	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	1,1-Dichloroethane	1.68E+02	µg/l	1.61E-06	mg/m3	R	3.2E-07	mg/kg-day	1.4E+00	mg/kg-day	5.0E+00	mg/m3	2.3E-07
	1,1-Dichloroethene	7.43E+02	µg/l	7.23E-06	mg/m3	R	1.4E-06	mg/kg-day	6.0E-02	mg/kg-day	2.1E-01	mg/m3	2.4E-05
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	5.15E-08	mg/m3	R	1.0E-08	mg/kg-day	5.7E-05	mg/kg-day	2.0E-04	mg/m3	1.8E-04
	1,2-Dichloroethane	7.16E+02	µg/l	6.66E-09	mg/m3	R	1.3E-09	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m3	9.3E-07
	1,2-Dichloropropane	1.30E+00	µg/l	1.20E-11	mg/m3	R	2.4E-12	mg/kg-day	3.7E-03	mg/kg-day	1.3E-02	mg/m3	6.4E-10
	Acetone	6.06E+03	µg/l	6.71E-08	mg/m3	R	1.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Bromodichloromethane	4.30E+00	µg/l	3.58E-11	mg/m3	R	7.0E-12	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Bromomethane	9.37E+02	µg/l	9.17E-09	mg/m3	R	1.8E-09	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m3	1.3E-06
	Carbon disulfide	6.62E+03	µg/l	6.84E-08	mg/m3	R	1.3E-08	mg/kg-day	2.0E-01	mg/kg-day	7.0E-01	mg/m3	6.7E-08
	Carbon tetrachloride	2.86E+05	µg/l	2.48E-06	mg/m3	R	4.9E-07	mg/kg-day	5.7E-04	mg/kg-day	2.0E-03	mg/m3	8.5E-04
	Chloroethane	2.62E+01	µg/l	2.83E-10	mg/m3	R	5.5E-11	mg/kg-day	2.9E+00	mg/kg-day	1.0E+01	mg/m3	1.9E-11
	Chloroform	5.76E+04	µg/l	5.27E-07	mg/m3	R	1.0E-07	mg/kg-day	1.4E-02	mg/kg-day	4.9E-02	mg/m3	7.4E-06
	Chloromethane	5.93E+04	µg/l	6.80E-07	mg/m3	R	1.3E-07	mg/kg-day	2.6E-02	mg/kg-day	9.1E-02	mg/m3	5.1E-06
	Dibromochloromethane	8.66E+01	µg/l	6.97E-10	mg/m3	R	1.4E-10	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Tetrachloroethene	1.40E+03	µg/l	1.19E-08	mg/m3	R	2.3E-09	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	1.7E-08
	Toluene	2.37E+02	µg/l	2.32E-09	mg/m3	R	4.5E-10	mg/kg-day	1.1E-01	mg/kg-day	4.0E-01	mg/m3	4.0E-09
	Trichloroethene	3.39E+02	µg/l	3.05E-09	mg/m3	R	6.0E-10	mg/kg-day	1.0E-02	mg/kg-day	4.0E-02	mg/m3	6.0E-08
	Vinyl chloride	2.82E+01	µg/l	3.05E-10	mg/m3	R	6.0E-11	mg/kg-day	2.8E-02	mg/kg-day	1.0E-01	mg/m3	2.1E-09
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.40E-08	mg/m3	R	2.7E-09	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.70E-09	mg/m3	R	7.2E-10	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.60E-11	mg/m3	R	9.0E-12	mg/kg-day	5.7E-03	mg/kg-day	2.0E-02	mg/m3	1.6E-09
	Naphthalene	5.27E+00	µg/l	4.40E-11	mg/m3	R	8.6E-12	mg/kg-day	9.0E-04	mg/kg-day	3.2E-03	mg/m3	9.6E-09
	(Total)												1.1E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Table 7.13.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Site 47 RI Report
Indian Head, Maryland

Chemical	Cw (µg/L)	MW (gram/mol)	K_H (unitless)	k_l (cm/hr)	k_g (cm/hr)	K_v (cm/hr)	ER (mg/hr)	ERa (g/sec-m^2)	Ca (ug/m^3)
1,1,2,2-Tetrachloroethane	3.00E+00	167.9	1.41E-02	2.91E+00	1.76E+03	2.60E+00	7.81E+00	8.03E-10	2.28E-05
1,1,2-Trichloroethane	3.40E+00	133.4	3.74E-02	3.08E+00	1.87E+03	2.95E+00	1.00E+01	1.03E-09	2.93E-05
1,1-Dichloroethane	1.68E+02	99	2.30E-01	3.32E+00	2.01E+03	3.29E+00	5.52E+02	5.68E-08	1.61E-03
1,1-Dichloroethene	7.43E+02	97	1.07E+00	3.33E+00	2.02E+03	3.33E+00	2.47E+03	2.55E-07	7.23E-03
1,2-Dibromo-3-chloropropan	6.60E+00	236.36	1.09E+03	2.67E+00	1.62E+03	2.67E+00	1.76E+01	1.81E-09	5.15E-05
1,2-Dichloroethane	7.16E-01	99	4.01E-02	3.32E+00	2.01E+03	3.19E+00	2.28E+00	2.35E-10	6.66E-06
1,2-Dichloropropane	1.30E-03	112.99	1.15E-01	3.21E+00	1.95E+03	3.16E+00	4.11E-03	4.23E-13	1.20E-08
Acetone	6.06E+00	58.09	1.55E+03	3.79E+00	2.30E+03	3.79E+00	2.30E+01	2.36E-09	6.71E-05
Bromodichloromethane	4.30E-03	163.83	6.56E-02	2.93E+00	1.77E+03	2.85E+00	1.23E-02	1.26E-12	3.58E-08
Bromomethane	9.37E-01	94.95	1.37E+03	3.35E+00	2.03E+03	3.35E+00	3.14E+00	3.23E-10	9.17E-06
Carbon disulfide	6.62E+00	76.13	1.24E+00	3.54E+00	2.15E+03	3.54E+00	2.34E+01	2.41E-09	6.84E-05
Carbon tetrachloride	2.86E+02	153.84	1.25E+00	2.97E+00	1.80E+03	2.97E+00	8.50E+02	8.74E-08	2.48E-03
Chloroethane	2.62E-02	64.2	1.51E+03	3.70E+00	2.24E+03	3.70E+00	9.69E-02	9.97E-12	2.83E-07
Chloroform	5.76E+01	119.39	1.50E-01	3.17E+00	1.92E+03	3.13E+00	1.80E+02	1.85E-08	5.27E-04
Chloromethane	5.93E+01	50.49	1.61E+03	3.93E+00	2.38E+03	3.93E+00	2.33E+02	2.39E-08	6.80E-04
Dibromochloromethane	8.66E-02	208.28	1.13E+03	2.75E+00	1.67E+03	2.75E+00	2.39E-01	2.45E-11	6.97E-07
Tetrachloroethene	1.40E+00	165.82	7.54E-01	2.92E+00	1.77E+03	2.91E+00	4.07E+00	4.19E-10	1.19E-05
Toluene	2.37E-01	92.13	2.72E-01	3.38E+00	2.05E+03	3.36E+00	7.96E-01	8.19E-11	2.32E-06
Trichloroethene	3.39E-01	131.4	4.22E-01	3.09E+00	1.87E+03	3.08E+00	1.04E+00	1.07E-10	3.05E-06
Vinyl chloride	2.82E-02	63	1.1E+00	3.71E+00	2.25E+03	3.71E+00	1.05E-01	1.08E-11	3.05E-07
cis-1,2-Dichloroethene	1.45E+00	97	1.67E-01	3.33E+00	2.02E+03	3.30E+00	4.79E+00	4.93E-10	1.40E-05
trans-1,2-Dichloroethene	3.82E-01	97	3.85E-01	3.33E+00	2.02E+03	3.32E+00	1.27E+00	1.30E-10	3.70E-06
trans-1,3-Dichloropropene	4.89E-03	110	7.26E-01	3.23E+00	1.96E+03	3.22E+00	1.58E-02	1.62E-12	4.60E-08
Naphthalene	5.27E-03	130	1.98E-02	3.10E+00	1.88E+03	2.86E+00	1.51E-02	1.55E-12	4.40E-08

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H * K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 ER = Kv * Cw * L/1000 cm^3 * mg/1000 µg

Equation 5 ERa = ER * g/1000 mg * hr/60 min * min/60 sec * 1/A

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(µg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch)	(m^2)	2,700
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(ug/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 7.14.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	7.7E-08	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	7.7E-07
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	2.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	6.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	8.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	9.8E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	9.8E-03
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	7.7E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.9E-02
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	8.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.8E-02
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	2.9E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-03
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	2.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.1E-02
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	2.0E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	5.7E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.8E-02
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	1.3E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.4E-02
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	4.2E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	8.4E-02
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	4.4E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.4E-02
	(Total)												3.4E-01
Dermal Absorption													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	2.6E-08	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	2.6E-07
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	2.0E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	3.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	9.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	1.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-03
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	8.5E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.4E-02
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.3E-03
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	3.2E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	6.4E-03
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	2.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.0E-03
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	2.2E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	6.3E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.9E-02
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	1.5E-06	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	7.0E-02
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	4.6E-05	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.3E-01
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	4.9E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.9E-01
	(Total)												6.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	9.5E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 7.15.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	3.2E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.2E-06
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	5.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	4.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	9.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	2.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	3.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	4.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.1E-03
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	3.2E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.0E-03
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	3.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-02
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	1.2E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	4.0E-03
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.4E-02
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	8.2E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	2.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E-02
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.8E-02
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	1.7E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	3.5E-02
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	1.8E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.8E-02
	(Total)												1.5E-01
Dermal Absorption													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	5.1E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	5.1E-06
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	4.1E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	3.3E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	6.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	1.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	2.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	2.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-03
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	1.7E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.8E-02
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	5.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.9E-02
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	6.4E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	8.5E-02
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	5.4E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E-02
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	4.4E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	1.3E-04	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.6E-01
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	2.9E-06	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	1.4E-01
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	9.2E-05	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	4.6E-01
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	9.7E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	3.7E-01
	(Total)												1.3E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 7.16.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Residential
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	4.5E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.5E-06
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	8.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	6.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	3.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	4.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	5.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.7E-03
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	4.5E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	4.9E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	1.7E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.6E-03
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	1.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.7E-02
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	1.2E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	3.3E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.7E-02
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	7.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.6E-02
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	2.4E-04	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	4.9E-02
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	2.6E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.6E-02
	(Total)												2.0E-01
Dermal Absorption													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	1.8E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.8E-06
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	2.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	6.7E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	8.2E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	7.5E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	7.5E-04
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	5.9E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	9.9E-03
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.5E-03
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	2.2E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.0E-02
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	1.9E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	6.3E-03
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	1.5E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	4.4E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.5E-02
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	1.0E-06	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	4.9E-02
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	3.2E-05	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	1.6E-01
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	3.4E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.3E-01
	(Total)												4.5E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.5E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

TABLE 7.17.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Residential
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	4.2E-07	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.2E-05
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	7.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	6.3E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	1.3E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	3.7E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	4.5E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	5.3E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.3E-02
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	4.2E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.1E-01
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	4.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-01
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	1.6E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.3E-02
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	1.3E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.4E-01
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	1.1E-03	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	3.1E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-01
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	7.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.4E-01
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	2.3E-03	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	4.5E-01
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	2.4E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.4E-01
	(Total)												1.9E+00
Dermal Absorption													
	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	2.4E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.4E-06
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	1.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.5E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	3.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	8.9E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	1.0E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.0E-03
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	7.9E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.3E-02
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.6E-03
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	3.0E-06	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	3.9E-02
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	2.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.3E-03
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	2.0E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	5.8E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.2E-02
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	1.3E-06	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	6.4E-02
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	4.3E-05	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	2.1E-01
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	4.5E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-01
	(Total)												5.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A Not applicable.

TABLE 7.18.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.30E-05	mg/m^3	R	8.7E-07	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	6.2E-06
	(Total)												6.2E-06
												Total Hazard Index Across All Exposure Routes/Pathways	6.2E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 7.19.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.30E-05	mg/m3	R	2.6E-06	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	1.8E-05
	(Total)												1.8E-05
												Total Hazard Index Across All Exposure Routes/Pathways	1.8E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 7.20.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Residential
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.30E-05	mg/m3	R	3.6E-06	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	2.5E-05
	(Total)												2.5E-05
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 7.21.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Residential
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.3E-05	mg/m3	R	1.0E-05	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	7.1E-05
	(Total)												7.1E-05
												Total Hazard Index Across All Exposure Routes/Pathways	7.1E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 7.22.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Concrete
Exposure Point: Concrete troughs
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.2E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.9E-03
	Lead	1.67E+03	mg/kg	1.67E+03	mg/kg	M	9.4E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	(Total)												3.9E-03
Dermal Absorption	Arsenic	2.10E+00	mg/kg	2.1E+00	mg/kg	M	3.9E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.3E-03
	Lead	1.67E+03	mg/kg	1.67E+03	mg/kg	M	1.0E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	N/A
	(Total)												1.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.3E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 7.23.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	6.48E-03	mg/kg	6.48E-03	mg/kg	M	1.2E-09	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.2E-07
	Benzo(a)anthracene	1.19E-01	mg/kg	1.19E-01	mg/kg	M	2.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	1.08E-01	mg/kg	1.08E-01	mg/kg	M	2.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.20E-01	mg/kg	1.20E-01	mg/kg	M	2.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	9.01E-02	mg/kg	9.01E-02	mg/kg	M	1.7E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	8.82E-02	mg/kg	8.82E-02	mg/kg	M	1.7E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	3.27E+03	mg/kg	3.27E+03	mg/kg	M	6.3E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	6.3E-04
	Antimony	1.02E+00	mg/kg	1.02E+00	mg/kg	M	2.0E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	4.9E-04
	Arsenic	1.65E+00	mg/kg	1.65E+00	mg/kg	M	3.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-03
	Chromium	8.97E+00	mg/kg	8.97E+00	mg/kg	M	1.7E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.8E-04
	Iron	6.11E+03	mg/kg	6.11E+03	mg/kg	M	1.2E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.9E-03
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	2.1E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.24E+02	mg/kg	1.24E+02	mg/kg	M	2.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E-03
	Mercury (mercuric chloride)	5.31E-01	mg/kg	5.31E-01	mg/kg	M	1.0E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.4E-04
	Silver	3.94E+00	mg/kg	3.94E+00	mg/kg	M	7.6E-07	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.5E-04
	Vanadium	1.10E+01	mg/kg	1.10E+01	mg/kg	M	2.1E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.1E-03
	(Total)												1.0E-02
Dermal Absorption													
	Tetrachloroethene	6.48E-03	mg/kg	6.48E-03	mg/kg	M	5.5E-10	mg/kg-day	1.00E-02	mg/kg-day	N/A	N/A	5.5E-08
	Benzo(a)anthracene	1.19E-01	mg/kg	1.19E-01	mg/kg	M	4.4E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	1.08E-01	mg/kg	1.08E-01	mg/kg	M	4.0E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.20E-01	mg/kg	1.20E-01	mg/kg	M	4.4E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	9.01E-02	mg/kg	9.01E-02	mg/kg	M	3.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	8.82E-02	mg/kg	8.82E-02	mg/kg	M	3.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	3.27E+03	mg/kg	3.27E+03	mg/kg	M	9.3E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	9.3E-05
	Antimony	1.02E+00	mg/kg	1.02E+00	mg/kg	M	2.9E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	4.9E-04
	Arsenic	1.65E+00	mg/kg	1.65E+00	mg/kg	M	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.7E-04
	Chromium	8.97E+00	mg/kg	8.97E+00	mg/kg	M	2.6E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	3.4E-03
	Iron	6.11E+03	mg/kg	6.11E+03	mg/kg	M	1.7E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.8E-04
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	3.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.24E+02	mg/kg	1.24E+02	mg/kg	M	3.5E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	4.4E-03
	Mercury (mercuric chloride)	5.31E-01	mg/kg	5.31E-01	mg/kg	M	1.5E-08	mg/kg-day	2.10E-05	mg/kg-day	N/A	N/A	7.2E-04
	Silver	3.94E+00	mg/kg	3.94E+00	mg/kg	M	1.1E-07	mg/kg-day	2.00E-04	mg/kg-day	N/A	N/A	5.6E-04
	Vanadium	1.10E+01	mg/kg	1.10E+01	mg/kg	M	3.1E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.2E-02
	(Total)												2.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Chronic.

Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.

N/A Not applicable.

TABLE 7.24.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	1.3E-05	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	2.2E-04
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	1.3E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	3.2E-03
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	1.6E-05	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.6E-04
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	2.1E-05	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	4.2E-04
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	3.5E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	3.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.7E-03
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	1.2E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	2.2E-04	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	2.4E-04
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	5.3E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.7E-04
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	1.6E-05	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	1.2E-02
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	3.6E-05	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	3.6E-04
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	1.4E-04	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	2.0E-01
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	1.4E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	3.6E-05
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	1.5E-04	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	1.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	1.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.4E-04
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	5.1E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	5.1E-03
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	1.6E-05	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	8.1E-05
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	5.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.9E-01
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	1.5E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.1E-03
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	4.4E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.4E-03
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	1.8E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.0E-04
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	1.3E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	4.3E-04
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	7.7E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	7.7E-02
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	6.2E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	5.1E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.7E-03
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	5.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.7E-03
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	9.3E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.6E-02
	Aluminum	5.19E+02	µg/l	5.19E+02	µg/l	M	6.6E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	6.6E-03
	Antimony	2.72E+00	µg/l	2.72E+00	µg/l	M	3.5E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.7E-02
	Arsenic	7.00E+00	µg/l	7.00E+00	µg/l	M	9.0E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.0E-01
	Barium	7.94E+01	µg/l	7.94E+01	µg/l	M	1.0E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Beryllium	3.18E-01	µg/l	3.18E-01	µg/l	M	4.1E-06	mg/kg-day	2.0E-03	mg/kg-day	N/A	N/A	2.0E-03
	Cadmium	4.07E-01	µg/l	4.07E-01	µg/l	M	5.2E-06	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Chromium	2.10E+00	µg/l	2.10E+00	µg/l	M	2.7E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	9.0E-03
	Cobalt	1.93E+01	µg/l	1.93E+01	µg/l	M	2.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E-02
	Iron	3.39E+03	µg/l	3.39E+03	µg/l	M	4.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E-01
	Lead	2.02E+00	µg/l	2.02E+00	µg/l	M	2.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.72E+02	µg/l	1.72E+02	µg/l	M	2.2E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.1E-01
	Nickel	1.28E+01	µg/l	1.28E+01	µg/l	M	1.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.2E-03
	Thallium	1.52E+00	µg/l	1.52E+00	µg/l	M	2.0E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.8E-01
	Vanadium	4.94E+00	µg/l	4.94E+00	µg/l	M	6.3E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.3E-02
	(Total)												1.6E+00

TABLE 7.24.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	1.8E-06	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.0E-05
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	1.3E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	3.2E-04
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	1.4E-06	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.4E-05
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	3.1E-06	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	6.2E-05
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	4.4E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	1.7E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.4E-05
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	1.3E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	8.8E-07	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	9.8E-07
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	4.6E-07	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E-05
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	5.2E-07	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	3.7E-04
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	7.1E-06	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	7.1E-05
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	4.3E-05	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	6.1E-02
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	8.5E-07	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	2.1E-06
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	1.4E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	4.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	3.6E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-03
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	3.7E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.7E-03
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	6.5E-06	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	3.3E-05
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.5E-02
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	8.1E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.7E-04
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	4.0E-06	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.0E-04
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	1.7E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.3E-05
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	7.4E-07	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	2.5E-05
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	8.0E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	8.0E-02
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	1.2E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.2E-02
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.0E-03	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	3.4E-02
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	3.6E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-03
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	2.4E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.2E-04
	Aluminum	5.19E+02	µg/l	5.19E+02	µg/l	M	1.7E-05	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.7E-05
	Antimony	2.72E+00	µg/l	2.72E+00	µg/l	M	9.0E-08	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.2E-04
	Arsenic	7.00E+00	µg/l	7.00E+00	µg/l	M	2.3E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.7E-04
	Barium	7.94E+01	µg/l	7.94E+01	µg/l	M	2.6E-06	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	5.3E-04
	Beryllium	3.18E-01	µg/l	3.18E-01	µg/l	M	1.0E-08	mg/kg-day	1.4E-05	mg/kg-day	N/A	N/A	7.5E-04
	Cadmium	4.07E-01	µg/l	4.07E-01	µg/l	M	1.3E-08	mg/kg-day	1.3E-05	mg/kg-day	N/A	N/A	1.1E-03
	Chromium	2.10E+00	µg/l	2.10E+00	µg/l	M	6.9E-08	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	9.2E-04
	Cobalt	1.93E+01	µg/l	1.93E+01	µg/l	M	6.4E-07	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.2E-05
	Iron	3.39E+03	µg/l	3.39E+03	µg/l	M	1.1E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.7E-04
	Lead	2.02E+00	µg/l	2.02E+00	µg/l	M	6.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.72E+02	µg/l	1.72E+02	µg/l	M	5.7E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	7.1E-03
	Nickel	1.28E+01	µg/l	1.28E+01	µg/l	M	4.2E-07	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	5.3E-04
	Thallium	1.52E+00	µg/l	1.52E+00	µg/l	M	5.0E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	7.2E-04
	Vanadium	4.94E+00	µg/l	4.94E+00	µg/l	M	1.6E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	6.3E-03
	(Total)												3.0E-01
											Total Hazard Index Across All Exposure Routes/Pathways		1.9E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic value used.

Table 7.24.CT Supplement
Calculation of DAevent (Adult)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	9.00E-03	9.2E-01	0.2	1.11E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	9.98E-01	µg/l	8.40E-03	5.7E-01	0.2	7.82E-09	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.27E+00	µg/l	8.90E-03	3.5E-01	0.2	8.24E-09	8.4E-01	6.2E-03	2
1,1-Dichloroethene	1.64E+00	µg/l	1.60E-02	3.4E-01	0.2	1.89E-08	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
1,2-Dichloroethane	2.62E+00	µg/l	5.30E-03	3.5E-01	0.2	1.01E-08	8.4E-01	3.0E-03	2
1,2-Dichloropropane	9.61E-01	µg/l	1.00E-02	4.3E-01	0.2	7.79E-09	1.0E+00	1.0E-02	2
Acetone	1.71E+01	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Bromodichloromethane	4.14E-01	µg/l	5.80E-03	8.7E-01	0.2	2.77E-09	2.1E+00	1.2E-02	2
Bromomethane	1.28E+00	µg/l	3.50E-03	3.3E-01	0.2	3.18E-09	8.0E-01	1.5E-03	2
Carbon disulfide	2.79E+00	µg/l	2.40E-02	2.7E-01	0.2	4.30E-08	6.5E-01	1.7E-02	2
Carbon tetrachloride	1.10E+01	µg/l	2.20E-02	7.6E-01	0.2	2.60E-07	1.8E+00	6.8E-02	2
Chloroethane	1.12E+00	µg/l	8.00E-03	2.2E-01	0.2	5.17E-09	5.2E-01	2.7E-03	2
Chloroform	1.14E+01	µg/l	8.90E-03	4.7E-01	0.2	8.58E-08	1.1E+00	9.3E-03	2
Chloromethane	1.24E+00	µg/l	4.20E-03	1.8E-01	0.2	2.74E-09	4.3E-01	8.1E-04	2
Dibromochloromethane	1.15E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Tetrachloroethene	3.96E+00	µg/l	4.80E-02	9.0E-01	0.2	2.23E-07	4.3E+00	2.5E-01	2
Toluene	1.26E+00	µg/l	4.50E-02	3.2E-01	0.2	3.97E-08	7.7E-01	5.4E-02	2
Trichloroethene	4.35E+00	µg/l	1.60E-02	5.5E-01	0.2	6.38E-08	1.3E+00	2.6E-02	2
Vinyl chloride	1.19E+00	µg/l	7.30E-03	2.1E-01	0.2	4.93E-09	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	3.40E+00	µg/l	1.00E-02	3.4E-01	0.2	2.45E-08	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	1.40E+00	µg/l	1.00E-02	3.4E-01	0.2	1.01E-08	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	1.02E+00	µg/l	5.50E-03	4.2E-01	0.2	4.48E-09	1.0E+00	4.0E-03	2
Hexachloroethane	6.00E+00	µg/l	4.20E-02	2.4E+00	0.2	4.83E-07	1.9E+01	8.5E-01	2
Naphthalene	4.86E+00	µg/l	6.50E-01	3.7E+00	0.2	7.51E-06	1.7E+01	7.2E+01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.2	6.18E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Cyanide	7.24E+01	µg/l	1.00E-03	N/A	0.2	1.45E-08	N/A	N/A	2
Aluminum	5.19E+02	µg/l	1.00E-03	N/A	0.2	1.04E-07	N/A	N/A	2
Antimony	2.72E+00	µg/l	1.00E-03	N/A	0.2	5.43E-10	N/A	N/A	2
Arsenic	7.00E+00	µg/l	1.00E-03	N/A	0.2	1.40E-09	N/A	N/A	1
Barium	7.94E+01	µg/l	1.00E-03	N/A	0.2	1.59E-08	N/A	N/A	1
Beryllium	3.18E-01	µg/l	1.00E-03	N/A	0.2	6.35E-11	N/A	N/A	1
Cadmium	4.07E-01	µg/l	1.00E-03	N/A	0.2	8.15E-11	N/A	N/A	1
Chromium	2.10E+00	µg/l	1.00E-03	N/A	0.2	4.19E-10	N/A	N/A	1
Cobalt	1.93E+01	µg/l	1.00E-03	N/A	0.2	3.85E-09	N/A	N/A	1
Iron	3.39E+03	µg/l	1.00E-03	N/A	0.2	6.79E-07	N/A	N/A	1
Lead	2.02E+00	µg/l	1.00E-03	N/A	0.2	4.03E-10	N/A	N/A	1
Manganese	1.72E+02	µg/l	1.00E-03	N/A	0.2	3.43E-08	N/A	N/A	1
Nickel	1.28E+01	µg/l	1.00E-03	N/A	0.2	2.56E-09	N/A	N/A	1
Thallium	1.52E+00	µg/l	1.00E-03	N/A	0.2	3.05E-10	N/A	N/A	1
Vanadium	4.94E+00	µg/l	1.00E-03	N/A	0.2	9.89E-10	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 7.24b.CT Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.2	2.75E+00	2.68E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.2	1.71E+01	5.34E-09
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.2	1.24E+00	6.12E-09
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.2	1.15E+00	2.20E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 7.25.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	4.4E-05	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	7.4E-04
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	4.3E-05	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	1.1E-02
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	5.4E-05	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	5.4E-04
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	7.0E-05	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	1.2E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	1.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.6E-03
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	4.1E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	7.3E-04	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	8.1E-04
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	1.8E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.8E-04
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	5.5E-05	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	3.9E-02
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	1.2E-04	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.2E-03
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	4.7E-04	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	6.7E-01
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	4.8E-05	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	1.2E-04
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	4.9E-04	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	4.9E-02
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	5.3E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	4.9E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.5E-03
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	1.7E-04	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.7E-02
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	5.4E-05	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	2.7E-04
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	1.9E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.2E-01
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	5.1E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.7E-02
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	1.5E-04	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	6.0E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.0E-03
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	4.3E-05	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	2.6E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.6E-01
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	2.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.7E-04	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	5.7E-03
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	1.8E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	9.1E-03
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	3.1E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-01
	Aluminum	5.19E+02	µg/l	5.19E+02	µg/l	M	2.2E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.2E-02
	Antimony	2.72E+00	µg/l	2.72E+00	µg/l	M	1.2E-04	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	2.9E-01
	Arsenic	7.00E+00	µg/l	7.00E+00	µg/l	M	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E+00
	Barium	7.94E+01	µg/l	7.94E+01	µg/l	M	3.4E-03	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	4.8E-02
	Beryllium	3.18E-01	µg/l	3.18E-01	µg/l	M	1.4E-05	mg/kg-day	2.0E-03	mg/kg-day	N/A	N/A	6.8E-03
	Cadmium	4.07E-01	µg/l	4.07E-01	µg/l	M	1.7E-05	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	3.5E-02
	Chromium	2.10E+00	µg/l	2.10E+00	µg/l	M	9.0E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	3.0E-02
	Cobalt	1.93E+01	µg/l	1.93E+01	µg/l	M	8.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.1E-02
	Iron	3.39E+03	µg/l	3.39E+03	µg/l	M	1.5E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.8E-01
	Lead	2.02E+00	µg/l	2.02E+00	µg/l	M	8.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.72E+02	µg/l	1.72E+02	µg/l	M	7.3E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.7E-01
	Nickel	1.28E+01	µg/l	1.28E+01	µg/l	M	5.5E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.7E-02
	Thallium	1.52E+00	µg/l	1.52E+00	µg/l	M	6.5E-05	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	9.3E-01
	Vanadium	4.94E+00	µg/l	4.94E+00	µg/l	M	2.1E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.1E-01
	(Total)												5.4E+00

TABLE 7.25.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	3.9E-06	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	6.6E-05
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	2.8E-06	mg/kg-day	4.0E-03	mg/kg-day	N/A	N/A	7.0E-04
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	2.9E-06	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	2.9E-05
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	6.7E-06	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	1.3E-04
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	9.6E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	3.6E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-04
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	2.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	1.9E-06	mg/kg-day	9.0E-01	mg/kg-day	N/A	N/A	2.1E-06
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	9.9E-07	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.9E-05
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	1.1E-06	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	8.1E-04
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	1.5E-05	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.5E-04
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	9.3E-05	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	1.3E-01
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	1.8E-06	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	4.6E-06
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	3.1E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	9.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	7.8E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.9E-03
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	7.9E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	7.9E-03
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	1.4E-05	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	7.1E-05
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	2.3E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.6E-02
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	1.8E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.9E-04
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	8.7E-06	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	8.7E-04
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	3.6E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-04
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	1.6E-06	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	5.3E-05
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	1.7E-04	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.7E-01
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	2.1E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.0E-01
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	2.2E-03	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	7.4E-02
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	7.8E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.9E-03
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	6.6E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.3E-04
	Aluminum	5.19E+02	µg/l	5.19E+02	µg/l	M	4.8E-05	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.8E-05
	Antimony	2.72E+00	µg/l	2.72E+00	µg/l	M	2.5E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	6.2E-04
	Arsenic	7.00E+00	µg/l	7.00E+00	µg/l	M	6.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-03
	Barium	7.94E+01	µg/l	7.94E+01	µg/l	M	7.3E-06	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	1.5E-03
	Beryllium	3.18E-01	µg/l	3.18E-01	µg/l	M	2.9E-08	mg/kg-day	1.4E-05	mg/kg-day	N/A	N/A	2.1E-03
	Cadmium	4.07E-01	µg/l	4.07E-01	µg/l	M	3.7E-08	mg/kg-day	1.3E-05	mg/kg-day	N/A	N/A	3.0E-03
	Chromium	2.10E+00	µg/l	2.10E+00	µg/l	M	1.9E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	2.6E-03
	Cobalt	1.93E+01	µg/l	1.93E+01	µg/l	M	1.8E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	8.8E-05
	Iron	3.39E+03	µg/l	3.39E+03	µg/l	M	3.1E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.0E-03
	Lead	2.02E+00	µg/l	2.02E+00	µg/l	M	1.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.72E+02	µg/l	1.72E+02	µg/l	M	1.6E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.0E-02
	Nickel	1.28E+01	µg/l	1.28E+01	µg/l	M	1.2E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	1.5E-03
	Thallium	1.52E+00	µg/l	1.52E+00	µg/l	M	1.4E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.0E-03
	Vanadium	4.94E+00	µg/l	4.94E+00	µg/l	M	4.5E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.7E-02
	(Total)												6.4E-01
											Total Hazard Index Across All Exposure Routes/Pathways		6.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic value used.

Table 7.25a.CT Supplement
Calculation of DAevent (Child)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	9.00E-03	9.2E-01	0.33	1.42E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	9.98E-01	µg/l	8.40E-03	5.7E-01	0.33	1.00E-08	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.27E+00	µg/l	8.90E-03	3.5E-01	0.33	1.06E-08	8.4E-01	6.2E-03	2
1,1-Dichloroethene	1.64E+00	µg/l	1.60E-02	3.4E-01	0.33	2.43E-08	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
1,2-Dichloroethane	2.62E+00	µg/l	5.30E-03	3.5E-01	0.33	1.30E-08	8.4E-01	3.0E-03	2
1,2-Dichloropropane	9.61E-01	µg/l	1.00E-02	4.3E-01	0.33	1.00E-08	1.0E+00	1.0E-02	2
Acetone	1.71E+01	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Bromodichloromethane	4.14E-01	µg/l	5.80E-03	8.7E-01	0.33	3.55E-09	2.1E+00	1.2E-02	2
Bromomethane	1.28E+00	µg/l	3.50E-03	3.3E-01	0.33	4.09E-09	8.0E-01	1.5E-03	2
Carbon disulfide	2.79E+00	µg/l	2.40E-02	2.7E-01	0.33	5.52E-08	6.5E-01	1.7E-02	2
Carbon tetrachloride	1.10E+01	µg/l	2.20E-02	7.6E-01	0.33	3.34E-07	1.8E+00	6.8E-02	2
Chloroethane	1.12E+00	µg/l	8.00E-03	2.2E-01	0.33	6.65E-09	5.2E-01	2.7E-03	2
Chloroform	1.14E+01	µg/l	8.90E-03	4.7E-01	0.33	1.10E-07	1.1E+00	9.3E-03	2
Chloromethane	1.24E+00	µg/l	4.20E-03	1.8E-01	0.33	3.52E-09	4.3E-01	8.1E-04	2
Dibromochloromethane	1.15E+00	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Tetrachloroethene	3.96E+00	µg/l	4.80E-02	9.0E-01	0.33	2.86E-07	4.3E+00	2.5E-01	2
Toluene	1.26E+00	µg/l	4.50E-02	3.2E-01	0.33	5.10E-08	7.7E-01	5.4E-02	2
Trichloroethene	4.35E+00	µg/l	1.60E-02	5.5E-01	0.33	8.19E-08	1.3E+00	2.6E-02	2
Vinyl chloride	1.19E+00	µg/l	7.30E-03	2.1E-01	0.33	6.33E-09	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	3.40E+00	µg/l	1.00E-02	3.4E-01	0.33	3.15E-08	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	1.40E+00	µg/l	1.00E-02	3.4E-01	0.33	1.29E-08	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	1.02E+00	µg/l	5.50E-03	4.2E-01	0.33	5.76E-09	1.0E+00	4.0E-03	2
Hexachloroethane	6.00E+00	µg/l	4.20E-02	2.4E+00	0.33	6.20E-07	1.9E+01	8.5E-01	2
Naphthalene	4.86E+00	µg/l	6.50E-01	3.7E+00	0.2	7.51E-06	1.7E+01	7.2E+01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.33	7.94E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Cyanide	7.24E+01	µg/l	1.00E-03	N/A	0.33	2.39E-08	N/A	N/A	2
Aluminum	5.19E+02	µg/l	1.00E-03	N/A	0.33	1.71E-07	N/A	N/A	2
Antimony	2.72E+00	µg/l	1.00E-03	N/A	0.33	8.97E-10	N/A	N/A	2
Arsenic	7.00E+00	µg/l	1.00E-03	N/A	0.33	2.31E-09	N/A	N/A	1
Barium	7.94E+01	µg/l	1.00E-03	N/A	0.33	2.62E-08	N/A	N/A	1
Beryllium	3.18E-01	µg/l	1.00E-03	N/A	0.33	1.05E-10	N/A	N/A	1
Cadmium	4.07E-01	µg/l	1.00E-03	N/A	0.33	1.34E-10	N/A	N/A	1
Chromium	2.10E+00	µg/l	1.00E-03	N/A	0.33	6.92E-10	N/A	N/A	1
Cobalt	1.93E+01	µg/l	1.00E-03	N/A	0.33	6.36E-09	N/A	N/A	1
Iron	3.39E+03	µg/l	1.00E-03	N/A	0.33	1.12E-06	N/A	N/A	1
Lead	2.02E+00	µg/l	1.00E-03	N/A	0.33	6.65E-10	N/A	N/A	1
Manganese	1.72E+02	µg/l	1.00E-03	N/A	0.33	5.67E-08	N/A	N/A	1
Nickel	1.28E+01	µg/l	1.00E-03	N/A	0.33	4.22E-09	N/A	N/A	1
Thallium	1.52E+00	µg/l	1.00E-03	N/A	0.33	5.03E-10	N/A	N/A	1
Vanadium	4.94E+00	µg/l	1.00E-03	N/A	0.33	1.63E-09	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 7.25b.CT Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.33	2.75E+00	3.44E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.33	1.71E+01	6.86E-09
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.33	1.24E+00	7.86E-09
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.33	1.15E+00	2.82E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 7.26.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	2.5E-06	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	4.2E-05
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	2.0E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	5.0E-05
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	2.4E-06	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.4E-06
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	5.6E-06	mg/kg-day	5.0E-02	mg/kg-day	N/A	N/A	1.1E-04
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	5.5E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	3.0E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-04
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	2.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	2.0E-06	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.0E-06
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	6.4E-07	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.2E-05
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	9.7E-07	mg/kg-day	1.4E-03	mg/kg-day	N/A	N/A	6.9E-04
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	1.4E-05	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	1.4E-04
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	6.1E-05	mg/kg-day	7.0E-04	mg/kg-day	N/A	N/A	8.7E-02
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	1.8E-06	mg/kg-day	4.0E-01	mg/kg-day	N/A	N/A	4.6E-06
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	2.3E-05	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.3E-03
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	4.5E-05	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	2.3E-04
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	4.6E-05	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	4.6E-04
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	1.2E-05	mg/kg-day	2.0E+00	mg/kg-day	N/A	N/A	5.9E-06
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.4E-02
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	1.8E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.9E-04
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	7.3E-06	mg/kg-day	1.0E-01	mg/kg-day	N/A	N/A	7.3E-05
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	3.0E-06	mg/kg-day	2.0E-01	mg/kg-day	N/A	N/A	1.5E-05
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	1.3E-06	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.2E-06
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	1.0E-04	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	1.6E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.8E-02
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.3E-03	mg/kg-day	3.0E-02	mg/kg-day	N/A	N/A	4.3E-02
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	4.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.3E-03
	Aluminum	7.52E+02	µg/l	7.52E+02	µg/l	M	1.4E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.4E-04
	Arsenic	5.21E+00	µg/l	5.21E+00	µg/l	M	9.6E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.2E-03
	Barium	8.02E+01	µg/l	8.02E+01	µg/l	M	1.5E-05	mg/kg-day	4.9E-03	mg/kg-day	N/A	N/A	3.0E-03
	Beryllium	4.98E-01	µg/l	4.98E-01	µg/l	M	9.2E-08	mg/kg-day	3.5E-05	mg/kg-day	N/A	N/A	2.6E-03
	Cadmium	6.70E-01	µg/l	6.70E-01	µg/l	M	1.2E-07	mg/kg-day	1.3E-05	mg/kg-day	N/A	N/A	9.9E-03
	Chromium	2.00E+00	µg/l	2.00E+00	µg/l	M	3.7E-07	mg/kg-day	5.0E-04	mg/kg-day	N/A	N/A	7.4E-04
	Cobalt	1.71E+01	µg/l	1.71E+01	µg/l	M	3.2E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.6E-04
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	1.3E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.7E-04
	Iron	5.05E+03	µg/l	5.05E+03	µg/l	M	9.3E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.1E-03
	Lead	2.46E+00	µg/l	2.46E+00	µg/l	M	4.6E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	1.64E+02	µg/l	1.64E+02	µg/l	M	3.0E-05	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.8E-02
	Nickel	1.07E+01	µg/l	1.07E+01	µg/l	M	2.0E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	2.5E-03
	Thallium	2.45E+00	µg/l	2.45E+00	µg/l	M	4.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.5E-03
	Vanadium	1.92E+01	µg/l	1.92E+01	µg/l	M	3.6E-06	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.4E-01
	(Total)												4.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.9E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.

Table 7.26a.CT Supplement
Calculation of DAevent (Construction Worker)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	9.00E-03	9.2E-01	4	5.44E-08	2.2E+00	2.5E-02	3
1,1,2-Trichloroethane	9.98E-01	µg/l	8.40E-03	5.7E-01	4	4.29E-08	1.4E+00	1.1E-02	3
1,1-Dichloroethane	1.27E+00	µg/l	8.90E-03	3.5E-01	4	5.27E-08	8.4E-01	6.2E-03	3
1,1-Dichloroethene	1.64E+00	µg/l	1.60E-02	3.4E-01	4	1.22E-07	8.2E-01	1.3E-02	3
1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	N/A	N/A	4	N/A	N/A	N/A	
1,2-Dichloroethane	2.62E+00	µg/l	5.30E-03	3.5E-01	4	6.51E-08	8.4E-01	3.0E-03	3
1,2-Dichloropropane	9.61E-01	µg/l	1.00E-02	4.3E-01	4	4.65E-08	1.0E+00	1.0E-02	3
Acetone	1.71E+01	µg/l	N/A	N/A	4	N/A	N/A	N/A	
Bromodichloromethane	4.14E-01	µg/l	5.80E-03	8.7E-01	4	1.38E-08	2.1E+00	1.2E-02	3
Bromomethane	1.28E+00	µg/l	3.50E-03	3.3E-01	4	2.09E-08	8.0E-01	1.5E-03	3
Carbon disulfide	2.79E+00	µg/l	2.40E-02	2.7E-01	4	3.01E-07	6.5E-01	1.7E-02	3
Carbon tetrachloride	1.10E+01	µg/l	2.20E-02	7.6E-01	4	1.32E-06	1.8E+00	6.8E-02	3
Chloroethane	1.12E+00	µg/l	8.00E-03	2.2E-01	4	3.95E-08	5.2E-01	2.7E-03	3
Chloroform	1.14E+01	µg/l	8.90E-03	4.7E-01	4	4.98E-07	1.1E+00	9.3E-03	3
Chloromethane	1.24E+00	µg/l	4.20E-03	1.8E-01	4	2.28E-08	4.3E-01	8.1E-04	3
Dibromochloromethane	1.15E+00	µg/l	N/A	N/A	4	N/A	N/A	N/A	
Tetrachloroethene	3.96E+00	µg/l	4.80E-02	9.0E-01	4	9.96E-07	4.3E+00	2.5E-01	2
Toluene	1.26E+00	µg/l	4.50E-02	3.2E-01	4	2.56E-07	7.7E-01	5.4E-02	3
Trichloroethene	4.35E+00	µg/l	1.60E-02	5.5E-01	4	3.52E-07	1.3E+00	2.6E-02	3
Vinyl chloride	1.19E+00	µg/l	7.30E-03	2.1E-01	4	3.84E-08	5.1E-01	2.3E-03	3
cis-1,2-Dichloroethene	3.40E+00	µg/l	1.00E-02	3.4E-01	4	1.59E-07	8.2E-01	7.2E-03	3
trans-1,2-Dichloroethene	1.40E+00	µg/l	1.00E-02	3.4E-01	4	6.51E-08	8.2E-01	7.2E-03	3
trans-1,3-Dichloropropene	1.02E+00	µg/l	5.50E-03	4.2E-01	4	2.70E-08	1.0E+00	4.0E-03	3
Hexachloroethane	6.00E+00	µg/l	4.20E-02	2.4E+00	4	2.16E-06	1.9E+01	8.5E-01	2
Naphthalene	4.86E+00	µg/l	6.50E-01	3.7E+00	4	3.36E-05	1.7E+01	7.2E+01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	4	2.76E-05	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	N/A	N/A	4	N/A	N/A	N/A	
Aluminum	7.52E+02	µg/l	1.00E-03	N/A	4	3.01E-06	N/A	N/A	1
Arsenic	5.21E+00	µg/l	1.00E-03	N/A	4	2.08E-08	N/A	N/A	1
Barium	8.02E+01	µg/l	1.00E-03	N/A	4	3.21E-07	N/A	N/A	1
Beryllium	4.98E-01	µg/l	1.00E-03	N/A	4	1.99E-09	N/A	N/A	1
Cadmium	6.70E-01	µg/l	1.00E-03	N/A	4	2.68E-09	N/A	N/A	1
Chromium	2.00E+00	µg/l	1.00E-03	N/A	4	8.01E-09	N/A	N/A	1
Cobalt	1.71E+01	µg/l	1.00E-03	N/A	4	6.85E-08	N/A	N/A	1
Cyanide	7.24E+01	µg/l	1.00E-03	N/A	4	2.90E-07	N/A	N/A	1
Iron	5.05E+03	µg/l	1.00E-03	N/A	4	2.02E-05	N/A	N/A	1
Lead	2.46E+00	µg/l	1.00E-03	N/A	4	9.83E-09	N/A	N/A	1
Manganese	1.64E+02	µg/l	1.00E-03	N/A	4	6.56E-07	N/A	N/A	1
Nickel	1.07E+01	µg/l	1.00E-03	N/A	4	4.27E-08	N/A	N/A	1
Thallium	2.45E+00	µg/l	1.00E-03	N/A	4	9.79E-09	N/A	N/A	1
Vanadium	1.92E+01	µg/l	1.00E-03	N/A	4	7.70E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 7.26b.CT Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	4	2.75E+00	1.20E-07
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	4	1.71E+01	4.27E-08
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	4	1.24E+00	2.83E-08
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	4	1.15E+00	9.83E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 7.27.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation													
	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	7.66E-06	mg/kg/shower	R	1.8E-06	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	1,1,2-Trichloroethane	9.98E-01	µg/l	1.75E-05	mg/kg/shower	R	4.2E-06	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	1,1-Dichloroethane	1.27E+00	µg/l	5.85E-05	mg/kg/shower	R	1.4E-05	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	1.0E-04
	1,1-Dichloroethene	1.64E+00	µg/l	9.47E-05	mg/kg/shower	R	2.3E-05	mg/kg-day	6.0E-02	mg/kg-day	2.1E-01	mg/m3	3.8E-04
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	5.00E-05	mg/kg/shower	R	1.2E-05	mg/kg-day	5.7E-05	mg/kg-day	2.0E-04	mg/m3	2.1E-01
	1,2-Dichloroethane	2.62E+00	µg/l	5.54E-05	mg/kg/shower	R	1.3E-05	mg/kg-day	1.4E-03	mg/kg-day	4.9E-03	mg/m3	9.5E-03
	1,2-Dichloropropane	9.61E-01	µg/l	3.36E-05	mg/kg/shower	R	8.1E-06	mg/kg-day	1.1E-03	mg/kg-day	4.0E-03	mg/m3	7.1E-03
	Acetone	1.71E+01	µg/l	1.37E-04	mg/kg/shower	R	3.3E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Bromodichloromethane	4.14E-01	µg/l	9.37E-06	mg/kg/shower	R	2.3E-06	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Bromomethane	1.28E+00	µg/l	7.75E-05	mg/kg/shower	R	1.9E-05	mg/kg-day	1.4E-03	mg/kg-day	5.0E-03	mg/m3	1.3E-02
	Carbon disulfide	2.79E+00	µg/l	1.78E-04	mg/kg/shower	R	4.3E-05	mg/kg-day	2.0E-01	mg/kg-day	7.0E-01	mg/m3	2.1E-04
	Carbon tetrachloride	1.10E+01	µg/l	5.36E-04	mg/kg/shower	R	1.3E-04	mg/kg-day	5.7E-04	mg/kg-day	2.0E-03	mg/m3	2.3E-01
	Chloroethane	1.12E+00	µg/l	7.82E-05	mg/kg/shower	R	1.9E-05	mg/kg-day	2.9E+00	mg/kg-day	1.0E+01	mg/m3	6.5E-06
	Chloroform	1.14E+01	µg/l	4.30E-04	mg/kg/shower	R	1.0E-04	mg/kg-day	8.6E-05	mg/kg-day	3.0E-04	mg/m3	1.2E+00
	Chloromethane	1.24E+00	µg/l	9.56E-05	mg/kg/shower	R	2.3E-05	mg/kg-day	2.6E-02	mg/kg-day	9.1E-02	mg/m3	8.8E-04
	Dibromochloromethane	1.15E+00	µg/l	4.23E-05	mg/kg/shower	R	1.0E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	Tetrachloroethene	3.96E+00	µg/l	1.27E-04	mg/kg/shower	R	3.1E-05	mg/kg-day	1.4E-01	mg/kg-day	4.9E-01	mg/m3	2.2E-04
	Toluene	1.26E+00	µg/l	5.43E-04	mg/kg/shower	R	1.3E-04	mg/kg-day	1.1E-01	mg/kg-day	4.0E-01	mg/m3	1.1E-03
	Trichloroethene	4.35E+00	µg/l	5.20E-05	mg/kg/shower	R	1.2E-05	mg/kg-day	1.0E-02	mg/kg-day	4.0E-02	mg/m3	1.2E-03
	Vinyl chloride	1.19E+00	µg/l	7.71E-04	mg/kg/shower	R	1.9E-04	mg/kg-day	2.8E-02	mg/kg-day	1.0E-01	mg/m3	6.6E-03
	cis-1,2-Dichloroethene	3.40E+00	µg/l	5.30E-05	mg/kg/shower	R	1.3E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	trans-1,2-Dichloroethene	1.40E+00	µg/l	5.97E-05	mg/kg/shower	R	1.4E-05	mg/kg-day	N/A	mg/kg-day	N/A	mg/m3	
	trans-1,3-Dichloropropene	1.02E+00	µg/l	5.44E-05	mg/kg/shower	R	1.3E-05	mg/kg-day	5.7E-03	mg/kg-day	2.0E-02	mg/m3	2.3E-03
	Naphthalene	4.86E+00	µg/l	2.35E-04	mg/kg/shower	R	5.7E-05	mg/kg-day	9.0E-04	mg/kg-day	3.2E-03	mg/m3	6.3E-02
	(Total)												1.7E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic Inhalation.
N/A - Not applicable; metals are not volatile.

Table 7.27.CT Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario
Site 47 RI Report
Indian Head, Maryland

Chemical	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
1,1,2,2-Tetrachloroethane	1.04E+00	167.9	1.41E-02	3.45E-05	9.82E+02	1.02E+01	1.24E+00	1.67E+00	5.63E-02	3.75E-01	7.66E-06
1,1,2-Trichloroethane	9.98E-01	133.4	3.74E-02	9.14E-05	1.10E+03	1.15E+01	3.07E+00	4.15E+00	1.29E-01	8.60E-01	1.75E-05
1,1-Dichloroethane	1.27E+00	99	2.30E-01	5.62E-04	1.28E+03	1.33E+01	9.23E+00	1.25E+01	4.30E-01	2.87E+00	5.85E-05
1,1-Dichloroethene	1.64E+00	97	1.07E+00	2.61E-03	1.29E+03	1.35E+01	1.23E+01	1.66E+01	6.96E-01	4.64E+00	9.47E-05
1,2-Dibromo-3-chloropropane	2.75E+00	236.36	6.02E-02	1.47E-04	8.28E+02	8.63E+00	3.19E+00	4.31E+00	3.68E-01	2.45E+00	5.00E-05
1,2-Dichloroethane	2.62E+00	99	4.01E-02	9.80E-05	1.28E+03	1.33E+01	3.75E+00	5.07E+00	4.07E-01	2.71E+00	5.54E-05
1,2-Dichloropropane	9.61E-01	112.99	1.15E-01	2.81E-04	1.20E+03	1.25E+01	6.60E+00	8.92E+00	2.47E-01	1.65E+00	3.36E-05
Acetone	1.71E+01	58.09	8.59E-03	2.10E-05	1.67E+03	1.74E+01	1.35E+00	1.82E+00	1.00E+00	6.70E+00	1.37E-04
Bromodichloromethane	4.14E-01	163.83	6.56E-02	1.60E-04	9.94E+02	1.04E+01	4.05E+00	5.47E+00	6.89E-02	4.59E-01	9.37E-06
Bromomethane	1.28E+00	94.95	2.55E+00	6.24E-03	1.31E+03	1.36E+01	1.31E+01	1.77E+01	5.70E-01	3.80E+00	7.75E-05
Carbon disulfide	2.79E+00	76.13	1.24E+00	3.03E-03	1.46E+03	1.52E+01	1.40E+01	1.90E+01	1.31E+00	8.72E+00	1.78E-04
Carbon tetrachloride	1.10E+01	153.84	1.25E+00	3.05E-03	1.03E+03	1.07E+01	9.89E+00	1.34E+01	3.94E+00	2.63E+01	5.36E-04
Chloroethane	1.12E+00	64.2	3.47E+00	8.48E-03	1.59E+03	1.66E+01	1.61E+01	2.17E+01	5.75E-01	3.83E+00	7.82E-05
Chloroform	1.14E+01	119.39	1.50E-01	3.67E-04	1.16E+03	1.21E+01	7.22E+00	9.75E+00	3.16E+00	2.11E+01	4.30E-04
Chloromethane	1.24E+00	50.49	9.82E+00	2.40E-02	1.79E+03	1.87E+01	1.85E+01	2.50E+01	7.03E-01	4.69E+00	9.56E-05
Dibromochloromethane	1.15E+00	208.28	3.20E-01	7.83E-04	8.82E+02	9.19E+00	6.97E+00	9.41E+00	3.11E-01	2.07E+00	4.23E-05
Tetrachloroethene	2.79E+00	165.82	7.54E-01	1.84E-03	9.88E+02	1.03E+01	9.07E+00	1.23E+01	9.35E-01	6.24E+00	1.27E-04
Toluene	1.10E+01	92.13	2.72E-01	6.65E-04	1.33E+03	1.38E+01	1.00E+01	1.36E+01	3.99E+00	2.66E+01	5.43E-04
Trichloroethene	1.12E+00	131.4	4.22E-01	1.03E-03	1.11E+03	1.16E+01	9.31E+00	1.26E+01	3.82E-01	2.55E+00	5.20E-05
Vinyl chloride	1.14E+01	63	1.1E+00	2.71E-03	1.60E+03	1.67E+01	1.53E+01	2.07E+01	5.67E+00	3.78E+01	7.71E-04
cis-1,2-Dichloroethene	1.24E+00	97	1.67E-01	4.08E-04	1.29E+03	1.35E+01	8.35E+00	1.13E+01	3.90E-01	2.60E+00	5.30E-05
trans-1,2-Dichloroethene	1.15E+00	97	3.85E-01	9.41E-04	1.29E+03	1.35E+01	1.06E+01	1.44E+01	4.39E-01	2.93E+00	5.97E-05
trans-1,3-Dichloropropene	1.02E+00	110	7.26E-01	1.77E-03	1.21E+03	1.26E+01	1.11E+01	1.50E+01	4.00E-01	2.67E+00	5.44E-05
Naphthalene	4.86E+00	130	1.98E-02	1.30E-03	1.12E+03	1.16E+01	9.76E+00	1.32E+01	1.73E+00	1.15E+01	2.35E-04

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	2
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	20
SV = shower room air volume	m^3	3
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	12
Dt = total duration in shower room	min	15
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Table 7.27.CT Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario
Site 47 RI Report
Indian Head, Maryland

Equation 1:	Kg(VOC) =	3000 * (18 / HH)$^{0.5}$	
Equation 2:	Kl(VOC) =	20 * (44 / HH)$^{0.5}$	
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H))$^{-1}$	
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

TABLE 7.28.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDANCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	6.22E-03	mg/kg	6.22E-03	mg/kg	M	2.7E-09	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.7E-07
	Benzo(a)anthracene	1.27E-01	mg/kg	1.27E-01	mg/kg	M	5.5E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	1.19E-01	mg/kg	1.19E-01	mg/kg	M	5.1E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.29E-01	mg/kg	1.29E-01	mg/kg	M	5.5E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	1.02E-01	mg/kg	1.02E-01	mg/kg	M	4.4E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	1.01E-01	mg/kg	1.01E-01	mg/kg	M	4.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	3.11E+03	mg/kg	3.11E+03	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-03
	Antimony	8.12E-01	mg/kg	8.12E-01	mg/kg	M	3.5E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.7E-04
	Arsenic	1.77E+00	mg/kg	1.77E+00	mg/kg	M	7.6E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.5E-03
	Chromium	9.12E+00	mg/kg	9.12E+00	mg/kg	M	3.9E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.3E-03
	Iron	6.54E+03	mg/kg	6.54E+03	mg/kg	M	2.8E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.3E-03
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	3.6E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	8.31E+01	mg/kg	8.31E+01	mg/kg	M	3.6E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-03
	Mercury (mercuric chloride)	3.55E-01	mg/kg	3.55E-01	mg/kg	M	1.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.1E-04
	Silver	2.04E+00	mg/kg	2.04E+00	mg/kg	M	8.7E-07	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.7E-04
	Vanadium	1.17E+01	mg/kg	1.17E+01	mg/kg	M	5.0E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.0E-03
	(Total)												2.3E-02
Dermal Absorption													
	Tetrachloroethene	6.22E-03	mg/kg	6.22E-03	mg/kg	M	6.4E-10	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	6.4E-08
	Benzo(a)anthracene	1.27E-01	mg/kg	1.27E-01	mg/kg	M	5.7E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	1.19E-01	mg/kg	1.19E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.29E-01	mg/kg	1.29E-01	mg/kg	M	5.7E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	1.02E-01	mg/kg	1.02E-01	mg/kg	M	4.6E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	1.01E-01	mg/kg	1.01E-01	mg/kg	M	4.5E-08	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	3.11E+03	mg/kg	3.11E+03	mg/kg	M	1.1E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-04
	Antimony	8.12E-01	mg/kg	8.12E-01	mg/kg	M	2.8E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	4.6E-04
	Arsenic	1.77E+00	mg/kg	1.77E+00	mg/kg	M	1.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.1E-04
	Chromium	9.12E+00	mg/kg	9.12E+00	mg/kg	M	3.1E-07	mg/kg-day	7.5E-05	mg/kg-day	N/A	N/A	4.2E-03
	Iron	6.54E+03	mg/kg	6.54E+03	mg/kg	M	2.2E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.5E-04
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	2.9E-06	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	8.31E+01	mg/kg	8.31E+01	mg/kg	M	2.8E-06	mg/kg-day	8.0E-04	mg/kg-day	N/A	N/A	3.6E-03
	Mercury (mercuric chloride)	3.55E-01	mg/kg	3.55E-01	mg/kg	M	1.2E-08	mg/kg-day	2.1E-05	mg/kg-day	N/A	N/A	5.8E-04
	Silver	2.04E+00	mg/kg	2.04E+00	mg/kg	M	7.0E-08	mg/kg-day	2.0E-04	mg/kg-day	N/A	N/A	3.5E-04
	Vanadium	1.17E+01	mg/kg	1.17E+01	mg/kg	M	4.0E-07	mg/kg-day	2.6E-05	mg/kg-day	N/A	N/A	1.5E-02
	(Total)												2.6E-02
												Total Hazard Index Across All Exposure Routes/Pathways	4.9E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

TABLE 7.28.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDANCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient

For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 1% for inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 7.29.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDANCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Residential
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion													
	Tetrachloroethene	6.22E-03	mg/kg	6.22E-03	mg/kg	M	2.7E-08	mg/kg-day	1.0E-02	mg/kg-day	N/A	N/A	2.7E-06
	Benzo(a)anthracene	1.27E-01	mg/kg	1.27E-01	mg/kg	M	5.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	1.19E-01	mg/kg	1.19E-01	mg/kg	M	5.1E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.29E-01	mg/kg	1.29E-01	mg/kg	M	5.5E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	1.02E-01	mg/kg	1.02E-01	mg/kg	M	4.4E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	1.01E-01	mg/kg	1.01E-01	mg/kg	M	4.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	3.11E+03	mg/kg	3.11E+03	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-02
	Antimony	8.12E-01	mg/kg	8.12E-01	mg/kg	M	3.5E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.7E-03
	Arsenic	1.77E+00	mg/kg	1.77E+00	mg/kg	M	7.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.5E-02
	Chromium	9.12E+00	mg/kg	9.12E+00	mg/kg	M	3.9E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.3E-02
	Iron	6.54E+03	mg/kg	6.54E+03	mg/kg	M	2.8E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.3E-02
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	3.6E-04	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	8.31E+01	mg/kg	8.31E+01	mg/kg	M	3.6E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.8E-02
	Mercury (mercuric chloride)	3.55E-01	mg/kg	3.55E-01	mg/kg	M	1.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.1E-03
	Silver	2.04E+00	mg/kg	2.04E+00	mg/kg	M	8.7E-06	mg/kg-day	5.0E-03	mg/kg-day	N/A	N/A	1.7E-03
	Vanadium	1.17E+01	mg/kg	1.17E+01	mg/kg	M	5.0E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	5.0E-02
	(Total)												2.3E-01
Dermal Absorption													
	Tetrachloroethene	6.22E-03	mg/kg	6.22E-03	mg/kg	M	2.5E-09	mg/kg-day	1.00E-02	mg/kg-day	N/A	N/A	2.5E-07
	Benzo(a)anthracene	1.27E-01	mg/kg	1.27E-01	mg/kg	M	2.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(a)pyrene	1.19E-01	mg/kg	1.19E-01	mg/kg	M	2.1E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Benzo(b)fluoranthene	1.29E-01	mg/kg	1.29E-01	mg/kg	M	2.3E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Dibenz(a,h)anthracene	1.02E-01	mg/kg	1.02E-01	mg/kg	M	1.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Indeno(1,2,3-cd)pyrene	1.01E-01	mg/kg	1.01E-01	mg/kg	M	1.8E-07	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Aluminum	3.11E+03	mg/kg	3.11E+03	mg/kg	M	4.2E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	4.2E-04
	Antimony	8.12E-01	mg/kg	8.12E-01	mg/kg	M	1.1E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.8E-03
	Arsenic	1.77E+00	mg/kg	1.77E+00	mg/kg	M	7.2E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.4E-03
	Chromium	9.12E+00	mg/kg	9.12E+00	mg/kg	M	1.2E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	1.7E-02
	Iron	6.54E+03	mg/kg	6.54E+03	mg/kg	M	8.9E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.0E-03
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	1.1E-05	mg/kg-day	N/A	mg/kg-day	N/A	N/A	
	Manganese	8.31E+01	mg/kg	8.31E+01	mg/kg	M	1.1E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.4E-02
	Mercury (mercuric chloride)	3.55E-01	mg/kg	3.55E-01	mg/kg	M	4.8E-08	mg/kg-day	2.10E-05	mg/kg-day	N/A	N/A	2.3E-03
	Silver	2.04E+00	mg/kg	2.04E+00	mg/kg	M	2.8E-07	mg/kg-day	2.00E-04	mg/kg-day	N/A	N/A	1.4E-03
	Vanadium	1.17E+01	mg/kg	1.17E+01	mg/kg	M	1.6E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	6.1E-02
	(Total)												1.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	4.4E-09	mg/kg-day	5.2E-02	mg/kg-day	2.3E-10
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	7.0E-08	mg/kg-day	7.3E-01	mg/kg-day	5.1E-08
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	5.2E-08	mg/kg-day	7.3E+00	mg/kg-day	3.8E-07
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	1.3E-07	mg/kg-day	7.3E-01	mg/kg-day	9.8E-08
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	2.6E-08	mg/kg-day	7.3E+00	mg/kg-day	1.9E-07
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	3.3E-08	mg/kg-day	7.3E-01	mg/kg-day	2.4E-08
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	3.9E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	3.1E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	3.6E-07	mg/kg-day	1.5E+00	mg/kg-day	5.3E-07
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	9.3E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	9.3E-06	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	1.3E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	4.8E-07	mg/kg-day	N/A	mg/kg-day	
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	2.6E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.3E-06
Dermal Absorption	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	2.0E-08	mg/kg-day	5.2E-02	mg/kg-day	1.0E-09
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	1.3E-06	mg/kg-day	7.3E-01	mg/kg-day	9.8E-07
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	1.0E-06	mg/kg-day	7.3E+00	mg/kg-day	7.4E-06
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	2.6E-06	mg/kg-day	7.3E-01	mg/kg-day	1.9E-06
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	4.9E-07	mg/kg-day	7.3E+00	mg/kg-day	3.6E-06
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	6.4E-07	mg/kg-day	7.3E-01	mg/kg-day	4.7E-07
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	5.8E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	4.6E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	1.6E-06	mg/kg-day	1.5E+00	mg/kg-day	2.4E-06
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	1.4E-03	mg/kg-day	N/A	mg/kg-day	
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	1.4E-05	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	1.9E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	7.1E-07	mg/kg-day	N/A	mg/kg-day	
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	3.8E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	2.5E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.7E-05
										Total Risk Across All Exposure Routes/Pathways	1.8E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 3% for arsenic, 1% for other inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Tetrachloroethene	5.24E-02	mg/kg	2.08E-05	mg/m^3	R	3.5E-07	mg/kg-day	1.0E-02	mg/kg-day	3.5E-09
	(Total)										3.5E-09
						Total Risk Across All Exposure Routes/Pathways					3.5E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Nitroglycerin	3.70E+03	mg/kg	3.70E+03	mg/kg	M	7.8E-05	mg/kg-day	1.4E-02	mg/kg-day	1.1E-06
	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	2.1E-07	mg/kg-day	1.5E+00	mg/kg-day	3.1E-07
	Iron	3.89E+04	mg/kg	3.89E+04	mg/kg	M	8.2E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	5.76E+03	mg/kg	5.76E+03	mg/kg	M	1.2E-04	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	8.02E+01	mg/kg	8.02E+01	mg/kg	M	1.7E-06	mg/kg-day	N/A	mg/kg-day	
	Silver	4.06E+02	mg/kg	4.06E+02	mg/kg	M	8.5E-06	mg/kg-day	N/A	mg/kg-day	
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.4E-06
Dermal Absorption	Nitroglycerin	3.70E+03	mg/kg	3.70E+03	mg/kg	M	4.7E-04	mg/kg-day	2.8E-02	mg/kg-day	1.3E-05
	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	3.8E-07	mg/kg-day	1.6E+00	mg/kg-day	6.0E-07
	Iron	3.89E+04	mg/kg	3.89E+04	mg/kg	M	4.9E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	5.76E+03	mg/kg	5.76E+03	mg/kg	M	7.2E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	8.02E+01	mg/kg	8.02E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	mg/kg-day	
	Silver	4.06E+02	mg/kg	4.06E+02	mg/kg	M	5.1E-06	mg/kg-day	N/A	mg/kg-day	
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	6.4E-07	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.4E-05
										Total Risk Across All Exposure Routes/Pathways	1.5E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 3% for arsenic, 1% for other inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Drainage Swales
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	9.9E-07	mg/kg-day	1.5E+00	mg/kg-day	1.5E-06
	Iron	2.49E+04	mg/kg	2.49E+04	mg/kg	M	2.5E-03	mg/kg-day	N/A	mg/kg-day	
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	5.0E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.5E-06
Dermal Absorption	Arsenic	1.00E+01	mg/kg	1.00E+01	mg/kg	M	9.3E-07	mg/kg-day	1.5E+00	mg/kg-day	1.4E-06
	Iron	2.49E+04	mg/kg	2.49E+04	mg/kg	M	7.7E-04	mg/kg-day	N/A	mg/kg-day	
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	1.6E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.4E-06
										Total Risk Across All Exposure Routes/Pathways	2.9E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	2.2E-07	mg/kg-day	1.5E+00	mg/kg-day	3.3E-07
	(Total)										3.3E-07
Dermal Absorption	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	5.2E-08	mg/kg-day	1.5E+00	mg/kg-day	7.9E-08
	(Total)										7.9E-08
										Total Risk Across All Exposure Routes/Pathways	4.1E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Table 8.5a.RME Supplement
Calculation of DAevent
Drainage Swales, Other Worker
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	t* (hr)	B (dimensionless)	DAevent (mg/cm^2-event)	Eq
Arsenic	5.20E+00	µg/L	1.0E-03	N/A	8.0E+00	N/A	N/A	4.2E-08	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Drainage Swales
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	mg/kg-day	3.5E-07
	(Total)										3.5E-07
Dermal Absorption	Arsenic	5.20E+00	mg/kg	5.20E+00	mg/kg	M	5.1E-08	mg/kg-day	1.5E+00	mg/kg-day	7.7E-08
	(Total)										7.7E-08
										Total Risk Across All Exposure Routes/Pathways	4.2E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

Table 8.6a.RME Supplement
Calculation of DAevent
Drainage Swales, Trespasser/Visitor
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	t* (hr)	B (dimensionless)	DAevent (mg/cm^2-event)	Eq
Arsenic	5.20E+00	µg/L	1.0E-03	N/A	1.8E+00	N/A	N/A	9.4E-09	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	5.2E-09	mg/kg-day	5.2E-02	mg/kg-day	2.7E-10
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	8.3E-08	mg/kg-day	7.3E-01	mg/kg-day	6.0E-08
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	6.2E-08	mg/kg-day	7.3E+00	mg/kg-day	4.5E-07
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	1.6E-07	mg/kg-day	7.3E-01	mg/kg-day	1.2E-07
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	3.0E-08	mg/kg-day	7.3E+00	mg/kg-day	2.2E-07
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	3.9E-08	mg/kg-day	7.3E-01	mg/kg-day	2.8E-08
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	4.7E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	3.7E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	4.2E-07	mg/kg-day	1.5E+00	mg/kg-day	6.3E-07
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	1.3E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	1.1E-03	mg/kg-day	N/A	mg/kg-day	
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	1.1E-05	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	5.7E-07	mg/kg-day	N/A	mg/kg-day	
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	3.0E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	2.0E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.5E-06
Dermal Absorption	Tetrachloroethene	5.24E-02	mg/kg	5.24E-02	mg/kg	M	7.2E-09	mg/kg-day	5.2E-02	mg/kg-day	3.7E-10
	Benzo(a)anthracene	8.34E-01	mg/kg	8.34E-01	mg/kg	M	4.9E-07	mg/kg-day	7.3E-01	mg/kg-day	3.6E-07
	Benzo(a)pyrene	6.23E-01	mg/kg	6.23E-01	mg/kg	M	3.7E-07	mg/kg-day	7.3E+00	mg/kg-day	2.7E-06
	Benzo(b)fluoranthene	1.60E+00	mg/kg	1.60E+00	mg/kg	M	9.5E-07	mg/kg-day	7.3E-01	mg/kg-day	6.9E-07
	Dibenz(a,h)anthracene	3.06E-01	mg/kg	3.06E-01	mg/kg	M	1.8E-07	mg/kg-day	7.3E+00	mg/kg-day	1.3E-06
	Indeno(1,2,3-cd)pyrene	3.94E-01	mg/kg	3.94E-01	mg/kg	M	2.3E-07	mg/kg-day	7.3E-01	mg/kg-day	1.7E-07
	Aluminum	4.70E+03	mg/kg	4.70E+03	mg/kg	M	2.1E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.7E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	4.24E+00	mg/kg	4.24E+00	mg/kg	M	5.8E-07	mg/kg-day	1.5E+00	mg/kg-day	8.7E-07
	Chromium	1.33E+01	mg/kg	1.33E+01	mg/kg	M	6.1E-07	mg/kg-day	N/A	mg/kg-day	
	Iron	1.11E+04	mg/kg	1.11E+04	mg/kg	M	5.0E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	1.11E+02	mg/kg	1.11E+02	mg/kg	M	5.1E-06	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.50E+02	mg/kg	1.50E+02	mg/kg	M	6.8E-06	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.71E+00	mg/kg	5.71E+00	mg/kg	M	2.6E-07	mg/kg-day	N/A	mg/kg-day	
	Silver	3.05E+02	mg/kg	3.05E+02	mg/kg	M	1.4E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	2.04E+01	mg/kg	2.04E+01	mg/kg	M	9.3E-07	mg/kg-day	N/A	mg/kg-day	
	(Total)										6.1E-06
										Total Risk Across All Exposure Routes/Pathways	7.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 3% for arsenic, 1% for other inorganics, 3% for VOCs, and 10% for semi-volatiles.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk

N/A Not applicable.

TABLE 8.8.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Tetrachloroethene	5.24E-02	mg/kg	2.08E-05	mg/m^3	R	3.1E-08	mg/kg-day	1.0E-02	mg/kg-day	3.1E-10
	(Total)										3.1E-10
						Total Risk Across All Exposure Routes/Pathways					3.1E-10

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	4.48E-05	mg/kg-day	2.0E-01	mg/kg-day	9.0E-06
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	5.08E-05	mg/kg-day	5.7E-02	mg/kg-day	2.9E-06
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	2.50E-03	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	1.11E-02	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	9.85E-05	mg/kg-day	1.4E+00	mg/kg-day	1.4E-04
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	1.07E-02	mg/kg-day	9.1E-02	mg/kg-day	9.7E-04
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	1.94E-05	mg/kg-day	6.8E-02	mg/kg-day	1.3E-06
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	9.05E-02	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	6.42E-05	mg/kg-day	6.2E-02	mg/kg-day	4.0E-06
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	1.40E-02	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	9.88E-02	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	4.28E+00	mg/kg-day	1.3E-01	mg/kg-day	4.3E-01
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	3.91E-04	mg/kg-day	2.9E-03	mg/kg-day	1.1E-06
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	8.60E-01	mg/kg-day	N/A	mg/kg-day	
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	8.85E-01	mg/kg-day	1.3E-02	mg/kg-day	1.1E-02
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	1.29E-03	mg/kg-day	8.4E-02	mg/kg-day	1.1E-04
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	2.09E-02	mg/kg-day	5.2E-02	mg/kg-day	1.1E-03
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	3.54E-03	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	5.06E-03	mg/kg-day	4.0E-01	mg/kg-day	2.0E-03
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	4.21E-04	mg/kg-day	1.4E+00	mg/kg-day	5.9E-04
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	2.17E-02	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	5.71E-03	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	7.17E-05	mg/kg-day	1.0E-01	mg/kg-day	7.2E-06
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	1.58E-04	mg/kg-day	1.4E-02	mg/kg-day	2.2E-06
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	7.87E-05	mg/kg-day	N/A	mg/kg-day	
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	5.97E-05	mg/kg-day	1.2E-01	mg/kg-day	7.2E-06
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	7.44E-05	mg/kg-day	1.4E-02	mg/kg-day	1.0E-06
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	3.46E-01	mg/kg-day	N/A	mg/kg-day	
	Aluminum	2.70E+04	µg/l	2.70E+04	µg/l	M	4.03E-01	mg/kg-day	N/A	mg/kg-day	
	Antimony	4.74E+00	µg/l	4.74E+00	µg/l	M	7.08E-05	mg/kg-day	N/A	mg/kg-day	
	Arsenic	1.06E+02	µg/l	1.06E+02	µg/l	M	1.58E-03	mg/kg-day	1.5E+00	mg/kg-day	2.4E-03
	Barium	3.31E+02	µg/l	3.31E+02	µg/l	M	4.94E-03	mg/kg-day	N/A	mg/kg-day	
	Beryllium	6.88E+00	µg/l	6.88E+00	µg/l	M	1.03E-04	mg/kg-day	N/A	mg/kg-day	
	Cadmium	1.67E+00	µg/l	1.67E+00	µg/l	M	2.49E-05	mg/kg-day	N/A	mg/kg-day	
	Chromium	2.25E+01	µg/l	2.25E+01	µg/l	M	3.36E-04	mg/kg-day	N/A	mg/kg-day	
	Cobalt	1.71E+02	µg/l	1.71E+02	µg/l	M	2.56E-03	mg/kg-day	N/A	mg/kg-day	
	Iron	9.92E+04	µg/l	9.92E+04	µg/l	M	1.48E+00	mg/kg-day	N/A	mg/kg-day	
	Lead	1.68E+01	µg/l	1.68E+01	µg/l	M	2.51E-04	mg/kg-day	N/A	mg/kg-day	
	Manganese	7.16E+02	µg/l	7.16E+02	µg/l	M	1.07E-02	mg/kg-day	N/A	mg/kg-day	
	Nickel	1.85E+02	µg/l	1.85E+02	µg/l	M	2.76E-03	mg/kg-day	N/A	mg/kg-day	
	Thallium	2.12E+00	µg/l	2.12E+00	µg/l	M	3.17E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	3.27E+02	µg/l	3.27E+02	µg/l	M	4.88E-03	mg/kg-day	N/A	mg/kg-day	
	(Total)										4.5E-01

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	3.2E-03	mg/kg-day	2.0E-01	mg/kg-day	6.4E-04
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	3.9E-06	mg/kg-day	5.7E-02	mg/kg-day	2.2E-07
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	1.6E-04	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	1.3E-03	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	2.0E-09	mg/kg-day	1.4E+00	mg/kg-day	2.8E-09
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	4.1E-04	mg/kg-day	9.1E-02	mg/kg-day	3.7E-05
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	1.5E-06	mg/kg-day	6.8E-02	mg/kg-day	1.1E-07
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	5.9E-08	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	4.2E-06	mg/kg-day	6.2E-02	mg/kg-day	2.6E-07
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	3.4E-04	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	1.5E-02	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	1.0E+00	mg/kg-day	1.3E-01	mg/kg-day	1.2E-01
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	1.8E-05	mg/kg-day	2.9E-03	mg/kg-day	5.2E-08
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	6.4E-02	mg/kg-day	N/A	mg/kg-day	
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	1.9E-02	mg/kg-day	1.3E-02	mg/kg-day	2.5E-04
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	3.0E-08	mg/kg-day	8.4E-02	mg/kg-day	2.5E-09
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	1.2E-02	mg/kg-day	5.2E-02	mg/kg-day	6.0E-04
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	1.1E-03	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	7.3E-04	mg/kg-day	4.0E-01	mg/kg-day	2.9E-04
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	1.7E-05	mg/kg-day	1.4E+00	mg/kg-day	2.4E-05
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	1.5E-03	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	4.0E-04	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	3.1E-06	mg/kg-day	1.0E-01	mg/kg-day	3.1E-07
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	1.3E-04	mg/kg-day	1.4E-02	mg/kg-day	1.8E-06
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	4.8E-05	mg/kg-day	N/A	mg/kg-day	
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	9.1E-04	mg/kg-day	1.2E-01	mg/kg-day	1.1E-04
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	3.0E-08	mg/kg-day	1.4E-02	mg/kg-day	4.2E-10
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	7.5E-04	mg/kg-day	N/A	mg/kg-day	
	Aluminum	2.70E+04	µg/l	2.70E+04	µg/l	M	8.7E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	4.74E+00	µg/l	4.74E+00	µg/l	M	1.5E-04	mg/kg-day	N/A	mg/kg-day	
	Arsenic	1.06E+02	µg/l	1.06E+02	µg/l	M	3.4E-06	mg/kg-day	1.5E+00	mg/kg-day	5.1E-06
	Barium	3.31E+02	µg/l	3.31E+02	µg/l	M	1.1E-05	mg/kg-day	N/A	mg/kg-day	
	Beryllium	6.88E+00	µg/l	6.88E+00	µg/l	M	2.2E-07	mg/kg-day	N/A	mg/kg-day	
	Cadmium	1.67E+00	µg/l	1.67E+00	µg/l	M	5.4E-08	mg/kg-day	N/A	mg/kg-day	
	Chromium	2.25E+01	µg/l	2.25E+01	µg/l	M	7.3E-07	mg/kg-day	N/A	mg/kg-day	
	Cobalt	1.71E+02	µg/l	1.71E+02	µg/l	M	5.5E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	9.92E+04	µg/l	9.92E+04	µg/l	M	3.2E-03	mg/kg-day	N/A	mg/kg-day	
	Lead	1.68E+01	µg/l	1.68E+01	µg/l	M	5.4E-07	mg/kg-day	N/A	mg/kg-day	
	Manganese	7.16E+02	µg/l	7.16E+02	µg/l	M	2.3E-05	mg/kg-day	N/A	mg/kg-day	
	Nickel	1.85E+02	µg/l	1.85E+02	µg/l	M	6.0E-06	mg/kg-day	N/A	mg/kg-day	
	Thallium	2.12E+00	µg/l	2.12E+00	µg/l	M	6.9E-08	mg/kg-day	N/A	mg/kg-day	
	Vanadium	3.27E+02	µg/l	3.27E+02	µg/l	M	1.1E-05	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.2E-01
						Total Risk Across All Exposure Routes/Pathways					5.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - not applicable.
One-Hit Equation for high carcinogenic risk levels was used to calculate risk for Carbontetrachloride and Chloromethane: Risk = 1-exp (-CDI XCSF)

Table 8.9a.RME Supplement
Calculation of DAevent (Adult)
Indian Head - Site 47

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	9.00E-03	9.2E-01	0.2	3.20E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	3.40E+00	µg/l	8.40E-03	5.7E-01	0.2	2.67E-08	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.68E+02	µg/l	8.90E-03	3.5E-01	0.2	1.09E-06	8.4E-01	6.2E-03	2
1,1-Dichloroethene	7.43E+02	µg/l	1.60E-02	3.4E-01	0.2	8.57E-06	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	N/A	N/A		N/A	N/A	N/A	
1,2-Dichloroethane	7.16E+02	µg/l	5.30E-03	3.5E-01	0.2	2.77E-06	8.4E-01	3.0E-03	2
1,2-Dichloropropane	1.30E+00	µg/l	1.00E-02	4.3E-01	0.2	1.05E-08	1.0E+00	1.0E-02	2
Acetone	6.06E+03	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Bromodichloromethane	4.30E+00	µg/l	5.80E-03	8.7E-01	0.2	2.88E-08	2.1E+00	1.2E-02	2
Bromomethane	9.37E+02	µg/l	3.50E-03	3.3E-01	0.2	2.33E-06	8.0E-01	1.5E-03	2
Carbon disulfide	6.62E+03	µg/l	2.40E-02	2.7E-01	0.2	1.02E-04	6.5E-01	1.7E-02	2
Carbon tetrachloride	2.86E+05	µg/l	2.20E-02	7.6E-01	0.2	6.79E-03	1.8E+00	6.8E-02	2
Chloroethane	2.62E+01	µg/l	8.00E-03	2.2E-01	0.2	1.22E-07	5.2E-01	2.7E-03	2
Chloroform	5.76E+04	µg/l	8.90E-03	4.7E-01	0.2	4.34E-04	1.1E+00	9.3E-03	2
Chloromethane	5.93E+04	µg/l	4.20E-03	1.8E-01	0.2	1.31E-04	4.3E-01	8.1E-04	2
Dibromochloromethane	8.66E+01	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Tetrachloroethene	1.40E+03	µg/l	4.80E-02	9.0E-01	0.2	7.88E-05	4.3E+00	2.5E-01	2
Toluene	2.37E+02	µg/l	4.50E-02	3.2E-01	0.2	7.46E-06	7.7E-01	5.4E-02	2
Trichloroethene	3.39E+02	µg/l	1.60E-02	5.5E-01	0.2	4.97E-06	1.3E+00	2.6E-02	2
Vinyl chloride	2.82E+01	µg/l	7.30E-03	2.1E-01	0.2	1.17E-07	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	1.45E+03	µg/l	1.00E-02	3.4E-01	0.2	1.05E-05	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	3.82E+02	µg/l	1.00E-02	3.4E-01	0.2	2.75E-06	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	4.80E+00	µg/l	5.50E-03	4.2E-01	0.2	2.11E-08	1.0E+00	4.0E-03	2
Hexachloroethane	1.06E+01	µg/l	4.20E-02	2.4E+00	0.2	8.53E-07	1.9E+01	8.5E-01	2
Naphthalene	5.27E+00	µg/l	6.90E-02	5.3E-01	0.2	3.27E-07	2.20E+00	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.2	6.18E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Cyanide	2.32E+04	µg/l	1.00E-03	N/A	0.2	4.64E-06	N/A	N/A	1
Aluminum	2.70E+04	µg/l	1.00E-03	N/A	0.2	5.40E-06	N/A	N/A	1
Antimony	4.74E+00	µg/l	1.00E+00	N/A	0.2	9.49E-07	N/A	N/A	1
Arsenic	1.06E+02	µg/l	1.00E-03	N/A	0.2	2.12E-08	N/A	N/A	1
Barium	3.31E+02	µg/l	1.00E-03	N/A	0.2	6.62E-08	N/A	N/A	1
Beryllium	6.88E+00	µg/l	1.00E-03	N/A	0.2	1.38E-09	N/A	N/A	1
Cadmium	1.67E+00	µg/l	1.00E-03	N/A	0.2	3.34E-10	N/A	N/A	1
Chromium	2.25E+01	µg/l	1.00E-03	N/A	0.2	4.50E-09	N/A	N/A	1
Cobalt	1.71E+02	µg/l	1.00E-03	N/A	0.2	3.42E-08	N/A	N/A	1
Iron	9.92E+04	µg/l	1.00E-03	N/A	0.2	1.98E-05	N/A	N/A	1
Lead	1.68E+01	µg/l	1.00E-03	N/A	0.2	3.36E-09	N/A	N/A	1
Manganese	7.16E+02	µg/l	1.00E-03	N/A	0.2	1.43E-07	N/A	N/A	1
Nickel	1.85E+02	µg/l	1.00E-03	N/A	0.2	3.70E-08	N/A	N/A	1
Thallium	2.12E+00	µg/l	1.00E-03	N/A	0.2	4.24E-10	N/A	N/A	1
Vanadium	3.27E+02	µg/l	1.00E-03	N/A	0.2	6.54E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 8.9b.RME Supplement
Calculation of DAevent (Child)
Indian Head - Site 47

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	9.00E-03	9.2E-01	0.33	4.11E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	3.40E+00	µg/l	8.40E-03	5.7E-01	0.33	3.42E-08	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.68E+02	µg/l	8.90E-03	3.5E-01	0.33	1.40E-06	8.4E-01	6.2E-03	2
1,1-Dichloroethene	7.43E+02	µg/l	1.60E-02	3.4E-01	0.33	1.10E-05	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	N/A	N/A		N/A	N/A	N/A	
1,2-Dichloroethane	7.16E+02	µg/l	5.30E-03	3.5E-01	0.33	3.56E-06	8.4E-01	3.0E-03	2
1,2-Dichloropropane	1.30E+00	µg/l	1.00E-02	4.3E-01	0.33	1.35E-08	1.0E+00	1.0E-02	2
Acetone	6.06E+03	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Bromodichloromethane	4.30E+00	µg/l	5.80E-03	8.7E-01	0.33	3.69E-08	2.1E+00	1.2E-02	2
Bromomethane	9.37E+02	µg/l	3.50E-03	3.3E-01	0.33	2.99E-06	8.0E-01	1.5E-03	2
Carbon disulfide	6.62E+03	µg/l	2.40E-02	2.7E-01	0.33	1.31E-04	6.5E-01	1.7E-02	2
Carbon tetrachloride	2.86E+05	µg/l	2.20E-02	7.6E-01	0.33	8.72E-03	1.8E+00	6.8E-02	2
Chloroethane	2.62E+01	µg/l	8.00E-03	2.2E-01	0.33	1.56E-07	5.2E-01	2.7E-03	2
Chloroform	5.76E+04	µg/l	8.90E-03	4.7E-01	0.33	5.58E-04	1.1E+00	9.3E-03	2
Chloromethane	5.93E+04	µg/l	4.20E-03	1.8E-01	0.33	1.68E-04	4.3E-01	8.1E-04	2
Dibromochloromethane	8.66E+01	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Tetrachloroethene	1.40E+03	µg/l	4.80E-02	9.0E-01	0.33	1.01E-04	4.3E+00	2.5E-01	2
Toluene	2.37E+02	µg/l	4.50E-02	3.2E-01	0.33	9.58E-06	7.7E-01	5.4E-02	2
Trichloroethene	3.39E+02	µg/l	1.60E-02	5.5E-01	0.33	6.39E-06	1.3E+00	2.6E-02	2
Vinyl chloride	2.82E+01	µg/l	7.30E-03	2.1E-01	0.33	1.50E-07	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	1.45E+03	µg/l	1.00E-02	3.4E-01	0.33	1.34E-05	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	3.82E+02	µg/l	1.00E-02	3.4E-01	0.33	3.54E-06	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	4.80E+00	µg/l	5.50E-03	4.2E-01	0.33	2.72E-08	1.0E+00	4.0E-03	2
Hexachloroethane	1.06E+01	µg/l	4.20E-02	2.4E+00	0.33	1.10E-06	1.9E+01	8.5E-01	2
Naphthalene	5.27E+00	µg/l	6.90E-02	5.3E-01	0.33	4.20E-07	2.20E+00	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.33	7.94E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Cyanide	2.32E+04	µg/l	1.00E-03	N/A	0.33	7.66E-06	N/A	N/A	1
Aluminum	2.70E+04	µg/l	1.00E-03	N/A	0.33	8.91E-06	N/A	N/A	1
Antimony	4.74E+00	µg/l	1.00E+00	N/A	0.33	1.57E-06	N/A	N/A	1
Arsenic	1.06E+02	µg/l	1.00E-03	N/A	0.33	3.50E-08	N/A	N/A	1
Barium	3.31E+02	µg/l	1.00E-03	N/A	0.33	1.09E-07	N/A	N/A	1
Beryllium	6.88E+00	µg/l	1.00E-03	N/A	0.33	2.27E-09	N/A	N/A	1
Cadmium	1.67E+00	µg/l	1.00E-03	N/A	0.33	5.51E-10	N/A	N/A	1
Chromium	2.25E+01	µg/l	1.00E-03	N/A	0.33	7.43E-09	N/A	N/A	1
Cobalt	1.71E+02	µg/l	1.00E-03	N/A	0.33	5.65E-08	N/A	N/A	1
Iron	9.92E+04	µg/l	1.00E-03	N/A	0.33	3.27E-05	N/A	N/A	1
Lead	1.68E+01	µg/l	1.00E-03	N/A	0.33	5.54E-09	N/A	N/A	1
Manganese	7.16E+02	µg/l	1.00E-03	N/A	0.33	2.36E-07	N/A	N/A	1
Nickel	1.85E+02	µg/l	1.00E-03	N/A	0.33	6.10E-08	N/A	N/A	1
Thallium	2.12E+00	µg/l	1.00E-03	N/A	0.33	7.00E-10	N/A	N/A	1
Vanadium	3.27E+02	µg/l	1.00E-03	N/A	0.33	1.08E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 8.9c.RME Supplement
Calculation of Daevent (Adult)
Indian Head - Site 47

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.2	6.60E+00	6.44E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.2	6.06E+03	1.90E-06
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.2	8.66E+01	4.26E-07
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.2	4.98E+00	9.49E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

Table 8.9d.RME Supplement
Calculation of Daevent (Child)
Indian Head - Site 47

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.33	6.60E+00	8.27E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.33	6.06E+03	2.44E-06
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.33	8.66E+01	5.47E-07
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.33	4.98E+00	1.22E-06

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	3.00E+00	µg/l	M	2.2E-07	mg/kg-day	2.0E-01	mg/kg-day	4.4E-08
	1,1,2-Trichloroethane	3.40E+00	µg/l	3.40E+00	µg/l	M	2.2E-07	mg/kg-day	5.7E-02	mg/kg-day	1.2E-08
	1,1-Dichloroethane	1.68E+02	µg/l	1.68E+02	µg/l	M	1.1E-05	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	7.43E+02	µg/l	7.43E+02	µg/l	M	8.6E-05	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	6.60E+00	µg/l	M	3.6E-07	mg/kg-day	1.4E+00	mg/kg-day	5.1E-07
	1,2-Dichloroethane	7.16E+02	µg/l	7.16E+02	µg/l	M	2.8E-05	mg/kg-day	9.1E-02	mg/kg-day	2.5E-06
	1,2-Dichloropropane	1.30E+00	µg/l	1.30E+00	µg/l	M	9.6E-08	mg/kg-day	6.8E-02	mg/kg-day	6.5E-09
	Acetone	6.06E+03	µg/l	6.06E+03	µg/l	M	2.4E-05	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.30E+00	µg/l	4.30E+00	µg/l	M	2.0E-07	mg/kg-day	6.2E-02	mg/kg-day	1.3E-08
	Bromomethane	9.37E+02	µg/l	9.37E+02	µg/l	M	2.4E-05	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	6.62E+03	µg/l	6.62E+03	µg/l	M	1.1E-03	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	2.86E+05	µg/l	2.86E+05	µg/l	M	4.9E-02	mg/kg-day	1.3E-01	mg/kg-day	6.3E-03
	Chloroethane	2.62E+01	µg/l	2.62E+01	µg/l	M	1.5E-06	mg/kg-day	2.9E-03	mg/kg-day	4.3E-09
	Chloroform	5.76E+04	µg/l	5.76E+04	µg/l	M	3.8E-03	mg/kg-day	N/A	mg/kg-day	
	Chloromethane	5.93E+04	µg/l	5.93E+04	µg/l	M	1.7E-03	mg/kg-day	1.3E-02	mg/kg-day	2.3E-05
	Dibromochloromethane	8.66E+01	µg/l	8.66E+01	µg/l	M	8.8E-05	mg/kg-day	8.4E-02	mg/kg-day	7.4E-06
	Tetrachloroethene	1.40E+03	µg/l	1.40E+03	µg/l	M	5.0E-04	mg/kg-day	5.2E-02	mg/kg-day	2.6E-05
	Toluene	2.37E+02	µg/l	2.37E+02	µg/l	M	7.4E-05	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	3.39E+02	µg/l	3.39E+02	µg/l	M	4.1E-05	mg/kg-day	4.0E-01	mg/kg-day	1.6E-05
	Vinyl chloride	2.82E+01	µg/l	2.82E+01	µg/l	M	1.5E-06	mg/kg-day	1.4E+00	mg/kg-day	2.0E-06
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.45E+03	µg/l	M	1.1E-04	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.82E+02	µg/l	M	2.8E-05	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.80E+00	µg/l	M	2.0E-07	mg/kg-day	1.0E-01	mg/kg-day	2.0E-08
	Hexachloroethane	1.06E+01	µg/l	1.06E+01	µg/l	M	4.5E-06	mg/kg-day	1.4E-02	mg/kg-day	6.3E-08
	Naphthalene	5.27E+00	µg/l	5.27E+00	µg/l	M	3.3E-05	mg/kg-day	N/A	mg/kg-day	
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.7E-04	mg/kg-day	1.2E-01	mg/kg-day	2.0E-05
	bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	4.98E+00	µg/l	M	8.8E-05	mg/kg-day	1.4E-02	mg/kg-day	1.2E-06
	Aluminum	2.52E+04	µg/l	2.52E+04	µg/l	M	2.3E-06	mg/kg-day	N/A	mg/kg-day	
	Arsenic	1.08E+02	µg/l	1.08E+02	µg/l	M	7.2E-07	mg/kg-day	1.50E+00	mg/kg-day	1.1E-06
	Barium	3.46E+02	µg/l	3.46E+02	µg/l	M	2.3E-06	mg/kg-day	N/A	mg/kg-day	
	Beryllium	6.11E+00	µg/l	6.11E+00	µg/l	M	4.1E-08	mg/kg-day	N/A	mg/kg-day	
	Cadmium	1.87E+00	µg/l	1.87E+00	µg/l	M	1.3E-08	mg/kg-day	N/A	mg/kg-day	
	Chromium	2.84E+01	µg/l	2.84E+01	µg/l	M	1.9E-07	mg/kg-day	N/A	mg/kg-day	
	Cobalt	1.64E+02	µg/l	1.64E+02	µg/l	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	
	Cyanide	2.32E+04	µg/l	2.32E+04	µg/l	M	1.6E-04	mg/kg-day	N/A	mg/kg-day	
	Iron	5.21E+04	µg/l	5.21E+04	µg/l	M	3.5E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	1.36E+01	µg/l	1.36E+01	µg/l	M	9.1E-08	mg/kg-day	N/A	mg/kg-day	
	Manganese	5.88E+02	µg/l	5.88E+02	µg/l	M	3.9E-06	mg/kg-day	N/A	mg/kg-day	
	Nickel	1.35E+02	µg/l	1.35E+02	µg/l	M	9.1E-07	mg/kg-day	N/A	mg/kg-day	
	Thallium	3.67E+00	µg/l	3.67E+00	µg/l	M	2.5E-08	mg/kg-day	N/A	mg/kg-day	
	Vanadium	8.63E+01	µg/l	8.63E+01	µg/l	M	5.8E-07	mg/kg-day	N/A	mg/kg-day	
	(Total)										6.4E-03
						Total Risk Across All Exposure Routes/Pathways					6.4E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - not applicable.

TABLE 8.10a.RME Supplement
Calculation of DAevent (Construction Worker)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	9.00E-03	9.2E-01	8	2.63E-07	2.2E+00	2.5E-02	3
1,1,2-Trichloroethane	3.40E+00	µg/l	8.40E-03	5.7E-01	8	2.59E-07	1.4E+00	1.1E-02	3
1,1-Dichloroethane	1.68E+02	µg/l	8.90E-03	3.5E-01	8	1.29E-05	8.4E-01	6.2E-03	3
1,1-Dichloroethene	7.43E+02	µg/l	1.60E-02	3.4E-01	8	1.02E-04	8.2E-01	1.3E-02	3
1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	N/A	N/A	8	N/A	N/A	N/A	
1,2-Dichloroethane	7.16E+02	µg/l	5.30E-03	3.5E-01	8	3.29E-05	8.4E-01	3.0E-03	3
1,2-Dichloropropane	1.30E+00	µg/l	1.00E-02	4.3E-01	8	1.14E-07	1.0E+00	1.0E-02	3
Acetone	6.06E+03	µg/l	N/A	N/A	8	N/A	N/A	N/A	
Bromodichloromethane	4.30E+00	µg/l	5.80E-03	8.7E-01	8	2.42E-07	2.1E+00	1.2E-02	3
Bromomethane	9.37E+02	µg/l	3.50E-03	3.3E-01	8	2.84E-05	8.0E-01	1.5E-03	3
Carbon disulfide	6.62E+03	µg/l	2.40E-02	2.7E-01	8	1.34E-03	6.5E-01	1.7E-02	3
Carbon tetrachloride	2.86E+05	µg/l	2.20E-02	7.6E-01	8	5.80E-02	1.8E+00	6.8E-02	3
Chloroethane	2.62E+01	µg/l	8.00E-03	2.2E-01	8	1.77E-06	5.2E-01	2.7E-03	3
Chloroform	5.76E+04	µg/l	8.90E-03	4.7E-01	8	4.55E-03	1.1E+00	9.3E-03	3
Chloromethane	5.93E+04	µg/l	4.20E-03	1.8E-01	8	2.08E-03	4.3E-01	8.1E-04	3
Dibromochloromethane	8.66E+01	µg/l	N/A	N/A	8	N/A	N/A	N/A	
Tetrachloroethene	1.40E+03	µg/l	4.80E-02	9.0E-01	8	5.99E-04	4.3E+00	2.5E-01	3
Toluene	2.37E+02	µg/l	4.50E-02	3.2E-01	8	8.85E-05	7.7E-01	5.4E-02	3
Trichloroethene	3.39E+02	µg/l	1.60E-02	5.5E-01	8	4.86E-05	1.3E+00	2.6E-02	3
Vinyl chloride	2.82E+01	µg/l	7.30E-03	2.1E-01	8	1.73E-06	5.1E-01	2.3E-03	3
cis-1,2-Dichloroethene	1.45E+03	µg/l	1.00E-02	3.4E-01	8	1.25E-04	8.2E-01	7.2E-03	3
trans-1,2-Dichloroethene	3.82E+02	µg/l	1.00E-02	3.4E-01	8	3.30E-05	8.2E-01	7.2E-03	3
trans-1,3-Dichloropropene	4.80E+00	µg/l	5.50E-03	4.2E-01	8	2.33E-07	1.0E+00	4.0E-03	3
Hexachloroethane	1.06E+01	µg/l	4.20E-02	2.4E+00	8	5.39E-06	1.9E+01	8.5E-01	2
Naphthalene	5.27E+00	µg/l	6.90E-02	5.3E-01	8	2.07E-06	2.20E+00	2.0E-01	3
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	8	3.91E-05	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.98E+00	µg/l	N/A	N/A	8	N/A	N/A	N/A	
Aluminum	2.52E+04	µg/l	1.00E-03	N/A	8	2.02E-04	N/A	N/A	2
Arsenic	1.08E+02	µg/l	1.00E-03	N/A	8	8.64E-07	N/A	N/A	2
Barium	3.46E+02	µg/l	1.00E-03	N/A	8	2.77E-06	N/A	N/A	1
Beryllium	6.11E+00	µg/l	1.00E-03	N/A	8	4.88E-08	N/A	N/A	1
Cadmium	1.87E+00	µg/l	1.00E-03	N/A	8	1.50E-08	N/A	N/A	1
Chromium	2.84E+01	µg/l	1.00E-03	N/A	8	2.27E-07	N/A	N/A	1
Cobalt	1.64E+02	µg/l	1.00E-03	N/A	8	1.31E-06	N/A	N/A	1
Cyanide	2.32E+04	µg/l	1.00E-03	N/A	8	1.86E-04	N/A	N/A	1
Iron	5.21E+04	µg/l	1.00E-03	N/A	8	4.17E-04	N/A	N/A	1
Lead	1.36E+01	µg/l	1.00E-03	N/A	8	1.09E-07	N/A	N/A	1
Manganese	5.88E+02	µg/l	1.00E-03	N/A	8	4.71E-06	N/A	N/A	1
Nickel	1.35E+02	µg/l	1.00E-03	N/A	8	1.08E-06	N/A	N/A	1
Thallium	3.67E+00	µg/l	1.00E-03	N/A	8	2.93E-08	N/A	N/A	1
Vanadium	8.63E+01	µg/l	1.00E-03	N/A	8	6.90E-07	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 8.10b.RME Supplement
Calculation of DAevent
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	8	6.60E+00	4.32E-07
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	8	6.06E+03	2.90E-05
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	8	5.93E+04	2.08E-03
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	8	8.66E+01	1.04E-04

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1,2,2-Tetrachloroethane	3.00E+00	mg/kg	2.22E-05	mg/kg/shower	R	7.3E-06	mg/kg-day	2.0E-01	mg/kg-day	1.5E-06
	1,1,2-Trichloroethane	3.40E+00	mg/kg	5.98E-05	mg/kg/shower	R	2.0E-05	mg/kg-day	5.6E-02	mg/kg-day	1.1E-06
	1,1-Dichloroethane	1.68E+02	mg/kg	7.75E-03	mg/kg/shower	R	2.5E-03	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	7.43E+02	mg/kg	4.30E-02	mg/kg/shower	R	1.4E-02	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	6.60E+00	mg/kg	1.20E-04	mg/kg/shower	R	4.0E-05	mg/kg-day	2.4E-03	mg/kg-day	9.5E-08
	1,2-Dichloroethane	7.16E+02	mg/kg	1.51E-02	mg/kg/shower	R	5.0E-03	mg/kg-day	9.1E-02	mg/kg-day	4.5E-04
	1,2-Dichloropropane	1.30E+00	mg/kg	4.55E-05	mg/kg/shower	R	1.5E-05	mg/kg-day	N/A	mg/kg-day	
	Acetone	6.06E+03	mg/kg	4.86E-02	mg/kg/shower	R	1.6E-02	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.30E+00	mg/kg	9.75E-05	mg/kg/shower	R	3.2E-05	mg/kg-day	N/A	mg/kg-day	
	Bromomethane	9.37E+02	mg/kg	5.68E-02	mg/kg/shower	R	1.9E-02	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	6.62E+03	mg/kg	4.22E-01	mg/kg/shower	R	1.4E-01	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	2.86E+05	mg/kg	1.40E+01	mg/kg/shower	R	4.6E+00	mg/kg-day	5.3E-02	mg/kg-day	2.2E-01
	Chloroethane	2.62E+01	mg/kg	1.84E-03	mg/kg/shower	R	6.0E-04	mg/kg-day	N/A	mg/kg-day	
	Chloroform	5.76E+04	mg/kg	2.17E+00	mg/kg/shower	R	7.1E-01	mg/kg-day	8.1E-02	mg/kg-day	5.6E-02
	Chloromethane	5.93E+04	mg/kg	4.55E+00	mg/kg/shower	R	1.5E+00	mg/kg-day	3.5E-03	mg/kg-day	5.2E-03
	Dibromochloromethane	8.66E+01	mg/kg	3.17E-03	mg/kg/shower	R	1.0E-03	mg/kg-day	N/A	mg/kg-day	
	Tetrachloroethene	1.40E+03	mg/kg	6.39E-02	mg/kg/shower	R	2.1E-02	mg/kg-day	1.0E-02	mg/kg-day	2.1E-04
	Toluene	2.37E+02	mg/kg	1.17E-02	mg/kg/shower	R	3.9E-03	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	3.39E+02	mg/kg	1.58E-02	mg/kg/shower	R	5.2E-03	mg/kg-day	4.0E-01	mg/kg-day	2.1E-03
	Vinyl chloride	2.82E+01	mg/kg	1.91E-03	mg/kg/shower	R	6.3E-04	mg/kg-day	3.0E-02	mg/kg-day	1.9E-05
	cis-1,2-Dichloroethene	1.45E+03	mg/kg	6.19E-02	mg/kg/shower	R	2.0E-02	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	3.82E+02	mg/kg	1.98E-02	mg/kg/shower	R	6.5E-03	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	4.80E+00	mg/kg	2.57E-04	mg/kg/shower	R	8.4E-05	mg/kg-day	1.0E-02	mg/kg-day	8.4E-07
	Naphthalene	5.27E+00	mg/kg	5.88E-05	mg/kg/shower	R	1.9E-05	mg/kg-day	N/A	mg/kg-day	
	(Total)										2.8E-01
						Total Risk Across All Exposure Routes/Pathways					2.8E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Route EPC Value is the Inhalation Exposure Concentration (Einh) calculated using a Two-Film Volatilization Model for Residential Scenario (Table 8.8.RME Supplement).

N/A Not applicable.

One-Hit Equation for high carcinogenic risk levels was used to calculate risk for Carbontetrachloride and Chloroform: Risk = 1-exp (-CDI XCSF)

Table 8.11.RME Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario

Indian Head - Site 47

Chemical	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m3 -min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
1,1,2,2-Tetrachloroethane	3.00E+00	167.9	1.41E-02	3.45E-05	9.82E+02	1.02E+01	1.24E+00	1.67E+00	1.63E-01	1.09E+00	2.22E-05
1,1,2-Trichloroethane	3.40E+00	133.4	3.74E-02	9.14E-05	1.10E+03	1.15E+01	3.07E+00	4.15E+00	4.39E-01	2.93E+00	5.98E-05
1,1-Dichloroethane	1.68E+02	99	2.30E-01	5.62E-04	1.28E+03	1.33E+01	9.23E+00	1.25E+01	5.69E+01	3.80E+02	7.75E-03
1,1-Dichloroethene	7.43E+02	97	1.07E+00	2.61E-03	1.29E+03	1.35E+01	1.23E+01	1.66E+01	3.16E+02	2.11E+03	4.30E-02
1,2-Dibromo-3-chloropropane	6.60E+00	236.36	6.02E-02	1.47E-04	8.28E+02	8.63E+00	3.19E+00	4.31E+00	8.84E-01	5.89E+00	1.20E-04
1,2-Dichloroethane	7.16E+02	99	4.01E-02	9.80E-05	1.28E+03	1.33E+01	3.75E+00	5.07E+00	1.11E+02	7.42E+02	1.51E-02
1,2-Dichloropropane	1.30E+00	112.99	1.15E-01	2.81E-04	1.20E+03	1.25E+01	6.60E+00	8.92E+00	3.34E-01	2.23E+00	4.55E-05
Acetone	6.06E+03	58.09	8.59E-03	2.10E-05	1.67E+03	1.74E+01	1.35E+00	1.82E+00	3.57E+02	2.38E+03	4.86E-02
Bromodichloromethane	4.30E+00	163.83	6.56E-02	1.60E-04	9.94E+02	1.04E+01	4.05E+00	5.47E+00	7.16E-01	4.78E+00	9.75E-05
Bromomethane	9.37E+02	94.95	2.55E+00	6.24E-03	1.31E+03	1.36E+01	1.31E+01	1.77E+01	4.17E+02	2.78E+03	5.68E-02
Carbon disulfide	6.62E+03	76.13	1.24E+00	3.03E-03	1.46E+03	1.52E+01	1.40E+01	1.90E+01	3.10E+03	2.07E+04	4.22E-01
Carbon tetrachloride	2.86E+05	153.84	1.25E+00	3.05E-03	1.03E+03	1.07E+01	9.89E+00	1.34E+01	1.03E+05	6.86E+05	1.40E+01
Chloroethane	2.62E+01	64.2	3.47E+00	8.48E-03	1.59E+03	1.66E+01	1.61E+01	2.17E+01	1.35E+01	9.00E+01	1.84E-03
Chloroform	5.76E+04	119.39	1.50E-01	3.67E-04	1.16E+03	1.21E+01	7.22E+00	9.75E+00	1.60E+04	1.06E+05	2.17E+00
Chloromethane	5.93E+04	50.49	9.82E+00	2.40E-02	1.79E+03	1.87E+01	1.85E+01	2.50E+01	3.35E+04	2.23E+05	4.55E+00
Dibromochloromethane	8.66E+01	208.28	3.20E-01	7.83E-04	8.82E+02	9.19E+00	6.97E+00	9.41E+00	2.33E+01	1.55E+02	3.17E-03
Tetrachloroethene	1.40E+03	165.82	7.54E-01	1.84E-03	9.88E+02	1.03E+01	9.07E+00	1.23E+01	4.69E+02	3.13E+03	6.39E-02
Toluene	2.37E+02	92.13	2.72E-01	6.65E-04	1.33E+03	1.38E+01	1.00E+01	1.36E+01	8.62E+01	5.75E+02	1.17E-02
Trichloroethene	3.39E+02	131.4	4.22E-01	1.03E-03	1.11E+03	1.16E+01	9.31E+00	1.26E+01	1.16E+02	7.74E+02	1.58E-02
Vinyl chloride	2.82E+01	63	1.1E+00	2.71E-03	1.60E+03	1.67E+01	1.53E+01	2.07E+01	1.40E+01	9.36E+01	1.91E-03
cis-1,2-Dichloroethene	1.45E+03	97	1.67E-01	4.08E-04	1.29E+03	1.35E+01	8.35E+00	1.13E+01	4.55E+02	3.03E+03	6.19E-02
trans-1,2-Dichloroethene	3.82E+02	97	3.85E-01	9.41E-04	1.29E+03	1.35E+01	1.06E+01	1.44E+01	1.45E+02	9.70E+02	1.98E-02
trans-1,3-Dichloropropene	4.80E+00	110	7.26E-01	1.77E-03	1.21E+03	1.26E+01	1.11E+01	1.50E+01	1.89E+00	1.26E+01	2.57E-04
Naphthalene	5.27E+00	128.16	1.98E-02	4.84E-05	1.12E+03	1.17E+01	1.90E+00	2.57E+00	4.32E-01	2.88E+00	5.88E-05

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	2
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	20
SV = shower room air volume	m^3	3
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	12
Dt = total duration in shower room	min	15
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Table 8.11.RME Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario

Indian Head - Site 47

Equation 1:	Kg(VOC) =	3000 * (18 / HH)$^{0.5}$	
Equation 2:	Kl(VOC) =	20 * (44 / HH)$^{0.5}$	
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$	
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Volatilization from open excavation
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1,2,2-Tetrachloroethane	3.00E+00	µg/l	2.28E-08	mg/m^3	R	6.4E-11	mg/kg-day	2.0E-01	mg/kg-day	1.3E-11
	1,1,2-Trichloroethane	3.40E+00	µg/l	2.93E-08	mg/m3	R	8.2E-11	mg/kg-day	5.6E-02	mg/kg-day	4.6E-12
	1,1-Dichloroethane	1.68E+02	µg/l	1.61E-06	mg/m3	R	4.5E-09	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	7.43E+02	µg/l	7.23E-06	mg/m3	R	2.0E-08	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	6.60E+00	µg/l	5.15E-08	mg/m3	R	1.4E-10	mg/kg-day	2.4E-03	mg/kg-day	3.5E-13
	1,2-Dichloroethane	7.16E+02	µg/l	6.66E-06	mg/m3	R	1.9E-08	mg/kg-day	9.1E-02	mg/kg-day	1.7E-09
	1,2-Dichloropropane	1.30E+00	µg/l	1.20E-08	mg/m3	R	3.4E-11	mg/kg-day	N/A	mg/kg-day	
	Acetone	6.06E+03	µg/l	6.71E-05	mg/m3	R	1.9E-07	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.30E+00	µg/l	3.58E-08	mg/m3	R	1.0E-10	mg/kg-day	N/A	mg/kg-day	
	Bromomethane	9.37E+02	µg/l	9.18E-06	mg/m3	R	2.6E-08	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	6.62E+03	µg/l	6.84E-05	mg/m3	R	1.9E-07	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	2.86E+05	µg/l	2.48E-03	mg/m3	R	6.9E-06	mg/kg-day	5.3E-02	mg/kg-day	3.7E-07
	Chloroethane	2.62E+01	µg/l	2.83E-07	mg/m3	R	7.9E-10	mg/kg-day	N/A	mg/kg-day	
	Chloroform	5.76E+04	µg/l	5.27E-04	mg/m3	R	1.5E-06	mg/kg-day	8.1E-02	mg/kg-day	1.2E-07
	Chloromethane	5.93E+04	µg/l	6.80E-04	mg/m3	R	1.9E-06	mg/kg-day	3.5E-03	mg/kg-day	6.6E-09
	Dibromochloromethane	8.66E+01	µg/l	6.97E-07	mg/m3	R	1.9E-09	mg/kg-day	N/A	mg/kg-day	
	Tetrachloroethene	1.40E+03	µg/l	1.19E-05	mg/m3	R	3.3E-08	mg/kg-day	1.0E-02	mg/kg-day	3.3E-10
	Toluene	2.37E+02	µg/l	2.32E-06	mg/m3	R	6.5E-09	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	3.39E+02	µg/l	3.05E-06	mg/m3	R	8.5E-09	mg/kg-day	4.0E-01	mg/kg-day	3.4E-09
	Vinyl chloride	2.82E+01	µg/l	3.05E-07	mg/m3	R	8.5E-10	mg/kg-day	3.0E-02	mg/kg-day	2.6E-11
	cis-1,2-Dichloroethene	1.45E+03	µg/l	1.40E-05	mg/m3	R	3.9E-08	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	3.82E+02	µg/l	3.71E-06	mg/m3	R	1.0E-08	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	4.80E+00	µg/l	4.52E-08	mg/m3	R	1.3E-10	mg/kg-day	1.0E-02	mg/kg-day	1.3E-12
	Naphthalene	5.27E+00	µg/l	4.76E-08	mg/m3	R	1.3E-10	mg/kg-day	N/A	mg/kg-day	
	(Total)										5.0E-07
						Total Risk Across All Exposure Routes/Pathways					5.0E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

N/A - Not applicable; metals are not volatile.

Table 8.12.RME Supplement
Inhalation of Volatiles from Groundwater During Construction
Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model
Future Construction Worker Senario
Indian Head, Site 47

Chemical	Cw (mg/L)	MW (mol/gram)	K_H (unitless)	k_l (cm/hr)	k_g (cm/hr)	K_v (cm/hr)	ER (mg/hr)	ERa (g/sec-m^2)	Ca (µg/m^3)
1,1,2,2-Tetrachloroethane	3.0E+00	167.9	1.41E-02	2.91E+00	1.76E+03	2.60E+00	7.81E+00	8.03E-10	2.28E-05
1,1,2-Trichloroethane	3.4E+00	133.4	3.74E-02	3.08E+00	1.87E+03	2.95E+00	1.00E+01	1.03E-09	2.93E-05
1,1-Dichloroethane	1.7E+02	99	2.30E-01	3.32E+00	2.01E+03	3.29E+00	5.52E+02	5.68E-08	1.61E-03
1,1-Dichloroethene	7.4E+02	97	1.07E+00	3.33E+00	2.02E+03	3.33E+00	2.47E+03	2.55E-07	7.23E-03
1,2-Dibromo-3-chloropropane	6.6E+00	236.36	1.09E+03	2.67E+00	1.62E+03	2.67E+00	1.76E+01	1.81E-09	5.15E-05
1,2-Dichloroethane	7.2E+02	99	4.01E-02	3.32E+00	2.01E+03	3.19E+00	2.28E+03	2.35E-07	6.66E-03
1,2-Dichloropropane	1.3E+00	112.99	1.15E-01	3.21E+00	1.95E+03	3.16E+00	4.11E+00	4.23E-10	1.20E-05
Acetone	6.1E+03	58.09	1.55E+03	3.79E+00	2.30E+03	3.79E+00	2.30E+04	2.36E-06	6.71E-02
Bromodichloromethane	4.3E+00	163.83	6.56E-02	2.93E+00	1.77E+03	2.85E+00	1.23E+01	1.26E-09	3.58E-05
Bromomethane	9.4E+02	94.95	1.37E+03	3.35E+00	2.03E+03	3.35E+00	3.14E+03	3.23E-07	9.18E-03
Carbon disulfide	6.6E+03	76.13	1.24E+00	3.54E+00	2.15E+03	3.54E+00	2.34E+04	2.41E-06	6.84E-02
Carbon tetrachloride	2.9E+05	153.84	1.25E+00	2.97E+00	1.80E+03	2.97E+00	8.50E+05	8.74E-05	2.48E+00
Chloroethane	2.6E+01	64.2	1.51E+03	3.70E+00	2.24E+03	3.70E+00	9.69E+01	9.97E-09	2.83E-04
Chloroform	5.8E+04	119.39	1.50E-01	3.17E+00	1.92E+03	3.13E+00	1.80E+05	1.85E-05	5.27E-01
Chloromethane	5.9E+04	50.49	1.61E+03	3.93E+00	2.38E+03	3.93E+00	2.33E+05	2.39E-05	6.80E-01
Dibromochloromethane	8.7E+01	208.28	1.13E+03	2.75E+00	1.67E+03	2.75E+00	2.39E+02	2.45E-08	6.97E-04
Tetrachloroethene	1.4E+03	165.82	7.54E-01	2.92E+00	1.77E+03	2.91E+00	4.07E+03	4.19E-07	1.19E-02
Toluene	2.4E+02	92.13	2.72E-01	3.38E+00	2.05E+03	3.36E+00	7.96E+02	8.19E-08	2.32E-03
Trichloroethene	3.4E+02	131.4	4.22E-01	3.09E+00	1.87E+03	3.08E+00	1.04E+03	1.07E-07	3.05E-03
Vinyl chloride	2.8E+01	63	1.1E+00	3.71E+00	2.25E+03	3.71E+00	1.05E+02	1.08E-08	3.05E-04
cis-1,2-Dichloroethene	1.5E+03	97	1.67E-01	3.33E+00	2.02E+03	3.30E+00	4.79E+03	4.93E-07	1.40E-02
trans-1,2-Dichloroethene	3.8E+02	97	3.85E-01	3.33E+00	2.02E+03	3.32E+00	1.27E+03	1.31E-07	3.71E-03
trans-1,3-Dichloropropene	4.8E+00	110	7.26E-01	3.23E+00	1.96E+03	3.22E+00	1.55E+01	1.59E-09	4.52E-05
Naphthalene	5.3E+00	130	1.16E+00	3.10E+00	1.88E+03	3.09E+00	1.63E+01	1.68E-09	4.76E-05

Equations

Equation 1 $Kv = 1/(1/k_l + 1/K_H{*}K_g)$

Equation 2 $k_g = 700(18/MW)^{1/4}V$

Equation 3 $k_l = (32/MW)^{1/4}Ka'$

Equation 4 ER = Kv * Cw * L/1000 cm^3 * mg/1000 µg

Equation 5 ERa = ER * g/1000 mg * hr/60 min * min/60 sec * 1/A

Variables	Units	Exposure Assumptions
Cw = groundwater concentration	(µg/L)	chem-specific
MW = molecular weight	(mol/gram)	chem-specific
K_H - Henry's Law Constant	(unitless)	chem-specific
Kv = volatilization rate	(cm/hr)	Solved by Eq 1
k_g = gas phase transfer coefficient	(cm/hr)	Solved by Eq 2
k_l = liquid phase transfer coefficient	(cm/hr)	Solved by Eq 3
V = wind speed	(m/s)	4.4
Ka' = aeration rate	(cm/hr)	0.0633
ER = emission rate	(mg/hr)	Solved by Eq 4
A = area of excavation (utility ditch)	(m^2)	2,700
Era = area emission rate	(g/sec-m^2)	Solved by Eq 5
Ca = air concentration	(µg/m^3)	Solved using SCREEN3 model

Note: aeration rate based on aeration rate for small pond (0.1/day) multiplied by depth of water in excavation (1/2 ft)

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	1.1E-09	mg/kg-day	5.2E-02	mg/kg-day	5.7E-11
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	2.0E-08	mg/kg-day	7.3E-01	mg/kg-day	1.5E-08
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.6E-08	mg/kg-day	7.3E+00	mg/kg-day	1.2E-07
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	3.4E-08	mg/kg-day	7.3E-01	mg/kg-day	2.5E-08
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	9.6E-09	mg/kg-day	7.3E+00	mg/kg-day	7.0E-08
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	1.2E-08	mg/kg-day	7.3E-01	mg/kg-day	8.6E-09
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	1.4E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	1.1E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	1.2E-07	mg/kg-day	1.5E+00	mg/kg-day	1.8E-07
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	4.1E-07	mg/kg-day	N/A	mg/kg-day	
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	3.5E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	2.8E-06	mg/kg-day	N/A	mg/kg-day	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	8.1E-06	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	1.9E-07	mg/kg-day	N/A	mg/kg-day	
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	6.0E-06	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	6.3E-07	mg/kg-day	N/A	mg/kg-day	
	(Total)										4.2E-07
Dermal Absorption	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	3.7E-10	mg/kg-day	5.2E-02	mg/kg-day	1.9E-11
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	2.9E-08	mg/kg-day	7.3E-01	mg/kg-day	2.1E-08
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	2.4E-08	mg/kg-day	7.3E+00	mg/kg-day	1.7E-07
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	4.9E-08	mg/kg-day	7.3E-01	mg/kg-day	3.6E-08
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E+00	mg/kg-day	1.0E-07
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	1.7E-08	mg/kg-day	7.3E-01	mg/kg-day	1.2E-08
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	1.5E-05	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	1.2E-08	mg/kg-day	N/A	mg/kg-day	
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	4.0E-08	mg/kg-day	1.5E+00	mg/kg-day	6.0E-08
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	4.6E-08	mg/kg-day	N/A	mg/kg-day	
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	3.8E-05	mg/kg-day	N/A	mg/kg-day	
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	3.1E-07	mg/kg-day	N/A	mg/kg-day	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	9.0E-07	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	2.1E-08	mg/kg-day	N/A	mg/kg-day	
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	6.6E-07	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	6.9E-08	mg/kg-day	N/A	mg/kg-day	
	(Total)										4.0E-07
						Total Risk Across All Exposure Routes/Pathways					8.2E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 3% for arsenic, 1% for other inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	1.1E-08	mg/kg-day	5.2E-02	mg/kg-day	6.0E-10
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	2.1E-07	mg/kg-day	7.3E-01	mg/kg-day	1.5E-07
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.7E-07	mg/kg-day	7.3E+00	mg/kg-day	1.3E-06
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	3.5E-07	mg/kg-day	7.3E-01	mg/kg-day	2.6E-07
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	1.0E-07	mg/kg-day	7.3E+00	mg/kg-day	7.3E-07
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	1.2E-07	mg/kg-day	7.3E-01	mg/kg-day	8.9E-08
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	1.5E-03	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	1.1E-06	mg/kg-day	N/A	mg/kg-day	
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	1.3E-06	mg/kg-day	1.5E+00	mg/kg-day	1.9E-06
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	4.3E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	3.6E-03	mg/kg-day	N/A	mg/kg-day	
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	2.9E-05	mg/kg-day	N/A	mg/kg-day	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	8.5E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	2.0E-06	mg/kg-day	N/A	mg/kg-day	
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	6.2E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	6.5E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										4.4E-06
Dermal Absorption	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	1.8E-08	mg/kg-day	5.2E-02	mg/kg-day	9.5E-10
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	1.5E-06	mg/kg-day	7.3E-01	mg/kg-day	1.1E-06
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	1.2E-06	mg/kg-day	7.3E+00	mg/kg-day	8.6E-06
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	2.4E-06	mg/kg-day	7.3E-01	mg/kg-day	1.8E-06
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	6.9E-07	mg/kg-day	7.3E+00	mg/kg-day	5.0E-06
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	8.4E-07	mg/kg-day	7.3E-01	mg/kg-day	6.2E-07
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	7.7E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	6.1E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	2.0E-06	mg/kg-day	1.5E+00	mg/kg-day	3.0E-06
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	2.3E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	1.9E-03	mg/kg-day	N/A	mg/kg-day	
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	1.6E-05	mg/kg-day	N/A	mg/kg-day	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	4.5E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	1.0E-06	mg/kg-day	N/A	mg/kg-day	
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	3.3E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	3.5E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										2.0E-05
										Total Risk Across All Exposure Routes/Pathways	2.4E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 3% for arsenic, 1% for other inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 8.15.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*
Exposure Point: Disposal Area
Receptor Population: Residential
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	5.2E-08	mg/kg-day	5.2E-02	mg/kg-day	2.7E-09
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	9.5E-07	mg/kg-day	7.3E-01	mg/kg-day	6.9E-07
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	7.7E-07	mg/kg-day	7.3E+00	mg/kg-day	5.6E-06
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	1.6E-06	mg/kg-day	7.3E-01	mg/kg-day	1.2E-06
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	4.5E-07	mg/kg-day	7.3E+00	mg/kg-day	3.3E-06
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	5.5E-07	mg/kg-day	7.3E-01	mg/kg-day	4.0E-07
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	6.5E-03	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	5.1E-06	mg/kg-day	N/A	mg/kg-day	
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	5.6E-06	mg/kg-day	1.5E+00	mg/kg-day	8.4E-06
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	1.9E-05	mg/kg-day	N/A	mg/kg-day	
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	1.6E-02	mg/kg-day	N/A	mg/kg-day	
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	1.3E-04	mg/kg-day	N/A	mg/kg-day	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	3.8E-04	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	8.8E-06	mg/kg-day	N/A	mg/kg-day	
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	2.8E-04	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	2.9E-05	mg/kg-day	N/A	mg/kg-day	
	(Total)										2.0E-05
Dermal Absorption	Tetrachloroethene	3.29E-02	mg/kg	3.29E-02	mg/kg	M	8.1E-09	mg/kg-day	5.2E-02	mg/kg-day	4.2E-10
	Benzo(a)anthracene	6.04E-01	mg/kg	6.04E-01	mg/kg	M	6.5E-07	mg/kg-day	7.3E-01	mg/kg-day	4.7E-07
	Benzo(a)pyrene	4.92E-01	mg/kg	4.92E-01	mg/kg	M	5.3E-07	mg/kg-day	7.3E+00	mg/kg-day	3.8E-06
	Benzo(b)fluoranthene	1.01E+00	mg/kg	1.01E+00	mg/kg	M	1.1E-06	mg/kg-day	7.3E-01	mg/kg-day	7.9E-07
	Dibenz(a,h)anthracene	2.87E-01	mg/kg	2.87E-01	mg/kg	M	3.1E-07	mg/kg-day	7.3E+00	mg/kg-day	2.2E-06
	Indeno(1,2,3-cd)pyrene	3.50E-01	mg/kg	3.50E-01	mg/kg	M	3.8E-07	mg/kg-day	7.3E-01	mg/kg-day	2.7E-07
	Aluminum	4.16E+03	mg/kg	4.16E+03	mg/kg	M	3.4E-04	mg/kg-day	N/A	mg/kg-day	
	Antimony	3.29E+00	mg/kg	3.29E+00	mg/kg	M	2.7E-07	mg/kg-day	N/A	mg/kg-day	
	Arsenic	3.58E+00	mg/kg	3.58E+00	mg/kg	M	8.9E-07	mg/kg-day	1.5E+00	mg/kg-day	1.3E-06
	Chromium	1.24E+01	mg/kg	1.24E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	mg/kg-day	
	Iron	1.04E+04	mg/kg	1.04E+04	mg/kg	M	8.6E-04	mg/kg-day	N/A	mg/kg-day	
	Lead	8.43E+01	mg/kg	8.43E+01	mg/kg	M	6.9E-06	mg/kg-day	N/A	mg/kg-day	
	Manganese	2.42E+02	mg/kg	2.42E+02	mg/kg	M	2.0E-05	mg/kg-day	N/A	mg/kg-day	
	Mercury (mercuric chloride)	5.64E+00	mg/kg	5.64E+00	mg/kg	M	4.7E-07	mg/kg-day	N/A	mg/kg-day	
	Silver	1.78E+02	mg/kg	1.78E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.87E+01	mg/kg	1.87E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										9.0E-06
									Total Risk Across All Exposure Routes/Pathways		2.9E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Skin absorption factor from EPA, Sept 2001 Part E, Supplemetnal Guidance for Dermal Risk Assessment(Interim) Exhibit 3-4.
For chemicals not found in 2001, default 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
Skin absorption factor is 3% for arsenic, 1% for other inorganics, 3% for VOCs, and 10% for semi-volatiles.
N/A Not applicable.

TABLE 8.16.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.30E-05	mg/m3	R	1.2E-08	mg/kg-day	1.0E-02	mg/kg-day	1.2E-10
	(Total)										1.2E-10
						Total Risk Across All Exposure Routes/Pathways					1.2E-10

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 8.17.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.30E-05	mg/m3	R	9.1E-07	mg/kg-day	1.0E-02	mg/kg-day	9.1E-09
	(Total)										9.1E-09
						Total Risk Across All Exposure Routes/Pathways					9.1E-09

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 8.18.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air
Exposure Point: Emissions from exposed soil at disposal area
Receptor Population: Residential
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Tetrachloroethene	3.29E-02	mg/kg	1.30E-05	mg/m3	R	2.1E-06	mg/kg-day	1.0E-02	mg/kg-day	2.1E-08
	(Total)										2.1E-08
						Total Risk Across All Exposure Routes/Pathways					2.1E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Route EPC Value is equal to Medium EPC value multiplied by the 1/fugitive dust air concentration and 1/volatilization factor. The fugitive dust air concentration is 1.32E+09 m^3/kg. The volatilization factor can be found on Table 2.2.A.
N/A Not applicable.

TABLE 8.19.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Concrete
Exposure Medium: Concrete
Exposure Point: Concrete troughs
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.7E-08	mg/kg-day	1.5E+00	mg/kg-day	2.5E-08
	Lead	1.67E+03	mg/kg	1.67E+03	mg/kg	M	1.3E-05	mg/kg-day	N/A	mg/kg-day	N/A
	(Total)										2.5E-08
Dermal Absorption	Arsenic	2.10E+00	mg/kg	2.10E+00	mg/kg	M	5.6E-09	mg/kg-day	1.5E+00	mg/kg-day	8.4E-09
	Lead	1.67E+03	mg/kg	1.67E+03	mg/kg	M	1.5E-06	mg/kg-day	N/A	mg/kg-day	N/A
	(Total)										8.4E-09
										Total Risk Across All Exposure Routes/Pathways	3.4E-08

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 8.20.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	5.51E-06	mg/kg-day	2.0E-01	mg/kg-day	1.1E-06
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	5.30E-06	mg/kg-day	5.7E-02	mg/kg-day	3.0E-07
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	6.72E-06	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	8.70E-06	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	1.46E-05	mg/kg-day	1.4E+00	mg/kg-day	2.0E-05
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	1.39E-05	mg/kg-day	9.1E-02	mg/kg-day	1.3E-06
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	5.11E-06	mg/kg-day	6.8E-02	mg/kg-day	3.5E-07
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	9.06E-05	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	2.20E-06	mg/kg-day	6.2E-02	mg/kg-day	1.4E-07
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	6.80E-06	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	1.48E-05	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	5.83E-05	mg/kg-day	1.3E-01	mg/kg-day	7.6E-06
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	5.92E-06	mg/kg-day	2.9E-03	mg/kg-day	1.7E-08
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	6.05E-05	mg/kg-day	N/A	mg/kg-day	
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	6.61E-06	mg/kg-day	1.3E-02	mg/kg-day	8.6E-08
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	6.13E-06	mg/kg-day	8.4E-02	mg/kg-day	5.1E-07
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	2.10E-05	mg/kg-day	5.2E-02	mg/kg-day	1.1E-06
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	6.70E-06	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	2.31E-05	mg/kg-day	4.0E-01	mg/kg-day	9.2E-06
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	6.33E-06	mg/kg-day	1.4E+00	mg/kg-day	8.9E-06
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	1.81E-05	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	7.42E-06	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	5.40E-06	mg/kg-day	1.0E-01	mg/kg-day	5.4E-07
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	3.19E-05	mg/kg-day	1.4E-02	mg/kg-day	4.5E-07
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	2.58E-05	mg/kg-day	N/A	mg/kg-day	
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	2.12E-05	mg/kg-day	1.2E-01	mg/kg-day	2.5E-06
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	2.26E-05	mg/kg-day	1.4E-02	mg/kg-day	3.2E-07
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	3.85E-04	mg/kg-day	N/A	mg/kg-day	
	Aluminum	5.19E+02	µg/l	5.19E+02	µg/l	M	2.75E-03	mg/kg-day	N/A	mg/kg-day	
	Antimony	2.72E+00	µg/l	2.72E+00	µg/l	M	1.44E-05	mg/kg-day	N/A	mg/kg-day	
	Arsenic	7.00E+00	µg/l	7.00E+00	µg/l	M	3.72E-05	mg/kg-day	1.5E+00	mg/kg-day	5.6E-05
	Barium	7.94E+01	µg/l	7.94E+01	µg/l	M	4.22E-04	mg/kg-day	N/A	mg/kg-day	
	Beryllium	3.18E-01	µg/l	3.18E-01	µg/l	M	1.69E-06	mg/kg-day	N/A	mg/kg-day	
	Cadmium	4.07E-01	µg/l	4.07E-01	µg/l	M	2.16E-06	mg/kg-day	N/A	mg/kg-day	
	Chromium	2.10E+00	µg/l	2.10E+00	µg/l	M	1.11E-05	mg/kg-day	N/A	mg/kg-day	
	Cobalt	1.93E+01	µg/l	1.93E+01	µg/l	M	1.02E-04	mg/kg-day	N/A	mg/kg-day	
	Iron	3.39E+03	µg/l	3.39E+03	µg/l	M	1.80E-02	mg/kg-day	N/A	mg/kg-day	
	Lead	2.02E+00	µg/l	2.02E+00	µg/l	M	1.07E-05	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.72E+02	µg/l	1.72E+02	µg/l	M	9.12E-04	mg/kg-day	N/A	mg/kg-day	
	Nickel	1.28E+01	µg/l	1.28E+01	µg/l	M	6.80E-05	mg/kg-day	N/A	mg/kg-day	
	Thallium	1.52E+00	µg/l	1.52E+00	µg/l	M	8.10E-06	mg/kg-day	N/A	mg/kg-day	
	Vanadium	4.94E+00	µg/l	4.94E+00	µg/l	M	2.63E-05	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.1E-04

TABLE 8.20.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Tap Water
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	6.1E-05	mg/kg-day	2.0E-01	mg/kg-day	1.2E-05
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	6.1E-07	mg/kg-day	5.7E-02	mg/kg-day	3.5E-08
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	6.4E-07	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	1.5E-06	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	8.4E-10	mg/kg-day	1.4E+00	mg/kg-day	1.2E-09
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	7.9E-07	mg/kg-day	9.1E-02	mg/kg-day	7.2E-08
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	6.0E-07	mg/kg-day	6.8E-02	mg/kg-day	4.1E-08
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	1.7E-10	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	2.1E-07	mg/kg-day	6.2E-02	mg/kg-day	1.3E-08
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	2.5E-07	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	3.3E-06	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	2.0E-05	mg/kg-day	1.3E-01	mg/kg-day	2.6E-06
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	4.0E-07	mg/kg-day	2.9E-03	mg/kg-day	1.2E-09
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	6.6E-06	mg/kg-day	N/A	mg/kg-day	
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	2.1E-07	mg/kg-day	1.3E-02	mg/kg-day	2.8E-09
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	1.9E-10	mg/kg-day	8.4E-02	mg/kg-day	1.6E-11
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	1.7E-05	mg/kg-day	5.2E-02	mg/kg-day	9.0E-07
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	3.1E-06	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	4.9E-06	mg/kg-day	4.0E-01	mg/kg-day	2.0E-06
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	3.8E-07	mg/kg-day	1.4E+00	mg/kg-day	5.3E-07
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	1.9E-06	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	7.8E-07	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	3.5E-07	mg/kg-day	1.0E-01	mg/kg-day	3.5E-08
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	3.7E-05	mg/kg-day	1.4E-02	mg/kg-day	5.2E-07
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	2.3E-05	mg/kg-day	N/A	mg/kg-day	
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	4.8E-04	mg/kg-day	1.2E-01	mg/kg-day	5.7E-05
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	6.9E-09	mg/kg-day	1.4E-02	mg/kg-day	9.6E-11
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	1.3E-06	mg/kg-day	N/A	mg/kg-day	
	Aluminum	5.19E+02	µg/l	5.19E+02	µg/l	M	9.4E-06	mg/kg-day	N/A	mg/kg-day	
	Antimony	2.72E+00	µg/l	2.72E+00	µg/l	M	3.7E-08	mg/kg-day	N/A	mg/kg-day	
	Arsenic	7.00E+00	µg/l	7.00E+00	µg/l	M	1.3E-07	mg/kg-day	1.5E+00	mg/kg-day	1.9E-07
	Barium	7.94E+01	µg/l	7.94E+01	µg/l	M	1.4E-06	mg/kg-day	N/A	mg/kg-day	
	Beryllium	3.18E-01	µg/l	3.18E-01	µg/l	M	5.7E-09	mg/kg-day	N/A	mg/kg-day	
	Cadmium	4.07E-01	µg/l	4.07E-01	µg/l	M	7.4E-09	mg/kg-day	N/A	mg/kg-day	
	Chromium	2.10E+00	µg/l	2.10E+00	µg/l	M	3.8E-08	mg/kg-day	N/A	mg/kg-day	
	Cobalt	1.93E+01	µg/l	1.93E+01	µg/l	M	3.5E-07	mg/kg-day	N/A	mg/kg-day	
	Iron	3.39E+03	µg/l	3.39E+03	µg/l	M	6.1E-05	mg/kg-day	N/A	mg/kg-day	
	Lead	2.02E+00	µg/l	2.02E+00	µg/l	M	3.6E-08	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.72E+02	µg/l	1.72E+02	µg/l	M	3.1E-06	mg/kg-day	N/A	mg/kg-day	
	Nickel	1.28E+01	µg/l	1.28E+01	µg/l	M	2.3E-07	mg/kg-day	N/A	mg/kg-day	
	Thallium	1.52E+00	µg/l	1.52E+00	µg/l	M	2.8E-08	mg/kg-day	N/A	mg/kg-day	
	Vanadium	4.94E+00	µg/l	4.94E+00	µg/l	M	8.9E-08	mg/kg-day	N/A	mg/kg-day	
	(Total)										7.7E-05
						Total Risk Across All Exposure Routes/Pathways					1.9E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
N/A - not applicable.

Table 8.20a.CT Supplement
Calculation of DAevent (Adult)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	9.00E-03	9.2E-01	0.2	1.11E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	9.98E-01	µg/l	8.40E-03	5.7E-01	0.2	7.82E-09	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.27E+00	µg/l	8.90E-03	3.5E-01	0.2	8.24E-09	8.4E-01	6.2E-03	2
1,1-Dichloroethene	1.64E+00	µg/l	1.60E-02	3.4E-01	0.2	1.89E-08	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	N/A	N/A		N/A	N/A	N/A	
1,2-Dichloroethane	2.62E+00	µg/l	5.30E-03	3.5E-01	0.2	1.01E-08	8.4E-01	3.0E-03	2
1,2-Dichloropropane	9.61E-01	µg/l	1.00E-02	4.3E-01	0.2	7.79E-09	1.0E+00	1.0E-02	2
Acetone	1.71E+01	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Bromodichloromethane	4.14E-01	µg/l	5.80E-03	8.7E-01	0.2	2.77E-09	2.1E+00	1.2E-02	2
Bromomethane	1.28E+00	µg/l	3.50E-03	3.3E-01	0.2	3.18E-09	8.0E-01	1.5E-03	2
Carbon disulfide	2.79E+00	µg/l	2.40E-02	2.7E-01	0.2	4.30E-08	6.5E-01	1.7E-02	2
Carbon tetrachloride	1.10E+01	µg/l	2.20E-02	7.6E-01	0.2	2.60E-07	1.8E+00	6.8E-02	2
Chloroethane	1.12E+00	µg/l	8.00E-03	2.2E-01	0.2	5.17E-09	5.2E-01	2.7E-03	2
Chloroform	1.14E+01	µg/l	8.90E-03	4.7E-01	0.2	8.58E-08	1.1E+00	9.3E-03	2
Chloromethane	1.24E+00	µg/l	4.20E-03	1.8E-01	0.2	2.74E-09	4.3E-01	8.1E-04	2
Dibromochloromethane	1.15E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	
Tetrachloroethene	3.96E+00	µg/l	4.80E-02	9.0E-01	0.2	2.23E-07	4.3E+00	2.5E-01	2
Toluene	1.26E+00	µg/l	4.50E-02	3.2E-01	0.2	3.97E-08	7.7E-01	5.4E-02	2
Trichloroethene	4.35E+00	µg/l	1.60E-02	5.5E-01	0.2	6.38E-08	1.3E+00	2.6E-02	2
Vinyl chloride	1.19E+00	µg/l	7.30E-03	2.1E-01	0.2	4.93E-09	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	3.40E+00	µg/l	1.00E-02	3.4E-01	0.2	2.45E-08	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	1.40E+00	µg/l	1.00E-02	3.4E-01	0.2	1.01E-08	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	1.02E+00	µg/l	5.50E-03	4.2E-01	0.2	4.48E-09	1.0E+00	4.0E-03	2
Hexachloroethane	6.00E+00	µg/l	4.20E-02	2.4E+00	0.2	4.83E-07	1.9E+01	8.5E-01	2
Naphthalene	4.86E+00	µg/l	6.90E-02	5.3E-01	0.2	3.02E-07	1.9E+01	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.2	6.18E-06	1.9E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	2
Cyanide	7.24E+01	µg/l	1.00E-03	N/A	0.2	1.45E-08	N/A	N/A	2
Aluminum	5.19E+02	µg/l	1.00E-03	N/A	0.2	1.04E-07	N/A	N/A	2
Antimony	2.72E+00	µg/l	1.00E-03	N/A	0.2	5.43E-10	N/A	N/A	2
Arsenic	7.00E+00	µg/l	1.00E-03	N/A	0.2	1.40E-09	N/A	N/A	2
Barium	7.94E+01	µg/l	1.00E-03	N/A	0.2	1.59E-08	N/A	N/A	1
Beryllium	3.18E-01	µg/l	1.00E-03	N/A	0.2	6.35E-11	N/A	N/A	1
Cadmium	4.07E-01	µg/l	1.00E-03	N/A	0.2	8.15E-11	N/A	N/A	1
Chromium	2.10E+00	µg/l	1.00E-03	N/A	0.2	4.19E-10	N/A	N/A	1
Cobalt	1.93E+01	µg/l	1.00E-03	N/A	0.2	3.85E-09	N/A	N/A	1
Iron	3.39E+03	µg/l	1.00E-03	N/A	0.2	6.79E-07	N/A	N/A	1
Lead	2.02E+00	µg/l	1.00E-03	N/A	0.2	4.03E-10	N/A	N/A	1
Manganese	1.72E+02	µg/l	1.00E-03	N/A	0.2	3.43E-08	N/A	N/A	1
Nickel	1.28E+01	µg/l	1.00E-03	N/A	0.2	2.56E-09	N/A	N/A	1
Thallium	1.52E+00	µg/l	1.00E-03	N/A	0.2	3.05E-10	N/A	N/A	1
Vanadium	4.94E+00	µg/l	1.00E-03	N/A	0.2	9.89E-10	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 8.20b.CT Supplement
Calculation of DAevent (Child)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	9.00E-03	9.2E-01	0.33	1.42E-08	2.2E+00	2.5E-02	2
1,1,2-Trichloroethane	9.98E-01	µg/l	8.40E-03	5.7E-01	0.33	1.00E-08	1.4E+00	1.1E-02	2
1,1-Dichloroethane	1.27E+00	µg/l	8.90E-03	3.5E-01	0.33	1.06E-08	8.4E-01	6.2E-03	2
1,1-Dichloroethene	1.64E+00	µg/l	1.60E-02	3.4E-01	0.33	2.43E-08	8.2E-01	1.3E-02	2
1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	N/A	N/A		N/A	N/A	N/A	
1,2-Dichloroethane	2.62E+00	µg/l	5.30E-03	3.5E-01	0.33	1.30E-08	8.4E-01	3.0E-03	2
1,2-Dichloropropane	9.61E-01	µg/l	1.00E-02	4.3E-01	0.33	1.00E-08	1.0E+00	1.0E-02	2
Acetone	1.71E+01	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Bromodichloromethane	4.14E-01	µg/l	5.80E-03	8.7E-01	0.33	3.55E-09	2.1E+00	1.2E-02	2
Bromomethane	1.28E+00	µg/l	3.50E-03	3.3E-01	0.33	4.09E-09	8.0E-01	1.5E-03	2
Carbon disulfide	2.79E+00	µg/l	2.40E-02	2.7E-01	0.33	5.52E-08	6.5E-01	1.7E-02	2
Carbon tetrachloride	1.10E+01	µg/l	2.20E-02	7.6E-01	0.33	3.34E-07	1.8E+00	6.8E-02	2
Chloroethane	1.12E+00	µg/l	8.00E-03	2.2E-01	0.33	6.65E-09	5.2E-01	2.7E-03	2
Chloroform	1.14E+01	µg/l	8.90E-03	4.7E-01	0.33	1.10E-07	1.1E+00	9.3E-03	2
Chloromethane	1.24E+00	µg/l	4.20E-03	1.8E-01	0.33	3.52E-09	4.3E-01	8.1E-04	2
Dibromochloromethane	1.15E+00	µg/l	N/A	N/A	0.33	N/A	N/A	N/A	
Tetrachloroethene	3.96E+00	µg/l	4.80E-02	9.0E-01	0.33	2.86E-07	4.3E+00	2.5E-01	2
Toluene	1.26E+00	µg/l	4.50E-02	3.2E-01	0.33	5.10E-08	7.7E-01	5.4E-02	2
Trichloroethene	4.35E+00	µg/l	1.60E-02	5.5E-01	0.33	8.19E-08	1.3E+00	2.6E-02	2
Vinyl chloride	1.19E+00	µg/l	7.30E-03	2.1E-01	0.33	6.33E-09	5.1E-01	2.3E-03	2
cis-1,2-Dichloroethene	3.40E+00	µg/l	1.00E-02	3.4E-01	0.33	3.15E-08	8.2E-01	7.2E-03	2
trans-1,2-Dichloroethene	1.40E+00	µg/l	1.00E-02	3.4E-01	0.33	1.29E-08	8.2E-01	7.2E-03	2
trans-1,3-Dichloropropene	1.02E+00	µg/l	5.50E-03	4.2E-01	0.33	5.76E-09	1.0E+00	4.0E-03	2
Hexachloroethane	6.00E+00	µg/l	4.20E-02	2.4E+00	0.33	6.20E-07	1.9E+01	8.5E-01	2
Naphthalene	4.86E+00	µg/l	6.90E-02	5.3E-01	0.33	3.88E-07	1.9E+01	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	0.33	7.94E-06	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	N/A	N/A	0.2	N/A	N/A	N/A	2
Cyanide	7.24E+01	µg/l	1.00E-03	N/A	0.33	2.39E-08	N/A	N/A	1
Aluminum	5.19E+02	µg/l	1.00E-03	N/A	0.33	1.71E-07	N/A	N/A	1
Antimony	2.72E+00	µg/l	1.00E-03	N/A	0.2	5.43E-10	N/A	N/A	2
Arsenic	7.00E+00	µg/l	1.00E-03	N/A	0.33	2.31E-09	N/A	N/A	1
Barium	7.94E+01	µg/l	1.00E-03	N/A	0.33	2.62E-08	N/A	N/A	1
Beryllium	3.18E-01	µg/l	1.00E-03	N/A	0.33	1.05E-10	N/A	N/A	1
Cadmium	4.07E-01	µg/l	1.00E-03	N/A	0.33	1.34E-10	N/A	N/A	1
Chromium	2.10E+00	µg/l	1.00E-03	N/A	0.33	6.92E-10	N/A	N/A	1
Cobalt	1.93E+01	µg/l	1.00E-03	N/A	0.33	6.36E-09	N/A	N/A	1
Iron	3.39E+03	µg/l	1.00E-03	N/A	0.33	1.12E-06	N/A	N/A	1
Lead	2.02E+00	µg/l	1.00E-03	N/A	0.33	6.65E-10	N/A	N/A	1
Manganese	1.72E+02	µg/l	1.00E-03	N/A	0.33	5.67E-08	N/A	N/A	1
Nickel	1.28E+01	µg/l	1.00E-03	N/A	0.33	4.22E-09	N/A	N/A	1
Thallium	1.52E+00	µg/l	1.00E-03	N/A	0.33	5.03E-10	N/A	N/A	1
Vanadium	4.94E+00	µg/l	1.00E-03	N/A	0.33	1.63E-09	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 8.20c.CT Supplement
Calculation of Daevent (Adult)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.2	2.75E+00	2.68E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.2	1.71E+01	5.34E-09
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.2	1.24E+00	6.12E-09
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.2	1.15E+00	2.20E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

Table 8.20d.CT Supplement
Calculation of Daevent (Child)
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	0.33	2.75E+00	3.44E-08
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	0.33	1.71E+01	6.86E-09
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	0.33	1.24E+00	7.86E-09
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	0.33	1.15E+00	2.82E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 8.21.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	1.04E+00	µg/l	M	3.6E-08	mg/kg-day	2.0E-01	mg/kg-day	7.2E-09
	1,1,2-Trichloroethane	9.98E-01	µg/l	9.98E-01	µg/l	M	2.8E-08	mg/kg-day	5.7E-02	mg/kg-day	1.6E-09
	1,1-Dichloroethane	1.27E+00	µg/l	1.27E+00	µg/l	M	3.5E-08	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	1.64E+00	µg/l	1.64E+00	µg/l	M	8.0E-08	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	2.75E+00	µg/l	2.75E+00	µg/l	M	7.9E-08	mg/kg-day	1.4E+00	mg/kg-day	1.1E-07
	1,2-Dichloroethane	2.62E+00	µg/l	2.62E+00	µg/l	M	4.3E-08	mg/kg-day	9.1E-02	mg/kg-day	3.9E-09
	1,2-Dichloropropane	9.61E-01	µg/l	9.61E-01	µg/l	M	3.1E-08	mg/kg-day	6.8E-02	mg/kg-day	2.1E-09
	Acetone	1.71E+01	µg/l	1.71E+01	µg/l	M	2.8E-08	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.14E-01	µg/l	4.14E-01	µg/l	M	9.1E-09	mg/kg-day	6.2E-02	mg/kg-day	5.6E-10
	Bromomethane	1.28E+00	µg/l	1.28E+00	µg/l	M	1.4E-08	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	2.79E+00	µg/l	2.79E+00	µg/l	M	2.0E-07	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	1.10E+01	µg/l	1.10E+01	µg/l	M	8.7E-07	mg/kg-day	1.3E-01	mg/kg-day	1.1E-07
	Chloroethane	1.12E+00	µg/l	1.12E+00	µg/l	M	2.6E-08	mg/kg-day	2.9E-03	mg/kg-day	7.6E-11
	Chloroform	1.14E+01	µg/l	1.14E+01	µg/l	M	3.3E-07	mg/kg-day	N/A	mg/kg-day	
	Chloromethane	1.24E+00	µg/l	1.24E+00	µg/l	M	1.5E-08	mg/kg-day	1.3E-02	mg/kg-day	2.0E-10
	Dibromochloromethane	1.15E+00	µg/l	1.15E+00	µg/l	M	6.5E-07	mg/kg-day	8.4E-02	mg/kg-day	5.5E-08
	Tetrachloroethene	3.96E+00	µg/l	3.96E+00	µg/l	M	6.6E-07	mg/kg-day	5.2E-02	mg/kg-day	3.4E-08
	Toluene	1.26E+00	µg/l	1.26E+00	µg/l	M	1.7E-07	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	4.35E+00	µg/l	4.35E+00	µg/l	M	2.3E-07	mg/kg-day	4.0E-01	mg/kg-day	9.3E-08
	Vinyl chloride	1.19E+00	µg/l	1.19E+00	µg/l	M	2.5E-08	mg/kg-day	1.4E+00	mg/kg-day	3.6E-08
	cis-1,2-Dichloroethene	3.40E+00	µg/l	3.40E+00	µg/l	M	1.0E-07	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	1.40E+00	µg/l	1.40E+00	µg/l	M	4.3E-08	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	1.02E+00	µg/l	1.02E+00	µg/l	M	1.8E-08	mg/kg-day	1.0E-01	mg/kg-day	1.8E-09
	Hexachloroethane	6.00E+00	µg/l	6.00E+00	µg/l	M	1.4E-06	mg/kg-day	1.4E-02	mg/kg-day	2.0E-08
	Naphthalene	4.86E+00	µg/l	4.86E+00	µg/l	M	8.9E-07	mg/kg-day	N/A	mg/kg-day	
	Pentachlorophenol	4.00E+00	µg/l	4.00E+00	µg/l	M	1.8E-05	mg/kg-day	1.2E-01	mg/kg-day	2.2E-06
	bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	4.25E+00	µg/l	M	6.5E-07	mg/kg-day	1.4E-02	mg/kg-day	9.1E-09
	Aluminum	7.52E+02	µg/l	7.52E+02	µg/l	M	2.0E-06	mg/kg-day	N/A	mg/kg-day	
	Arsenic	5.21E+00	µg/l	5.21E+00	µg/l	M	1.4E-08	mg/kg-day	1.5E+00	mg/kg-day	2.1E-08
	Barium	8.02E+01	µg/l	8.02E+01	µg/l	M	2.1E-07	mg/kg-day	N/A	mg/kg-day	
	Beryllium	4.98E-01	µg/l	4.98E-01	µg/l	M	1.3E-09	mg/kg-day	N/A	mg/kg-day	
	Cadmium	6.70E-01	µg/l	6.70E-01	µg/l	M	1.8E-09	mg/kg-day	N/A	mg/kg-day	
	Chromium	2.00E+00	µg/l	2.00E+00	µg/l	M	5.3E-09	mg/kg-day	N/A	mg/kg-day	
	Cobalt	1.71E+01	µg/l	1.71E+01	µg/l	M	4.5E-08	mg/kg-day	N/A	mg/kg-day	
	Cyanide	7.24E+01	µg/l	7.24E+01	µg/l	M	1.9E-07	mg/kg-day	N/A	mg/kg-day	
	Iron	5.05E+03	µg/l	5.05E+03	µg/l	M	1.3E-05	mg/kg-day	N/A	mg/kg-day	

TABLE 8.21.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Upper Aquifer - Shallow groundwater beneath disposal area
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
	Lead	2.46E+00	µg/l	2.46E+00	µg/l	M	6.5E-09	mg/kg-day	N/A	mg/kg-day	
	Manganese	1.64E+02	µg/l	1.64E+02	µg/l	M	4.3E-07	mg/kg-day	N/A	mg/kg-day	
	Nickel	1.07E+01	µg/l	1.07E+01	µg/l	M	2.8E-08	mg/kg-day	N/A	mg/kg-day	
	Thallium	2.45E+00	µg/l	2.45E+00	µg/l	M	6.5E-09	mg/kg-day	N/A	mg/kg-day	
	Vanadium	1.92E+01	µg/l	1.92E+01	µg/l	M	5.1E-08	mg/kg-day	N/A	mg/kg-day	
	(Total)										2.7E-06
										Total Risk Across All Exposure Routes/Pathways	2.7E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.

TABLE 8.21a.CT Supplement
Calculation of DAevent (Construction Worker)
Indian Head - Site 47

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC)[1]	Lag Time (t)[2]	Duration of Event (ET)	DAevent	t*	B (dimensionless)	Eq
1,1,2,2-Tetrachloroethane	1.04E+00	µg/l	9.00E-03	9.2E-01	4	5.44E-08	2.2E+00	2.5E-02	3
1,1,2-Trichloroethane	9.98E-01	µg/l	8.40E-03	5.7E-01	4	4.29E-08	1.4E+00	1.1E-02	3
1,1-Dichloroethane	1.27E+00	µg/l	8.90E-03	3.5E-01	4	5.27E-08	8.4E-01	6.2E-03	3
1,1-Dichloroethene	1.64E+00	µg/l	1.60E-02	3.4E-01	4	1.22E-07	8.2E-01	1.3E-02	3
1,2-Dibromo-3-chloropropan	2.75E+00	µg/l	N/A	N/A	4	N/A	N/A	N/A	
1,2-Dichloroethane	2.62E+00	µg/l	5.30E-03	3.5E-01	4	6.51E-08	8.4E-01	3.0E-03	3
1,2-Dichloropropane	9.61E-01	µg/l	1.00E-02	4.3E-01	4	4.65E-08	1.0E+00	1.0E-02	3
Acetone	1.71E+01	µg/l	N/A	N/A	4	N/A	N/A	N/A	
Bromodichloromethane	4.14E-01	µg/l	5.80E-03	8.7E-01	4	1.38E-08	2.1E+00	1.2E-02	3
Bromomethane	1.28E+00	µg/l	3.50E-03	3.3E-01	4	2.09E-08	8.0E-01	1.5E-03	3
Carbon disulfide	2.79E+00	µg/l	2.40E-02	2.7E-01	4	3.01E-07	6.5E-01	1.7E-02	3
Carbon tetrachloride	1.10E+01	µg/l	2.20E-02	7.6E-01	4	1.32E-06	1.8E+00	6.8E-02	3
Chloroethane	1.12E+00	µg/l	8.00E-03	2.2E-01	4	3.95E-08	5.2E-01	2.7E-03	3
Chloroform	1.14E+01	µg/l	8.90E-03	4.7E-01	4	4.98E-07	1.1E+00	9.3E-03	3
Chloromethane	1.24E+00	µg/l	4.20E-03	1.8E-01	4	2.28E-08	4.3E-01	8.1E-04	3
Dibromochloromethane	1.15E+00	µg/l	N/A	N/A	4	N/A	N/A	N/A	
Tetrachloroethene	3.96E+00	µg/l	4.80E-02	9.0E-01	4	9.96E-07	4.3E+00	2.5E-01	2
Toluene	1.26E+00	µg/l	4.50E-02	3.2E-01	4	2.56E-07	7.7E-01	5.4E-02	3
Trichloroethene	4.35E+00	µg/l	1.60E-02	5.5E-01	4	3.52E-07	1.3E+00	2.6E-02	3
Vinyl chloride	1.19E+00	µg/l	7.30E-03	2.1E-01	4	3.84E-08	5.1E-01	2.3E-03	3
cis-1,2-Dichloroethene	3.40E+00	µg/l	1.00E-02	3.4E-01	4	1.59E-07	8.2E-01	7.2E-03	3
trans-1,2-Dichloroethene	1.40E+00	µg/l	1.00E-02	3.4E-01	4	6.51E-08	8.2E-01	7.2E-03	3
trans-1,3-Dichloropropene	1.02E+00	µg/l	5.50E-03	4.2E-01	4	2.70E-08	1.0E+00	4.0E-03	3
Hexachloroethane	6.00E+00	µg/l	4.20E-02	2.4E+00	4	2.16E-06	1.9E+01	8.5E-01	2
Naphthalene	4.86E+00	µg/l	6.90E-02	5.3E-01	4	1.35E-06	1.9E+01	2.0E-01	2
Pentachlorophenol	4.00E+00	µg/l	6.50E-01	3.7E+00	4	2.76E-05	1.7E+01	7.2E+01	2
bis(2-Ethylhexyl)phthalate	4.25E+00	µg/l	N/A	N/A	4	N/A	N/A	N/A	2
Aluminum	7.52E+02	µg/l	1.00E-03	N/A	4	3.01E-06	N/A	N/A	1
Arsenic	5.21E+00	µg/l	1.00E-03	N/A	4	2.08E-08	N/A	N/A	1
Barium	8.02E+01	µg/l	1.00E-03	N/A	4	3.21E-07	N/A	N/A	1
Beryllium	4.98E-01	µg/l	1.00E-03	N/A	4	1.99E-09	N/A	N/A	1
Cadmium	6.70E-01	µg/l	1.00E-03	N/A	4	2.68E-09	N/A	N/A	1
Chromium	2.00E+00	µg/l	1.00E-03	N/A	4	8.01E-09	N/A	N/A	1
Cobalt	1.71E+01	µg/l	1.00E-03	N/A	4	6.85E-08	N/A	N/A	1
Cyanide	7.24E+01	µg/l	1.00E-03	N/A	4	2.90E-07	N/A	N/A	1
Iron	5.05E+03	µg/l	1.00E-03	N/A	4	2.02E-05	N/A	N/A	1
Lead	2.46E+00	µg/l	1.00E-03	N/A	4	9.83E-09	N/A	N/A	1
Manganese	1.64E+02	µg/l	1.00E-03	N/A	4	6.56E-07	N/A	N/A	1
Nickel	1.07E+01	µg/l	1.00E-03	N/A	4	4.27E-08	N/A	N/A	1
Thallium	2.45E+00	µg/l	1.00E-03	N/A	4	9.79E-09	N/A	N/A	1
Vanadium	1.92E+01	µg/l	1.00E-03	N/A	4	7.70E-08	N/A	N/A	1

Inorganics: DAevent (mg/cm2-event) =
PC x CW x ET x CF1 x CF2 (eq 1)

Organics: DAevent (mg/cm2-event) =

ET<t*: DAevent (mg/cm2-event) =
2 x PC x CW x (sqrt((6 x t x ET)/3.1415))
x CF1 x CF2 (eq 2)

ET>t*: DAevent (mg/cm2-event) =
PC x CW x (ET/(1+B) + 2 x t x ((1 + 3xB)/(1+B))
x CF1 x CF2 (eq 3)

Permeability constants from EPA 1992, Dermal Exposure Assessment: Principals and Applications.
ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not applicable.
1 From EPA Dermal Guidance 1992, table 5-7
2 From EPA Dermal Guidance 1992, table 5-8

Table 8.21b.CT Supplement
Calculation of Daevent (Construction Worker)
Indian Head - Site 47

Chemical	MW	log Kow	Kow	log Kp	Kp (cm/hr)	B	log Dsc/lsc	lsc (cm)	log Dsc	Dsc (cm^2/hr)	Tau (hr)	c	b	T* (hr)	Tevent (hr/event)	Medium EPC Value, Cv?	DAevent mg/(cm^2-event)
1,2-Dibromo-3-chloropropane	236.36	2.63	4.27E+02	-2.29E+00	5.08E-03	4.27E-02	-4.16E+00	1.00E-03	-7.16E+00	6.89E-08	2.42E+00	3.76E-01	3.16E-01	5.81E+00	4	2.75E+00	1.20E-07
Acetone	58.08	-0.24	5.75E-01	-3.24E+00	5.69E-04	5.75E-05	-3.07E+00	1.00E-03	-6.07E+00	8.43E-07	1.98E-01	3.33E-01	3.03E-01	4.75E-01	4	1.71E+01	4.27E-08
dibromochloromethane	208.28	2.09	1.23E+02	-2.51E+00	3.11E-03	1.23E-02	-3.99E+00	1.00E-03	-6.99E+00	1.02E-07	1.63E+00	3.46E-01	3.07E-01	3.91E+00	4	1.24E+00	2.83E-08
bis(2-Ethylhexyl)phthalate	390.54	5.11	1.29E+05	-1.47E+00	3.36E-02	1.29E+01	-5.10E+00	1.00E-03	-8.10E+00	7.90E-09	2.11E+01	1.32E+01	1.09E+02	1.01E+02	4	1.15E+00	9.83E-07

Equations from *Dermal Exposure Assessment: Principles and Applications*. EPA/600/8-91/011B. January 1992.

TABLE 8.22.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Upper Aquifer - Water Vapors at Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	1,1,2,2-Tetrachloroethane	1.04E+00	mg/kg	7.66E-06	mg/kg/shower	R	6.3E-07	mg/kg-day	2.0E-01	mg/kg-day	1.3E-07
	1,1,2-Trichloroethane	9.98E-01	mg/kg	1.75E-05	mg/kg/shower	R	1.4E-06	mg/kg-day	5.6E-02	mg/kg-day	8.1E-08
	1,1-Dichloroethane	1.27E+00	mg/kg	5.85E-05	mg/kg/shower	R	4.8E-06	mg/kg-day	N/A	mg/kg-day	
	1,1-Dichloroethene	1.64E+00	mg/kg	9.47E-05	mg/kg/shower	R	7.8E-06	mg/kg-day	N/A	mg/kg-day	
	1,2-Dibromo-3-chloropropane	2.75E+00	mg/kg	5.00E-05	mg/kg/shower	R	4.1E-06	mg/kg-day	2.4E-03	mg/kg-day	9.9E-09
	1,2-Dichloroethane	2.62E+00	mg/kg	5.54E-05	mg/kg/shower	R	4.6E-06	mg/kg-day	9.1E-02	mg/kg-day	4.2E-07
	1,2-Dichloropropane	9.61E-01	mg/kg	3.36E-05	mg/kg/shower	R	2.8E-06	mg/kg-day	N/A	mg/kg-day	
	Acetone	1.71E+01	mg/kg	1.37E-04	mg/kg/shower	R	1.1E-05	mg/kg-day	N/A	mg/kg-day	
	Bromodichloromethane	4.14E-01	mg/kg	9.37E-06	mg/kg/shower	R	7.7E-07	mg/kg-day	N/A	mg/kg-day	
	Bromomethane	1.28E+00	mg/kg	7.75E-05	mg/kg/shower	R	6.4E-06	mg/kg-day	N/A	mg/kg-day	
	Carbon disulfide	2.79E+00	mg/kg	1.78E-04	mg/kg/shower	R	1.5E-05	mg/kg-day	N/A	mg/kg-day	
	Carbon tetrachloride	1.10E+01	mg/kg	5.36E-04	mg/kg/shower	R	4.4E-05	mg/kg-day	5.3E-02	mg/kg-day	2.3E-06
	Chloroethane	1.12E+00	mg/kg	7.82E-05	mg/kg/shower	R	6.4E-06	mg/kg-day	N/A	mg/kg-day	
	Chloroform	1.14E+01	mg/kg	4.30E-04	mg/kg/shower	R	3.5E-05	mg/kg-day	8.1E-02	mg/kg-day	2.9E-06
	Chloromethane	1.24E+00	mg/kg	9.56E-05	mg/kg/shower	R	7.9E-06	mg/kg-day	3.5E-03	mg/kg-day	2.8E-08
	Dibromochloromethane	1.15E+00	mg/kg	4.23E-05	mg/kg/shower	R	3.5E-06	mg/kg-day	N/A	mg/kg-day	
	Tetrachloroethene	3.96E+00	mg/kg	1.80E-04	mg/kg/shower	R	1.5E-05	mg/kg-day	1.0E-02	mg/kg-day	1.5E-07
	Toluene	1.26E+00	mg/kg	6.24E-05	mg/kg/shower	R	5.1E-06	mg/kg-day	N/A	mg/kg-day	
	Trichloroethene	4.35E+00	mg/kg	2.03E-04	mg/kg/shower	R	1.7E-05	mg/kg-day	4.0E-01	mg/kg-day	6.7E-06
	Vinyl chloride	1.19E+00	mg/kg	8.07E-05	mg/kg/shower	R	6.7E-06	mg/kg-day	3.0E-02	mg/kg-day	2.0E-07
	cis-1,2-Dichloroethene	3.40E+00	mg/kg	1.45E-04	mg/kg/shower	R	1.2E-05	mg/kg-day	N/A	mg/kg-day	
	trans-1,2-Dichloroethene	1.40E+00	mg/kg	7.23E-05	mg/kg/shower	R	6.0E-06	mg/kg-day	N/A	mg/kg-day	
	trans-1,3-Dichloropropene	1.02E+00	mg/kg	5.44E-05	mg/kg/shower	R	4.5E-06	mg/kg-day	1.0E-02	mg/kg-day	4.5E-08
	Naphthalene	4.86E+00	mg/kg	5.42E-05	mg/kg/shower	R	4.5E-06	mg/kg-day	N/A	mg/kg-day	
	(Total)										1.3E-05
						Total Risk Across All Exposure Routes/Pathways					1.3E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Route EPC Value is the Inhalation Exposure Concentration (Einh) calculated using a Two-Film Volatilization Model for Residential Scenario (Table 8.18.CT Supplement).

N/A Not applicable.

One-Hit Equation for high carcinogenic risk levels was used to calculate risk for Carbontetrachloride and Chloroform: Risk = 1-exp (-CDI XCSF)

Table 8.22.CT Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario
Indian Head - Site 47

Chemical	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law dimensionless	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3-min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
1,1,2,2-Tetrachloroethane	1.04E+00	167.9	1.41E-02	3.45E-05	9.82E+02	1.02E+01	1.24E+00	1.67E+00	5.63E-02	3.75E-01	7.66E-06
1,1,2-Trichloroethane	9.98E-01	133.4	3.74E-02	9.14E-05	1.10E+03	1.15E+01	3.07E+00	4.15E+00	1.29E-01	8.60E-01	1.75E-05
1,1-Dichloroethane	1.27E+00	99	2.30E-01	5.62E-04	1.28E+03	1.33E+01	9.23E+00	1.25E+01	4.30E-01	2.87E+00	5.85E-05
1,1-Dichloroethene	1.64E+00	97	1.07E+00	2.61E-03	1.29E+03	1.35E+01	1.23E+01	1.66E+01	6.96E-01	4.64E+00	9.47E-05
1,2-Dibromo-3-chloropropane	2.75E+00	236.36	6.02E-02	1.47E-04	8.28E+02	8.63E+00	3.19E+00	4.31E+00	3.68E-01	2.45E+00	5.00E-05
1,2-Dichloroethane	2.62E+00	99	4.01E-02	9.80E-05	1.28E+03	1.33E+01	3.75E+00	5.07E+00	4.07E-01	2.71E+00	5.54E-05
1,2-Dichloropropane	9.61E-01	112.99	1.15E-01	2.81E-04	1.20E+03	1.25E+01	6.60E+00	8.92E+00	2.47E-01	1.65E+00	3.36E-05
Acetone	1.71E+01	58.09	8.59E-03	2.10E-05	1.67E+03	1.74E+01	1.35E+00	1.82E+00	1.00E+00	6.70E+00	1.37E-04
Bromodichloromethane	4.14E-01	163.83	6.56E-02	1.60E-04	9.94E+02	1.04E+01	4.05E+00	5.47E+00	6.89E-02	4.59E-01	9.37E-06
Bromomethane	1.28E+00	94.95	2.55E+00	6.24E-03	1.31E+03	1.36E+01	1.31E+01	1.77E+01	5.70E-01	3.80E+00	7.75E-05
Carbon disulfide	2.79E+00	76.13	1.24E+00	3.03E-03	1.46E+03	1.52E+01	1.40E+01	1.90E+01	1.31E+00	8.72E+00	1.78E-04
Carbon tetrachloride	1.10E+01	153.84	1.25E+00	3.05E-03	1.03E+03	1.07E+01	9.89E+00	1.34E+01	3.94E+00	2.63E+01	5.36E-04
Chloroethane	1.12E+00	64.2	3.47E+00	8.48E-03	1.59E+03	1.66E+01	1.61E+01	2.17E+01	5.75E-01	3.83E+00	7.82E-05
Chloroform	1.14E+01	119.39	1.50E-01	3.67E-04	1.16E+03	1.21E+01	7.22E+00	9.75E+00	3.16E+00	2.11E+01	4.30E-04
Chloromethane	1.24E+00	50.49	9.82E+00	2.40E-02	1.79E+03	1.87E+01	1.85E+01	2.50E+01	7.03E-01	4.69E+00	9.56E-05
Dibromochloromethane	1.15E+00	208.28	3.20E-01	7.83E-04	8.82E+02	9.19E+00	6.97E+00	9.41E+00	3.11E-01	2.07E+00	4.23E-05
Tetrachloroethene	3.96E+00	165.82	7.54E-01	1.84E-03	9.88E+02	1.03E+01	9.07E+00	1.23E+01	1.33E+00	8.84E+00	1.80E-04
Toluene	1.26E+00	92.13	2.72E-01	6.65E-04	1.33E+03	1.38E+01	1.00E+01	1.36E+01	4.59E-01	3.06E+00	6.24E-05
Trichloroethene	4.35E+00	131.4	4.22E-01	1.03E-03	1.11E+03	1.16E+01	9.31E+00	1.26E+01	1.49E+00	9.93E+00	2.03E-04
Vinyl chloride	1.19E+00	63	1.1E+00	2.71E-03	1.60E+03	1.67E+01	1.53E+01	2.07E+01	5.93E-01	3.95E+00	8.07E-05
cis-1,2-Dichloroethene	3.40E+00	97	1.67E-01	4.08E-04	1.29E+03	1.35E+01	8.35E+00	1.13E+01	1.07E+00	7.11E+00	1.45E-04
trans-1,2-Dichloroethene	1.40E+00	97	3.85E-01	9.41E-04	1.29E+03	1.35E+01	1.06E+01	1.44E+01	5.32E-01	3.54E+00	7.23E-05
trans-1,3-Dichloropropene	1.02E+00	110	7.26E-01	1.77E-03	1.21E+03	1.26E+01	1.11E+01	1.50E+01	4.00E-01	2.67E+00	5.44E-05
Naphthalene	4.86E+00	128.16	1.98E-02	4.84E-05	1.12E+03	1.17E+01	1.90E+00	2.57E+00	3.98E-01	2.66E+00	5.42E-05

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	ug/l	Solved by Eq 5
sdt = shower droplet drop time	sec	2
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	20
SV = shower room air volume	m^3	3
S = indoor VOC generation rate	ug/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	12
Dt = total duration in shower room	min	15

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Disposal area											
			Tetrachloroethene	2.3E-10	--	1.02E-09	1.2E-09	Tetrachloroethene	Liver	1.2E-06	--	2.0E-06	3.2E-06
			Benzo(a)anthracene	5.1E-08	--	9.85E-07	1.0E-06	Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(a)pyrene	3.8E-07	--	7.36E-06	7.7E-06	Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(b)fluoranthene	9.8E-08	--	1.89E-06	2.0E-06	Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Dibenz(a,h)anthracene	1.9E-07	--	3.61E-06	3.8E-06	Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Indeno(1,2,3-cd)pyrene	2.4E-08	--	4.66E-07	4.9E-07	Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Aluminum	0.0E+00	--	0.00E+00	0.0E+00	Aluminum	CNS	1.1E-03	--	5.8E-04	1.7E-03
			Antimony	0.0E+00	--	0.00E+00	0.0E+00	Antimony	Blood	2.2E-03	--	7.7E-03	9.8E-03
			Arsenic	5.3E-07	--	2.37E-06	2.9E-06	Arsenic	Skin	3.3E-03	--	5.3E-03	8.6E-03
			Chromium	0.0E+00	--	0.00E+00	0.0E+00	Chromium	NOAEL	1.0E-03	--	2.2E-02	2.3E-02
			Iron	0.0E+00	--	0.00E+00	0.0E+00	Iron	Gastrointestinal	8.7E-03	--	4.6E-03	1.3E-02
			Lead	0.0E+00	--	0.00E+00	0.0E+00	Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Manganese	0.0E+00	--	0.00E+00	0.0E+00	Manganese	CNS	1.8E-03	--	2.3E-02	2.5E-02
			Mercury (mercuric chloride)	0.0E+00	--	0.00E+00	0.0E+00	Mercury (mercuric chloride)	Nervous System	4.5E-03	--	3.4E-02	3.8E-02
			Silver	0.0E+00	--	0.00E+00	0.0E+00	Silver	Skin	1.4E-02	--	1.9E-01	2.0E-01
			Vanadium	0.0E+00	--	0.00E+00	0.0E+00	Vanadium	Kidney	4.8E-03	--	9.8E-02	1.0E-01
			(Total)	1.3E-06	0.0E+00	1.7E-05	1.8E-05	(Total)		4.2E-02	0.0E+00	3.9E-01	4.3E-01
	Air	Emissions from exposed soil at disposal area	Tetrachloroethene		3.5E-09		3.5E-09	Tetrachloroethene	Liver		7.0E-06		7.0E-06
			(Total)	--	3.5E-09	--	3.5E-09	(Total)	--	--	7.0E-06	--	7.0E-06
			Total Risk Across Surface Soil				1.8E-05	Total Risk Across Surface Soil					4.3E-01
			Total Risk Across All Media and All Exposure Routes				1.8E-05	Total Hazard Index Across All Media and All Exposure Routes					4.3E-01

Total Skin HI =	2.1E-01
Total Liver HI =	1.0E-05
Total CNS HI =	2.7E-02
Total Blood HI =	9.8E-03
Total Gastrointestinal HI =	1.3E-02
Total NAOEL HI =	2.3E-02
Total Nervous System HI =	3.8E-02
Total Kidney HI =	1.0E-01

Table 8.22.CT Supplement
Inhalation of Volatiles from Groundwater
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Future Residential Scenario
Indian Head - Site 47

R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	ug/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Equation 1:	Kg(VOC) =	$3000 * (18 / HH)^{0.5}$	
Equation 2:	Kl(VOC) =	$20 * (44 / HH)^{0.5}$	
Equation 3:	KL =	$((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$	
Equation 4:	Kal =	$(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	**Einh =**	**If t>Ds**	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

Henry's Law Constant from USEPA's *Superfund Public Health Evaluation Manual.* USEPA/540/1-86/060, October 1986.

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Other Worker
Receptor Age: Adults

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Sediment	Sediment	Drainage Swales											
			Nitroglycerin	1.1E-06		1.3E-05	1.4E-05	Nitroglycerin	N/A	0.0E+00		0.0E+00	0.0E+00
			Arsenic	3.1E-07		6.0E-07	9.2E-07	Arsenic	Skin	3.3E-03		5.9E-03	9.1E-03
			Iron	0.0E+00		0.0E+00	0.0E+00	Iron	Gastrointestinal	1.3E-02		7.6E-03	2.0E-02
			Lead	0.0E+00	--	0.0E+00	0.0E+00	Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Mercury (mercuric chloride)	0.0E+00		0.0E+00	0.0E+00	Mercury (mercuric chloride)	Nervous System	2.6E-02		2.2E-01	2.5E-01
			Silver	0.0E+00		0.0E+00	0.0E+00	Silver	Skin	7.9E-03		1.2E-01	1.3E-01
			Vanadium	0.0E+00		0.0E+00	0.0E+00	Vanadium	Kidney	5.0E-03		1.1E-01	1.2E-01
			(Total)	1.4E-06	0.0E+00	1.4E-05	1.5E-05	(Total)		5.5E-02	0.0E+00	4.7E-01	5.3E-01
			Total Risk Across Sediment				1.5E-05	Total Risk Across Sediment					5.3E-01
Surface Water	Surface Water	Drainage Swales											
			Arsenic	3.3E-07		7.9E-08	4.1E-07	Arsenic	Skin	2.0E-03		4.9E-04	2.5E-03
			(Total)	3.3E-07	0.0E+00	7.9E-08	4.1E-07	(Total)		2.0E-03	0.0E+00	4.9E-04	2.5E-03
			Total Risk Across Surface Water				4.1E-07	Total Risk Across Surface Water					2.5E-03
			Total Risk Across All Media and All Exposure Routes				1.5E-05	Total Hazard Index Across All Media and All Exposure Routes					5.3E-01

Total Skin HI =	1.4E-01
Total Gastrointestinal HI =	2.0E-02

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Sediment	Sediment	Drainage Swales											
			Arsenic	1.5E-06		1.4E-06	2.9E-06	Arsenic	Skin	2.6E-02		2.4E-02	5.0E-02
			Iron	0.0E+00		0.0E+00	0.0E+00	Iron	Gastrointestinal	6.4E-02		2.0E-02	8.4E-02
			Vanadium	0.0E+00		0.0E+00	0.0E+00	Vanadium	Kidney	3.9E-02		4.7E-01	5.1E-01
			(Total)	1.5E-06	0.0E+00	1.4E-06	2.9E-06	(Total)		1.3E-01	0.0E+00	5.2E-01	6.4E-01
			Total Risk Across Sediment				2.9E-06	Total Risk Across Sediment					6.4E-01
Surface Wate	Surface Water	Drainage Swales											
			Arsenic	3.5E-07		7.7E-08	4.2E-07	Arsenic	Skin	6.0E-03		1.4E-03	7.4E-03
			(Total)	3.5E-07	0.0E+00	7.7E-08	4.2E-07	(Total)		6.0E-03	0.0E+00	1.4E-03	7.4E-03
			Total Risk Across Surface Water				4.2E-07	Total Risk Across Surface Water					7.4E-03
Surface Soil	Surface Soil	Disposal area											
			Tetrachloroethene	2.7E-10	--	3.7E-10	6.4E-10	Tetrachloroethene	Liver	2.7E-10	--	5.6E-06	5.6E-06
			Benzo(a)anthracene	6.0E-08	--	3.6E-07	4.2E-07	Benzo(a)anthracene	N/A	6.0E-08	--	0.0E+00	6.0E-08
			Benzo(a)pyrene	4.5E-07	--	2.7E-06	3.1E-06	Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(b)fluoranthene	1.2E-07	--	6.9E-07	8.1E-07	Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Dibenz(a,h)anthracene	2.2E-07	--	1.3E-06	1.5E-06	Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Indeno(1,2,3-cd)pyrene	2.8E-08	--	1.7E-07	2.0E-07	Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Aluminum	0.0E+00	--	0.0E+00	0.0E+00	Aluminum	CNS	3.6E-03	--	1.7E-03	5.3E-03
			Antimony	0.0E+00	--	0.0E+00	0.0E+00	Antimony	Blood	7.1E-03	--	2.2E-02	2.9E-02
			Arsenic	6.3E-07	--	8.7E-07	1.5E-06	Arsenic	Skin	1.1E-02	--	1.5E-02	2.6E-02
			Chromium	0.0E+00	--	0.0E+00	0.0E+00	Chromium	NOAEL	3.4E-03	--	6.3E-02	6.6E-02
			Iron	0.0E+00	--	0.0E+00	0.0E+00	Iron	Gastrointestinal	2.8E-02	--	1.3E-02	4.1E-02
			Lead	0.0E+00	--	0.0E+00	0.0E+00	Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Manganese	0.0E+00	--	0.0E+00	0.0E+00	Manganese	CNS	5.8E-03	--	6.6E-02	7.2E-02
			Mercury (mercuric chloride)	0.0E+00	--	0.0E+00	0.0E+00	Mercury (mercuric chloride)	Nervous System	1.5E-02	--	9.6E-02	1.1E-01
			Silver	0.0E+00	--	0.0E+00	0.0E+00	Silver	Skin	4.7E-02	--	5.4E-01	5.9E-01
			Vanadium	0.0E+00	--	0.0E+00	0.0E+00	Vanadium	Kidney	1.6E-02	--	2.8E-01	2.9E-01
			(Total)	1.5E-06	0.0E+00	6.1E-06	7.6E-06	(Total)		1.4E-01	0.0E+00	1.1E+00	1.2E+00

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Air	Emissions from exposed soil at disposal area	Tetrachloroethene		3.1E-10		3.1E-10	Tetrachloroethene	Liver		1.7E-06		1.7E-06
			(Total)	--	3.1E-10	--	3.1E-10	(Total)	--	--	1.7E-06	--	1.7E-06
			Total Risk Across Surface Soil				7.6E-06	Total Risk Across Surface Soil					1.2E+00
			Total Risk Across All Media and All Exposure Routes				1.1E-05	Total Hazard Index Across All Media and All Exposure Routes					1.9E+00

Total Skin HI =	6.7E-01
Total Liver HI =	7.3E-06
Total CNS HI =	7.7E-02
Total Blood HI =	2.9E-02
Total Gastrointestinal HI =	1.3E-01
Total NAOEL HI =	6.6E-02
Total Nervous System HI =	1.1E-01
Total Kidney HI =	8.0E-01

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								1,1,2,2-Tetrachloroethane	Liver, Kidney	1.4E-03	--	1.5E-04	1.5E-03
								1,1,2-Trichloroethane	Blood	2.3E-02	--	1.8E-03	2.5E-02
								1,1-Dichloroethane	NOAEL	4.6E-02	--	3.0E-03	4.9E-02
								1,1-Dichloroethene	Liver	4.1E-01	--	4.7E-02	4.5E-01
								1,2-Dibromo-3-chloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								1,2-Dichloroethane	Liver	9.8E-01	--	3.8E-02	1.0E+00
								1,2-Dichloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Acetone	Liver, Kidney	1.8E-01	--	5.8E-04	1.9E-01
								Bromodichloromethane	Kidney	5.9E-03	--	3.9E-04	6.3E-03
								Bromomethane	Gastrointestinal	1.8E+01	--	4.6E-01	1.9E+01
								Carbon disulfide	Fetus	1.8E+00	--	2.8E-01	2.1E+00
								Carbon tetrachloride	Liver	1.1E+04	--	2.7E+03	1.4E+04
								Chloroethane	Fetus	1.8E-03	--	8.3E-05	1.9E-03
								Chloroform	Liver	1.6E+02	--	1.2E+01	1.7E+02
								Chloromethane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibromochloromethane	Liver	1.2E-01	--	5.8E-03	1.2E-01
								Tetrachloroethene	Liver	3.8E+00	--	2.2E+00	6.0E+00
								Toluene	Liver, Kidney	3.2E-02	--	1.0E-02	4.3E-02
								Trichloroethene	Liver, Kidney	3.1E+01	--	4.5E+00	3.5E+01
								Vinyl chloride	Liver	2.6E-01	--	1.1E-02	2.7E-01
								cis-1,2-Dichloroethene	Blood	4.0E+00	--	2.9E-01	4.3E+00
								trans-1,2-Dichloroethene	Blood	5.2E-01	--	3.8E-02	5.6E-01
								trans-1,3-Dichloropropene	Organs	4.4E-03	--	1.9E-04	4.6E-03
								Hexachloroethane	Kidney	2.9E-01	--	2.3E-01	5.2E-01
								Naphthalene	Decreased Body Weight	7.2E-03		4.5E-03	1.2E-02
								Pentachlorophenol	Fetus	3.7E-03	--	5.6E-02	6.0E-02
								bis(2-Ethylhexyl)phthalate	Liver/Reproductive	6.8E-03		1.3E-02	2.0E-02
								Cyanide	Whole body	3.2E+01		6.4E-02	3.2E+01
								Aluminum	CNS	7.4E-01	--	1.5E-03	7.4E-01
								Antimony	Blood	3.2E-01		6.5E-04	3.3E-01
								Arsenic	Skin	9.7E+00	--	1.9E-02	9.7E+00
								Barium	Cardiovascular	1.3E-01	--	3.7E-03	1.3E-01
								Beryllium	Gastrointestinal	9.4E-02	--	2.7E-02	1.2E-01
								Cadmium	Kidney	9.2E-02	--	7.3E-03	9.9E-02
								Chromium	NOAEL	2.1E-01	--	1.6E-02	2.2E-01
								Cobalt	Sensitizer	2.3E-01	--	4.7E-04	2.3E-01

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
								Iron	Gastrointestinal	9.1E+00	--	1.8E-02	9.1E+00
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Manganese	CNS	9.8E-01	--	4.9E-02	1.0E+00
								Nickel	Whole body	2.5E-01	--	1.3E-02	2.7E-01
								Thallium	Liver, Blood	8.3E-01	--	1.7E-03	8.3E-01
								Vanadium	Kidney	9.0E+00	--	6.9E-01	9.6E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.1E+04	0.0E+00	2.7E+03	1.4E+04
			Total Risk Across Tap water				0.0E+00			Total Risk Across Tap water			1.4E+04
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead											
			1,1,2,2-Tetrachloroethane	--	1.5E-06	--	1.5E-06	1,1,2,2-Tetrachloroethane	N/A	--	0.0E+00	--	0.0E+00
			1,1,2-Trichloroethane	--	1.1E-06	--	1.1E-06	1,1,2-Trichloroethane	N/A	--	0.0E+00	--	0.0E+00
			1,1-Dichloroethane	--	0.0E+00	--	0.0E+00	1,1-Dichloroethane	Kidney	--	5.3E-02	--	5.3E-02
			1,1-Dichloroethene	--	0.0E+00	--	0.0E+00	1,1-Dichloroethene	Liver	--	6.9E-01	--	6.9E-01
			1,2-Dibromo-3-chloropropane	--	9.5E-08	--	9.5E-08	1,2-Dibromo-3-chloropropane	Respiratory	--	2.0E+00	--	2.0E+00
			1,2-Dichloroethane	--	4.5E-04	--	4.5E-04	1,2-Dichloroethane	Liver, Kidney	--	1.0E+01	--	1.0E+01
			1,2-Dichloropropane	--	0.0E+00	--	0.0E+00	1,2-Dichloropropane	Nasal Mucosa	--	3.8E-02	--	3.8E-02
			Acetone	--	0.0E+00	--	0.0E+00	Acetone	N/A	--	0.0E+00	--	0.0E+00
			Bromodichloromethane	--	0.0E+00	--	0.0E+00	Bromodichloromethane	N/A	--	0.0E+00	--	0.0E+00
			Bromomethane	--	0.0E+00	--	0.0E+00	Bromomethane	Nose	--	3.9E+01	--	3.9E+01
			Carbon disulfide	--	0.0E+00	--	0.0E+00	Carbon disulfide	Nervous System	--	2.0E+00	--	2.0E+00
			Carbon tetrachloride	--	2.2E-01	--	2.2E-01	Carbon tetrachloride	Liver	--	2.4E+04	--	2.4E+04
			Chloroethane	--	0.0E+00	--	0.0E+00	Chloroethane	Fetus	--	6.1E-04	--	6.1E-04
			Chloroform	--	5.6E-02	--	5.6E-02	Chloroform	Liver, Kidney	--	1.5E+02	--	1.5E+02
			Chloromethane	--	5.2E-03	--	5.2E-03	Chloromethane	CNS	--	1.7E+02	--	1.7E+02
			Dibromochloromethane	--	0.0E+00	--	0.0E+00	Dibromochloromethane	N/A	--	0.0E+00	--	0.0E+00
			Tetrachloroethene	--	2.1E-04	--	2.1E-04	Tetrachloroethene	Liver	--	4.4E-01	--	4.4E-01
			Toluene	--	0.0E+00	--	0.0E+00	Toluene	Nervous System	--	9.9E-02	--	9.9E-02
			Trichloroethene	--	2.1E-03	--	2.1E-03	Trichloroethene	Liver, Kidney	--	1.5E+00	--	1.5E+00
			Vinyl chloride	--	1.9E-05	--	1.9E-05	Vinyl chloride	Liver	--	6.5E-02	--	6.5E-02
			cis-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00	cis-1,2-Dichloroethene	N/A	--	0.0E+00	--	0.0E+00
			trans-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00	trans-1,2-Dichloroethene	N/A	--	0.0E+00	--	0.0E+00
			trans-1,3-Dichloropropene	--	8.4E-07	--	8.4E-07	trans-1,3-Dichloropropene	Nose	--	4.3E-02	--	4.3E-02
			Naphthalene		0.0E+00		0.0E+00	Naphthalene	Respiratory		2.7E-01		2.7E-01
			(Total)	0.0E+00	2.8E-01	0.0E+00	2.8E-01	(Total)		0.0E+00	2.4E+04	0.0E+00	2.4E+04
			Total Risk Across Vapors at Showerhead				2.8E-01	Total Hazard Index Across Vapors at Showerhead					2.4E+04
			Total Risk Across Groundwater				2.8E-01	Total Hazard Index Across Groundwater					3.8E+04

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal area						Tetrachloroethene	Liver	4.5E-06	--	1.8E-06	6.3E-06
								Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Aluminum	CNS	5.7E-03	--	7.5E-04	6.5E-03
								Antimony	Blood	1.1E-02	--	9.9E-03	2.1E-02
								Arsenic	Skin	1.6E-02	--	6.5E-03	2.3E-02
								Chromium	NOAEL	5.6E-03	--	3.0E-02	3.5E-02
								Iron	Gastrointestinal	4.7E-02	--	6.3E-03	5.4E-02
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Manganese	CNS	1.7E-02	--	5.5E-02	7.1E-02
								Mercury (mercuric chloride)	Nervous System	2.6E-02	--	4.9E-02	7.4E-02
								Silver	Skin	4.9E-02	--	1.6E-01	2.1E-01
								Vanadium	Kidney	2.6E-02	--	1.3E-01	1.6E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.0E-01	0.0E+00	4.5E-01	6.5E-01
	Air	Emissions from exposed soil at disposal area						Tetrachloroethene	Liver		2.5E-05		2.5E-05
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		0.0E+00	2.5E-05	0.0E+00	2.5E-05
			Total Risk Across Soil				0.0E+00	Total Risk Across Soil					6.5E-01
			Total Risk Across All Media and All Exposure Routes				2.8E-01	Total Hazard Index Across All Media and All Exposure Routes					3.8E+04

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total

Total Blood HI =	6.0E+00
Total Body HI =	3.2E+01
Total Cardiovascular HI =	1.3E-01
Total Fetus HI =	2.2E+00
Total Gastrointestinal HI =	2.8E+01
Total Liver HI =	3.8E+04
Total NOAEL HI =	8.4E-02
Total Neural HI =	1.7E+02
Total Organs HI =	4.6E-03
Total Respiratory HI =	4.1E+01
Total Sensitizer HI =	2.3E-01
Total Skin HI =	9.9E+00
Total Decreased Body Weight HI =	1.2E-02
Total Reproductive HI =	2.0E-02
Total Nervous System HI =	7.4E-02
Total Kidney HI =	2.0E+02

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								1,1,2,2-Tetrachloroethane	Liver, Kidney	3.2E-03	--	3.3E-04	3.5E-03
								1,1,2-Trichloroethane	Blood	5.4E-02	--	4.1E-03	5.8E-02
								1,1-Dichloroethane	NOAEL	1.1E-01	--	6.7E-03	1.1E-01
								1,1-Dichloroethene	Liver	9.5E-01	--	1.1E-01	1.1E+00
								1,2-Dibromo-3-chloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								1,2-Dichloroethane	Liver	2.3E+00	--	8.5E-02	2.4E+00
								1,2-Dichloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Acetone	Liver, Kidney	4.3E-01	--	1.3E-03	4.3E-01
								Bromodichloromethane	Kidney	1.4E-02	--	8.9E-04	1.5E-02
								Bromomethane	Gastrointestinal	4.3E+01	--	1.0E+00	4.4E+01
								Carbon disulfide	Fetus	4.2E+00	--	6.3E-01	4.9E+00
								Carbon tetrachloride	Liver	2.6E+04	--	6.0E+03	3.2E+04
								Chloroethane	Fetus	4.2E-03	--	1.9E-04	4.4E-03
								Chloroform	Liver	3.7E+02	--	2.7E+01	3.9E+02
								Chloromethane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibromochloromethane	Liver	2.8E-01	--	2.9E-02	3.1E-01
								Tetrachloroethene	Liver	8.9E+00	--	4.9E+00	1.4E+01
								Toluene	Liver, Kidney	7.6E-02	--	2.3E-02	9.9E-02
								Trichloroethene	Liver, Kidney	7.2E+01	--	1.0E+01	8.2E+01
								Vinyl chloride	Liver	6.0E-01	--	2.4E-02	6.2E-01
								cis-1,2-Dichloroethene	Blood	9.3E+00	--	6.4E-01	9.9E+00
								trans-1,2-Dichloroethene	Blood	1.2E+00	--	8.5E-02	1.3E+00
								trans-1,3-Dichloropropene	Organs	1.0E-02	--	4.3E-04	1.1E-02
								Hexachloroethane	Kidney	6.8E-01	--	5.3E-01	1.2E+00
								Naphthalene	Decreased Body Weigh	1.7E-02		1.0E-02	2.7E-02
								Pentachlorophenol	Fetus	8.5E-03	--	1.3E-01	1.4E-01
								bis(2-Ethylhexyl)phthalate	Liver/Reproductive	1.6E-02		2.9E-02	4.5E-02
								Cyanide	Whole body	7.4E+01		1.8E-01	7.4E+01
								Aluminum	CNS	1.7E+00	--	4.3E-03	1.7E+00
								Antimony	Blood	7.6E-01		1.9E-03	7.6E-01
								Arsenic	Skin	2.3E+01	--	5.6E-02	2.3E+01
								Barium	Cardiovascular	3.0E-01	--	1.1E-02	3.1E-01
								Beryllium	Gastrointestinal	2.2E-01	--	7.8E-02	3.0E-01
								Cadmium	Kidney	2.1E-01	--	2.1E-02	2.3E-01
								Chromium	NOAEL	4.8E-01	--	4.7E-02	5.3E-01
								Cobalt	Sensitizer	5.5E-01	--	1.4E-03	5.5E-01

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
								Iron	Gastrointestinal	2.1E+01	--	5.2E-02	2.1E+01
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Manganese	CNS	2.3E+00	--	1.4E-01	2.4E+00
								Nickel	Whole body	5.9E-01	--	3.7E-02	6.3E-01
								Thallium	Liver, Blood	1.9E+00	--	4.8E-03	1.9E+00
								Vanadium	Kidney	2.1E+01	--	2.0E+00	2.3E+01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.7E+04	0.0E+00	6.0E+03	3.3E+04
			Total Risk Across Tap water				0.0E+00	Total Risk Across Tap water					3.3E+04
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.3E+04
Soil*	Soil*	Disposal area											
								Tetrachloroethene	Liver	4.2E-05	--	2.4E-06	4.4E-05
								Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Aluminum	CNS	5.3E-02	--	1.0E-03	5.4E-02
								Antimony	Blood	1.1E-01	--	1.3E-02	1.2E-01
								Arsenic	Skin	1.5E-01	--	8.6E-03	1.6E-01
								Chromium	NOAEL	5.3E-02	--	3.9E-02	9.2E-02
								Iron	Gastrointestinal	4.4E-01	--	8.3E-03	4.5E-01
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Manganese	CNS	1.5E-01	--	7.2E-02	2.3E-01
								Mercury (mercuric chloride)	Nervous System	2.4E-01	--	6.4E-02	3.0E-01
								Silver	Skin	4.5E-01	--	2.1E-01	6.7E-01
								Vanadium	Kidney	2.4E-01	--	1.7E-01	4.1E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.9E+00	0.0E+00	5.9E-01	2.5E+00
	Air	Emissions from exposed soil at disposal area	Tetrachloroethene	--	--	--	0.0E+00	Tetrachloroethene	Liver		7.1E-05		7.1E-05
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		0.0E+00	7.1E-05	0.0E+00	7.1E-05
			Total Risk Across Soil				0.0E+00	Total Risk Across Soil					2.5E+00
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.3E+04

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total

Total Blood HI =	1.4E+01
Total Body HI =	7.5E+01
Total Cardiovascular HI =	3.1E-01
Total Fetus HI =	5.0E+00
Total Gastrointestinal HI =	6.5E+01
Total Liver HI =	3.3E+04
Total NOAEL HI =	2.1E-01
Total Neural HI =	4.4E+00
Total Organs HI =	1.1E-02
Total Sensitizer HI =	5.5E-01
Total Reproductive HI =	4.5E-02
Total Decreased Body Weight HI =	2.7E-02
Total Skin HI =	2.3E+01
Total Nervous System HI =	3.0E-01
Total Kidney HI =	1.1E+02

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
			1,1,2,2-Tetrachloroethane	9.0E-06	--	6.4E-04	6.5E-04						
			1,1,2-Trichloroethane	2.9E-06	--	2.2E-07	3.1E-06						
			1,1-Dichloroethane	0.0E+00	--	0.0E+00	0.0E+00						
			1,1-Dichloroethene	0.0E+00	--	0.0E+00	0.0E+00						
			1,2-Dibromo-3-chloropropane	1.4E-04	--	2.8E-09	1.4E-04						
			1,2-Dichloroethane	9.7E-04	--	3.7E-05	1.0E-03						
			1,2-Dichloropropane	1.3E-06	--	1.1E-07	1.4E-06						
			Acetone	0.0E+00	--	0.0E+00	0.0E+00						
			Bromodichloromethane	4.0E-06	--	2.6E-07	4.2E-06						
			Bromomethane	0.0E+00	--	0.0E+00	0.0E+00						
			Carbon disulfide	0.0E+00	--	0.0E+00	0.0E+00						
			Carbon tetrachloride	4.3E-01	--	1.2E-01	5.5E-01						
			Chloroethane	1.1E-06	--	5.2E-08	1.2E-06						
			Chloroform	0.0E+00	--	0.0E+00	0.0E+00						
			Chloromethane	1.1E-02	--	2.5E-04	1.2E-02						
			Dibromochloromethane	1.1E-04	--	2.5E-09	1.1E-04						
			Tetrachloroethene	1.1E-03	--	6.0E-04	1.7E-03						
			Toluene	0.0E+00	--	0.0E+00	0.0E+00						
			Trichloroethene	2.0E-03	--	2.9E-04	2.3E-03						
			Vinyl chloride	5.9E-04	--	2.4E-05	6.1E-04						
			cis-1,2-Dichloroethene	0.0E+00	--	0.0E+00	0.0E+00						
			trans-1,2-Dichloroethene	0.0E+00	--	0.0E+00	0.0E+00						
			trans-1,3-Dichloropropene	7.2E-06	--	3.1E-07	7.5E-06						
			Hexachloroethane	2.2E-06	--	1.8E-06	4.0E-06						
			Naphthalene	0.0E+00		0.0E+00	0.0E+00						
			Pentachlorophenol	7.2E-06	--	1.1E-04	1.2E-04						
			bis(2-Ethylhexyl)phthalate	1.0E-06		4.2E-10	1.0E-06						
			Cyanide	0.0E+00		0.0E+00	0.0E+00						
			Aluminum	0.0E+00	--	0.0E+00	0.0E+00						
			Antimony	0.0E+00		0.0E+00	0.0E+00						
			Arsenic	2.4E-03	--	5.1E-06	2.4E-03						
			Barium	0.0E+00	--	0.0E+00	0.0E+00						
			Beryllium	0.0E+00	--	0.0E+00	0.0E+00						
			Cadmium	0.0E+00	--	0.0E+00	0.0E+00						
			Chromium	0.0E+00	--	0.0E+00	0.0E+00						
			Cobalt	0.0E+00	--	0.0E+00	0.0E+00						
			Iron	0.0E+00	--	0.0E+00	0.0E+00						
			Lead	0.0E+00	--	0.0E+00	0.0E+00						
			Manganese	0.0E+00	--	0.0E+00	0.0E+00						

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
			Nickel	0.0E+00	--	0.0E+00	0.0E+00						
			Thallium	0.0E+00	--	0.0E+00	0.0E+00						
			Vanadium	0.0E+00	--	0.0E+00	0.0E+00						
			(Total)	4.5E-01	0.0E+00	1.2E-01	5.7E-01						
			Total Risk Across Tap water				5.7E-01	Total Risk Across Tap water					0.0E+00
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead											
			1,1,2,2-Tetrachloroethane	--	1.5E-06	--	1.5E-06						
			1,1,2-Trichloroethane	--	1.1E-06	--	1.1E-06						
			1,1-Dichloroethane	--	0.0E+00	--	0.0E+00						
			1,1-Dichloroethene	--	0.0E+00	--	0.0E+00						
			1,2-Dibromo-3-chloropropane	--	9.5E-08	--	9.5E-08						
			1,2-Dichloroethane	--	4.5E-04	--	4.5E-04						
			1,2-Dichloropropane	--	0.0E+00	--	0.0E+00						
			Acetone	--	0.0E+00	--	0.0E+00						
			Bromodichloromethane	--	0.0E+00	--	0.0E+00						
			Bromomethane	--	0.0E+00	--	0.0E+00						
			Carbon disulfide	--	0.0E+00	--	0.0E+00						
			Carbon tetrachloride	--	2.2E-01	--	2.2E-01						
			Chloroethane	--	0.0E+00	--	0.0E+00						
			Chloroform	--	5.6E-02	--	5.6E-02						
			Chloromethane	--	5.2E-03	--	5.2E-03						
			Dibromochloromethane	--	0.0E+00	--	0.0E+00						
			Tetrachloroethene	--	2.1E-04	--	2.1E-04						
			Toluene	--	0.0E+00	--	0.0E+00						
			Trichloroethene	--	2.1E-03	--	2.1E-03						
			Vinyl chloride	--	1.9E-05	--	1.9E-05						
			cis-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00						
			trans-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00						
			trans-1,3-Dichloropropene	--	8.4E-07	--	8.4E-07						
			Naphthalene		0.0E+00		0.0E+00						
			(Total)	4.5E-01	2.8E-01	1.2E-01	2.8E-01	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				2.8E-01	Total Hazard Index Across Vapors at Showerhead					0.0E+00
	All Media		Total Risk Across Groundwater				8.5E-01	Total Hazard Index Across Groundwater					0.0E+00

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal area											
			Tetrachloroethene	2.7E-09	--	4.2E-10	3.1E-09			--	--	--	0.0E+00
			Benzo(a)anthracene	6.9E-07	--	4.7E-07	1.2E-06			--	--	--	0.0E+00
			Benzo(a)pyrene	5.6E-06	--	3.8E-06	9.5E-06			--	--	--	0.0E+00
			Benzo(b)fluoranthene	1.2E-06	--	7.9E-07	2.0E-06			--	--	--	0.0E+00
			Dibenz(a,h)anthracene	3.3E-06	--	2.2E-06	5.5E-06			--	--	--	0.0E+00
			Indeno(1,2,3-cd)pyrene	4.0E-07	--	2.7E-07	6.7E-07			--	--	--	0.0E+00
			Aluminum	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Antimony	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Arsenic	8.4E-06	--	1.3E-06	9.7E-06			--	--	--	0.0E+00
			Chromium	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Iron	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Lead	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Manganese	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Mercury (mercuric chloride)	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Silver	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			Vanadium	0.0E+00	--	0.0E+00	0.0E+00			--	--	--	0.0E+00
			(Total)	2.0E-05	0.0E+00	9.0E-06	2.9E-05	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Air	Emissions from exposed soil at disposal area	Tetrachloroethene	--	2.1E-08	--	2.1E-08			--	--	--	0.0E+00
			(Total)	0.0E+00	2.1E-08	0.0E+00	2.1E-08	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
						Total Risk Across Soil	2.9E-05					Total Risk Across Soil	0.0E+00
						Total Risk Across All Media and All Exposure Routes	8.5E-01					Total Hazard Index Across All Media and All Exposure Routes	0.0E+00

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer-Shallow groundwater beneath disposal area											
			1,1,2,2-Tetrachloroethane	--	--	4.4E-08	4.4E-08	1,1,2,2-Tetrachloroethane	Liver, Kidney	--	--	2.6E-04	2.6E-04
			1,1,2-Trichloroethane	--	--	1.2E-08	1.2E-08	1,1,2-Trichloroethane	Blood	--	--	3.8E-04	3.8E-04
			1,1-Dichloroethane	--	--	0.0E+00	0.0E+00	1,1-Dichloroethane	NOAEL	--	--	7.6E-04	7.6E-04
			1,1-Dichloroethene	--	--	0.0E+00	0.0E+00	1,1-Dichloroethene	Liver	--	--	1.2E-01	1.2E-01
			1,2-Dibromo-3-chloropropane	--	--	5.1E-07	5.1E-07	1,2-Dibromo-3-chloropropane	N/A	--	--	0.0E+00	0.0E+00
			1,2-Dichloroethane	--	--	2.5E-06	2.5E-06	1,2-Dichloroethane	Liver	--	--	9.7E-02	9.7E-02
			1,2-Dichloropropane	--	--	6.5E-09	6.5E-09	1,2-Dichloropropane	N/A	--	--	0.0E+00	0.0E+00
			Acetone	--	--	0.0E+00	0.0E+00	Acetone	Liver, Kidney	--	--	1.7E-03	1.7E-03
			Bromodichloromethane	--	--	1.3E-08	1.3E-08	Bromodichloromethane	Kidney	--	--	7.1E-04	7.1E-04
			Bromomethane	--	--	0.0E+00	0.0E+00	Bromomethane	Gastrointestinal	--	--	1.2E+00	1.2E+00
			Carbon disulfide	--	--	0.0E+00	0.0E+00	Carbon disulfide	Fetus	--	--	7.9E-01	7.9E-01
			Carbon tetrachloride	--	--	6.3E-03	6.3E-03	Carbon tetrachloride	Liver	--	--	4.9E+03	4.9E+03
			Chloroethane	--	--	4.3E-09	4.3E-09	Chloroethane	Fetus	--	--	2.6E-04	2.6E-04
			Chloroform	--	--	0.0E+00	0.0E+00	Chloroform	Liver	--	--	2.7E+01	2.7E+01
			Chloromethane	--	--	2.3E-05	2.3E-05	Chloromethane	N/A	--	--	0.0E+00	0.0E+00
			Dibromochloromethane	--	--	7.4E-06	7.4E-06	Dibromochloromethane	Liver	--	--	1.8E-03	1.8E-03
			Tetrachloroethene	--	--	2.6E-05	2.6E-05	Tetrachloroethene	Liver	--	--	3.5E-01	3.5E-01
			Toluene	--	--	0.0E+00	0.0E+00	Toluene	Liver, Kidney	--	--	2.6E-03	2.6E-03
			Trichloroethene	--	--	1.6E-05	1.6E-05	Trichloroethene	Liver, Kidney	--	--	9.5E+00	9.5E+00
			Vinyl chloride	--	--	2.0E-06	2.0E-06	Vinyl chloride	Liver	--	--	3.4E-02	3.4E-02
			cis-1,2-Dichloroethene	--	--	0.0E+00	0.0E+00	cis-1,2-Dichloroethene	Blood	--	--	7.4E-02	7.4E-02
			trans-1,2-Dichloroethene	--	--	0.0E+00	0.0E+00	trans-1,2-Dichloroethene	Blood	--	--	9.7E-03	9.7E-03
			trans-1,3-Dichloropropene	--	--	2.0E-08	2.0E-08	trans-1,3-Dichloropropene	Organs	--	--	4.6E-05	4.6E-05
			Hexachloroethane	--	--	6.3E-08	6.3E-08	Hexachloroethane	Kidney	--	--	3.2E-02	3.2E-02
			Naphthalene	--	--	0.0E+00	0.0E+00	Naphthalene	Decreased Body Weigh	--	--	6.1E-03	6.1E-03
			Pentachlorophenol	--	--	2.0E-05	2.0E-05	Pentachlorophenol	Fetus	--	--	7.7E-02	7.7E-02
			bis(2-Ethylhexyl)phthalate	--	--	1.2E-06	1.2E-06	bis(2-Ethylhexyl)phthalate	Liver/Reproductive	--	--	1.8E-02	1.8E-02
			Aluminum	--	--	0.0E+00	0.0E+00	Aluminum	CNS	--	--	1.2E-02	1.2E-02
			Arsenic	--	--	1.1E-06	1.1E-06	Arsenic	Skin	--	--	1.7E-01	1.7E-01
			Barium	--	--	0.0E+00	0.0E+00	Barium	Cardiovascular	--	--	3.3E-02	3.3E-02
			Beryllium	--	--	0.0E+00	0.0E+00	Beryllium	Gastrointestinal	--	--	8.2E-02	8.2E-02
			Cadmium	--	--	0.0E+00	0.0E+00	Cadmium	Kidney	--	--	7.0E-02	7.0E-02
			Chromium	--	--	0.0E+00	0.0E+00	Chromium	NOAEL	--	--	2.7E-02	2.7E-02
			Cobalt	--	--	0.0E+00	0.0E+00	Cobalt	Sensitizer	--	--	3.8E-03	3.8E-03
			Cyanide	--	--	0.0E+00	0.0E+00	Cyanide	Whole body	--	--	5.4E-01	5.4E-01

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
			Iron	--	--	0.0E+00	0.0E+00	Iron	Gastrointestinal	--	--	8.2E-02	8.2E-02
			Lead	--	--	0.0E+00	0.0E+00	Lead	N/A	--	--	0.0E+00	0.0E+00
			Manganese	--	--	0.0E+00	0.0E+00	Manganese	CNS	--	--	3.5E-01	3.5E-01
			Nickel	--	--	0.0E+00	0.0E+00	Nickel	Whole body	--	--	7.9E-02	7.9E-02
			Thallium	--	--	0.0E+00	0.0E+00	Thallium	Liver, Blood	--	--	2.5E-02	2.5E-02
			Vanadium	--	--	0.0E+00	0.0E+00	Vanadium	Kidney	--	--	1.6E+00	1.6E+00
			(Total)	0.0E+00	0.0E+00	6.4E-03	6.4E-03	(Total)		0.0E+00	0.0E+00	4.9E+03	4.9E+03
			Total Risk Across Shallow Groundwater Beneath Disposal Area				6.4E-03	Total Risk Across Shallow Groundwater Beneath Disposal Area					4.9E+03
Groundwater	Air	Upper Aquifer-Volatilization from open excavation											
			1,1,2,2-Tetrachloroethane	--	1.3E-11	--	1.3E-11	1,1,2,2-Tetrachloroethane	N/A	--	0.0E+00	--	0.0E+00
			1,1,2-Trichloroethane	--	4.6E-12	--	4.6E-12	1,1,2-Trichloroethane	N/A	--	0.0E+00	--	0.0E+00
			1,1-Dichloroethane	--	0.0E+00	--	0.0E+00	1,1-Dichloroethane	Kidney	--	2.3E-07	--	2.3E-07
			1,1-Dichloroethene	--	0.0E+00	--	0.0E+00	1,1-Dichloroethene	Liver	--	2.4E-05	--	2.4E-05
			1,2-Dibromo-3-chloropropane	--	3.5E-13	--	3.5E-13	1,2-Dibromo-3-chloropropane	Respiratory	--	1.8E-04	--	1.8E-04
			1,2-Dichloroethane	--	1.7E-09	--	1.7E-09	1,2-Dichloroethane	Liver, Kidney	--	9.3E-07	--	9.3E-07
			1,2-Dichloropropane	--	0.0E+00	--	0.0E+00	1,2-Dichloropropane	Nasal Mucosa	--	6.4E-10	--	6.4E-10
			Acetone	--	0.0E+00	--	0.0E+00	Acetone	N/A	--	0.0E+00	--	0.0E+00
			Bromodichloromethane	--	0.0E+00	--	0.0E+00	Bromodichloromethane	N/A	--	0.0E+00	--	0.0E+00
			Bromomethane	--	0.0E+00	--	0.0E+00	Bromomethane	Nose	--	1.3E-06	--	1.3E-06
			Carbon disulfide	--	0.0E+00	--	0.0E+00	Carbon disulfide	Nervous System	--	6.7E-08	--	6.7E-08
			Carbon tetrachloride	--	3.7E-07	--	3.7E-07	Carbon tetrachloride	Liver	--	8.5E-04	--	8.5E-04
			Chloroethane	--	0.0E+00	--	0.0E+00	Chloroethane	Fetus	--	1.9E-11	--	1.9E-11
			Chloroform	--	1.2E-07	--	1.2E-07	Chloroform	Liver, Kidney	--	7.4E-06	--	7.4E-06
			Chloromethane	--	6.6E-09	--	6.6E-09	Chloromethane	N/A	--	5.1E-06	--	5.1E-06
			Dibromochloromethane	--	0.0E+00	--	0.0E+00	Dibromochloromethane	N/A	--	0.0E+00	--	0.0E+00
			Tetrachloroethene	--	3.3E-10	--	3.3E-10	Tetrachloroethene	Liver	--	1.7E-08	--	1.7E-08
			Toluene	--	0.0E+00	--	0.0E+00	Toluene	Nervous System	--	4.0E-09	--	4.0E-09
			Trichloroethene	--	3.4E-09	--	3.4E-09	Trichloroethene	Liver, Kidney	--	6.0E-08	--	6.0E-08
			Vinyl chloride	--	2.6E-11	--	2.6E-11	Vinyl chloride	Liver	--	2.1E-09	--	2.1E-09
			cis-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00	cis-1,2-Dichloroethene	N/A	--	0.0E+00	--	0.0E+00
			trans-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00	trans-1,2-Dichloroethene	N/A	--	0.0E+00	--	0.0E+00
			trans-1,3-Dichloropropene	--	1.3E-12	--	1.3E-12	trans-1,3-Dichloropropene	Nose	--	1.6E-09	--	1.6E-09
			Naphthalene		0.0E+00		0.0E+00	Naphthalene	Respiratory		9.6E-09		9.6E-09
			(Total)	0.0E+00	5.0E-07	0.0E+00	5.0E-07	(Total)		0.0E+00	1.1E-03	0.0E+00	1.1E-03
			Total Risk Across Volatilization from Open Excavation				5.0E-07	Total Risk Across Volatilization from Open Excavation					1.1E-03
			Total Risk Across Groundwater				6.4E-03	Total Hazard Index Across Groundwater					4.9E+03

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal area											
			Tetrachloroethene	5.7E-11	--	1.9E-11	7.6E-11	Tetrachloroethene	Liver	7.7E-07	--	2.6E-07	1.0E-06
			Benzo(a)anthracene	1.5E-08	--	2.1E-08	3.6E-08	Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(a)pyrene	1.2E-07	--	1.7E-07	2.9E-07	Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(b)fluoranthene	2.5E-08	--	3.6E-08	6.1E-08	Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Dibenz(a,h)anthracene	7.0E-08	--	1.0E-07	1.7E-07	Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Indeno(1,2,3-cd)pyrene	8.6E-09	--	1.2E-08	2.1E-08	Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Aluminum	0.0E+00	--	0.0E+00	0.0E+00	Aluminum	CNS	9.8E-03	--	1.1E-03	1.1E-02
			Antimony	0.0E+00	--	0.0E+00	0.0E+00	Antimony	Blood	1.9E-02	--	1.4E-02	3.3E-02
			Arsenic	1.8E-07	--	6.0E-08	2.4E-07	Arsenic	Skin	2.8E-02	--	9.3E-03	3.7E-02
			Chromium	0.0E+00	--	0.0E+00	0.0E+00	Chromium	NOAEL	1.5E-03	--	6.4E-03	7.9E-03
			Iron	0.0E+00	--	0.0E+00	0.0E+00	Iron	Gastrointestinal	8.1E-02	--	9.0E-03	9.0E-02
			Lead	0.0E+00	--	0.0E+00	0.0E+00	Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Manganese	0.0E+00	--	0.0E+00	0.0E+00	Manganese	CNS	2.8E-02	--	7.9E-02	1.1E-01
			Mercury (mercuric chloride)	0.0E+00	--	0.0E+00	0.0E+00	Mercury (mercuric chloride)	Nervous System	4.4E-02	--	7.0E-02	1.1E-01
			Silver	0.0E+00	--	0.0E+00	0.0E+00	Silver	Skin	8.4E-02	--	2.3E-01	3.1E-01
			Vanadium	0.0E+00	--	0.0E+00	0.0E+00	Vanadium	Kidney	4.4E-02	--	1.9E-01	2.3E-01
			(Total)	4.2E-07	0.0E+00	4.0E-07	8.2E-07	(Total)		3.4E-01	0.0E+00	6.1E-01	9.5E-01
	Air	Emissions from exposed soil at disposal area											
			Tetrachloroethene		1.2E-10		1.2E-10	Tetrachloroethene	Liver		6.2E-06		6.2E-06
			(Total)	0.0E+00	1.2E-10	0.0E+00	1.2E-10	(Total)		0.0E+00	6.2E-06	0.0E+00	6.2E-06
			Total Risk Across Soil				8.2E-07	Total Risk Across Soil					9.5E-01
Concrete	Concrete	Concrete troughs											
			Arsenic	2.54E-08		8.40E-09	3.4E-08	Arsenic	Skin	3.95E-03		1.31E-03	5.3E-03
			Lead	N/A	--	N/A	0.0E+00	Lead	N/A	N/A	--	N/A	0.0E+00
			(Total)	2.5E-08	0.0E+00	8.4E-09	3.4E-08	(Total)		3.9E-03	0.0E+00	1.3E-03	5.3E-03
			Total Risk Across Concrete				3.4E-08	Total Risk Across Concrete					5.3E-03
			Total Risk Across All Media and All Exposure Routes				6.4E-03	Total Hazard Index Across All Media and All Exposure Routes					4.9E+03

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total

Total Blood HI =	1.4E-01
Total Body HI =	6.2E-01
Total Cardiovascular HI =	3.3E-02
Total Fetus HI =	8.6E-01
Total Gastrointestinal HI =	1.4E+00
Total Kidney HI =	1.1E+01
Total Liver HI =	4.9E+03
Total NOAEL HI =	3.5E-02
Total Neural HI =	4.7E-01
Total Organs HI =	4.6E-05
Total Respiratory HI =	1.8E-04
Total Sensitizer HI =	3.8E-03
Total Skin HI =	5.3E-01
Total Decreased Body Weight HI =	6.1E-03
Total Reproductive HI =	1.8E-02
Total CNS HI =	4.8E-01
Total Nervous System HI =	1.1E-01

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal Area											
			Tetrachloroethene	6.0E-10	--	9.5E-10	1.5E-09	Tetrachloroethene	Liver	3.2E-06	--	5.1E-06	8.3E-06
			Benzo(a)anthracene	1.5E-07	--	1.1E-06	1.2E-06	Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(a)pyrene	1.3E-06	--	8.6E-06	9.9E-06	Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(b)fluoranthene	2.6E-07	--	1.8E-06	2.0E-06	Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Dibenz(a,h)anthracene	7.3E-07	--	5.0E-06	5.8E-06	Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Indeno(1,2,3-cd)pyrene	8.9E-08	--	6.2E-07	7.0E-07	Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Aluminum	0.0E+00	--	0.0E+00	0.0E+00	Aluminum	CNS	4.1E-03	--	2.2E-03	6.2E-03
			Antimony	0.0E+00	--	0.0E+00	0.0E+00	Antimony	Blood	8.0E-03	--	2.8E-02	3.6E-02
			Arsenic	1.9E-06	--	3.0E-06	4.9E-06	Arsenic	Skin	1.2E-02	--	1.9E-02	3.0E-02
			Chromium	0.0E+00	--	0.0E+00	0.0E+00	Chromium	NOAEL	4.0E-03	--	8.5E-02	8.9E-02
			Iron	0.0E+00	--	0.0E+00	0.0E+00	Iron	Gastrointestinal	3.4E-02	--	1.8E-02	5.2E-02
			Lead	0.0E+00	--	0.0E+00	0.0E+00	Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Manganese	0.0E+00	--	0.0E+00	0.0E+00	Manganese	CNS	1.2E-02	--	1.6E-01	1.7E-01
			Mercury (mercuric chloride)	0.0E+00	--	0.0E+00	0.0E+00	Mercury (mercuric chloride)	Nervous System	1.8E-02	--	1.4E-01	1.6E-01
			Silver	0.0E+00	--	0.0E+00	0.0E+00	Silver	Skin	3.5E-02	--	4.6E-01	5.0E-01
			Vanadium	0.0E+00	--	0.0E+00	0.0E+00	Vanadium	Kidney	1.8E-02	--	3.7E-01	3.9E-01
			(Total)	4.4E-06	0.0E+00	2.0E-05	2.4E-05	(Total)		1.5E-01	0.0E+00	1.3E+00	1.4E+00
	Air	Emissions from exposed soil at disposal area											
			Tetrachloroethene	--	9.1E-09	--	9.1E-09	Tetrachloroethene	Liver	--	1.8E-05	--	1.8E-05
			(Total)	0.0E+00	9.1E-09	0.0E+00	9.1E-09	(Total)		0.0E+00	1.8E-05	0.0E+00	1.8E-05
			Total Risk Across Soil				2.4E-05	Total Risk Across Soil					1.4E+00
Total Risk Across All Media and All Exposure Routes							2.4E-05	Total Hazard Index Across All Media and All Exposure Routes					1.4E+00

Total Skin HI =	5.3E-01
Total Liver HI =	2.7E-05
Total CNS HI =	1.8E-01
Total Blood HI =	3.6E-02
Total Gastrointestinal HI =	5.2E-02
Total NAOEL HI =	8.9E-02
Total Nervous System HI =	1.6E-01
Total Kidney HI =	3.9E-01

TABLE 9.9.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Surface Soil	Surface Soil	Disposal Area											
				--	--	--	0.0E+00	Tetrachloroethene	Liver	1.25E-07	--	5.54E-08	1.8E-07
				--	--	--	0.0E+00	Benzo(a)anthracene	N/A	0.00E+00	--	0.00E+00	0.0E+00
				--	--	--	0.0E+00	Benzo(a)pyrene	N/A	0.00E+00	--	0.00E+00	0.0E+00
				--	--	--	0.0E+00	Benzo(b)fluoranthene	N/A	0.00E+00	--	0.00E+00	0.0E+00
				--	--	--	0.0E+00	Dibenz(a,h)anthracene	N/A	0.00E+00	--	0.00E+00	0.0E+00
				--	--	--	0.0E+00	Indeno(1,2,3-cd)pyrene	N/A	0.00E+00	--	0.00E+00	0.0E+00
				--	--	--	0.0E+00	Aluminum	CNS	6.30E-04	--	9.32E-05	7.2E-04
				--	--	--	0.0E+00	Antimony	Blood	4.92E-04	--	4.85E-04	9.8E-04
				--	--	--	0.0E+00	Arsenic	Skin	1.06E-03	--	4.71E-04	1.5E-03
				--	--	--	0.0E+00	Chromium	NOAEL	5.76E-04	--	3.41E-03	4.0E-03
				--	--	--	0.0E+00	Iron	Gastrointestinal	3.92E-03	--	5.80E-04	4.5E-03
				--	--	--	0.0E+00	Lead	N/A	0.00E+00	--	0.00E+00	0.0E+00
				--	--	--	0.0E+00	Manganese	CNS	1.20E-03	--	4.43E-03	5.6E-03
				--	--	--	0.0E+00	Mercury (mercuric chloride)	Nervous System	3.41E-04	--	7.21E-04	1.1E-03
				--	--	--	0.0E+00	Silver	Skin	1.52E-04	--	5.61E-04	7.1E-04
				--	--	--	0.0E+00	Vanadium	Kidney	2.11E-03	--	1.20E-02	1.4E-02
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.0E-02	0.0E+00	2.3E-02	3.3E-02
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					3.3E-02
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.3E-02
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.3E-02

Total Blood HI =	9.8E-04
Total Gastrointestinal HI =	4.5E-03
Total Liver HI =	1.8E-07
Total NOAEL HI =	4.0E-03
Total Skin HI =	2.2E-03
Total CNS HI =	7.4E-03
Total Kidney HI =	1.4E-02

TABLE 9.10.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								1,1,2,2-Tetrachloroethane	Liver, Kidney	2.2E-04	--	3.0E-05	2.5E-04
								1,1,2-Trichloroethane	Blood	3.2E-03	--	3.2E-04	3.5E-03
								1,1-Dichloroethane	NOAEL	1.6E-04	--	1.4E-05	1.8E-04
								1,1-Dichloroethene	Liver	4.2E-04	--	6.2E-05	4.8E-04
								1,2-Dibromo-3-chloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								1,2-Dichloroethane	Liver	1.7E-03	--	8.4E-05	1.8E-03
								1,2-Dichloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Acetone	Liver, Kidney	2.4E-04	--	9.8E-07	2.4E-04
								Bromodichloromethane	Kidney	2.7E-04	--	2.3E-05	2.9E-04
								Bromomethane	Gastrointestinal	1.2E-02	--	3.7E-04	1.2E-02
								Carbon disulfide	Fetus	3.6E-04	--	7.1E-05	4.3E-04
								Carbon tetrachloride	Liver	2.0E-01	--	6.1E-02	2.6E-01
								Chloroethane	Fetus	3.6E-05	--	2.1E-06	3.8E-05
								Chloroform	Liver	1.5E-02	--	1.4E-03	1.6E-02
								Chloromethane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibromochloromethane	Liver	7.4E-04	--	1.8E-03	2.6E-03
								Tetrachloroethene	Liver	5.1E-03	--	3.7E-03	8.7E-03
								Toluene	Liver, Kidney	8.1E-05	--	3.3E-05	1.1E-04
								Trichloroethene	Liver, Kidney	1.9E-01	--	3.5E-02	2.2E-01
								Vinyl chloride	N/A	5.1E-03	--	2.7E-04	5.4E-03
								cis-1,2-Dichloroethene	Blood	4.4E-03	--	4.0E-04	4.8E-03
								trans-1,2-Dichloroethene	Blood	9.0E-04	--	8.3E-05	9.8E-04
								trans-1,3-Dichloropropene	Organs	4.3E-04	--	2.5E-05	4.6E-04
								Hexachloroethane	Kidney	7.7E-02	--	8.0E-02	1.6E-01
								Naphthalene	Decreased Body Weigh	3.1E-03	--	6.2E-02	6.5E-02
								Pentachlorophenol	Fetus	1.7E-03	--	3.4E-02	3.6E-02
								bis(2-Ethylhexyl)phthalate	Liver/Reproductive	2.7E-03	--	1.8E-03	4.5E-03
								Cyanide	Whole body	4.6E-02	--	1.2E-04	4.7E-02
								Aluminum	CNS	6.6E-03	--	1.7E-05	6.7E-03
								Antimony	Blood	8.7E-02	--	2.2E-04	8.7E-02
								Arsenic	Skin	3.0E-01	--	7.7E-04	3.0E-01
								Barium	Cardiovascular	1.5E-02	--	5.3E-04	1.5E-02
								Beryllium	Gastrointestinal	2.0E-03	--	7.5E-04	2.8E-03
								Cadmium	Kidney	1.0E-02	--	1.1E-03	1.2E-02
								Chromium	NOAEL	9.0E-03	--	9.2E-04	9.9E-03
								Cobalt	Sensitizer	1.2E-02	--	3.2E-05	1.2E-02
								Iron	Gastrointestinal	1.5E-01	--	3.7E-04	1.5E-01
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00

TABLE 9.10.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
								Manganese	CNS	1.1E-01	--	7.1E-03	1.2E-01
								Nickel	Whole body	8.2E-03	--	5.3E-04	8.7E-03
								Thallium	Liver, Blood	2.8E-01	--	7.2E-04	2.8E-01
								Vanadium	Kidney	6.3E-02	--	6.3E-03	7.0E-02
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.6E+00	0.0E+00	3.0E-01	1.9E+00
			Total Risk Across Tap water				0.0E+00	Total Risk Across Tap water					1.9E+00
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead											
			1,1,2,2-Tetrachloroethane	--	1.3E-07	--	1.3E-07	1,1,2,2-Tetrachloroethane	N/A	--	0.0E+00	--	0.0E+00
			1,1,2-Trichloroethane	--	8.1E-08	--	8.1E-08	1,1,2-Trichloroethane	N/A	--	0.0E+00	--	0.0E+00
			1,1-Dichloroethane	--	0.0E+00	--	0.0E+00	1,1-Dichloroethane	Kidney	--	1.0E-04	--	1.0E-04
			1,1-Dichloroethene	--	0.0E+00	--	0.0E+00	1,1-Dichloroethene	Liver	--	3.8E-04	--	3.8E-04
			1,2-Dibromo-3-chloropropane	--	9.9E-09	--	9.9E-09	1,2-Dibromo-3-chloropropane	Respiratory	--	2.1E-01	--	2.1E-01
			1,2-Dichloroethane	--	4.2E-07	--	4.2E-07	1,2-Dichloroethane	Liver, Kidney	--	9.5E-03	--	9.5E-03
			1,2-Dichloropropane	--	0.0E+00	--	0.0E+00	1,2-Dichloropropane	Nasal Mucosa	--	7.1E-03	--	7.1E-03
			Acetone	--	0.0E+00	--	0.0E+00	Acetone	N/A	--	0.0E+00	--	0.0E+00
			Bromodichloromethane	--	0.0E+00	--	0.0E+00	Bromodichloromethane	N/A	--	0.0E+00	--	0.0E+00
			Bromomethane	--	0.0E+00	--	0.0E+00	Bromomethane	Nose	--	1.3E-02	--	1.3E-02
			Carbon disulfide	--	0.0E+00	--	0.0E+00	Carbon disulfide	Nervous System	--	2.1E-04	--	2.1E-04
			Carbon tetrachloride	--	2.3E-06	--	2.3E-06	Carbon tetrachloride	Liver	--	2.3E-01	--	2.3E-01
			Chloroethane	--	0.0E+00	--	0.0E+00	Chloroethane	Fetus	--	6.5E-06	--	6.5E-06
			Chloroform	--	2.9E-06	--	2.9E-06	Chloroform	Liver, Kidney	--	1.2E+00	--	1.2E+00
			Chloromethane	--	2.8E-08	--	2.8E-08	Chloromethane	N/A	--	8.8E-04	--	8.8E-04
			Dibromochloromethane	--	0.0E+00	--	0.0E+00	Dibromochloromethane	N/A	--	0.0E+00	--	0.0E+00
			Tetrachloroethene	--	1.5E-07	--	1.5E-07	Tetrachloroethene	Liver	--	2.2E-04	--	2.2E-04
			Toluene	--	0.0E+00	--	0.0E+00	Toluene	Nervous System	--	1.1E-03	--	1.1E-03
			Trichloroethene	--	6.7E-06	--	6.7E-06	Trichloroethene	Liver, Kidney	--	1.2E-03	--	1.2E-03
			Vinyl chloride	--	2.0E-07	--	2.0E-07	Vinyl chloride	N/A	--	6.6E-03	--	6.6E-03
			cis-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00	cis-1,2-Dichloroethene	N/A	--	0.0E+00	--	0.0E+00
			trans-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00	trans-1,2-Dichloroethene	N/A	--	0.0E+00	--	0.0E+00
			trans-1,3-Dichloropropene	--	4.5E-08	--	4.5E-08	trans-1,3-Dichloropropene	Nose	--	2.3E-03	--	2.3E-03
			Naphthalene		0.0E+00		0.0E+00	Naphthalene	Respiratory		6.3E-02		6.3E-02
			(Total)	0.0E+00	1.3E-05	0.0E+00	1.3E-05	(Total)		0.0E+00	1.7E+00	0.0E+00	1.7E+00
			Total Risk Across Vapors at Showerhead				1.3E-05	Total Hazard Index Across Vapors at Showerhead					1.7E+00
			Total Risk Across Groundwater				1.3E-05	Total Hazard Index Across Groundwater					3.7E+00
			Total Risk Across All Media and All Exposure Routes				1.3E-05	Total Hazard Index Across All Media and All Exposure Routes					3.7E+00

TABLE 9.10.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total

Total Blood HI =	3.8E-01
Total Body HI =	5.5E-02
Total Cardiovascular HI =	1.5E-02
Total Fetus HI =	3.6E-02
Total Gastrointestinal HI =	1.6E-01
Total Kidney HI =	1.7E+00
Total Liver HI =	2.2E+00
Total NOAEL HI =	1.8E-04
Total Neural HI =	1.3E-01
Total Organs HI =	4.6E-04
Total Respiratory HI =	3.0E-01
Total Sensitizer HI =	1.2E-02
Total Skin HI =	3.0E-01
Total Decreased Body Weight HI =	6.5E-02
Total Reproductive HI =	4.5E-03

TABLE 9.11.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								1,1,2,2-Tetrachloroethane	Liver, Kidney	7.4E-04	--	6.6E-05	8.0E-04
								1,1,2-Trichloroethane	Blood	1.1E-02	--	7.0E-04	1.1E-02
								1,1-Dichloroethane	NOAEL	5.4E-04	--	2.9E-05	5.7E-04
								1,1-Dichloroethene	Liver	1.4E-03	--	1.3E-04	1.5E-03
								1,2-Dibromo-3-chloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								1,2-Dichloroethane	Liver	5.6E-03	--	1.8E-04	5.8E-03
								1,2-Dichloropropane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Acetone	Liver, Kidney	8.1E-04	--	2.1E-06	8.1E-04
								Bromodichloromethane	Kidney	8.8E-04	--	4.9E-05	9.3E-04
								Bromomethane	Gastrointestinal	3.9E-02	--	8.1E-04	4.0E-02
								Carbon disulfide	Fetus	1.2E-03	--	1.5E-04	1.3E-03
								Carbon tetrachloride	Liver	6.7E-01	--	1.3E-01	8.0E-01
								Chloroethane	Fetus	1.2E-04	--	4.6E-06	1.2E-04
								Chloroform	Liver	4.9E-02	--	3.1E-03	5.2E-02
								Chloromethane	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibromochloromethane	Liver	2.5E-03	--	3.9E-03	6.4E-03
								Tetrachloroethene	Liver	1.7E-02	--	7.9E-03	2.5E-02
								Toluene	Liver, Kidney	2.7E-04	--	7.1E-05	3.4E-04
								Trichloroethene	Liver, Kidney	6.2E-01	--	7.6E-02	7.0E-01
								Vinyl chloride	N/A	1.7E-02	--	5.9E-04	1.8E-02
								cis-1,2-Dichloroethene	Blood	1.5E-02	--	8.7E-04	1.5E-02
								trans-1,2-Dichloroethene	Blood	3.0E-03	--	1.8E-04	3.2E-03
								trans-1,3-Dichloropropene	Organs	1.4E-03	--	5.3E-05	1.5E-03
								Hexachloroethane	Kidney	2.6E-01	--	1.7E-01	4.3E-01
								Naphthalene	Decreased Body Weigh	1.0E-02	--	1.0E-01	1.1E-01
								Pentachlorophenol	Fetus	5.7E-03	--	7.4E-02	7.9E-02
								bis(2-Ethylhexyl)phthalate	Liver/Reproductive	9.1E-03	--	3.9E-03	1.3E-02
								Cyanide	Whole body	1.5E-01	--	3.3E-04	1.6E-01
								Aluminum	CNS	2.2E-02	--	4.8E-05	2.2E-02
								Antimony	Blood	2.9E-01	--	6.2E-04	2.9E-01
								Arsenic	Skin	1.0E+00	--	2.1E-03	1.0E+00
								Barium	Cardiovascular	4.8E-02	--	1.5E-03	5.0E-02
								Beryllium	Gastrointestinal	6.8E-03	--	2.1E-03	8.9E-03
								Cadmium	Kidney	3.5E-02	--	3.0E-03	3.8E-02
								Chromium	NOAEL	3.0E-02	--	2.6E-03	3.2E-02
								Cobalt	Sensitizer	4.1E-02	--	8.8E-05	4.1E-02
								Iron	Gastrointestinal	4.8E-01	--	1.0E-03	4.8E-01
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00

TABLE 9.11.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
								Manganese	CNS	3.7E-01	--	2.0E-02	3.9E-01
								Nickel	Whole body	2.7E-02	--	1.5E-03	2.9E-02
								Thallium	Liver, Blood	9.3E-01	--	2.0E-03	9.3E-01
								Vanadium	Kidney	2.1E-01	--	1.7E-02	2.3E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		5.4E+00	0.0E+00	6.4E-01	6.0E+00
			Total Risk Across Tap water				0.0E+00	Total Risk Across Tap water					6.0E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					6.0E+00
Soil*	Soil*	Disposal area											
								Tetrachloroethene	Liver	2.7E-06	--	2.5E-07	2.9E-06
								Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Aluminum	CNS	1.3E-02	--	4.2E-04	1.4E-02
								Antimony	Blood	8.7E-03	--	1.8E-03	1.1E-02
								Arsenic	Skin	2.5E-02	--	2.4E-03	2.8E-02
								Chromium	NOAEL	1.3E-02	--	1.7E-02	3.0E-02
								Iron	Gastrointestinal	9.3E-02	--	3.0E-03	9.6E-02
								Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
								Manganese	CNS	1.8E-02	--	1.4E-02	3.2E-02
								Mercury (mercuric chloride)	Nervous System	5.1E-03	--	2.3E-03	7.4E-03
								Silver	Skin	1.7E-03	--	1.4E-03	3.1E-03
								Vanadium	Kidney	5.0E-02	--	6.1E-02	1.1E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.3E-01	0.0E+00	1.0E-01	3.3E-01
			Total Risk Across Soil				0.0E+00	Total Risk Across Soil					3.3E-01
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					6.3E+00

TABLE 9.11.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total

Total Blood HI =	1.3E+00
Total Body HI =	1.8E-01
Total Cardiovascular HI =	5.0E-02
Total Fetus HI =	8.1E-02
Total Gastrointestinal HI =	6.3E-01
Total Kidney HI =	1.5E+00
Total Liver HI =	2.5E+00
Total NOAEL HI =	3.0E-02
Total Neural HI =	4.5E-01
Total Organs HI =	1.5E-03
Total Sensitizer HI =	4.1E-02
Total Skin HI =	1.0E+00
Total Decreased Body Weight HI =	1.1E-01
Total Reproductive HI =	1.3E-02
Total Nervous System HI =	7.4E-03

TABLE 9.12.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
			1,1,2,2-Tetrachloroethane	1.1E-06	--	1.2E-05	1.3E-05						
			1,1,2-Trichloroethane	3.0E-07	--	3.5E-08	3.4E-07						
			1,1-Dichloroethane	0.0E+00	--	0.0E+00	0.0E+00						
			1,1-Dichloroethene	0.0E+00	--	0.0E+00	0.0E+00						
			1,2-Dibromo-3-chloropropane	2.0E-05	--	1.2E-09	2.0E-05						
			1,2-Dichloroethane	1.3E-06	--	7.2E-08	1.3E-06						
			1,2-Dichloropropane	3.5E-07	--	4.1E-08	3.9E-07						
			Acetone	0.0E+00	--	0.0E+00	0.0E+00						
			Bromodichloromethane	1.4E-07	--	1.3E-08	1.5E-07						
			Bromomethane	0.0E+00	--	0.0E+00	0.0E+00						
			Carbon disulfide	0.0E+00	--	0.0E+00	0.0E+00						
			Carbon tetrachloride	7.6E-06	--	2.6E-06	1.0E-05						
			Chloroethane	1.7E-08	--	1.2E-09	1.8E-08						
			Chloroform	0.0E+00	--	0.0E+00	0.0E+00						
			Chloromethane	8.6E-08	--	2.8E-09	8.9E-08						
			Dibromochloromethane	5.1E-07	--	1.6E-11	5.1E-07						
			Tetrachloroethene	1.1E-06	--	9.0E-07	2.0E-06						
			Toluene	0.0E+00	--	0.0E+00	0.0E+00						
			Trichloroethene	9.2E-06	--	2.0E-06	1.1E-05						
			Vinyl chloride	8.9E-06	--	5.3E-07	9.4E-06						
			cis-1,2-Dichloroethene	0.0E+00	--	0.0E+00	0.0E+00						
			trans-1,2-Dichloroethene	0.0E+00	--	0.0E+00	0.0E+00						
			trans-1,3-Dichloropropene	5.4E-07	--	3.5E-08	5.8E-07						
			Hexachloroethane	4.5E-07	--	5.2E-07	9.7E-07						
			Naphthalene	0.0E+00		0.0E+00	0.0E+00						
			Pentachlorophenol	2.5E-06	--	5.7E-05	6.0E-05						
			bis(2-Ethylhexyl)phthalate	3.2E-07	--	9.6E-11	3.2E-07						
			Cyanide	0.0E+00	--	0.0E+00	0.0E+00						
			Aluminum	0.0E+00	--	0.0E+00	0.0E+00						
			Antimony	0.0E+00	--	0.0E+00	0.0E+00						
			Arsenic	5.6E-05	--	1.9E-07	5.6E-05						
			Barium	0.0E+00	--	0.0E+00	0.0E+00						
			Beryllium	0.0E+00	--	0.0E+00	0.0E+00						
			Cadmium	0.0E+00	--	0.0E+00	0.0E+00						
			Chromium	0.0E+00	--	0.0E+00	0.0E+00						
			Cobalt	0.0E+00	--	0.0E+00	0.0E+00						
			Iron	0.0E+00	--	0.0E+00	0.0E+00						
			Lead	0.0E+00	--	0.0E+00	0.0E+00						
			Manganese	0.0E+00	--	0.0E+00	0.0E+00						
			Nickel	0.0E+00	--	0.0E+00	0.0E+00						
			Thallium	0.0E+00	--	0.0E+00	0.0E+00						
			Vanadium	0.0E+00	--	0.0E+00	0.0E+00						
			(Total)	1.1E-04	0.0E+00	7.7E-05	1.9E-04						

TABLE 9.12.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Residen
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead											
			1,1,2,2-Tetrachloroethane	--	1.3E-07	--	1.3E-07						
			1,1,2-Trichloroethane	--	8.1E-08	--	8.1E-08						
			1,1-Dichloroethane	--	0.0E+00	--	0.0E+00						
			1,1-Dichloroethene	--	0.0E+00	--	0.0E+00						
			1,2-Dibromo-3-chloropropane	--	9.9E-09	--	9.9E-09						
			1,2-Dichloroethane	--	4.2E-07	--	4.2E-07						
			1,2-Dichloropropane	--	0.0E+00	--	0.0E+00						
			Acetone	--	0.0E+00	--	0.0E+00						
			Bromodichloromethane	--	0.0E+00	--	0.0E+00						
			Bromomethane	--	0.0E+00	--	0.0E+00						
			Carbon disulfide	--	0.0E+00	--	0.0E+00						
			Carbon tetrachloride	--	2.3E-06	--	2.3E-06						
			Chloroethane	--	0.0E+00	--	0.0E+00						
			Chloroform	--	2.9E-06	--	2.9E-06						
			Chloromethane	--	2.8E-08	--	2.8E-08						
			Dibromochloromethane	--	0.0E+00	--	0.0E+00						
			Tetrachloroethene	--	1.5E-07	--	1.5E-07						
			Toluene	--	0.0E+00	--	0.0E+00						
			Trichloroethene	--	6.7E-06	--	6.7E-06						
			Vinyl chloride	--	2.0E-07	--	2.0E-07						
			cis-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00						
			trans-1,2-Dichloroethene	--	0.0E+00	--	0.0E+00						
			trans-1,3-Dichloropropene	--	4.5E-08	--	4.5E-08						
			Naphthalene		0.0E+00		0.0E+00						
			(Total)	0.0E+00	1.3E-05	0.0E+00	1.3E-05	(Total)		0.0E+00	0.0E+00	0.0E+00	0.0E+00
			Total Risk Across Vapors at Showerhead				1.3E-05	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Groundwater				2.0E-04	Total Hazard Index Across Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				2.0E-04	Total Hazard Index Across All Media and All Exposure Routes					0.0E+00

TABLE 9.13.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Construction Worke
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer-Shallow groundwater beneath disposal area											
			1,1,2,2-Tetrachloroethane	--	--	7.2E-09	7.2E-09	1,1,2,2-Tetrachloroethane	Liver, Kidney	--	--	4.2E-05	4.2E-05
			1,1,2-Trichloroethane	--	--	1.6E-09	1.6E-09	1,1,2-Trichloroethane	Blood	--	--	5.0E-05	5.0E-05
			1,1-Dichloroethane	--	--	0.0E+00	0.0E+00	1,1-Dichloroethane	NOAEL	--	--	2.4E-06	2.4E-06
			1,1-Dichloroethene	--	--	0.0E+00	0.0E+00	1,1-Dichloroethene	Liver	--	--	1.1E-04	1.1E-04
			1,2-Dibromo-3-chloropropane	--	--	1.1E-07	1.1E-07	1,2-Dibromo-3-chloropropane	N/A	--	--	0.0E+00	0.0E+00
			1,2-Dichloroethane	--	--	3.9E-09	3.9E-09	1,2-Dichloroethane	Liver	--	--	1.5E-04	1.5E-04
			1,2-Dichloropropane	--	--	2.1E-09	2.1E-09	1,2-Dichloropropane	N/A	--	--	0.0E+00	0.0E+00
			Acetone	--	--	0.0E+00	0.0E+00	Acetone	Liver, Kidney	--	--	2.0E-06	2.0E-06
			Bromodichloromethane	--	--	5.6E-10	5.6E-10	Bromodichloromethane	Kidney	--	--	3.2E-05	3.2E-05
			Bromomethane	--	--	0.0E+00	0.0E+00	Bromomethane	Gastrointestinal	--	--	6.9E-04	6.9E-04
			Carbon disulfide	--	--	0.0E+00	0.0E+00	Carbon disulfide	Fetus	--	--	1.4E-04	1.4E-04
			Carbon tetrachloride	--	--	1.1E-07	1.1E-07	Carbon tetrachloride	Liver	--	--	8.7E-02	8.7E-02
			Chloroethane	--	--	7.6E-11	7.6E-11	Chloroethane	Fetus	--	--	4.6E-06	4.6E-06
			Chloroform	--	--	0.0E+00	0.0E+00	Chloroform	Liver	--	--	2.3E-03	2.3E-03
			Chloromethane	--	--	2.0E-10	2.0E-10	Chloromethane	N/A	--	--	0.0E+00	0.0E+00
			Dibromochloromethane	--	--	5.5E-08	5.5E-08	Dibromochloromethane	Liver	--	--	2.3E-04	2.3E-04
			Tetrachloroethene	--	--	3.4E-08	3.4E-08	Tetrachloroethene	Liver	--	--	4.6E-04	4.6E-04
			Toluene	--	--	0.0E+00	0.0E+00	Toluene	Liver, Kidney	--	--	5.9E-06	5.9E-06
			Trichloroethene	--	--	9.3E-08	9.3E-08	Trichloroethene	Liver, Kidney	--	--	5.4E-02	5.4E-02
			Vinyl chloride	--	--	3.6E-08	3.6E-08	Vinyl chloride	N/A	--	--	5.9E-04	5.9E-04
			cis-1,2-Dichloroethene	--	--	0.0E+00	0.0E+00	cis-1,2-Dichloroethene	Blood	--	--	7.3E-05	7.3E-05
			trans-1,2-Dichloroethene	--	--	0.0E+00	0.0E+00	trans-1,2-Dichloroethene	Blood	--	--	1.5E-05	1.5E-05
			trans-1,3-Dichloropropene	--	--	1.8E-09	1.8E-09	trans-1,3-Dichloropropene	Organs	--	--	4.2E-06	4.2E-06
			Hexachloroethane	--	--	2.0E-08	2.0E-08	Hexachloroethane	Kidney	--	--	1.0E-02	1.0E-02
			Naphthalene			0.0E+00	0.0E+00	Naphthalene	Decreased Body Weight			7.8E-02	7.8E-02
			Pentachlorophenol	--	--	2.2E-06	2.2E-06	Pentachlorophenol	Fetus	--	--	4.3E-02	4.3E-02
			bis(2-Ethylhexyl)phthalate			9.1E-09	9.1E-09	bis(2-Ethylhexyl)phthalate	Liver/Reproductive			2.3E-03	2.3E-03
			Aluminum	--	--	0.0E+00	0.0E+00	Aluminum	CNS	--	--	1.4E-04	1.4E-04
			Arsenic	--	--	2.1E-08	2.1E-08	Arsenic	Skin	--	--	3.2E-03	3.2E-03
			Barium	--	--	0.0E+00	0.0E+00	Barium	Cardiovascular	--	--	3.0E-03	3.0E-03
			Beryllium	--	--	0.0E+00	0.0E+00	Beryllium	Gastrointestinal	--	--	2.6E-03	2.6E-03
			Cadmium	--	--	0.0E+00	0.0E+00	Cadmium	Kidney	--	--	9.9E-03	9.9E-03
			Chromium	--	--	0.0E+00	0.0E+00	Chromium	NOAEL	--	--	7.4E-04	7.4E-04
			Cobalt	--	--	0.0E+00	0.0E+00	Cobalt	Sensitizer	--	--	1.6E-04	1.6E-04
			Cyanide	--	--	0.0E+00	0.0E+00	Cyanide	Whole body	--	--	6.7E-04	6.7E-04
			Iron	--	--	0.0E+00	0.0E+00	Iron	Gastrointestinal	--	--	3.1E-03	3.1E-03
			Lead	--	--	0.0E+00	0.0E+00	Lead	N/A	--	--	0.0E+00	0.0E+00

TABLE 9.13.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Construction Worke
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
			Manganese	--	--	0.0E+00	0.0E+00	Manganese	CNS	--	--	3.8E-02	3.8E-02
			Nickel	--	--	0.0E+00	0.0E+00	Nickel	Whole body	--	--	2.5E-03	2.5E-03
			Thallium	--	--	0.0E+00	0.0E+00	Thallium	Liver, Blood	--	--	6.5E-03	6.5E-03
			Vanadium	--	--	0.0E+00	0.0E+00	Vanadium	Kidney	--	--	1.4E-01	1.4E-01
			(Total)	0.0E+00	0.0E+00	2.7E-06	2.7E-06	(Total)		0.0E+00	0.0E+00	4.9E-01	4.9E-01
			Total Risk Across Shallow Groundwater Beneath Disposal Area				2.7E-06	Total Risk Across Shallow Groundwater Beneath Disposal Area					4.9E-01

Total Blood HI =	6.6E-03
Total Body HI =	3.1E-03
Total Cardiovascular HI =	3.0E-03
Total Fetus HI =	4.3E-02
Total Gastrointestinal HI =	6.4E-03
Total Kidney HI =	2.1E-01
Total Liver HI =	1.5E-01
Total NOAEL HI =	2.4E-06
Total Neural HI =	3.8E-02
Total Organs HI =	4.2E-06
Total Sensitizer HI =	1.6E-04
Total Skin HI =	3.2E-03
Total Decreased Body Weight HI =	7.8E-02
Total Reproductive HI =	2.3E-03

TABLE 9.14.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

Indian Head - Site 47

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal Area											
			Tetrachloroethene					Tetrachloroethene	Liver	2.7E-07	--	6.4E-08	3.3E-07
			Benzo(a)anthracene					Benzo(a)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(a)pyrene					Benzo(a)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Benzo(b)fluoranthene					Benzo(b)fluoranthene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Dibenz(a,h)anthracene					Dibenz(a,h)anthracene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Indeno(1,2,3-cd)pyrene					Indeno(1,2,3-cd)pyrene	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Aluminum					Aluminum	CNS	1.3E-03	--	1.1E-04	1.4E-03
			Antimony					Antimony	Blood	8.7E-04	--	4.6E-04	1.3E-03
			Arsenic					Arsenic	Skin	2.5E-03	--	6.1E-04	3.1E-03
			Chromium					Chromium	NOAEL	1.3E-03	--	4.2E-03	5.5E-03
			Iron					Iron	Gastrointestinal	9.3E-03	--	7.5E-04	1.0E-02
			Lead					Lead	N/A	0.0E+00	--	0.0E+00	0.0E+00
			Manganese					Manganese	CNS	1.8E-03	--	3.6E-03	5.3E-03
			Mercury (mercuric chloride)					Mercury (mercuric chloride)	Nervous System	5.1E-04	--	5.8E-04	1.1E-03
			Silver					Silver	Skin	1.7E-04	--	3.5E-04	5.2E-04
			Vanadium					Vanadium	Kidney	5.0E-03	--	1.5E-02	2.0E-02
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.3E-02	0.0E+00	2.6E-02	4.9E-02
							Total Risk Across Soil						Total Risk Across Soil 4.9E-02
							Total Risk Across All Media and All Exposure Routes 0.0E+00						Total Hazard Index Across All Media and All Exposure Routes 4.9E-02

Total Skin HI =	3.7E-03
Total Liver HI =	3.3E-07
Total CNS HI =	6.8E-03
Total Blood HI =	1.3E-03
Total Gastrointestinal HI =	1.0E-02
Total NAOEL HI =	5.5E-03
Total Nervous System HI =	1.1E-03
Total Kidney HI =	2.0E-02

TABLE 10.1.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Sediment	Sediment	Drainage Swales						Vanadium	Kidney	3.9E-02		4.7E-01	5.1E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		3.9E-02	0.0E+00	4.7E-01	5.1E-01
			Total Risk Across Sediment				0.0E+00	Total Risk Across Sediment					5.1E-01
Surface Soil	Surface Soil	Disposal area						Mercury (mercuric chloride)	Nervous System	1.5E-02	--	9.6E-02	1.1E-01
								Silver	Skin	4.7E-02	--	5.4E-01	5.9E-01
								Vanadium	Kidney	1.6E-02	--	2.8E-01	2.9E-01
								(Total)		7.7E-02	0.0E+00	9.2E-01	9.9E-01
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.5E+00

Total Skin HI =	5.9E-01
Total Kidney HI =	8.0E-01
Total Nervous System HI =	1.1E-01

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								1,1-Dichloroethene	Liver	4.1E-01	--	4.7E-02	4.5E-01
								1,2-Dichloroethane	Liver	9.8E-01	--	3.8E-02	1.0E+00
								Acetone	Liver, Kidney	1.8E-01	--	5.8E-04	1.9E-01
								Bromomethane	Gastrointestinal	1.8E+01	--	4.6E-01	1.9E+01
								Carbon disulfide	Fetus	1.8E+00	--	2.8E-01	2.1E+00
								Carbon tetrachloride	Liver	1.1E+04	--	2.7E+03	1.4E+04
								Chloroform	Liver	1.6E+02	--	1.2E+01	1.7E+02
								Dibromochloromethane	Liver	1.2E-01	--	5.8E-03	1.2E-01
								Tetrachloroethene	Liver	3.8E+00	--	2.2E+00	6.0E+00
								Trichloroethene	Liver, Kidney	3.1E+01	--	4.5E+00	3.5E+01
								Vinyl chloride	Liver	2.6E-01	--	1.1E-02	2.7E-01
								cis-1,2-Dichloroethene	Blood	4.0E+00	--	2.9E-01	4.3E+00
								trans-1,2-Dichloroethene	Blood	5.2E-01	--	3.8E-02	5.6E-01
								Hexachloroethane	Kidney	2.9E-01	--	2.3E-01	5.2E-01
								Cyanide	Whole body	3.2E+01		6.4E-02	3.2E+01
								Aluminum	CNS	7.4E-01	--	1.5E-03	7.4E-01
								Antimony	Blood	3.2E-01		6.5E-04	3.3E-01
								Arsenic	Skin	9.7E+00	--	1.9E-02	9.7E+00
								Barium	Cardiovascular	1.3E-01	--	3.7E-03	1.3E-01
								Beryllium	Gastrointestinal	9.4E-02	--	2.7E-02	1.2E-01
								Chromium	NOAEL	2.1E-01	--	1.6E-02	2.2E-01
								Cobalt	Sensitizer	2.3E-01	--	4.7E-04	2.3E-01
								Iron	Gastrointestinal	9.1E+00	--	1.8E-02	9.1E+00
								Manganese	CNS	9.8E-01	--	4.9E-02	1.0E+00
								Nickel	Whole body	2.5E-01	--	1.3E-02	2.7E-01
								Thallium	Liver, Blood	8.3E-01	--	1.7E-03	8.3E-01
								Vanadium	Kidney	9.0E+00	--	6.9E-01	9.6E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.1E+04	0.0E+00	2.7E+03	1.4E+04
			Total Risk Across Tap water				0.0E+00			Total Risk Across Tap water			1.4E+04

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead											
			1,1,2,2-Tetrachloroethane	--	1.5E-06	--	1.5E-06	1,1-Dichloroethene	Liver	--	6.9E-01	--	6.9E-01
			1,1,2-Trichloroethane	--	1.1E-06	--	1.1E-06	1,2-Dibromo-3-chloropropane	Respiratory	--	2.0E+00	--	2.0E+00
			1,2-Dichloroethane	--	4.5E-04	--	4.5E-04	1,2-Dichloroethane	Liver, Kidney	--	1.0E+01	--	1.0E+01
			Carbon tetrachloride	--	2.2E-01	--	2.2E-01	Bromomethane	Nose	--	3.9E+01	--	3.9E+01
			Chloroform	--	5.6E-02	--	5.6E-02	Carbon disulfide	Nervous System	--	2.0E+00	--	2.0E+00
			Chloromethane	--	5.2E-03	--	5.2E-03	Carbon tetrachloride	Liver	--	2.4E+04	--	2.4E+04
			Tetrachloroethene	--	2.1E-04	--	2.1E-04	Chloroform	Liver, Kidney	--	1.5E+02	--	1.5E+02
			Trichloroethene	--	2.1E-03	--	2.1E-03	Chloromethane	CNS	--	1.7E+02	--	1.7E+02
			Vinyl chloride	--	1.9E-05	--	1.9E-05	Tetrachloroethene	Liver	--	4.4E-01	--	4.4E-01
								Trichloroethene	Liver, Kidney	--	1.5E+00	--	1.5E+00
								Naphthalene	Respiratory		2.7E-01		2.7E-01
			(Total)	0.0E+00	2.8E-01	0.0E+00	2.8E-01	(Total)		0.0E+00	2.4E+04	0.0E+00	2.4E+04
			Total Risk Across Vapors at Showerhead				2.8E-01	Total Hazard Index Across Vapors at Showerhead					2.4E+04
			Total Risk Across Groundwater				2.8E-01	Total Hazard Index Across Groundwater					3.8E+04
			Total Risk Across All Media and All Exposure Routes				2.8E-01	Total Hazard Index Across All Media and All Exposure Routes					3.8E+04

Total Blood HI =	6.0E+00
Total Body HI =	3.2E+01
Total Cardiovascular HI =	1.3E-01
Total Fetus HI =	2.1E+00
Total Gastrointestinal HI =	2.8E+01
Total Kidney HI =	2.1E+02
Total Liver HI =	3.8E+04
Total Neural HI =	1.7E+02
Total Respiratory HI =	4.1E+01
Total Sensitizer HI =	2.3E-01
Total Skin HI =	9.7E+00

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								1,1-Dichloroethane	NOAEL	1.1E-01	--	6.7E-03	1.1E-01
								1,1-Dichloroethene	Liver	9.5E-01	--	1.1E-01	1.1E+00
								1,2-Dichloroethane	Liver	2.3E+00	--	8.5E-02	2.4E+00
								Acetone	Liver, Kidney	4.3E-01	--	1.3E-03	4.3E-01
								Bromomethane	Gastrointestinal	4.3E+01	--	1.0E+00	4.4E+01
								Carbon disulfide	Fetus	4.2E+00	--	6.3E-01	4.9E+00
								Carbon tetrachloride	Liver	2.6E+04	--	6.0E+03	3.2E+04
								Chloroform	Liver	3.7E+02	--	2.7E+01	3.9E+02
								Dibromochloromethane	Liver	2.8E-01	--	2.9E-02	3.1E-01
								Tetrachloroethene	Liver	8.9E+00	--	4.9E+00	1.4E+01
								Trichloroethene	Liver, Kidney	7.2E+01	--	1.0E+01	8.2E+01
								Vinyl chloride	Liver	6.0E-01	--	2.4E-02	6.2E-01
								cis-1,2-Dichloroethene	Blood	9.3E+00	--	6.4E-01	9.9E+00
								trans-1,2-Dichloroethene	Blood	1.2E+00	--	8.5E-02	1.3E+00
								Hexachloroethane	Kidney	6.8E-01	--	5.3E-01	1.2E+00
								Pentachlorophenol	Fetus	8.5E-03	--	1.3E-01	1.4E-01
								Cyanide	Whole body	7.4E+01		1.8E-01	7.4E+01
								Aluminum	CNS	1.7E+00	--	4.3E-03	1.7E+00
								Antimony	Blood	7.6E-01		1.9E-03	7.6E-01
								Arsenic	Skin	2.3E+01	--	5.6E-02	2.3E+01
								Barium	Cardiovascular	3.0E-01	--	1.1E-02	3.1E-01
								Beryllium	Gastrointestinal	2.2E-01	--	7.8E-02	3.0E-01
								Cadmium	Kidney	2.1E-01	--	2.1E-02	2.3E-01
								Chromium	NOAEL	4.8E-01	--	4.7E-02	5.3E-01
								Cobalt	Sensitizer	5.5E-01	--	1.4E-03	5.5E-01
								Iron	Gastrointestinal	2.1E+01	--	5.2E-02	2.1E+01
								Manganese	CNS	2.3E+00	--	1.4E-01	2.4E+00
								Nickel	Whole body	5.9E-01	--	3.7E-02	6.3E-01
								Thallium	Liver, Blood	1.9E+00	--	4.8E-03	1.9E+00
								Vanadium	Kidney	2.1E+01	--	2.0E+00	2.3E+01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		2.7E+04	0.0E+00	6.0E+03	3.3E+04
			Total Risk Across Tap water				0.0E+00	Total Risk Across Tap water					3.3E+04
	All Media		Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.3E+04

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal area											
								Antimony	Blood	1.1E-01	--	1.3E-02	1.2E-01
								Arsenic	Skin	1.5E-01	--	8.6E-03	1.6E-01
								Iron	Gastrointestinal	4.4E-01	--	8.3E-03	4.5E-01
								Manganese	CNS	1.5E-01	--	7.2E-02	2.3E-01
								Mercury (mercuric chloride)	Nervous System	2.4E-01		6.4E-02	3.0E-01
								Silver	Skin	4.5E-01	--	2.1E-01	6.7E-01
								Vanadium	Kidney	2.4E-01	--	1.7E-01	4.1E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.8E+00	0.0E+00	5.5E-01	2.3E+00
							Total Risk Across Soil						Total Risk Across Soil
							0.0E+00						2.3E+00
							Total Risk Across All Media and All Exposure Routes						Total Hazard Index Across All Media and All Exposure Routes
							0.0E+00						3.3E+04

Total Blood HI =	1.4E+01
Total Body HI =	7.5E+01
Total Cardiovascular HI =	3.1E-01
Total Fetus HI =	5.0E+00
Total Gastrointestinal HI =	6.6E+01
Total Kidney HI =	1.1E+02
Total Liver HI =	3.3E+04
Total NOAEL HI =	6.4E-01
Total Neural HI =	4.7E+00
Total Sensitizer HI =	5.5E-01
Total Skin HI =	2.3E+01

TABLE 10.4.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
			1,1,2,2-Tetrachloroethane	9.0E-06	--	6.4E-04	6.5E-04						
			1,1,2-Trichloroethane	2.9E-06	--	2.2E-07	3.1E-06						
			1,2-Dibromo-3-chloropropane	1.4E-04	--	2.8E-09	1.4E-04						
			1,2-Dichloroethane	9.7E-04	--	3.7E-05	1.0E-03						
			1,2-Dichloropropane	1.3E-06	--	1.1E-07	1.4E-06						
			Bromodichloromethane	4.0E-06	--	2.6E-07	4.2E-06						
			Carbon tetrachloride	4.3E-01	--	1.2E-01	5.5E-01						
			Chloroethane	1.1E-06	--	5.2E-08	1.2E-06						
			Chloromethane	1.1E-02	--	2.5E-04	1.2E-02						
			Dibromochloromethane	1.1E-04	--	2.5E-09	1.1E-04						
			Tetrachloroethene	1.1E-03	--	6.0E-04	1.7E-03						
			Trichloroethene	2.0E-03	--	2.9E-04	2.3E-03						
			Vinyl chloride	5.9E-04	--	2.4E-05	6.1E-04						
			trans-1,3-Dichloropropene	7.2E-06	--	3.1E-07	7.5E-06						
			Hexachloroethane	2.2E-06	--	1.8E-06	4.0E-06						
			Pentachlorophenol	7.2E-06	--	1.1E-04	1.2E-04						
			bis(2-Ethylhexyl)phthalate	1.0E-06		4.2E-10	1.0E-06						
			Arsenic	2.4E-03	--	5.1E-06	2.4E-03						
			(Total)	4.5E-01	0.0E+00	1.2E-01	5.7E-01						
			Total Risk Across Tap water				5.7E-01	Total Risk Across Tap water					0.0E+00

TABLE 10.4.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead											
			1,1,2,2-Tetrachloroethane	--	1.5E-06	--	1.5E-06						
			1,1,2-Trichloroethane	--	1.1E-06	--	1.1E-06						
			1,2-Dichloroethane	--	4.5E-04	--	4.5E-04						
			Carbon tetrachloride	--	2.2E-01	--	2.2E-01						
			Chloroform	--	5.6E-02	--	5.6E-02						
			Chloromethane	--	5.2E-03	--	5.2E-03						
			Tetrachloroethene	--	2.1E-04	--	2.1E-04						
			Trichloroethene	--	2.1E-03	--	2.1E-03						
			Vinyl chloride	--	1.9E-05	--	1.9E-05						
			(Total)	0.0E+00	2.8E-01	0.0E+00	2.8E-01	(Total)					
			Total Risk Across Vapors at Showerhead				2.8E-01	Total Hazard Index Across Vapors at Showerhead					0.0E+00
			Total Risk Across Groundwater				8.5E-01	Total Hazard Index Across Groundwater					0.0E+00
Total Risk Across All Media and All Exposure Routes							8.5E-01	Total Hazard Index Across All Media and All Exposure Routes					#REF!

TABLE 10.5.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer-Shallow groundwater beneath disposal area											
			1,2-Dichloroethane	--	--	2.5E-06	2.5E-06	1,1-Dichloroethene	Liver	--	--	1.2E-01	1.2E-01
			Carbon tetrachloride	--	--	6.3E-03	6.3E-03	Bromomethane	Gastrointestinal	--	--	1.2E+00	1.2E+00
			Chloromethane	--	--	2.3E-05	2.3E-05	Carbon disulfide	Fetus	--	--	7.9E-01	7.9E-01
			Dibromochloromethane	--	--	7.4E-06	7.4E-06	Carbon tetrachloride	Liver	--	--	4.9E+03	4.9E+03
			Tetrachloroethene	--	--	2.6E-05	2.6E-05	Chloroform	Liver	--	--	2.7E+01	2.7E+01
			Trichloroethene	--	--	1.6E-05	1.6E-05	Tetrachloroethene	Liver	--	--	3.5E-01	3.5E-01
			Vinyl chloride	--	--	2.0E-06	2.0E-06	Trichloroethene	Liver, Kidney	--	--	9.5E+00	9.5E+00
			Pentachlorophenol	--	--	2.0E-05	2.0E-05	cis-1,2-Dichloroethene	Blood	--	--	7.4E-02	7.4E-02
			bis(2-Ethylhexyl)phthalate			1.2E-06	1.2E-06	Hexachloroethane	Kidney	--	--	3.2E-02	3.2E-02
			Arsenic	--	--	1.1E-06	1.1E-06	Pentachlorophenol	Fetus	--	--	7.7E-02	7.7E-02
								Arsenic	Skin	--	--	1.7E-01	1.7E-01
								Cadmium	Kidney	--	--	7.0E-02	7.0E-02
								Chromium	NOAEL	--	--	2.7E-02	2.7E-02
								Cobalt	Sensitizer	--	--	3.8E-03	3.8E-03
								Cyanide	Whole Body	--	--	5.4E-01	5.4E-01
								Iron	Gastrointestinal	--	--	8.2E-02	8.2E-02
								Manganese	CNS	--	--	3.5E-01	3.5E-01
								Vanadium	Kidney	--	--	1.6E+00	1.6E+00
			(Total)	0.0E+00	0.0E+00	6.4E-03	6.4E-03	(Total)		0.0E+00	0.0E+00	4.9E+03	4.9E+03
			Total Risk Across Shallow Groundwater Beneath Disposal Area				6.4E-03	Total Risk Across Shallow Groundwater Beneath Disposal Area					4.9E+03
			Total Risk Across All Media and All Exposure Routes				6.4E-03	Total Hazard Index Across All Media and All Exposure Routes					4.9E+03

Total Blood HI =	7.4E-02
Total Fetus HI =	8.6E-01
Total Gastrointestinal HI =	1.3E+00
Total Kidney HI =	1.1E+01
Total Liver HI =	4.9E+03
Total NOAEL HI =	2.7E-02
Total Neural HI =	3.5E-01
Total Sensitizer HI =	3.8E-03
Total Skin HI =	1.7E-01
Total CNS HI =	3.5E-01
Total Whole Body HI =	5.4E-01

TABLE 10.6.RME

RISK ASSESSMENT SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Soil*	Soil*	Disposal Area						Manganese	CNS	1.2E-02	--	1.6E-01	1.7E-01
								Mercury (mercuric chloride)	Nervous System	1.8E-02	--	1.4E-01	1.6E-01
								Silver	Skin	3.5E-02	--	4.6E-01	5.0E-01
								Vanadium	Kidney	1.8E-02	--	3.7E-01	3.9E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		8.3E-02	0.0E+00	1.1E+00	1.2E+00
							Total Risk Across Soil						Total Risk Across Soil
							0.0E+00						1.2E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.2E+00

Total Skin HI =	5.0E-01
Total CNS HI =	1.7E-01
Total Nervous System HI =	1.6E-01
Total Kidney HI =	3.9E-01

TABLE 10.7.CT
CENTRAL TENDENCY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water						Carbon tetrachloride	Liver	2.0E-01	--	6.1E-02	2.6E-01
								Trichloroethene	Liver, Kidney	1.9E-01	--	3.5E-02	2.2E-01
								Hexachloroethane	Kidney	7.7E-02	--	8.0E-02	1.6E-01
								Arsenic	Skin	3.0E-01	--	7.7E-04	3.0E-01
								Iron	Gastrointestinal	1.5E-01	--	3.7E-04	1.5E-01
								Manganese	CNS	1.1E-01	--	7.1E-03	1.2E-01
								Thallium	Liver, Blood	2.8E-01	--	7.2E-04	2.8E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		1.3E+00	0.0E+00	1.8E-01	1.5E+00
			Total Risk Across Tap water				0.0E+00	Total Risk Across Tap water					1.5E+00
Groundwater	Air	Upper Aquifer-Water Vapors at Showerhead						1,2-Dibromo-3-chloropropane	Respiratory	--	2.1E-01	--	2.1E-01
								Carbon tetrachloride	Liver	--	2.3E-01	--	2.3E-01
								Chloroform	Liver, Kidney	--	1.2E+00	--	1.2E+00
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		0.0E+00	1.6E+00	0.0E+00	1.6E+00
			Total Risk Across Vapors at Showerhead				0.0E+00	Total Hazard Index Across Vapors at Showerhead					1.6E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					3.1E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					3.1E+00

Total Blood HI =	2.8E-01
Total Gastrointestinal HI =	1.5E-01
Total Kidney HI =	1.6E+00
Total Liver HI =	2.2E+00
Total Neural HI =	1.2E-01
Total Respiratory HI =	2.1E-01
Total Skin HI =	3.0E-01

TABLE 10.8.CT
CENTRAL TENDENCY
REASONABLE MAXIMUM EXPOSURE
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
								Carbon tetrachloride	Liver	6.7E-01	--	1.3E-01	8.0E-01
								Trichloroethene	Liver, Kidney	6.2E-01	--	7.6E-02	7.0E-01
								Hexachloroethane	Kidney	2.6E-01	--	1.7E-01	4.3E-01
								Naphthalene	Decreased Body Weight	1.0E-02	--	1.0E-01	1.1E-01
								Cyanide	Whole Body	1.5E-01	--	3.3E-04	1.6E-01
								Antimony	Blood	2.9E-01	--	6.2E-04	2.9E-01
								Arsenic	Skin	1.0E+00	--	2.1E-03	1.0E+00
								Iron	Gastrointestinal	4.8E-01	--	1.0E-03	4.8E-01
								Manganese	CNS	3.7E-01	--	2.0E-02	3.9E-01
								Thallium	Liver, Blood	9.3E-01	--	2.0E-03	9.3E-01
								Vanadium	Kidney	2.1E-01	--	1.7E-02	2.3E-01
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		5.0E+00	0.0E+00	5.3E-01	5.5E+00
Soil			Total Risk Across Tap water				0.0E+00	Total Risk Across Tap water					5.5E+00
			Total Risk Across Groundwater				0.0E+00	Total Hazard Index Across Groundwater					5.5E+00
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					5.5E+00

Total Blood HI =	1.2E+00
Total Gastrointestinal HI =	4.8E-01
Total Kidney HI =	1.4E+00
Total Liver HI =	2.4E+00
Total Neural HI =	3.9E-01
Total Skin HI =	1.0E+00
Total Decreased Body Weight HI =	1.1E-01
Total Body HI =	1.6E-01

TABLE 10.9.CT

CENTRAL TENDENCY

REASONABLE MAXIMUM EXPOSURE

Site 47 RI Report

IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal Absorption	Exposure Routes Total
Groundwater	Groundwater	Upper Aquifer- Tap Water											
			1,1,2,2-Tetrachloroethane	1.1E-06	--	1.2E-05	1.3E-05						
			1,2-Dibromo-3-chloropropane	2.0E-05	--	1.2E-09	2.0E-05						
			1,2-Dichloroethane	1.3E-06	--	7.2E-08	1.3E-06						
			Carbon tetrachloride	7.6E-06	--	2.6E-06	1.0E-05						
			Tetrachloroethene	1.1E-06	--	9.0E-07	2.0E-06						
			Trichloroethene	9.2E-06	--	2.0E-06	1.1E-05						
			Vinyl chloride	8.9E-06	--	5.3E-07	9.4E-06						
			Hexachloroethane	4.5E-07	--	5.2E-07	9.7E-07						
			Pentachlorophenol	2.5E-06	--	5.7E-05	6.0E-05						
			Arsenic	5.6E-05	--	1.9E-07	5.6E-05						
			(Total)	1.1E-04	0.0E+00	7.7E-05	1.8E-04						
			Total Risk Across Tap water				1.8E-04	Total Risk Across Tap water					0.0E+00
			Total Risk Across Groundwater				1.8E-04	Total Hazard Index Across Groundwater					0.0E+00
			Total Risk Across All Media and All Exposure Routes				1.8E-04	Total Hazard Index Across All Media and All Exposure Routes					#REF!

Calculations of Preliminary Remediation Goals (PRGs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 8/14/01

Exposure Variable	PRG Equation[1] 1*	PRG Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = 1.9	Using Equation 1, GSDi = 2.3	Using Equation 2, GSDi = 1.9	Using Equation 2, GSDi = 2.3
$PbB_{fetal,\ 0.95}$	X	X	95th percentile PbB in fetus	ug/dL	10	10	10	10
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	1.9	2.3	1.9	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.4	1.8	1.4	1.8
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,\ D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,\ D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,\ D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PRG			**Preliminary Remediation Goal**	**ppm**	**1,712**	**710**	**1,712**	**710**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same PRG.

***Equation 1, based on Eq. 4 in USEPA (1996).**

$$PRG = \frac{([PbB_{95}fetal/(R*(GSD_i^{1.645})])-PbB_0)*AT_{S,D}}{BKSF*(IR_{S+D}*AF_{S,D}*EF_{S,D})}$$

****Equation 2, alternate approach based on Eq. 4 and Eq. A-19 in USEPA (1996).**

$$PRG = \frac{([PbB_{fetal,0.95}/(R*(GSD_i^{1.645})])-PbB_0)*AT_{S,D}}{BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])}$$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Appendix I
Ecological Risk Assessment Tables

Medium-Specific Screening Values for Screening Ecological Risk Assessments
NSWC Indian Head

Chemical	Screening Value	Units	Reference	Hardness (mg/L)	pH	TOC (%)
Surface Soil						
1,1,1,2-Tetrachloroethane	300	ug/kg	USEPA 1995			
1,1,1-Trichloroethane	300	ug/kg	USEPA 1995			
1,1,2,2-Tetrachloroethane	300	ug/kg	USEPA 1995			
1,1,2-Trichloroethane	300	ug/kg	USEPA 1995			
1,1-Dichloroethane	300	ug/kg	USEPA 1995			
1,2,4,5-Tetrachlorobenzene	100	ug/kg	USEPA 1995			
1,2,4-Trichlorobenzene	1270	ug/kg	Efroymson et al. 1997b			
1,2-Dibromoethane	5000	ug/kg	USEPA 1995			
1,2-Dichlorobenzene	100	ug/kg	USEPA 1995			
1,2-Dichloroethane	401	ug/kg	MHSPE 1994			2
1,2-Dichloroethene (total)	300	ug/kg	USEPA 1995			
1,2-Dichloropropane	38800	ug/kg	Efroymson et al. 1997b			
1,3-Dichloropropene	300	ug/kg	USEPA 1995			
1,4-Dichlorobenzene	1280	ug/kg	Efroymson et al. 1997b			
2,3,4,6-Tetrachlorophenol	100	ug/kg	USEPA 1995			
2,4,5-Trichlorophenol	430	ug/kg	Efroymson et al. 1997a			
2,4,6-Trichlorophenol	580	ug/kg	Efroymson et al. 1997b			
2,4-Dichlorophenol	13400	ug/kg	Efroymson et al. 1997b			
2,4-Dimethylphenol	100	ug/kg	USEPA 1995			
2,4-Dinitrophenol	20000	ug/kg	Efroymson et al. 1997a			
2,6-Dichlorophenol	100	ug/kg	USEPA 1995			
2-Chloronaphthalene	1033	ug/kg	MHSPE 1994			2
2-Chlorophenol	100	ug/kg	USEPA 1995			
2-Methylphenol	100	ug/kg	USEPA 1995			
4,4'-DDD	100	ug/kg	USEPA 1995			
4,4'-DDE	100	ug/kg	USEPA 1995			
4,4'-DDT	100	ug/kg	USEPA 1995			
4-Methyl-2-pentanone	10000	ug/kg	USEPA 1995 (with safety factor of 10)			
4-Methylphenol	100	ug/kg	USEPA 1995			
4-Nitrophenol	380	ug/kg	Efroymson et al. 1997b			
Acenaphthene	2500	ug/kg	Efroymson et al. 1997a			
Acenaphthylene	100	ug/kg	USEPA 1995			

Medium-Specific Screening Values for Screening Ecological Risk Assessments
NSWC Indian Head

Chemical	Screening Value	Units	Reference	Hardness (mg/L)	pH	TOC (%)
Aldrin	100	ug/kg	USEPA 1995			
alpha-BHC	100000	ug/kg	USEPA 1995			
alpha-Chlordane	100	ug/kg	USEPA 1995			
Aluminum	50	mg/kg	Efroymson et al. 1997a			
Anthracene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Antimony	5	mg/kg	Efroymson et al. 1997a			
Aroclor-1016	100	ug/kg	USEPA 1995			
Aroclor-1221	100	ug/kg	USEPA 1995			
Aroclor-1232	100	ug/kg	USEPA 1995			
Aroclor-1242	100	ug/kg	USEPA 1995			
Aroclor-1248	100	ug/kg	USEPA 1995			
Aroclor-1254	100	ug/kg	USEPA 1995			
Aroclor-1260	100	ug/kg	USEPA 1995			
Arsenic	60	mg/kg	Efroymson et al. 1997b			
Barium	500	mg/kg	Efroymson et al. 1997a			
Benzene	105	ug/kg	MHSPE 1994			2
Benzo(a)anthracene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Benzo(a)pyrene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Benzo(b)fluoranthene	100	ug/kg	USEPA 1995			
Benzo(g,h,i)perylene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Benzo(k)fluoranthene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Beryllium	10	mg/kg	Efroymson et al. 1997a			
beta-BHC	100000	ug/kg	USEPA 1995			
Bromochloromethane	300000	ug/kg	USEPA 1995 (with safety factor of 10)			
Bromodichloromethane	45000	ug/kg	USEPA 1995 (with safety factor of 10)			
Cadmium	4	mg/kg	Efroymson et al. 1997a			
Carbon tetrachloride	1000000	ug/kg	Efroymson et al. 1997b			
Chlordane	100	ug/kg	USEPA 1995			
Chlorobenzene	2400	ug/kg	Efroymson et al. 1997b			
Chloroform	1000	ug/kg	MHSPE 1994			2
Chromium	0.4	mg/kg	Efroymson et al. 1997b			
Chrysene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
cis-1,2-Dichloroethene	300	ug/kg	USEPA 1995			

Medium-Specific Screening Values for Screening Ecological Risk Assessments
NSWC Indian Head

Chemical	Screening Value	Units	Reference	Hardness (mg/L)	pH	TOC (%)
cis-1,3-Dichloropropene	300	ug/kg	USEPA 1995			
Cobalt	100	mg/kg	USEPA 1995			
Copper	50	mg/kg	Efroymson et al. 1997b			
Cyanide	0.06	mg/kg	Eisler 1991			
delta-BHC	100000	ug/kg	USEPA 1995			
Dibenz(a,h)anthracene	100	ug/kg	USEPA 1995			
Dieldrin	100	ug/kg	USEPA 1995			
Diethylphthalate	13400	ug/kg	Efroymson et al. 1997a			
Dimethyl phthalate	10640	ug/kg	Efroymson et al. 1997b			
Di-n-butylphthalate	200000	ug/kg	Efroymson et al. 1997a			
Dinitrophenol	100	ug/kg	USEPA 1995			
Endrin	100	ug/kg	USEPA 1995			
Endrin aldehyde	100	ug/kg	USEPA 1995			
Endrin ketone	100	ug/kg	USEPA 1995			
Ethylbenzene	5005	ug/kg	MHSPE 1994			2
Fluoranthene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Fluorene	1700	ug/kg	Efroymson et al. 1997b			
Fluoride	1	mg/kg	USEPA 1995			
gamma-BHC (Lindane)	100	ug/kg	USEPA 1995			
gamma-Chlordane	100	ug/kg	USEPA 1995			
HCH-technical	100000	ug/kg	USEPA 1995			
Heptachlor epoxide	100	ug/kg	USEPA 1995			
Hexachlorocyclopentadiene	1000	ug/kg	Efroymson et al. 1997a			
Indeno(1,2,3-cd)pyrene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Iron	200	mg/kg	Efroymson et al. 1997b			
Lead	50	mg/kg	Efroymson et al. 1997a			
Magnesium	4400	mg/kg	USEPA 1995			
Manganese	500	mg/kg	Efroymson et al. 1997a			
Mercury	0.1	mg/kg	Efroymson et al. 1997b			
Methoxychlor	100	ug/kg	USEPA 1995			
Methylene chloride	1001	ug/kg	MHSPE 1994			2
Naphthalene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Nickel	30	mg/kg	Efroymson et al. 1997a			

Medium-Specific Screening Values for Screening Ecological Risk Assessments
NSWC Indian Head

Chemical	Screening Value	Units	Reference	Hardness (mg/L)	pH	TOC (%)
Nitrobenzene	2260	ug/kg	Efroymson et al. 1997b			
n-Nitrosodiphenylamine	1090	ug/kg	Efroymson et al. 1997b			
PAH (total)	4100	ug/kg	MHSPE 1994			2
Pentachlorobenzene	1150	ug/kg	Efroymson et al. 1997b			
Pentachlorophenol	3000	ug/kg	Efroymson et al. 1997a			
Phenanthrene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995			
Phenol	1880	ug/kg	Efroymson et al. 1997b			
Pyrene	100	ug/kg	USEPA 1995			
Selenium	1.8	mg/kg	USEPA 1995			
Silver	2	mg/kg	Efroymson et al. 1997a			
Styrene	10010	ug/kg	MHSPE 1994			2
Tetrachloroethene	401	ug/kg	MHSPE 1994			2
Thallium	1	mg/kg	Efroymson et al. 1997a			
Toluene	13005	ug/kg	MHSPE 1994			2
trans-1,2-Dichloroethene	300	ug/kg	USEPA 1995			
trans-1,3-Dichloropropene	300	ug/kg	USEPA 1995			
Tribromomethane	114700	ug/kg	USEPA 1995 (with safety factor of 10)			
Trichlorobenzene	100	ug/kg	USEPA 1995			
Trichloroethene	6000	ug/kg	MHSPE 1994			2
Vanadium	2	mg/kg	Efroymson et al. 1997a			
Vinyl chloride	300	ug/kg	USEPA 1995			
Xylene, total	2505	ug/kg	MHSPE 1994			2
Zinc	50	mg/kg	Efroymson et al. 1997a			

Screening values are based on either Region 3 BTAG screening values (USEPA 1995) or on alternate screening values approved for use at Virginia bases by part of the Region 3 BTAG (CH2M HILL 2000). Where more than one final screening value was available for a specific medium and chemical (e.g., one value for soil fauna and one value for soil flora), the lowest of these values was selected. Surface soil screening values based on Dutch soil standards for certain organic chemicals are presented based on a TOC value of two percent. Two percent is the minimum default value for these screening values.

References:

CH2M HILL, Inc. 2000. *Technical memorandum - alternate screening values - ecological risk assessment, IR sites 5, 7, 8, 9, 10, 11, 12, 13, 16, and SWMU-3. Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia.* Final. January.

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Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological benchmarks for screening contaminants of potential concern for effects on soil and litter invertebrates and heterotrophic process: 1997 revision.* Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-126/R2.

Eisler, R. 1991. *Cyanide hazards to fish, wildlife, and invertebrates: a synoptic review.* U.S. Fish and Wildlife Service Biological Report 85(1.23), Contaminant Hazard Reviews Report No. 23. 55 pp.

Ministry of Housing, Spatial Planning and Environment (MHSPE). 1994. *Intervention values.* Directorate-General for Environmental Protection, Department of Soil Protection, The Hague, Netherlands. 9 May. DBO/07494013.

U.S. Environmental Protection Agency (USEPA) Region III. 1995. *Revised Region III BTAG screening levels.* Memorandum from R.S. Davis to Users. 9 August.

Appendix J
Raw Analytical Data and Data Quality Evaluation Report

Data Quality Assessment

The data quality was evaluated to assess the usability of the analytical results. The analytical data quality is dependent on laboratory performance, matrix interference, ambient laboratory and field conditions, and field sampling technique. Data quality is used to assess whether the project's data quality objectives were met. The data quality assessment comprised reviewing the results of the laboratory quality control (QC) review, the data validation reports, and the data validation qualifiers applied to the data.

Laboratory Quality Control Review

Prior to the release of the analytical results, the laboratory reviewed the sample and QC data to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the results were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Non-conforming results were identified and were discussed in the data package cover letter and associated case narrative.

Data Validation

The data packages were reviewed by an independent data validator based on the validation criteria outlined by USEPA Region III (1993b, 1994a). As specified in USEPA Region III's *Innovative Approaches to Data Validation* (June 1995) a level M-3 data validation was performed on the organic analytes, and a level IM-2 data validation was performed on the inorganic analytes. This data review process was independent of the laboratory review. The review completed by the validator focused on the impact that the laboratory performance and matrix effect had on the analytical results. Areas of review included holding time compliance, surrogate recovery accuracy, matrix spiked sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, laboratory and field sample duplicate precision. Additionally, the analytical spectrum and raw data output were reviewed and the laboratory results were recalculated from the raw data.

Only one result per analyte, per sample was reported. If a sample was reanalyzed or diluted, and thus reported twice, only the result with the best data quality was chosen for reporting.

The following data validation flags were applied to one or more analytical results:

- **U** Not detected. Samples were analyzed for this analyte, but it was not detected above the reporting limit (RL). This flag is not an indicator of a quality control problem.
- **UJ** Detection limit estimated. Samples were analyzed for this analyte, but the results were qualified as not detected. The concentration that the analyte was not detected at is estimated.
- **J** Estimated. The analyte was present but the reported concentration may not be accurate or precise and is considered an estimate.

- **K** The analyte is present. The reported value may be biased high. The actual value is expected to be lower than reported.
- **UL** The analyte was not detected, the reported quantitation limit is probably higher than reported.
- **L** The analyte is present. The reported values may be biased low. The actual value is expected to be higher than reported.
- **B** Not detected. The analyte was found to be present due to contamination. The concentration of the field result is not statistically greater than the concentration reported in a blank, therefore the field result are corrected to read as "being not detected" at the contaminant concentration.
- **D** Diluted sample. The sample may have been diluted because the analyte concentration exceeded the working range of the instrument, or the sample matrix was such that the sample had to be diluted to aid in the identification of the analyte.
- **R** Rejected. The analytical result is unusable. (NOTE: Analyte/compound may or may not be detected.)
- **(No qualifier present)** Detected. The result for the target parameter is usable at the concentration reported.

Data Quality Evaluation

The data quality evaluation consisted of reviewing the analytical data for systematic errors. The distribution of data qualifiers and systematic errors are discussed below. An evaluation of the data quality is made based on the number of, severity of, and distribution of these data qualifiers. The data for Site 47 has been divided into two phases of the sampling that took place at the site. The most recent sampling corresponds to the site remedial investigation data, sampled from July 1999 through September 2002. The findings of the remedial investigation data quality evaluation and the overall assessment, discussed in Section 3.1.4, are used to make a conclusion of their impact on data usability, which is discussed in Section 3.1.4.1. Data from July of 1999 and October 2001 had already been archived. For these sampling rounds the data qualifiers were tallied, but the data validation reports were not reviewed. Also, the groundwater data from March of 2001 was not validated. This data was not used for risk assessment. For the purpose of calculating the percentages of qualified data in section 3.1.4, the lab qualifiers were used.

Well before the remedial investigation, additional data was sampled and collected as Site 47. For the purpose of this report we have called this "Historic Site 47 Data," sampled on September and October or 1992. The findings of the "Historic Site 47 Data" data quality evaluation and the overall assessment, discussed in Section 3.1.5, are used to make a conclusion of their impact on data usability, which is discussed in Section 3.1.5.1.

Remedial Investigation Data

These are patterns that are found in the distribution of data qualifiers for remedial investigation samples collected from Site 47 at Indian Head Division Naval Surface Warfare Center from July 1999 through September 2002. However, no validation reports were

provided upon review of the qualified results from July 1999 and October 2001, so none of the commentary is in regards to these sampling rounds.

Volatile Organic Compounds

VOCs were analyzed by USEPA Contract Laboratory Program (CLP) method OLM04.2. Including field quality control samples, 5,886 non-redundant data points were generated. Of these, 2.20 percent (130 results) were "B" qualified, 1.30 percent (78 results) were "J" qualified, 0.68 percent (40 results) were "UJ" qualified, 1.46 percent (86 results) were "UL" qualified, and 0.75 percent (44 results) were "R" qualified. All "B" qualifiers were due to blank contamination.

The majority of the "J" qualified results (32 results) in the are due to low sample concentrations. The laboratory is required to "J" qualify sample results between the laboratory's method detection limit and the USEPA's contract required reporting limit. The remaining "J" qualifiers, 12 results for acetone and 2-butanone, were qualified and flagged due to low relative response factors in the initial calibration.

"UJ" qualifiers were applied to detected results for having initial calibration percent relative standard deviation (%RSD) greater than 50 percent for acetone. Other "UJ" qualifiers were applied to results with undetected concentrations for not meeting internal standard performance criteria.

"R" qualifiers were applied to three compounds (acetone, 2-butanone, and 1,2-dibromo-3-chloropropane) in one sample delivery group (SDG). Initial and continuing calibration relative response factor criterion within this SDG were less than 0.05.

Semivolatile Organic Compounds

Semivolatile organic compounds were analyzed by USEPA CLP method OLM04.2. Including field quality control samples, 3,943 non-redundant data points were generated. Of these, 0.46 percent (18 results) were "B" qualified, 6.60 percent (260 results) were "J" qualified, 0.35 percent (14 results) were "UL" qualified, 0.051 percent (2 results) were "K" qualified, and 0.98 percent (39 results) were "R" qualified.

The majority of the "J" qualified results in the Remedial investigation are due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit).

The rejected sample results in the Remedial investigation are all caused by low average relative response factors in the initial calibration. Table 3-1 lists all samples that have been qualified with an "R".

Explosives

Nitroaromatics and nitroamines are analyzed by USEPA's SW-846 method 8330. Nitroglycerine is analyzed by method SW-846 8332, nitroguanidine is analyzed by a modified SW-846 8330, and perchlorate is analyzed by USEPA method 314. Including field quality control samples, 892 non-redundant data points were generated. Of these 0.89 percent (8 results) were "UL" qualified..

The "UL" qualified results in the Remedial investigation are due to a low percent recovery in the laboratory control sample (LCS), therefore concentrations of HMX were qualified and flagged "UL".

Metals and Cyanide

Total and dissolved metals were analyzed by USEPA CLP method ILM04. USEPA method 335.2 was used to analyze Cyanide. Including field quality control samples, 2,981 non-redundant data points were generated. Of these, 8.50 percent (255 results) were "B" qualified, 25.29 percent (754 results) were "J" qualified, 2.0 percent (60 results) were "UL" qualified, 1.10 percent (33 results) were "L" qualified, 0.97 percent (29 results) were "K" qualified, 0.10 percent (3 results) were "N" qualified, and 20 results (0.67 percent) were "R" qualified. Table 3-1 lists all sample results that have been qualified with an "R".

The "B" qualified results in the Remedial investigation were a result of beryllium, cyanide, calcium, manganese, potassium, copper, and aluminum contamination in one or more of the associated blanks.

Most of the "J" qualified results in the Remedial investigation were due to ICP serial dilution inefficiencies. Barium, potassium, sodium, and zinc were consistently qualified "J" throughout the samples as there may be interferences in the samples with similar matrix. Other "J" qualified results were due to low sample concentrations. The laboratory is required to "J" qualify sample results between the laboratory's method detection limit and the USEPA's contract required reporting limit.

The "L" and "UL" qualified results in the Remedial investigation are due to low matrix spike recovery, or CRDL standard recovery below acceptable limits for the following compounds: mercury, silver, manganese, zinc, calcium, copper, thallium, and selenium.

The twenty rejected results in the Remedial investigation are due to matrix spike recoveries of mercury that are less than the lowest performance criteria (< 30%). Table 3-1 has a list of samples which were qualified "R" due to matrix spike inefficiencies.

Wet Chemistry

Samples were analyzed for hardness by USEPA wastewater method 130.2, percent solids by UPEPA 160.3, pH by SW-846 9045C, and total organic carbon by SW-846 9060. No wet chemistry data qualifications in either the Remedial investigation or Remedial Investigation were deemed necessary.

Impact of Remedial Investigation Data Quality on Project Data Quality Objectives and Data Usability

The data received were analyzed and reviewed as specified in the work plan:

- The laboratory analyzed the samples in accordance with the USEPA methods as stated in the work plan.
- The data packages were then reviewed by an independent data validator based on the criteria outlined by the USEPA Region III (1993b, 1994a).

The data evaluation showed that the majority of the analytical results (86 percent) were unqualified and acceptable as reported. Eight percent of the total results were qualified "J" as estimated in concentration. The vast majority of these "J" qualifiers are present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J" qualified results are also acceptable for use as reported. When this is considered, over 93 percent of the results are not qualified and are usable as reported.

The "J", "JB", "K", "L", "UJ", and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem, but not a problem that necessarily negatively affects the usability of the data. These data points are considered usable by risk assessors when determining risk to human health and the environment. Data points qualified as such also are considered usable by the project team when assessing impacts to a site.

The sample results qualified with a "B", indicating blank contamination, are usable at their adjusted reporting limits. Sample results with a "B" qualifier made up 2.9 percent of the data. Sample results qualified with a "B" will negatively affect data usability if the blank contamination (and subsequently the elevated reporting limit) is greater than the project's action level for that analyte. Analytes such as acetone and methylene chloride are common laboratory contaminants, and the qualified results should not, alone, be used to make project decisions.

The "R" qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large environmental sampling effort. Often the project team can work around rejected data by observing data in previous and future rounds of sampling, or by looking at data at adjacent sites. During this RI less than 0.8 percent of the data were rejected. The results that are rejected should not be used to make project decisions.

With the exception of the "R" qualified results (and with caution regarding the "B" qualified results), the Remedial investigation data for CTO 66 at Site 47 are of sufficient quality to support risk and site assessment.

Historic Site 47 Data

These are patterns that are found in the distribution of data qualifiers for Site 47 water and soil samples collected September and October 1992.

Volatile Organic Compounds

VOCs were analyzed by USEPA Contract Laboratory Program (CLP) method OLM04.2. Including field quality control samples, 485 non-redundant data points were generated. Of these, 0.21 percent (1 result) was "B" qualified, and 1.4 percent (7 results) were "J" qualified.

All results were previously validated, however no validation reports were provided upon review of the qualified results.

Semivolatile Organic Compounds

Semivolatile organic compounds were analyzed by USEPA CLP method OLM04.2. Including field quality control samples, 798 non-redundant data points were generated. Of these, 13.5 percent (108 results) were "J" qualified, 0.2 percent (2 results) were "R" qualified.

All results were previously validated, however no validation reports were provided upon review of the qualified results.

Explosives

Explosives are analyzed by different methods. Nitroaromatics and nitroamines are analyzed by USEPA's SW-846 method 8330 and CLP method OLM04.2. Nitroglycerine is analyzed by method SW-846 8332, nitroguanidine is analyzed by a modified SW-846 8330, and perchlorate is analyzed by USEPA method 314. Including field quality control samples, 42 non-redundant data points were generated. Of these, 2.4 percent (1 result) was "J" qualified.

All results were previously validated, however no validation reports were provided upon review of the qualified results.

Metals and Cyanide

Metals were analyzed by USEPA CLP method ILM04, and USEPA method 335.2 was used to analyze Cyanide. Including field quality control samples, 336 non-redundant data points were generated. Of these, 26.8 percent (90 results) were "B" qualified, 13.9 percent (47 results) were "J" qualified, and 17 results (5 percent) were "UL" qualified.

All results were previously validated, however no validation reports were provided upon review of the qualified results.

Wet Chemistry

Samples were analyzed for hardness by USEPA wastewater method 130.2, percent solids by UPEPA 160.3, pH by SW-846 9045C, and total organic carbon by SW-846 9060. No wet chemistry data qualifications were applied, therefore no action was deemed necessary.

Impact of Data Quality on Project Data Quality Objectives and Data Usability

The data received were analyzed and reviewed as specified in the work plan:

- The laboratory analyzed the samples in accordance with the USEPA methods as stated in the work plan.
- The data packages were then reviewed by an independent data validator based on the criteria outlined by the USEPA Region III (1993b, 1994a).

The data evaluation showed that the majority of the analytical results (84 percent) were acceptable as reported. Ten percent of the total results were qualified "J" as estimated in concentration. The vast majority of these "J" qualifiers are present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J" qualified results are acceptable for use as reported.

The "J", "JB", "K", "L", "UJ", and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem, but not a

problem that negatively affects the usability of the data. These data points are considered usable by risk assessors when determining risk to human health and the environment. Data points qualified as such also are considered usable by the project team when assessing impacts to a site.

The sample results qualified with a “B”, indicating blank contamination, are usable at their adjusted reporting limits. Sample results with a “B” qualifier made up five percent of the data. Sample results qualified with a “B” will negatively affect data usability if the blank contamination (and subsequently the elevated reporting limit) is greater than the project’s action level for that analyte. Analytes such as acetone and methylene chloride are common laboratory contaminants, and their results should not, alone, be used to make project decisions.

The “R” qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large Remedial Investigation (RI). Often the project team can work around rejected data by observing data in previous and future rounds of sampling, or by looking at data at adjacent sites. During this RI less than 0.1 percent of the data (2 results) were rejected. The results that are rejected should not be used to make project decisions.

With the exception of the “R” qualified results (and with caution regarding the “B” qualified results), the data for CTO 66 at Site 47 are of sufficient quality to support risk and site assessment.

Table 3-1
Rejected Results

	Sample	Fraction	Compound
RI Data			
	RI47CO01	SVOA	Pentachlorophenol
	RI47CO01	SVOA	2,4,5-Trichlorophenol
	RI47CO01	SVOA	2-Chlorophenol
	RI47CO01	SVOA	2-Methylphenol
	RI47CO01	SVOA	4-Nitrophenol
	RI47CO01	SVOA	2,4,6-Trichlorophenol
	RI47CO01	SVOA	4-Chloro-3-methylphenol
	RI47CO01	SVOA	4,6-Dinitro-2-methylphenol
	RI47CO01	SVOA	2,4-Dinitrophenol
	RI47CO01	SVOA	2,4-Dichlorophenol
	RI47CO01	SVOA	Phenol
	RI47CO01	SVOA	4-Methylphenol
	RI47CO01	SVOA	2,4-Dimethylphenol
	RI47CO01	SVOA	2-Nitrophenol
	RI47CO02	SVOA	4-Nitrophenol
	RI47CO02	SVOA	2,4-Dimethylphenol
	RI47CO02	SVOA	4-Methylphenol
	RI47CO02	SVOA	Phenol
	RI47CO02	SVOA	2,4-Dichlorophenol
	RI47CO02	SVOA	2,4-Dinitrophenol
	RI47CO02	SVOA	4,6-Dinitro-2-methylphenol
	RI47CO02	SVOA	4-Chloro-3-methylphenol
	RI47CO02	SVOA	Pentachlorophenol
	RI47CO02	SVOA	2,4,6-Trichlorophenol
	RI47CO02	SVOA	2-Nitrophenol
	RI47CO02	SVOA	2-Methylphenol
	RI47CO02	SVOA	2,4,5-Trichlorophenol
	RI47GW01	VOA	2-Butanone
	RI47GW01	VOA	Acetone
	RI47GW02	VOA	2-Butanone
	RI47GW03	VOA	Acetone
	RI47GW99	VOA	2-Butanone
	RI47GW99	VOA	Acetone
	RI47GW04	VOA	2-Butanone
	RI47GW04	VOA	Toluene
	IS47SS19	SVOA	2,4,5-Trichlorophenol
	IS47SS19	SVOA	2,4-Dinitrophenol
	IS47SS19	SVOA	2-Nitroaniline
	IS47SS19	SVOA	3-Nitroaniline
	IS47SS19	SVOA	4,6-Dinitro-2-methylphenol
	IS47SS19	SVOA	4-Nitroaniline
	IS47SS19	SVOA	4-Nitrophenol
	IS47SW02P	SVOA	Caprolactam
	IS47SW02	SVOA	Caprolactam

Table 3-1
Rejected Results

	Sample	Fraction	Compound
RI Data			
	IS47SW01	SVOA	Caprolactam
	IS47SS19	SVOA	Pentachlorophenol
	IS47MW010401	FMETAL	Mercury
	IS47MW020401	FMETAL	Mercury
	IS47MW030401	FMETAL	Mercury
	IS47MW040401	FMETAL	Mercury
	IS47MW050401	FMETAL	Mercury
	IS47MW060401	FMETAL	Mercury
	IS47MW070401	FMETAL	Mercury
	IS47MW080401	FMETAL	Mercury
	IS47MW090401	FMETAL	Mercury
	IS47MW100401	FMETAL	Mercury
	IS47MW410401	FMETAL	Mercury
	IS47MW010401	METAL	Mercury
	IS47MW040401	METAL	Mercury
	IS47MW050401	METAL	Mercury
	IS47MW060401	METAL	Mercury
	IS47MW070401	METAL	Mercury
	IS47MW080401	METAL	Mercury
	IS47MW090401	METAL	Mercury
	IS47MW100401	METAL	Mercury
	IS47MW410401	METAL	Mercury
Historic Data			
	47SA11	SVOC	Fluorene
	47SA12	SVOC	Fluorene

Appendix J
Raw Data for Site 47 Concrete Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	CO-01		CO-02	
Sample ID	RI47CO01		RI47CO02	
Sample Date	07/08/99		07/08/99	
Chemical Name				
Semi-volatile Organic Compounds (UG/KG)				
1,2,4-Trichlorobenzene	350	U	360	U
1,2-Dichlorobenzene	350	U	360	U
1,3-Dichlorobenzene	350	U	360	U
1,4-Dichlorobenzene	350	U	360	U
2,2'-Oxybis(1-chloropropane)	350	U	360	U
2,4,5-Trichlorophenol	870	R	900	R
2,4,6-Trichlorophenol	350	R	360	R
2,4-Dichlorophenol	350	R	360	R
2,4-Dimethylphenol	350	R	360	R
2,4-Dinitrophenol	870	R	900	R
2-Chloronaphthalene	350	U	360	U
2-Chlorophenol	350	R	360	R
2-Methylnaphthalene	350	U	360	U
2-Methylphenol	350	R	360	R
2-Nitroaniline	870	U	900	U
2-Nitrophenol	350	R	360	R
3,3'-Dichlorobenzidine	350	U	360	U
3-Nitroaniline	870	U	900	U
4,6-Dinitro-2-methylphenol	870	R	900	R
4-Bromophenyl-phenylether	350	U	360	U
4-Chloro-3-methylphenol	350	R	360	R
4-Chloroaniline	350	U	360	U
4-Chlorophenyl-phenylether	350	U	360	U
4-Methylphenol	350	R	360	R
4-Nitroaniline	870	U	900	U
4-Nitrophenol	870	R	900	R
Acenaphthene	350	U	360	U
Acenaphthylene	350	U	360	U
Anthracene	350	U	360	U
Benzo(a)anthracene	350	U	360	U
Benzo(a)pyrene	350	U	360	U
Benzo(b)fluoranthene	350	U	360	U
Benzo(g,h,i)perylene	350	U	360	U
Benzo(k)fluoranthene	350	U	360	U
Butylbenzylphthalate	350	U	360	U
Carbazole	350	U	360	U
Chrysene	350	U	360	U
Di-n-butylphthalate	350	U	360	U
Di-n-octylphthalate	350	U	360	U
Dibenz(a,h)anthracene	350	U	360	U
Dibenzofuran	350	U	360	U
Diethylphthalate	350	U	360	U
Dimethyl phthalate	350	U	360	U
Fluoranthene	350	U	360	U
Fluorene	350	U	360	U
Hexachlorobenzene	350	U	360	U
Hexachlorobutadiene	350	U	360	U
Hexachlorocyclopentadiene	350	U	360	U

NA - Not analyzed
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Appendix J
Raw Data for Site 47 Concrete Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	CO-01		CO-02	
Sample ID	RI47CO01		RI47CO02	
Sample Date	07/08/99		07/08/99	
Chemical Name				
Hexachloroethane	350	U	360	U
Indeno(1,2,3-cd)pyrene	350	U	360	U
Isophorone	350	U	360	U
Naphthalene	350	U	360	U
Pentachlorophenol	870	R	900	R
Phenanthrene	350	U	360	U
Phenol	350	R	360	R
Pyrene	350	U	360	U
bis(2-Chloroethoxy)methane	350	U	360	U
bis(2-Chloroethyl)ether	350	U	360	U
bis(2-Ethylhexyl)phthalate	350	U	360	U
n-Nitroso-di-n-propylamine	350	U	360	U
n-Nitrosodiphenylamine	350	U	NA	
Explosives (UG/KG)				
1,3,5-Trinitrobenzene	240	U	250	U
1,3-Dinitrobenzene	240	U	250	U
2,4,6-Trinitrotoluene	240	U	250	U
2,4-Dinitrotoluene	240	U	250	U
2,6-Dinitrotoluene	240	U	250	U
2-Amino-4,6-dinitrotoluene	240	U	250	U
2-Nitrotoluene	480	U	500	U
3-Nitrotoluene	480	U	500	U
4-Amino-2,6-dinitrotoluene	240	U	250	U
4-Nitrotoluene	480	U	500	U
HMX	480	U	500	U
Nitrobenzene	240	U	250	U
Nitrocellulose	24,400	U	33,200	U
Nitroglycerin	5,100,000	U	5,200,000	U
Nitroguanidine	108,700	U	114	U
PETN	238	U	250	U
RDX	480	U	500	U
Tetryl	480	U	500	U
Total Metals (MG/KG)				
Aluminum	5,730		5,660	
Antimony	0.55	UL	0.54	J
Arsenic	1.8	J	2.1	
Barium	53.3		59.2	
Beryllium	0.15	J	0.16	J
Cadmium	0.25	J	0.48	J
Calcium	66,800		66,500	
Chromium	5.6		6	
Cobalt	1.9	J	1.5	J
Copper	4.9	J	14.2	
Cyanide	0.22	U	0.24	U
Iron	3,550		3,680	
Lead	2,110		1,220	
Magnesium	1,140		1,370	
Manganese	36.3		40.3	

NA - Not analyzed
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Appendix J
Raw Data for Site 47 Concrete Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	CO-01		CO-02	
Sample ID	RI47CO01		RI47CO02	
Sample Date	07/08/99		07/08/99	
Chemical Name				
Mercury	0.21		4.4	
Nickel	3.3	J	3.2	J
Potassium	294	J	385	J
Selenium	0.53	U	0.52	U
Silver	0.42	J	2.5	
Sodium	67.5	J	83.8	J
Thallium	0.65	U	0.64	U
Vanadium	8.8	J	8.8	J
Zinc	19.6	J	63.2	J

NA - Not analyzed
J - Reported value is estimated
R - Unreliable result
U - Analyte not detected

Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW01		IS47GW02				IS47GW03		IS47GW04		IS47GW05		IS47GW06		IS47GW07		IS47GW08		IS47GW09		IS47GW10	
Sample ID	IS47GW010301		IS47GW220301		IS47GW020301		IS47GW030301		IS47GW040301		IS47GW050301		IS47GW060301		IS47GW070301		IS47GW080301		IS47GW090301		IS47GW100301	
Sample Date	03/13/01		03/13/01		03/13/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01	
Chemical Name																						
Volatile Organic Compounds (UG/L)																						
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	9.6	J	10	U	10	U	10	U	4.7	J	10	U	8.3	J	10	U	10	U
1,2,3-Trichlorobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,2,4-Trichlorobenzene	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2,4-Trimethylbenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dibromo-3-chloropropane	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromoethane	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	310	D	240	D	82		21		10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,3,5-Trimethylbenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,3-Dichlorobenzene	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,3-Dichloropropane	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Acetone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	2,000	UD	10	U	10	U	41		74		10	U	10	U	10	U	10	U
Carbon tetrachloride	400	D	550	D	9,000	D	10	U	10	U	350	D	31		10	U	10	U	10	U	4	J
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroform	410	D	590	D	16,000	D	10	U	10	U	350	D	280	D	10	U	10	U	10	U	30	
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cumene	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cyclohexane	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorobutadiene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Methyl acetate	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	NA		NA		NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	10	U	10	U	2,000	UD	10	U	10	U	10	U	120		10	U	10	U	10	U	10	U

NA - Not analyzed
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D - Spike diluted out

E - Concentration exceeds calibration range
J - Reported value is estimated
L - Biased low
U - Undetected

Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW01	IS47GW02		IS47GW03	IS47GW04	IS47GW05	IS47GW06	IS47GW07	IS47GW08	IS47GW09	IS47GW10
Sample ID	IS47GW010301	IS47GW220301	IS47GW020301	IS47GW030301	IS47GW040301	IS47GW050301	IS47GW060301	IS47GW070301	IS47GW080301	IS47GW090301	IS47GW100301
Sample Date	03/13/01	03/13/01	03/13/01	03/15/01	03/15/01	03/15/01	03/15/01	03/15/01	03/15/01	03/15/01	03/15/01
Chemical Name											
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	77	110	34	82	160	10 U	29	10 U	38
Toluene	10 U	10 U	22	11	6.4 J	10 U	72	10 U	10 U	8.1 J	10
Trichloroethene	4.3 J	3.3 J	11	170	57	190	80	8.1 J	10 U	10 U	4.6 J
Trichlorofluoromethane(Freon-11)	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	18	23	10 U	10 U	14	68	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	140	140	36	86	89	2,300 D	10 U	12
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	10 U	10 U	10 U	6.5 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U
n-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	10 U	10 U	10 U	2.8 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U
p-Isopropyltoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	33	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Total Metals (UG/L)											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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D - Spike diluted out

E - Concentration exceeds calibration range
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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
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Indian Head, Maryland

Station ID	IS47GW01		IS47GW02				IS47GW03		IS47GW04		IS47GW05		IS47GW06		IS47GW07		IS47GW08		IS47GW09		IS47GW10	
Sample ID	IS47GW010301		IS47GW220301		IS47GW020301		IS47GW030301		IS47GW040301		IS47GW050301		IS47GW060301		IS47GW070301		IS47GW080301		IS47GW090301		IS47GW100301	
Sample Date	03/13/01		03/13/01		03/13/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01		03/15/01	
Chemical Name																						
Beryllium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Cadmium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Calcium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Chromium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Cobalt	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Copper	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Iron	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Lead	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Magnesium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Manganese	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Mercury	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Nickel	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Potassium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Selenium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Silver	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Sodium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Thallium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Vanadium	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Dissolved Metals (UG/L)																						
Aluminum	46.7	B	72.1	B	8.2	U	1,070	E	218	E	96.9	BE	253	E	51.5	BE	83.7	BE	316	E	8.2	UE
Antimony	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U
Arsenic	7.4	B	15.8		4.5	U	4.5	U	4.5	U	17.5		6.3	B	4.5	U	4.5	U	4.5	U	4.5	U
Barium	63	B	210		0.3	U	81	B	53.6	B	67.5	B	67.1	B	48.1	B	12.5	B	41	B	6	B
Beryllium	0.1	U	0.56	B	0.1	U	0.1	U	0.1	U	0.4	B	0.65	B	0.1	U	0.1	B	0.1	U	0.1	U
Cadmium	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Calcium	4,310	B	9,000		3.1	U	5,020		3,710	B	5,980		5,600		4,590	B	5,630		3,530	B	2,090	B
Chromium	0.5	U	0.5	U	0.5	U	1.4	B	0.5	U	2.1	B	2.7	B	0.5	U	0.5	U	0.5	U	0.5	U
Cobalt	3.5	B	105		1.1	U	5.2	B	1.1	U	40.3	B	26.7	B	1.1	B	4.7	B	1.2	B	2.6	B
Copper	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U
Iron	14,700		23,500		20.6	U	31,200		19,500		11,200		23,900		20,500		1,440		20,400		1,180	
Lead	1.5	U	1.7	B	1.5	U	6		3.4		1.5	U	3		3.6		1.5	U	5.1		1.5	U
Magnesium	3,560	B	7,180		5.5	U	4,850	B	3,470	B	2,540	B	1,400	B	2,080	B	1,090	B	2,620	B	687	B
Manganese	430		382		0.3	U	830		563		171		246		496		47.4		476		44.2	
Mercury	0.2	U	0.2	U	0.2	U	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN	0.2	UN
Nickel	2.5		48.5		1.6	U	1.6	U	3.1	B	15	B	20.4	B	1.6	U	1.8	B	1.6	U	1.6	U
Potassium	3,090	BE	3,500	BE	22.3	UE	3,480	BE	2,060	BE	1,740	BE	979	BE	1,490	BE	1,010	BE	2,010	BE	1,200	BE
Selenium	4.8	U	4.8	U	4.8	U	4.8	U	4.8	U	4.8	U	32		4.8	U	19.7		4.8	U	4.8	U
Silver	1.6	U	1.6	U	1.6	U	1.6	U	1.6	B	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U
Sodium	22,000		17,600		289	U	15,900		14,600		4,980	B	6,080		16,700		12,800		18,900		2,220	B
Thallium	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.2	U	5.7	B	5.2	U	7.6	B
Vanadium	1.9	B	3.5	B	0.8	B	5.9	B	2.8	B	7.4	B	12.7	B	2	B	2.6	B	2.4	B	2.8	B
Zinc	11.7	B	106		5.9	B	14.3	B	55.1		42.8		38.2		10.5	B	7.8	B	11.2	B	7.8	B

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW11		IS47GW12		IS47GW12		IS47GW23		IS47GW24		IS47GW25		IS47GW26		IS47GW27		IS47GW27		IS47GW28		IS47GW29	
Sample ID	IS47GW110301		IS47GW120301		IS47GW320301		IS47GW230602		IS47GW240602		IS47GW250602		IS47GW260602		IS47GW270602		IS47GW270602P		IS47GW280602		IS47GW290602	
Sample Date	03/15/01		03/15/01		03/15/01		06/17/02		06/18/02		06/19/02		06/19/02		06/19/02		06/19/02		06/18/02		06/18/02	
Chemical Name																						
Volatile Organic Compounds (UG/L)																						
1,1,1-Trichloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,2,3-Trichlorobenzene	NA		NA		NA		3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
1,2,4-Trimethylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dibromoethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,2-Dichlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,2-Dichloroethane	140		20		16		3	U	3	U	7		3	U	27		24		3	U	3	U
1,2-Dichloropropane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,3,5-Trimethylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,3-Dichlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,3-Dichloropropane	NA		NA		NA		3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
1,4-Dichlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
2-Butanone	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
2-Hexanone	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Acetone	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Benzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Bromodichloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Bromoform	10	U	10	U	10	U	2	U	1	JB	2	U	2	U	2	U	2	U	1	JB	2	U
Bromomethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Carbon disulfide	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Carbon tetrachloride	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	1	J
Chlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloroform	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Cumene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Cyclohexane	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Dibromochloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Ethylbenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Hexachlorobutadiene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Methyl acetate	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Methylcyclohexane	10	U	10	U	10	U	NA		NA		NA		NA		NA		NA		NA		NA	
Methylene chloride	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U

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D - Spike diluted out

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Station ID	IS47GW11		IS47GW12		IS47GW12		IS47GW23		IS47GW24		IS47GW25		IS47GW26		IS47GW27		IS47GW27		IS47GW28		IS47GW29	
Sample ID	IS47GW110301		IS47GW120301		IS47GW320301		IS47GW230602		IS47GW240602		IS47GW250602		IS47GW260602		IS47GW270602		IS47GW270602P		IS47GW280602		IS47GW290602	
Sample Date	03/15/01		03/15/01		03/15/01		06/17/02		06/18/02		06/19/02		06/19/02		06/19/02		06/19/02		06/18/02		06/18/02	
Chemical Name																						
Naphthalene	NA		NA		NA		3	U	2		3	U	3	U	3	U	3	U	3	U	3	U
Styrene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Tetrachloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Toluene	8.1	J	13		5.7	J	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Trichloroethene	6.7	J	6.7	J	5.2	J	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Trichlorofluoromethane(Freon-11)	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Vinyl chloride	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
cis-1,2-Dichloroethene	10	U	15		9.5	J	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
m- and p-Xylene	10	U	10	U	10	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U
n-Butylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
n-Propylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
o-Xylene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
p-Isopropyltoluene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
sec-Butylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
tert-Butylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Total Metals (UG/L)																						
Aluminum	NA		NA		NA		NA		NA		216	B	58.7	B	270	B	NA		NA		NA	
Antimony	NA		NA		NA		NA		NA		3.8	B	3.1	B	4.9	B	NA		NA		NA	
Arsenic	NA		NA		NA		NA		NA		4.2	U	4.2	U	4.2	U	NA		NA		NA	
Barium	NA		NA		NA		NA		NA		95.2	J	146	J	124	J	NA		NA		NA	

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW11	IS47GW12		IS47GW23	IS47GW24	IS47GW25	IS47GW26	IS47GW27		IS47GW28	IS47GW29
Sample ID	IS47GW110301	IS47GW120301	IS47GW320301	IS47GW230602	IS47GW240602	IS47GW250602	IS47GW260602	IS47GW270602	IS47GW270602P	IS47GW280602	IS47GW290602
Sample Date	03/15/01	03/15/01	03/15/01	06/17/02	06/18/02	06/19/02	06/19/02	06/19/02	06/19/02	06/18/02	06/18/02
Chemical Name											
Beryllium	NA	NA	NA	NA	NA	0.37 B	0.4 B	0.65 B	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	0.3 U	0.3 U	0.3 U	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	5,370	28,500	4,240 J	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.93 B	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	1.2 B	1.1 B	2 B	NA	NA	NA
Copper	NA	NA	NA	NA	NA	1 L	0.7 UL	0.7 UL	NA	NA	NA
Iron	NA	NA	NA	NA	NA	45,900	37,900	31,100	NA	NA	NA
Lead	NA	NA	NA	NA	NA	1.3 U	1.3 U	1.3 U	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	3,230 J	5,910	4,260 J	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	1,680	1,390	1,400	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	0.46	0.12 J	0.1 J	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	1.2 B	1.6 B	9.1 B	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	1,070 J	5,660 J	1,610 J	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	2.2 J	2.2 U	2.7 J	NA	NA	NA
Silver	NA	NA	NA	NA	NA	0.7 U	0.7 U	0.7 U	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	8,750 B	18,200 B	16,000 B	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	4.4 J	3.7 J	5.2 J	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	1.5 B	0.5 U	2.6 B	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	19.2 L	22.4	13.3 L	NA	NA	NA
Dissolved Metals (UG/L)											
Aluminum	8.2 UE	196 BE	94.9 BE	NA	NA	56.5 B	59.3 B	58.6 B	NA	NA	NA
Antimony	7.5 U	7.5 U	7.5 U	NA	NA	1.6 U	1.6 U	4.2 B	NA	NA	NA
Arsenic	5.4 B	4.5 U	4.5 U	NA	NA	4.2 U	4.2 U	5.5 J	NA	NA	NA
Barium	78.3 B	48 B	48 B	NA	NA	97.1 J	161 J	138 J	NA	NA	NA
Beryllium	0.1 U	0.1 U	0.1 U	NA	NA	0.76 B	0.73 B	0.74 B	NA	NA	NA
Cadmium	0.5 U	0.5 U	0.5 U	NA	NA	0.3 U	0.3 U	0.3 U	NA	NA	NA
Calcium	5,710	3,160 B	3,090 B	NA	NA	5,400	28,800	5,120	NA	NA	NA
Chromium	0.5 U	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	NA	NA	NA
Cobalt	1.1 U	1.4 B	1.1 U	NA	NA	1.1 B	2.1 B	1.8 B	NA	NA	NA
Copper	1.2 U	1.2 U	1.2 U	NA	NA	0.7 UL	0.7 UL	0.7 UL	NA	NA	NA
Iron	22,000	22,800	22,300	NA	NA	45,000	41,300	37,600	NA	NA	NA
Lead	3.8	2.3 B	3.1	NA	NA	1.3 U	1.3 U	1.3 U	NA	NA	NA
Magnesium	5,030	2,790 B	2,740 B	NA	NA	3,220 J	6,410	5,290	NA	NA	NA
Manganese	867	688	671	NA	NA	1,650	1,470	1,660	NA	NA	NA
Mercury	0.2 UN	0.2 UN	0.2 UN	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA
Nickel	2.5 B	1.6 U	1.6 U	NA	NA	2.9 B	5.3 B	10.3 B	NA	NA	NA
Potassium	3,770 BE	2,260 BE	2,140 BE	NA	NA	1,170 B	7,030 J	2,410 J	NA	NA	NA
Selenium	4.8 U	4.8 U	4.8 U	NA	NA	2.2 U	2.2 U	2.5 J	NA	NA	NA
Silver	1.6 U	1.6 U	1.6 U	NA	NA	0.7 U	0.7 U	0.7 U	NA	NA	NA
Sodium	16,100	14,800	14,700	NA	NA	9,030 B	22,500 B	18,900 B	NA	NA	NA
Thallium	5.2 U	5.2 U	5.2 U	NA	NA	7.2 L	6.4 L	6 L	NA	NA	NA
Vanadium	1.7 B	1.8 B	1.7 B	NA	NA	0.9 B	0.75 B	1.3 B	NA	NA	NA
Zinc	11.9 B	12.2 B	11 B	NA	NA	24.6 B	63.6 B	13.3 B	NA	NA	NA

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW30	IS47GW31	IS47GW32	IS47GW33		IS47GW34	IS47GW35	IS47GW36		IS47GW37
Sample ID	IS47GW300602	IS47GW310602	IS47GW320602	IS47GW330602	IS47GW330602P	IS47GW340602	IS47GW350602	IS47GW360602	IS47GW360602P	IS47GW370602
Sample Date	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,1-Trichloroethane	2	12	2 U	2 U	NA	3	2 U	3	2 U	2 U
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	2 U	1 J	2 U	2 U	NA	4	2 U	2 U	2 U	2 U
1,1-Dichloroethane	2 U	2 U	2 U	2 U	NA	2 U	5 DJ	2 U	2 U	2
1,1-Dichloroethene	2 U	4	2 U	2 U	NA	2 U	6 D	2 U	2 U	3
1,2,3-Trichlorobenzene	3 U	3 U	3 U	3 U	NA	3 U	3 U	3 U	3 U	3 U
1,2,4-Trichlorobenzene	3 U	3 U	3 U	3 U	NA	3 U	3 U	3 U	3 U	3 U
1,2,4-Trimethylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
1,2-Dichloroethane	1 J	8	3 U	19	NA	3 U	7 DJ	3 U	3 U	3 U
1,2-Dichloropropane	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
1,3,5-Trimethylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
1,3-Dichlorobenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
1,3-Dichloropropane	3 U	3 U	3 U	3 U	NA	3 U	3 U	3 U	3 U	3 U
1,4-Dichlorobenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Bromodichloromethane	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Bromoform	1 JB	2 U	2 U	1 JB	NA	2 U	2 U	2 U	2 U	2 U
Bromomethane	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	11,000 D	110,000 D	14,000 D	12	NA	18,000 D	3	8,000 D	930 E	2,400 D
Chlorobenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Chloroethane	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Chloroform	4,300 D	56,000 D	6,100 D	2 U	NA	4,800 D	15 D	7,700 D	620 E	8,100 D
Chloromethane	2 U	3	2	2 U	NA	2 U	2 U	2 U	2 U	2 U
Cumene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	2 U	3	2 U	2 U	NA	64 E	8 DJ	2 U	2 U	2 U
Dichlorodifluoromethane(Freon-12)	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Ethylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Hexachlorobutadiene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	4	31	2	2 U	NA	3	2 U	10	9	18

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW30	IS47GW31	IS47GW32	IS47GW33		IS47GW34	IS47GW35	IS47GW36		IS47GW37
Sample ID	IS47GW300602	IS47GW310602	IS47GW320602	IS47GW330602	IS47GW330602P	IS47GW340602	IS47GW350602	IS47GW360602	IS47GW360602P	IS47GW370602
Sample Date	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02
Chemical Name										
Naphthalene	3 U	3 U	3 U	3 U	NA	3 U	3 U	3 U	3 U	3 U
Styrene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Tetrachloroethene	21	3	30	2 U	NA	69 E	9 DJ	100 D	57 E	16
Toluene	2 U	52 E	2 U	2 U	NA	2 U	2 U	6	7	4
Trichloroethene	2 U	16	2 U	18	NA	2 U	170 D	2	2 U	47
Trichlorofluoromethane(Freon-11)	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Vinyl chloride	2 U	1 J	2 U	1 J	NA	2 U	2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene	2 U	8	2 U	1 J	NA	2 U	39	2 U	2 U	23
cis-1,3-Dichloropropene	2 U	1 J	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
m- and p-Xylene	4 U	4 U	4 U	4 U	NA	4 U	4 U	4 U	4 U	4 U
n-Butylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
n-Propylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
o-Xylene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
p-Isopropyltoluene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
sec-Butylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
tert-Butylbenzene	2 U	2 U	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
trans-1,2-Dichloroethene	2 U	2 U	2 U	2 U	NA	2 U	1 J	2 U	2 U	2 U
trans-1,3-Dichloropropene	2 U	2	2 U	2 U	NA	2 U	2 U	2 U	2 U	2 U
Total Metals (UG/L)										
Aluminum	90.5 B	5,140	152 B	63.9 B	166 B	116 B	129 B	157 B	NA	109 B
Antimony	1.6 U	3.4 B	2.7 B	1.6 U	1.7 B	1.6 U	6.2 B	4.7 B	NA	1.6 U
Arsenic	4.2 U	36.5	4.2 U	4.2 U	4.2 U	4.2 U	5.7 J	4.2 U	NA	8.4 J
Barium	8.2 B	196 J	4.3 B	104 J	101 J	6.6 B	193 J	11.7 B	NA	228

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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW30	IS47GW31	IS47GW32	IS47GW33		IS47GW34	IS47GW35	IS47GW36		IS47GW37
Sample ID	IS47GW300602	IS47GW310602	IS47GW320602	IS47GW330602	IS47GW330602P	IS47GW340602	IS47GW350602	IS47GW360602	IS47GW360602P	IS47GW370602
Sample Date	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02	06/19/02
Chemical Name										
Beryllium	0.58 B	13.4	0.63 B	0.64 B	0.69 B	0.78 B	0.6 B	1 B	NA	2.3 B
Cadmium	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.81 B	NA	0.3 U
Calcium	932 J	8,550	1,420 J	3,600 J	3,470 J	2,140 J	8,280	3,080 J	NA	13,300
Chromium	0.5 U	3.9 B	0.5 U	0.5 U	0.5 U	0.5 U	1.1 B	0.5 U	NA	0.66 B
Cobalt	3.2 B	428	8.9 J	0.6 U	0.78 B	10.5 J	32.3 J	24.5 J	NA	288
Copper	0.7 UL	0.7 UL	0.7 UL	0.7 UL	0.7 UL	0.7 UL	1.3 L	0.7 UL	NA	0.7 UL
Iron	398	62,600	619	19,700	19,000	517	20,200	5,980	NA	53,700
Lead	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 B	1.3 U	1.3 U	NA	1.3 U
Magnesium	420 J	13,700	1,080 J	3,900 J	3,720 J	1,380 J	9,450	2,410 J	NA	15,600
Manganese	19.1 B	602	76.3 B	548	537	79 B	400	184	NA	731
Mercury	0.1 J	0.12 J	0.11 B	0.1 J	0.11 J	0.11	0.1 U	0.11 J	NA	0.1 J
Nickel	4.9 B	264	10.2 B	2 B	2 B	8 B	25.6 J	19.9 J	NA	126
Potassium	488 J	4,030 J	810 J	6,410 J	6,140 J	835 J	8,990 J	1,790 J	NA	9,210 J
Selenium	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	NA	2.3 J
Silver	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	NA	0.7 U
Sodium	22,100 B	39,700	26,300 B	23,500 B	22,800 B	17,900 B	51,200	39,400	NA	50,700
Thallium	3.3 U	8 J	3.3 U	3.5 J	3.3 U	3.3 U	4.3 J	3.3 U	NA	6.7 J
Vanadium	0.5 U	115	0.73 B	0.77 B	1.8 B	0.5 U	2.4 B	0.56 B	NA	1.6 B
Zinc	9.9 L	522	19.9 L	6.1 L	16.9 L	24.8	31.5	72.7	NA	119
Dissolved Metals (UG/L)										
Aluminum	64.9 B	4,880	82.3 B	39 B	30 B	59 B	67.6 B	96.4 B	NA	81.5 B
Antimony	1.6 U	2.3 B	1.8 B	1.6 U	1.6 U	3 B	2.6 B	1.6 U	NA	4.4 B
Arsenic	4.2 U	37.7	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	NA	9.1 J
Barium	7.7 B	207	3.7 B	99 J	98.9 J	5.6 B	178 J	11.6 B	NA	215
Beryllium	0.69 B	13.5	0.68 B	0.54 B	0.37 B	0.26 B	1.1 B	0.4 B	NA	1.7 B
Cadmium	0.3 U	0.3 U	0.3 B	0.3 U	0.3 U	0.3 U	0.3 U	0.79 B	NA	0.3 U
Calcium	683 J	8,730	1,410 J	3,450 J	3,420 J	2,240 J	7,440	2,980 J	NA	13,100
Chromium	0.5 U	4.1 B	0.5 U	0.5 U	0.5 U	0.5 U	0.64 B	0.5 U	NA	0.5 U
Cobalt	2.4 B	440	8.9 J	0.6 U	0.62 B	11 J	27.2 J	24.2 J	NA	297
Copper	0.7 UL	0.7 UL	0.7 UL	0.7 UL	0.7 UL	0.78 B	0.7 UL	0.95 B	NA	0.71 B
Iron	1,250 B	65,100	555 B	19,200	18,500	565 B	18,600	5,780	NA	53,200
Lead	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	NA	1.3 U
Magnesium	273 B	14,200	1,060 J	3,810 J	3,710 J	1,450 J	8,730	2,350 J	NA	15,300
Manganese	32.8 B	634	76.8 B	557	546	88.4 B	366	194	NA	745
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 J	0.1 U	0.1 U	NA	0.1 U
Nickel	6.3 B	272	8.8 B	1.3 B	1.5 B	8.1 B	16.8 J	19.7 J	NA	120
Potassium	741 B	4,440 J	839 B	6,320 J	6,240 J	852 B	8,890 J	1,780 J	NA	8,800 J
Selenium	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.3 J	NA	2.2 U
Silver	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	NA	0.7 U
Sodium	21,600 B	40,800	24,600 B	23,900 B	24,000 B	16,200 B	46,200	33,900	NA	53,000
Thallium	3.3 UL	9.1 L	3.3 UL	4.4 L	3.3 UL	3.3 UL	4.4 L	3.5 L	NA	5.8 L
Vanadium	0.5 U	114	0.5 U	0.5 U	0.54 B	0.5 U	1.8 B	0.5 U	NA	1.2 B
Zinc	13.1 B	566	20.6 B	10.6 B	19.2 B	28.9 B	28.4 B	74 B	NA	132

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW38	IS47GW39	IS47GW40	IS47GW41	IS47GW42	RI47GW13	RI47GW14	RI47GW15	RI47GW16	RI47GW17	RI47GW18
Sample ID	IS47GW380602	IS47GW390602	IS47GW400602	IS47GW410602	IS47GW420602	RI47GW13	RI47GW14	RI47GW15	RI47GW16	RI47GW17	RI47GW18
Sample Date	06/20/02	06/20/02	06/20/02	06/26/02	06/28/02	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,1,1-Trichloroethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	2 U	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethene	2 U	14	2 U	2 U	2 U	2 U	1 J	2 J	2 J	2 U	2 U
1,2,3-Trichlorobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
1,2,4-Trichlorobenzene	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
1,2,4-Trimethylbenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2-Dichloroethane	3 U	3 U	3 U	25	3 U	17	124 D	1,580 D	1,290 D	11	650 D
1,2-Dichloropropane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,3,5-Trimethylbenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,3-Dichlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,3-Dichloropropane	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
1,4-Dichlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Bromodichloromethane	2 U	1 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Bromoform	2 U	2 U	1 JB	2 U	1 JB	2 U	2 U	2 U	2 U	2 U	2 U
Bromomethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	2,300 D	250,000 DE	15	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Chlorobenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Chloroethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2	2 J	2 U	2 U
Chloroform	2,000 D	91,000 DE	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Chloromethane	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cumene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	9	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Dichlorodifluoromethane(Freon-12)	2 U	8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethylbenzene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Hexachlorobutadiene	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	2	2,000 DJ	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

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E - Concentration exceeds calibration range
J - Reported value is estimated
L - Biased low
U - Undetected

Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47GW38		IS47GW39		IS47GW40		IS47GW41		IS47GW42		RI47GW13		RI47GW14		RI47GW15		RI47GW16		RI47GW17		RI47GW18	
Sample ID	IS47GW380602		IS47GW390602		IS47GW400602		IS47GW410602		IS47GW420602		RI47GW13		RI47GW14		RI47GW15		RI47GW16		RI47GW17		RI47GW18	
Sample Date	06/20/02		06/20/02		06/20/02		06/26/02		06/28/02		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01		10/29/01	
Chemical Name																						
Naphthalene	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U	3	U
Styrene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Tetrachloroethene	10		20		2	U	2	U	2	U	2	U	2	U	103	D	81	D	2	U	2	U
Toluene	2	U	49		2	U	3		2	U	2	U	2	U	2	U	2	U	2	U	2	U
Trichloroethene	2	U	2	U	2	U	2	U	2	U	7		75	D	270	D	200	D	2	U	2	U
Trichlorofluoromethane(Freon-11)	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Vinyl chloride	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
cis-1,2-Dichloroethene	2	U	21		2	U	2	U	2	U	2	U	32		40		34		2	U	2	
cis-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
m- and p-Xylene	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U	4	U
n-Butylbenzene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
n-Propylbenzene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
o-Xylene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
p-Isopropyltoluene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
sec-Butylbenzene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
tert-Butylbenzene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	2	U	2	U	2	U	2	U	2	U	2	U	1	J	4		3		2	U	2	U
trans-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Total Metals (UG/L)																						
Aluminum	116	B	16,400		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Antimony	3.5	B	1.9	B	NA		NA		NA		NA		NA		NA		NA		NA		NA	
Arsenic	4.2	U	15.1		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Barium	5	B	170	J	NA		NA		NA		NA		NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
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Indian Head, Maryland

Station ID	IS47GW38	IS47GW39	IS47GW40	IS47GW41	IS47GW42	RI47GW13	RI47GW14	RI47GW15	RI47GW16	RI47GW17	RI47GW18
Sample ID	IS47GW380602	IS47GW390602	IS47GW400602	IS47GW410602	IS47GW420602	RI47GW13	RI47GW14	RI47GW15	RI47GW16	RI47GW17	RI47GW18
Sample Date	06/20/02	06/20/02	06/20/02	06/26/02	06/28/02	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01
Chemical Name											
Beryllium	0.82 B	15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	2.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	1,410 J	7,770	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.5 U	15.3 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	14.3 J	279	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	0.7 UL	0.7 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	674	76,600	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1.3 U	6.1 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	1,600 J	16,100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	172	697	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.11 J	0.11 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	8.7 B	245	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	890 J	4,360 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	2.2 U	2.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.7 U	0.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	8,990 B	38,200	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	3.3 U	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	0.5 U	332	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	21.1 L	522	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)											
Aluminum	49.1 B	17,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	2.1 B	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	4.2 U	15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	4.3 B	185 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.2 U	14.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.3 U	3.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	1,370 J	8,100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.5 U	17.5 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	14.2 J	292	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	0.79 B	0.7 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	705 B	80,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1.3 U	3.8 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	1,530 J	17,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	172	760	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.12 J	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	9 B	277	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	1,030 B	4,460 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	2.2 U	2.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.7 U	0.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	9,730 B	41,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	3.3 UL	10.6 L	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	0.5 U	350	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	18.9 B	572	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47GW19		RI47GW20		RI47GW21		RI47GW22		RI47SP01	
Sample ID	RI47GW19		RI47GW20		RI47GW21		RI47GW22		RI47SP01	
Sample Date	10/29/01		10/29/01		10/29/01		10/29/01		10/29/01	
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,1-Trichloroethane	2	U	2	U	2	U	2	U	2	U
1,1,2,2-Tetrachloroethane	NA		NA		NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethane	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethene	2	U	1	J	2	U	2	U	2	U
1,2,3-Trichlorobenzene	3	U	3	U	3	U	3	U	3	U
1,2,4-Trichlorobenzene	3	U	3	U	3	U	3	U	3	U
1,2,4-Trimethylbenzene	2	U	2	U	2	U	2	U	2	U
1,2-Dibromo-3-chloropropane	NA		NA		NA		NA		NA	
1,2-Dibromoethane	2	U	2	U	2	U	2	U	2	U
1,2-Dichlorobenzene	2	U	2	U	2	U	2	U	2	U
1,2-Dichloroethane	96	D	120	D	3	U	3	U	3	U
1,2-Dichloropropane	2	U	2	U	2	U	2	U	2	U
1,3,5-Trimethylbenzene	2	U	2	U	2	U	2	U	2	U
1,3-Dichlorobenzene	2	U	2	U	2	U	2	U	2	U
1,3-Dichloropropane	3	U	3	U	3	U	3	U	3	U
1,4-Dichlorobenzene	2	U	2	U	2	U	2	U	2	U
2-Butanone	NA		NA		NA		NA		NA	
2-Hexanone	NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	NA		NA		NA		NA		NA	
Acetone	NA		NA		NA		NA		NA	
Benzene	2	U	2	U	2	U	2	U	2	U
Bromodichloromethane	2	U	2	U	2	U	2	U	2	U
Bromoform	2	U	2	U	2	U	2	U	2	U
Bromomethane	2	U	2	U	2	U	2	U	2	U
Carbon disulfide	NA		NA		NA		NA		NA	
Carbon tetrachloride	2	U	2	U	2	U	2	U	2	U
Chlorobenzene	2	U	2	U	2	U	2	U	2	U
Chloroethane	2	U	2	U	2	U	2	U	2	U
Chloroform	2	U	2	U	2	U	2	U	2	U
Chloromethane	2	U	2	U	2	U	2	U	2	U
Cumene	2	U	2	U	2	U	2	U	2	U
Cyclohexane	NA		NA		NA		NA		NA	
Dibromochloromethane	2	U	2	U	2	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	2	U	2	U	2	U	2	U	2	U
Ethylbenzene	2	U	2	U	2	U	2	U	2	U
Hexachlorobutadiene	2	U	2	U	2	U	2	U	2	U
Methyl acetate	NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		NA	
Methylcyclohexane	NA		NA		NA		NA		NA	
Methylene chloride	2	U	2	U	2	U	2	U	2	U

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Appendix J
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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47GW19		RI47GW20		RI47GW21		RI47GW22		RI47SP01	
Sample ID	RI47GW19		RI47GW20		RI47GW21		RI47GW22		RI47SP01	
Sample Date	10/29/01		10/29/01		10/29/01		10/29/01		10/29/01	
Chemical Name										
Naphthalene	3		3	U	3	U	3	U	3	U
Styrene	2	U	2	U	2	U	2	U	2	U
Tetrachloroethene	2	U	2	U	2	U	2	U	2	U
Toluene	2	U	2	U	2	U	2	U	2	U
Trichloroethene	2	U	34		2	U	2	U	2	U
Trichlorofluoromethane(Freon-11)	2	U	2	U	2	U	2	U	2	U
Vinyl chloride	2	U	2	U	2	U	2	U	2	U
cis-1,2-Dichloroethene	1	J	34		2	U	2	U	2	U
cis-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U
m- and p-Xylene	4	U	4	U	4	U	4	U	4	U
n-Butylbenzene	2	U	2	U	2	U	2	U	2	U
n-Propylbenzene	2	U	2	U	2	U	2	U	2	U
o-Xylene	2	U	2	U	2	U	2	U	2	U
p-Isopropyltoluene	2	U	2	U	2	U	2	U	2	U
sec-Butylbenzene	2	U	2	U	2	U	2	U	2	U
tert-Butylbenzene	2	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	2	U	1	J	2	U	2	U	2	U
trans-1,3-Dichloropropene	2	U	2	U	2	U	2	U	2	U
Total Metals (UG/L)										
Aluminum	NA		NA		NA		NA		NA	
Antimony	NA		NA		NA		NA		NA	
Arsenic	NA		NA		NA		NA		NA	
Barium	NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Unvalidated Direct Push Groundwater Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47GW19	RI47GW20	RI47GW21	RI47GW22	RI47SP01
Sample ID	RI47GW19	RI47GW20	RI47GW21	RI47GW22	RI47SP01
Sample Date	10/29/01	10/29/01	10/29/01	10/29/01	10/29/01
Chemical Name					
Beryllium	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)					
Aluminum	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04		
Sample ID	RI47GW01	IS47MW010401	RI47GW02	IS47MW020401	RI47GW03	RI47GW99	IS47MW030401	IS47MW030902	RI47GW04	IS47MW040401	IS47MW040902
Sample Date	07/13/99	04/10/01	07/13/99	04/10/01	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/10/01	09/26/02
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	0.7 J	6,300 U	6.3	1 U	3,300 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1.2	1.1	1 U	6,300 U	0.5 J	3	3,300 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	3.9 J	NA	NA	NA	6,300 U	NA	NA	3,300 U
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	3.4	3.4	1 U	6,300 U	0.3 J	1 U	3,300 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	168 J	1 U	1 U	6,300 U	1.2	0.9 J	3,300 U
1,1-Dichloroethene	1.9	1.3	1 U	1 U	743 J	1 U	1 U	6,300 U	3.3	3.9	3,300 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	6.6	1 U	1 U	6,300 U	1 U	1 R	3,300 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
1,2-Dichloroethane	6.7	2.2	1 U	1.5	716 J	1 U	1 U	6,300 U	1 U	53	3,300 U
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1.3	1 U	1 U	6,300 U	1 U	1 U	3,300 U
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
1,3-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
2-Butanone	5 R	5 U	5 R	5 U	5 R	5 R	5 U	6,300 U	5 R	5 R	3,300 U
2-Hexanone	5 U	5 U	5 U	5 U	2.1 J	5 U	5 U	6,300 U	5 UJ	5 U	3,300 U
4-Methyl-2-pentanone	5 U	5 U	5 U	5 U	10.8	5 U	5 U	6,300 U	5 UJ	5 U	3,300 U
Acetone	5 R	5 U	5 R	5 U	6,064 L	5 R	5 U	6,300 U	13.5 L	5 R	3,300 U
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Bromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	1 U	1 U	NA
Bromodichloromethane	1 U	1 U	1 U	1 U	4.3	1 U	1 U	6,300 U	0.9 J	1 U	3,300 U
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Bromomethane	1 U	1 U	1 U	1 U	937 J	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Carbon disulfide	0.5 B	1 U	0.6 B	1 U	6,620 L	1 U	1.1	2,200 J	777	2,900	2,800 J
Carbon tetrachloride	0.6 J	1 U	87.5 L	3.6	286,340 L	270,710 L	6,500	100,000	6,483 L	34,000	28,000
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Chloroethane	1 U	1 U	1 U	1 U	26.2 J	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Chloroform	9.9 B	1 U	20.8 B	2.4	57,570 L	1 U	2,000	39,000	6,063 L	23,000	23,000
Chloromethane	1 U	1 U	1 U	1 U	59,259 J	1 U	1 U	6,300 U	1 U	1.1	3,300 U
Cumene	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Dibromochloromethane	1 U	1 U	1 U	1 U	86.6 J	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04		
Sample ID	RI47GW01	IS47MW010401	RI47GW02	IS47MW020401	RI47GW03	RI47GW99	IS47MW030401	IS47MW030902	RI47GW04	IS47MW040401	IS47MW040902
Sample Date	07/13/99	04/10/01	07/13/99	04/10/01	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/10/01	09/26/02
Chemical Name											
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Methylene chloride	1 B	2 U	0.9 B	2 U	1,660 B	2 U	2 U	4,500 B	259 B	42 R	2,400 B
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Tetrachloroethene	2.8	2.1	2.9	1.3	116 J	116 J	5.2	6,300 U	290 L	1,400	1,300 J
Toluene	1 U	1 U	1 U	1 U	233 J	237 J	1 U	1,100 B	26.8 R	25	540 B
Trichloroethene	168 L	130	1 J	4.1	0.4 J	1 U	1 U	6,300 U	339	120	3,300 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	6,300 U	NA	NA	3,300 U
Vinyl chloride	1 U	1 U	1 U	2	28.2 J	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Xylene, total	1 U	1 U	1 U	1 U	0.3 J	1 U	1 U	6,300 U	1 U	1 U	3,300 U
cis-1,2-Dichloroethene	15	15	0.7 J	13	1,452 J	1 U	1 U	6,300 U	12.4	12	3,300 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	6,300 U	1 U	1 U	3,300 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	1 U	NA	1 U	NA	NA	1 U	NA	NA	1 U	NA
p-Isopropyltoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	0.6 J	1 U	1 U	1 U	382 J	1 U	1 U	6,300 U	1.7	1.6	3,300 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	4.8	1 U	1 U	6,300 U	1 U	1 U	3,300 U
Semivolatile Organic Compounds (UG/L)											
1,1-Biphenyl	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	10 U	NA
2,2'-Oxybis(1-chloropropane)	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2,4,5-Trichlorophenol	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
2,4,6-Trichlorophenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2,4-Dichlorophenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2,4-Dimethylphenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2,4-Dinitrophenol	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
2-Chloronaphthalene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2-Chlorophenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2-Methylnaphthalene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2-Methylphenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
2-Nitroaniline	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
2-Nitrophenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
3,3'-Dichlorobenzidine	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
3- and 4-Methylphenol	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	10 U	NA
3-Nitroaniline	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
4,6-Dinitro-2-methylphenol	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
4-Bromophenyl-phenylether	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA

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Appendix J
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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04		
Sample ID	RI47GW01	IS47MW010401	RI47GW02	IS47MW020401	RI47GW03	RI47GW99	IS47MW030401	IS47MW030902	RI47GW04	IS47MW040401	IS47MW040902
Sample Date	07/13/99	04/10/01	07/13/99	04/10/01	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/10/01	09/26/02
Chemical Name											
4-Chloro-3-methylphenol	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
4-Chloroaniline	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
4-Chlorophenyl-phenylether	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
4-Methylphenol	11 U	NA	11 U	NA	11 U	11 U	NA	NA	11 U	NA	NA
4-Nitroaniline	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
4-Nitrophenol	27 U	25 U	27 U	25 U	28 U	28 U	25 U	NA	29 U	25 U	NA
Acenaphthene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Acenaphthylene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Acetophenone	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	10 U	NA
Anthracene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Atrazine	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	10 U	NA
Benzaldehyde	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	1.9 J	NA
Benzo(a)anthracene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Benzo(a)pyrene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Benzo(b)fluoranthene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Benzo(g,h,i)perylene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Benzo(k)fluoranthene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Butylbenzylphthalate	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Caprolactam	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	10 U	NA
Carbazole	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Chrysene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Di-n-butylphthalate	11 U	10 U	11 U	10 U	3 B	2 B	10 U	NA	8 B	10 U	NA
Di-n-octylphthalate	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Dibenz(a,h)anthracene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Dibenzofuran	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Diethylphthalate	11 U	10 U	11 U	10 U	2 J	2 J	10 U	NA	11 U	10 U	NA
Dimethyl phthalate	11 U	10 U	11 U	10 U	3 J	3 J	10 U	NA	11 U	10 U	NA
Fluoranthene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Fluorene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Hexachlorobenzene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Hexachlorobutadiene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Hexachlorocyclopentadiene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Hexachloroethane	11 U	10 U	11 U	10 U	58	54	10 U	NA	11 U	10 U	NA
Indeno(1,2,3-cd)pyrene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Isophorone	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Naphthalene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Pentachlorophenol	27 U	25 U	27 U	25 U	4 J	3 J	25 U	NA	29 U	25 U	NA
Phenanthrene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
Phenol	11 U	10 U	11 U	10 U	13	12	10 U	NA	21	10 U	NA
Pyrene	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
bis(2-Chloroethoxy)methane	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
bis(2-Chloroethyl)ether	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
bis(2-Ethylhexyl)phthalate	11 U	10 U	11 U	10 U	1 B	11 U	10 U	NA	6 B	10 U	NA
n-Nitroso-di-n-propylamine	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA
n-Nitrosodiphenylamine	11 U	10 U	11 U	10 U	11 U	11 U	10 U	NA	11 U	10 U	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04		
Sample ID	RI47GW01	IS47MW010401	RI47GW02	IS47MW020401	RI47GW03	RI47GW99	IS47MW030401	IS47MW030902	RI47GW04	IS47MW040401	IS47MW040902
Sample Date	07/13/99	04/10/01	07/13/99	04/10/01	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/10/01	09/26/02
Chemical Name											
Explosives (UG/L)											
1,3,5-Trinitrobenzene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
1,3-Dinitrobenzene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
2,4,6-Trinitrotoluene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
2,4-Dinitrotoluene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
2,6-Dinitrotoluene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
2-Amino-4,6-dinitrotoluene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
2-Nitrotoluene	2.6 U	0.5 U	2.6 U	0.7 U	2.6 U	2.6 U	1.2 U	NA	2.6 U	0.7 U	NA
3-Nitrotoluene	2.6 U	0.5 U	2.6 U	0.7 U	2.6 U	2.6 U	1.2 U	NA	2.6 U	0.7 U	NA
4-Amino-2,6-dinitrotoluene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
4-Nitrotoluene	2.6 U	0.5 U	2.6 U	0.7 U	2.6 U	2.6 U	1.2 U	NA	2.6 U	0.7 U	NA
HMX	2.6 U	0.5 U	2.6 U	0.7 U	2.6 U	2.6 U	1.2 U	NA	2.6 U	0.7 U	NA
Nitrobenzene	1.2 U	0.5 U	1.2 U	0.7 U	1.2 U	1.2 U	1.2 U	NA	1.2 U	0.7 U	NA
Nitrocellulose	180 U	100 U	180 U	100 U	180 U	180 U	100 U	NA	180 U	100 U	NA
Nitroglycerin	2,000 U	50 U	2,000 U	70 U	2,000 U	2,000 U	120 U	NA	2,000 U	70 U	NA
Nitroguanidine	5 U	100 U	5 U	140 U	37.4	25.3	240 U	NA	5 U	140 U	NA
PETN	0.6 U	50 U	0.6 U	70 U	0.6 U	0.6 U	120 U	NA	0.6 U	70 U	NA
Perchlorate	5 U	10 U	5 U	10 U	5 U	5 U	10 U	NA	5 U	10 U	NA
RDX	2.6 U	0.5 U	2.6 U	0.7 U	2.6 U	2.6 U	1.2 U	NA	2.6 U	0.7 U	NA
Tetryl	2.6 U	0.5 U	2.6 U	0.7 U	2.6 U	2.6 U	1.2 U	NA	2.6 U	0.7 U	NA
Total Metals (UG/L)											
Aluminum	122 B	94.5 B	1,100	1,890	27,100	25,400	288	NA	2,660	559	NA
Antimony	2.7 U	3.1 U	2.7 U	3.1 U	2.7 U	2.7 U	3.1 U	NA	2.7 U	3.1 U	NA
Arsenic	10.9	32.9	3.7 B	4.5 J	108	100	2.5 U	NA	104	47.9	NA
Barium	176 J	239 J	55.9 J	109 J	335	312	3.5 J	NA	163 J	102 J	NA
Beryllium	0.1 U	0.34 B	0.28 J	0.35 B	14.5	13.8	0.1 U	NA	4.1 J	1.2 B	NA
Cadmium	0.41 J	0.4 U	0.66 J	0.64 J	5.6	5.3	1.6 J	NA	0.69 J	0.48 J	NA
Calcium	5,560	6,490	36,400	20,500	7,630	7,140	6,220	NA	3,570 J	2,990 J	NA
Chromium	1.1 U	0.8 U	13.2	5.1 J	14.9	14.3	0.8 U	NA	28.4	0.8 U	NA
Cobalt	11.1 J	15.3 J	6.6 B	15.7 J	282	267	2.3 J	NA	100	50.4	NA
Copper	4.1 B	1.4 J	12.5 J	7.2 J	38.9	34.6	1.9 J	NA	5.3 B	0.8 U	NA
Cyanide	NA	10 U	NA	10 U	NA	NA	10 U	NA	NA	10 U	NA
Iron	6,310	12,300	1,070	4,280	99,300	94,300	548	NA	36,000	16,700	NA
Lead	1 U	2.5 U	12.7	6.5	35	33.8	2.5 U	NA	8.3	2.5 U	NA
Magnesium	5,670	8,000	10,300	7,630	17,300	16,400	1,180 J	NA	4,140 J	2,530 J	NA
Manganese	364	252	45.5	206	869	823	25.3	NA	350	168	NA
Mercury	0.1 U	0.2 R	0.28	0.29 L	0.1 U	0.1 U	0.2 L	NA	0.1 U	0.2 R	NA
Nickel	3.9 J	2.1 J	8.4 J	10.7 J	249	234	5.1 J	NA	86.3	33.9 J	NA
Potassium	5,070	4,900 J	3,470 J	3,420 J	3,160 J	2,910 J	1,050 J	NA	2,660 J	1,470 J	NA
Selenium	2.6 U	3.2 U	2.6 U	3.2 U	2.6 U	2.6 U	3.2 U	NA	2.6 U	3.2 U	NA
Silver	0.9 U	1.3 U	0.9 U	1.3 U	0.9 U	0.9 U	1.3 U	NA	0.9 U	1.3 U	NA
Sodium	40,300	55,800 J	16,300	21,700 J	51,100	47,700	3,270 J	NA	30,200	32,200	NA
Thallium	3.2 U	3.9 U	3.2 U	5.6 J	3.6 J	3.2 U	3.9 U	NA	3.2 U	6.5 J	NA
Vanadium	1.2 J	34.9 U	15.3 J	34.9 U	326	309	34.9 U	NA	67.1	34.9 U	NA
Zinc	38	85.9 J	26.2 B	49.3 J	655	619	70.7 J	NA	201	120 J	NA

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Station ID	IS47MW01		IS47MW02		IS47MW03				IS47MW04		
Sample ID	RI47GW01	IS47MW010401	RI47GW02	IS47MW020401	RI47GW03	RI47GW99	IS47MW030401	IS47MW030902	RI47GW04	IS47MW040401	IS47MW040902
Sample Date	07/13/99	04/10/01	07/13/99	04/10/01	07/13/99	07/13/99	04/10/01	09/26/02	07/13/99	04/10/01	09/26/02
Chemical Name											
Dissolved Metals (UG/L)											
Aluminum	38.2 U	124 B	118 J	5,190	27,000	26,800	317	NA	1,390	915	NA
Antimony	2.7 U	5.8 J	2.7 U	4.9 U	2.7 U	2.7 U	4.9 U	NA	2.7 U	4.9 U	NA
Arsenic	11.9	28.5	3.7 J	12.1	105	106	3.7 U	NA	103	53.7	NA
Barium	167 J	218	33.4 J	185 J	331	330	4.8 J	NA	152 J	105 J	NA
Beryllium	0.1 U	0.28 B	0.1 U	1.2 B	14.4	14.5	0.1 U	NA	3.7 J	1.4 B	NA
Cadmium	0.44 J	0.4 U	0.3 U	0.4 U	5.7	5.7	0.4 U	NA	0.7 J	0.4 U	NA
Calcium	5,470	6,470	36,300	23,100	8,200	7,530	6,790	NA	3,450 J	3,050 J	NA
Chromium	1.1 U	0.9 J	4.5 J	22.5	15.2	14.4	1.1 J	NA	2.1 J	1.2 J	NA
Cobalt	11.1 B	16.2 J	3.5 B	28.4 J	279	283	3.6 J	NA	95.6	61.5	NA
Copper	3 B	3.4 J	3.3 B	31.8	38.2	37.4	0.7 U	NA	2.9 B	0.97 J	NA
Iron	6,400	8,490	39.2 J	9,680	98,400	99,200	516	NA	34,500	19,400	NA
Lead	1 U	2 U	1.4 J	34.6	34.4	34.9	2 U	NA	5.5	2 U	NA
Magnesium	5,470	8,050	10,200	8,560	17,100	17,300	1,320 J	NA	3,920 J	2,930 J	NA
Manganese	375	258	30.1	245	868	870	24.6	NA	352	192	NA
Mercury	0.1 U	0.2 R	0.1 U	0.2 R	0.1 U	0.1 U	0.2 R	NA	0.1 U	0.2 R	NA
Nickel	3.7 J	2.2 J	5.4 J	19.8 J	244	246	5.2 J	NA	72.8	42.6	NA
Potassium	4,950 J	5,270	3,660 J	4,240 J	3,100 J	3,080 J	1,390 J	NA	2,440 J	1,860 J	NA
Selenium	2.6 UL	2.2 U	2.6 UL	2.2 U	2.6 UL	2.6 UL	2.2 U	NA	2.6 UL	2.2 U	NA
Silver	0.9 U	0.6 UL	0.9 U	0.6 UL	0.9 U	0.9 U	0.6 UL	NA	0.9 U	0.6 UL	NA
Sodium	39,400	54,500	16,300	23,100	50,600	50,700	4,110 J	NA	29,900	37,300	NA
Thallium	3.2 U	2.3 U	3.2 U	2.3 U	3.2 U	3.2 U	3 J	NA	3.7 J	3.5 J	NA
Vanadium	0.6 U	1 U	4.3 J	63.8	324	327	2.2 J	NA	55.3	13.7 J	NA
Zinc	40.5	86.8	10.8 B	79.3	673	653	48.2	NA	180	117	NA
Wet Chemistry (MG/L)											
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	44	NA	23	NA	NA	0.2 U	NA	NA	86	NA
Ferrous iron	NA	1 U	NA	1 U	NA	NA	1 U	NA	NA	1 U	NA
Nitrate	NA	8.9	NA	0.2 U	NA	NA	0.2 U	NA	NA	8.9	NA
Nitrite	NA	0.2 U	NA	0.2 U	NA	NA	0.2 U	NA	NA	0.2 U	NA
Sulfate	NA	0.2 U	NA	0.2 U	NA	NA	1.9	NA	NA	0.2 U	NA
Total organic carbon (TOC)	NA	1.9	NA	2.5	NA	NA	1.2	NA	NA	2.4	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
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Indian Head, Maryland

Station ID	IS47MW05		IS47MW06		IS47MW07		IS47MW07		IS47MW08		IS47MW09		IS47MW10		IS47MW11		IS47MW11		IS47MW12		IS47MW13		IS47MW13	
Sample ID	IS47MW050401		IS47MW060401		IS47MW070401		IS47MW410401		IS47MW080401		IS47MW090401		IS47MW100401		IS47MW110602		IS47MW110902		IS47MW120902		IS47MW130902		IS47MW130902P	
Sample Date	04/09/01		04/09/01		04/09/01		04/09/01		04/10/01		04/09/01		04/09/01		06/28/02		09/26/02		09/25/02		09/26/02		09/26/02	
Chemical Name																								
Volatile Organic Compounds (UG/L)																								
1,1,1-Trichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-Tetrachloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	NA		0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethene	1	U	1	U	1	U	1	U	1	U	1	U	0.9	J	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-Trichlorobenzene	NA		NA		NA		NA		NA		NA		NA		3	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trichlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	3	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,4-Trimethylbenzene	NA		NA		NA		NA		NA		NA		NA		2	U	NA		NA		NA		NA	
1,2-Dibromo-3-chloropropane	1	R	1	R	1	R	1	R	1	U	1	R	1	R	NA		0.5	R	0.5	R	0.5	R	0.5	R
1,2-Dibromoethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	23		3	U	0.5	U	0.5	U	3.5		3.6	
1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,3,5-Trimethylbenzene	NA		NA		NA		NA		NA		NA		NA		2	U	NA		NA		NA		NA	
1,3-Dichlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
1,3-Dichloropropane	NA		NA		NA		NA		NA		NA		NA		3	U	NA		NA		NA		NA	
1,4-Dichlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
2-Butanone	5	R	5	R	5	R	5	R	5	U	5	R	5	R	NA		5	R	1.8	J	2.1	J	1.9	J
2-Hexanone	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NA		5	U	0.82	J	5	U	5	U
4-Methyl-2-pentanone	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NA		5	U	1.1	B	5	U	5	U
Acetone	5	R	5	R	5	R	5	R	5	U	5	R	5	R	NA		2.3	J	12	J	2.3	J	2.7	J
Benzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromochloromethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	NA		0.5	U	0.18	J	0.5	U	0.5	U
Bromodichloromethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.7		0.5	U	0.5	U
Bromoform	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	B	0.27	B	0.5	U	0.5	U	0.24	B
Bromomethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon disulfide	1	U	1	U	1	U	1	U	1	U	1	U	1	U	NA		0.5	U	0.11	J	0.5	U	0.5	U
Carbon tetrachloride	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
Chlorobenzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.36	J	0.38	J
Chloroform	1	U	1	U	1	U	1	U	1	U	1	U	5.5	J	2	U	0.5	U	8.1		0.24	B	0.24	B
Chloromethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.2	B	0.17	B	0.13	B	0.15	B
Cumene	NA		NA		NA		NA		NA		NA		NA		2	U	0.5	U	0.5	U	0.5	U	0.5	U
Cyclohexane	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U	0.5	U	0.5	U
Dibromochloromethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U	0.5	U	0.5	U	0.5	U	0.5	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		NA		NA		NA		NA		2	U	0.5	U	0.5	U	0.5	U	0.5	U
Ethane	NA		NA		NA		NA		NA		NA		NA		NA		0.07	J	2	U	2	U	0.7	J
Ethene	NA		NA		NA		NA		NA		NA		NA		NA		2	U	2	U	2	U	0.9	J

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Indian Head, Maryland

Station ID	IS47MW05	IS47MW06	IS47MW07		IS47MW08	IS47MW09	IS47MW10	IS47MW11		IS47MW12	IS47MW13	
Sample ID	IS47MW050401	IS47MW060401	IS47MW070401	IS47MW410401	IS47MW080401	IS47MW090401	IS47MW100401	IS47MW110602	IS47MW110902	IS47MW120902	IS47MW130902	IS47MW130902P
Sample Date	04/09/01	04/09/01	04/09/01	04/09/01	04/10/01	04/09/01	04/09/01	06/28/02	09/26/02	09/25/02	09/26/02	09/26/02
Chemical Name												
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	0.4 J	0.6 J	0.3 J	29
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.11 B	0.5 U	0.5 U
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	1.5 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.58 B	0.97 B	0.74 B	0.67 B
Naphthalene	NA	NA	NA	NA	NA	NA	NA	3 U	NA	NA	NA	NA
Styrene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	1 U	1 U	1 U	1 U	1 U	1 U	160	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	0.19 B	0.53 B	4.5 B	4.2 B
Trichloroethene	2.6	1 U	1 U	1 U	1 U	1.1	150	2 U	0.5 U	0.26 J	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	0.8 J	1 U	1 U	1 U	1 U	1 U	1 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	1 U	1 U	1 U	1 U	1 U	1 J	1 U	NA	0.5 U	0.21 B	0.5 U	0.5 U
cis-1,2-Dichloroethene	14	1 U	1 U	1 U	1 U	1 U	5.3	2 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	4 U	NA	NA	NA	NA
n-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA
o-Xylene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	NA	NA	NA	NA
p-Isopropyltoluene	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA
tert-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	0.7 J	2 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)												
1,1-Biphenyl	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2-Methylnaphthalene	10 U	10 U	1.5 J	2.2 J	10 U	10 U	10 U	NA	NA	NA	NA	NA
2-Methylphenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
2-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
3- and 4-Methylphenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
3-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA

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Station ID	IS47MW05	IS47MW06	IS47MW07		IS47MW08	IS47MW09	IS47MW10	IS47MW11		IS47MW12	IS47MW13	
Sample ID	IS47MW050401	IS47MW060401	IS47MW070401	IS47MW410401	IS47MW080401	IS47MW090401	IS47MW100401	IS47MW110602	IS47MW110902	IS47MW120902	IS47MW130902	IS47MW130902P
Sample Date	04/09/01	04/09/01	04/09/01	04/09/01	04/10/01	04/09/01	04/09/01	06/28/02	09/26/02	09/25/02	09/26/02	09/26/02
Chemical Name												
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
4-Nitrophenol	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
Acenaphthene	10 U	10 U	1.3 J	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Acenaphthylene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Acetophenone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Anthracene	10 U	10 U	1.2 J	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Atrazine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Benzaldehyde	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Benzo(a)anthracene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Benzo(a)pyrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Butylbenzylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Caprolactam	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Carbazole	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Chrysene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Di-n-butylphthalate	10 U	3.7 J	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Di-n-octylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Dibenzofuran	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Diethylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Dimethyl phthalate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Fluoranthene	10 U	10 U	1.4 J	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Fluorene	10 U	10 U	1.4 J	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Hexachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Isophorone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Naphthalene	10 U	2.5 J	2.9 J	5.5 J	10 U	10 U	10 U	NA	NA	NA	NA	NA
Pentachlorophenol	25 U	25 U	25 U	25 U	25 U	25 U	25 U	NA	NA	NA	NA	NA
Phenanthrene	1.1 J	10 U	4.3 J	1.9 J	10 U	10 U	10 U	NA	NA	NA	NA	NA
Phenol	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
Pyrene	1.3 J	10 U	1.9 J	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	1.7 J	1.3 J	5.1 J	1.2 J	10 U	10 U	10 U	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW05	IS47MW06	IS47MW07		IS47MW08	IS47MW09	IS47MW10	IS47MW11		IS47MW12	IS47MW13	
Sample ID	IS47MW050401	IS47MW060401	IS47MW070401	IS47MW410401	IS47MW080401	IS47MW090401	IS47MW100401	IS47MW110602	IS47MW110902	IS47MW120902	IS47MW130902	IS47MW130902P
Sample Date	04/09/01	04/09/01	04/09/01	04/09/01	04/10/01	04/09/01	04/09/01	06/28/02	09/26/02	09/25/02	09/26/02	09/26/02
Chemical Name												
Explosives (UG/L)												
1,3,5-Trinitrobenzene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
2-Nitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
3-Nitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
4-Nitrotoluene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
HMX	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
Nitrobenzene	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
Nitrocellulose	100 U	100 U	100 U	100 U	100 U	100 U	100 U	NA	NA	NA	NA	NA
Nitroglycerin	50 U	40 U	120 U	30 U	40 U	40 U	50 U	NA	NA	NA	NA	NA
Nitroguanidine	100 U	80 U	240 U	60 U	80 U	80 U	100 U	NA	NA	NA	NA	NA
PETN	50 U	40 U	120 U	30 U	40 U	40 U	50 U	NA	NA	NA	NA	NA
Perchlorate	5 U	5 U	5 U	5 U	10 U	5 U	5 U	NA	NA	NA	NA	NA
RDX	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
Tetryl	0.5 U	0.4 U	1.2 U	0.3 U	0.4 U	0.4 U	0.5 U	NA	NA	NA	NA	NA
Total Metals (UG/L)												
Aluminum	77.6 J	6,740	1,040	1,260	2,680	399	271	NA	NA	NA	NA	NA
Antimony	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	NA	NA	NA	NA	NA
Arsenic	2.5 U	2.5 U	2.5 U	3.1 J	3 J	2.5 U	2.5 U	NA	NA	NA	NA	NA
Barium	46.6 J	346 J	96 J	88 J	16.7 J	69 J	46.5 J	NA	NA	NA	NA	NA
Beryllium	0.68 J	1.2 B	0.57 J	1 J	0.25 J	0.92 J	0.72 J	NA	NA	NA	NA	NA
Cadmium	0.6 J	1.6 J	1 J	1.2 J	0.4 U	0.52 J	0.4 U	NA	NA	NA	NA	NA
Calcium	5,200	12,500	10,700	9,390	6,740	3,640 J	2,570 J	NA	NA	NA	NA	NA
Chromium	0.8 U	13.5	1.5 J	3.7 J	7 J	0.8 U	0.8 U	NA	NA	NA	NA	NA
Cobalt	3.4 J	50.5	25.7 J	23.2 J	3 J	40.9 J	8.9 J	NA	NA	NA	NA	NA
Copper	0.8 U	14.5 J	3.8 J	2.9 J	5.1 J	0.8 U	0.8 U	NA	NA	NA	NA	NA
Cyanide	10 U	211	23,200	137	438	1,757	177	NA	NA	NA	NA	NA
Iron	12,400	4,940	1,380	1,690	2,880	1,230	5,980	NA	NA	NA	NA	NA
Lead	2.5 U	8.1	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NA	NA	NA	NA	NA
Magnesium	2,600 J	4,950 J	1,990 J	1,770 J	2,280 J	1,750 J	2,210 J	NA	NA	NA	NA	NA
Manganese	315	125	129	112	25	316	337	NA	NA	NA	NA	NA
Mercury	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	NA	NA	NA	NA	NA
Nickel	1.7 U	36 J	12.9 J	12.7 J	3.3 J	18.9 J	3.1 J	NA	NA	NA	NA	NA
Potassium	1,170 J	3,550 J	1,290 J	1,230 J	1,320 J	836 J	1,590 J	NA	NA	NA	NA	NA
Selenium	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	NA	NA	NA	NA	NA
Silver	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	NA	NA	NA	NA	NA
Sodium	15,300	102,000 J	42,700 J	39,800 J	22,100 J	20,500	50,500 J	NA	NA	NA	NA	NA
Thallium	6 J	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	NA	NA	NA	NA	NA
Vanadium	34.9 U	34.9 U	34.9 U	34.9 U	34.9 U	34.9 U	34.9 U	NA	NA	NA	NA	NA
Zinc	36.7 J	94.8	60.6 J	58.3 J	30.6 J	87.7	92.1 J	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW05	IS47MW06	IS47MW07		IS47MW08	IS47MW09	IS47MW10	IS47MW11		IS47MW12	IS47MW13	
Sample ID	IS47MW050401	IS47MW060401	IS47MW070401	IS47MW410401	IS47MW080401	IS47MW090401	IS47MW100401	IS47MW110602	IS47MW110902	IS47MW120902	IS47MW130902	IS47MW130902P
Sample Date	04/09/01	04/09/01	04/09/01	04/09/01	04/10/01	04/09/01	04/09/01	06/28/02	09/26/02	09/25/02	09/26/02	09/26/02
Chemical Name												
Dissolved Metals (UG/L)												
Aluminum	49.1 J	3,850	146 J	430	3,890	663	218	NA	NA	NA	NA	NA
Antimony	4.9 U	10 J	4.9 U	5.3 J	6 J	4.9 U	4.9 U	NA	NA	NA	NA	NA
Arsenic	3.7 U	3.7 U	3.7 U	3.7 U	7.2 J	3.7 U	3.7 U	NA	NA	NA	NA	NA
Barium	51.6 J	266	80 J	80.9 J	20.9 J	72.1 J	40.9 J	NA	NA	NA	NA	NA
Beryllium	0.1 B	0.98 J	0.34 J	0.4 J	0.2 J	0.4 J	0.16 J	NA	NA	NA	NA	NA
Cadmium	0.4 U	1.3 J	1.6 J	0.98 J	0.4 U	0.4 U	0.4 U	NA	NA	NA	NA	NA
Calcium	6,290	10,800	10,300	11,200	7,700	4,100 J	2,790 J	NA	NA	NA	NA	NA
Chromium	0.7 U	13.7	0.7 U	4.4 J	11	1.1 J	0.7 U	NA	NA	NA	NA	NA
Cobalt	6.1 J	45.7 J	25.6 J	27.4 J	5.1 J	48.9 J	14.4 J	NA	NA	NA	NA	NA
Copper	0.7 U	16.8 J	0.84 J	79.9	6.8 J	0.7 U	0.7 U	NA	NA	NA	NA	NA
Iron	13,000	4,110	205	661	3,820	1,320	3,560	NA	NA	NA	NA	NA
Lead	2 U	7.9	2 U	2 U	2 U	2 U	2 U	NA	NA	NA	NA	NA
Magnesium	3,220 J	4,190 J	1,840 J	2,020 J	2,680 J	2,070 J	2,270 J	NA	NA	NA	NA	NA
Manganese	412	117	123	133	28.2	377	383	NA	NA	NA	NA	NA
Mercury	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	0.2 R	NA	NA	NA	NA	NA
Nickel	2 U	34.6 J	10.8 J	75.5	5.4 J	20.8 J	3.7 J	NA	NA	NA	NA	NA
Potassium	1,520 J	2,590 J	1,230 J	1,430 J	1,910 J	1,180 J	1,560 J	NA	NA	NA	NA	NA
Selenium	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	NA	NA	NA	NA	NA
Silver	0.6 UL	0.6 UL	0.6 UL	0.6 UL	0.6 UL	0.6 UL	0.6 UL	NA	NA	NA	NA	NA
Sodium	18,500	78,600	41,400	45,300	26,600	24,100	59,900	NA	NA	NA	NA	NA
Thallium	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	NA	NA	NA	NA	NA
Vanadium	1.9 J	25.2 J	1.1 J	1.3 J	15.2 J	2.2 J	1 U	NA	NA	NA	NA	NA
Zinc	23.4	134	43.1	63.7	42	82.8	85.1	NA	NA	NA	NA	NA
Wet Chemistry (MG/L)												
Carbon	NA	NA	NA	NA	NA	NA	NA	NA	5 U	37.0	5 U	5 U
Chloride	0.2 U	42	44	86	0.2 U	11	29	NA	43.6	51.6	25.8	25.6
Ferrous iron	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA	NA	NA	NA
Nitrate	3.5	8.5	8.1	9.2	0.2 U	1.8	4.4	NA	0.05 U	0.05 U	0.05 U	0.05 U
Nitrite	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	9.9	35	NA	NA	NA	NA	NA
Sulfate	9.6	0.2 U	13	0.2 U	0.2 U	0.2 U	2.6	NA	5 U	74.1	9.46	9.24
Total organic carbon (TOC)	4.4	8.2	2.7	4.2	1.6	3.3	3.3	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Monitoring Well Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW14		IS47MW15	
Sample ID	IS47MW140902		IS47MW150902	
Sample Date	09/25/02		09/26/02	
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	0.5	U	0.5	U
1,1,2,2-Tetrachloroethane	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5	U	0.5	U
1,1,2-Trichloroethane	0.5	U	0.5	U
1,1-Dichloroethane	0.5	U	0.5	U
1,1-Dichloroethene	0.1	J	0.5	U
1,2,3-Trichlorobenzene	0.5	U	0.5	U
1,2,4-Trichlorobenzene	0.5	U	0.5	U
1,2,4-Trimethylbenzene	NA		NA	
1,2-Dibromo-3-chloropropane	0.5	U	0.5	R
1,2-Dibromoethane	0.5	U	0.5	U
1,2-Dichlorobenzene	0.5	U	0.5	U
1,2-Dichloroethane	0.5	U	0.5	U
1,2-Dichloropropane	0.5	U	0.5	U
1,3,5-Trimethylbenzene	NA		NA	
1,3-Dichlorobenzene	0.5	U	0.5	U
1,3-Dichloropropane	NA		NA	
1,4-Dichlorobenzene	0.5	U	0.5	U
2-Butanone	5	R	5	R
2-Hexanone	5	U	5	U
4-Methyl-2-pentanone	5	U	5	U
Acetone	3.5	J	2.4	J
Benzene	0.5	U	0.5	U
Bromochloromethane	0.5	U	0.5	U
Bromodichloromethane	0.5	U	0.5	U
Bromoform	0.19	B	0.2	B
Bromomethane	0.5	U	0.5	U
Carbon disulfide	0.5	U	0.5	U
Carbon tetrachloride	0.5	U	0.5	U
Chlorobenzene	0.5	U	0.5	U
Chloroethane	0.5	U	0.5	U
Chloroform	0.43	J	0.5	U
Chloromethane	0.21	B	0.11	B
Cumene	0.5	U	0.5	U
Cyclohexane	0.1	J	0.5	U
Dibromochloromethane	0.5	U	0.5	U
Dichlorodifluoromethane(Freon-12)	0.5	U	0.5	U
Ethane	2	U	0.04	J
Ethene	0.06	J	2	U

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Appendix J
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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW14		IS47MW15	
Sample ID	IS47MW140902		IS47MW150902	
Sample Date	09/25/02		09/26/02	
Chemical Name				
Ethylbenzene	0.5	U	0.5	U
Hexachlorobutadiene	NA		NA	
Methane	0.8	J	48	
Methyl acetate	0.5	U	0.5	U
Methyl-tert-butyl ether (MTBE)	0.5	U	2.1	
Methylcyclohexane	0.5	U	0.5	U
Methylene chloride	0.65	B	0.71	B
Naphthalene	NA		NA	
Styrene	0.5	U	0.5	U
Tetrachloroethene	0.5	U	0.5	U
Toluene	0.21	B	0.26	B
Trichloroethene	1.2		0.5	U
Trichlorofluoromethane(Freon-11)	0.5	U	0.5	U
Vinyl chloride	0.5	U	0.5	U
Xylene, total	0.5	U	0.5	U
cis-1,2-Dichloroethene	0.16	J	0.5	U
cis-1,3-Dichloropropene	0.5	U	0.5	U
m- and p-Xylene	NA		NA	
n-Butylbenzene	NA		NA	
n-Propylbenzene	NA		NA	
o-Xylene	NA		NA	
p-Isopropyltoluene	NA		NA	
sec-Butylbenzene	NA		NA	
tert-Butylbenzene	NA		NA	
trans-1,2-Dichloroethene	0.5	U	0.5	U
trans-1,3-Dichloropropene	0.5	U	0.5	U
Semivolatile Organic Compounds (UG/L)				
1,1-Biphenyl	NA		NA	
2,2'-Oxybis(1-chloropropane)	NA		NA	
2,4,5-Trichlorophenol	NA		NA	
2,4,6-Trichlorophenol	NA		NA	
2,4-Dichlorophenol	NA		NA	
2,4-Dimethylphenol	NA		NA	
2,4-Dinitrophenol	NA		NA	
2-Chloronaphthalene	NA		NA	
2-Chlorophenol	NA		NA	
2-Methylnaphthalene	NA		NA	
2-Methylphenol	NA		NA	
2-Nitroaniline	NA		NA	
2-Nitrophenol	NA		NA	
3,3'-Dichlorobenzidine	NA		NA	
3- and 4-Methylphenol	NA		NA	
3-Nitroaniline	NA		NA	
4,6-Dinitro-2-methylphenol	NA		NA	
4-Bromophenyl-phenylether	NA		NA	

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IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW14	IS47MW15
Sample ID	IS47MW140902	IS47MW150902
Sample Date	09/25/02	09/26/02
Chemical Name		
4-Chloro-3-methylphenol	NA	NA
4-Chloroaniline	NA	NA
4-Chlorophenyl-phenylether	NA	NA
4-Methylphenol	NA	NA
4-Nitroaniline	NA	NA
4-Nitrophenol	NA	NA
Acenaphthene	NA	NA
Acenaphthylene	NA	NA
Acetophenone	NA	NA
Anthracene	NA	NA
Atrazine	NA	NA
Benzaldehyde	NA	NA
Benzo(a)anthracene	NA	NA
Benzo(a)pyrene	NA	NA
Benzo(b)fluoranthene	NA	NA
Benzo(g,h,i)perylene	NA	NA
Benzo(k)fluoranthene	NA	NA
Butylbenzylphthalate	NA	NA
Caprolactam	NA	NA
Carbazole	NA	NA
Chrysene	NA	NA
Di-n-butylphthalate	NA	NA
Di-n-octylphthalate	NA	NA
Dibenz(a,h)anthracene	NA	NA
Dibenzofuran	NA	NA
Diethylphthalate	NA	NA
Dimethyl phthalate	NA	NA
Fluoranthene	NA	NA
Fluorene	NA	NA
Hexachlorobenzene	NA	NA
Hexachlorobutadiene	NA	NA
Hexachlorocyclopentadiene	NA	NA
Hexachloroethane	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA
Isophorone	NA	NA
Naphthalene	NA	NA
Pentachlorophenol	NA	NA
Phenanthrene	NA	NA
Phenol	NA	NA
Pyrene	NA	NA
bis(2-Chloroethoxy)methane	NA	NA
bis(2-Chloroethyl)ether	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA
n-Nitroso-di-n-propylamine	NA	NA
n-Nitrosodiphenylamine	NA	NA

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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW14	IS47MW15
Sample ID	IS47MW140902	IS47MW150902
Sample Date	09/25/02	09/26/02
Chemical Name		
Explosives (UG/L)		
1,3,5-Trinitrobenzene	NA	NA
1,3-Dinitrobenzene	NA	NA
2,4,6-Trinitrotoluene	NA	NA
2,4-Dinitrotoluene	NA	NA
2,6-Dinitrotoluene	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA
2-Nitrotoluene	NA	NA
3-Nitrotoluene	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA
4-Nitrotoluene	NA	NA
HMX	NA	NA
Nitrobenzene	NA	NA
Nitrocellulose	NA	NA
Nitroglycerin	NA	NA
Nitroguanidine	NA	NA
PETN	NA	NA
Perchlorate	NA	NA
RDX	NA	NA
Tetryl	NA	NA
Total Metals (UG/L)		
Aluminum	NA	NA
Antimony	NA	NA
Arsenic	NA	NA
Barium	NA	NA
Beryllium	NA	NA
Cadmium	NA	NA
Calcium	NA	NA
Chromium	NA	NA
Cobalt	NA	NA
Copper	NA	NA
Cyanide	NA	NA
Iron	NA	NA
Lead	NA	NA
Magnesium	NA	NA
Manganese	NA	NA
Mercury	NA	NA
Nickel	NA	NA
Potassium	NA	NA
Selenium	NA	NA
Silver	NA	NA
Sodium	NA	NA
Thallium	NA	NA
Vanadium	NA	NA
Zinc	NA	NA

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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47MW14		IS47MW15	
Sample ID	IS47MW140902		IS47MW150902	
Sample Date	09/25/02		09/26/02	
Chemical Name				
Dissolved Metals (UG/L)				
Aluminum	NA		NA	
Antimony	NA		NA	
Arsenic	NA		NA	
Barium	NA		NA	
Beryllium	NA		NA	
Cadmium	NA		NA	
Calcium	NA		NA	
Chromium	NA		NA	
Cobalt	NA		NA	
Copper	NA		NA	
Iron	NA		NA	
Lead	NA		NA	
Magnesium	NA		NA	
Manganese	NA		NA	
Mercury	NA		NA	
Nickel	NA		NA	
Potassium	NA		NA	
Selenium	NA		NA	
Silver	NA		NA	
Sodium	NA		NA	
Thallium	NA		NA	
Vanadium	NA		NA	
Zinc	NA		NA	
Wet Chemistry (MG/L)				
Carbon	5	U	17.0	
Chloride	208		55.1	
Ferrous iron	NA		NA	
Nitrate	0.15		0.05	U
Nitrite	NA		NA	
Sulfate	15.7		13.6	
Total organic carbon (TOC)	NA		NA	

NA - Not analyzed
B - Blank contamination
J - Estimated
L - Biased low

R - Unusable
U - Undetected
UJ - Undetected, estimated limit
UL - Undetected, limit biased low

Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01		IS47SB02		IS47SB03		IS47SB04		IS47SB05		IS47SB06		IS47SB07		IS47SB08	
Sample ID	IS47SB010204		IS47SB020203		IS47SB030203		IS47SB040506		IS47SB050203		IS47SB060203		IS47SB070304		IS47SB080304	
Sample Date	03/28/01		03/30/01		03/29/01		03/29/01		03/29/01		03/30/01		03/20/01		03/20/01	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,1,2,2-Tetrachloroethane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA		NA		12	U	12	U
1,1,2-Trichloroethane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,1-Dichloroethane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,1-Dichloroethene	NA		NA		NA		NA		NA		NA		12	U	12	U
1,2,4-Trichlorobenzene	NA		NA		NA		NA		NA		NA		12	U	12	U
1,2-Dibromo-3-chloropropane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,2-Dibromoethane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,2-Dichlorobenzene	NA		NA		NA		NA		NA		NA		12	U	12	U
1,2-Dichloroethane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	NA		NA		NA		NA		NA		NA		12	U	12	U
1,3-Dichlorobenzene	NA		NA		NA		NA		NA		NA		12	U	12	U
1,4-Dichlorobenzene	NA		NA		NA		NA		NA		NA		12	U	12	U
2-Butanone	NA		NA		NA		NA		NA		NA		12	U	12	U
2-Hexanone	NA		NA		NA		NA		NA		NA		12	U	12	U
4-Methyl-2-pentanone	NA		NA		NA		NA		NA		NA		12	U	12	U
Acetone	NA		NA		NA		NA		NA		NA		12	U	12	U
Benzene	NA		NA		NA		NA		NA		NA		12	U	12	U
Bromodichloromethane	NA		NA		NA		NA		NA		NA		12	U	12	U
Bromoform	NA		NA		NA		NA		NA		NA		12	U	12	U
Bromomethane	NA		NA		NA		NA		NA		NA		12	U	12	U
Carbon disulfide	NA		NA		NA		NA		NA		NA		12	U	12	U
Carbon tetrachloride	NA		NA		NA		NA		NA		NA		12	U	12	U
Chlorobenzene	NA		NA		NA		NA		NA		NA		12	U	12	U
Chloroethane	NA		NA		NA		NA		NA		NA		12	U	12	U
Chloroform	NA		NA		NA		NA		NA		NA		12	U	12	U
Chloromethane	NA		NA		NA		NA		NA		NA		12	U	12	U
Cumene	NA		NA		NA		NA		NA		NA		12	U	12	U
Cyclohexane	NA		NA		NA		NA		NA		NA		12	U	12	U
Dibromochloromethane	NA		NA		NA		NA		NA		NA		12	U	12	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		NA		NA		NA		12	U	12	U

NA - Not analyzed
B - Blank contamination
J - Estimated
K - Biased high
L - Biased low

U - Undetected
UL - Undetected, limit biased low

Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01		IS47SB02		IS47SB03		IS47SB04		IS47SB05		IS47SB06		IS47SB07		IS47SB08	
Sample ID	IS47SB010204		IS47SB020203		IS47SB030203		IS47SB040506		IS47SB050203		IS47SB060203		IS47SB070304		IS47SB080304	
Sample Date	03/28/01		03/30/01		03/29/01		03/29/01		03/29/01		03/30/01		03/20/01		03/20/01	
Chemical Name																
Ethylbenzene	NA		NA		NA		NA		NA		NA		12	U	12	U
Methyl acetate	NA		NA		NA		NA		NA		NA		12	U	12	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		NA		NA		12	U	12	U
Methylcyclohexane	NA		NA		NA		NA		NA		NA		12	U	12	U
Methylene chloride	NA		NA		NA		NA		NA		NA		12	U	12	
Styrene	NA		NA		NA		NA		NA		NA		12	U	12	U
Tetrachloroethene	NA		NA		NA		NA		NA		NA		12	U	12	U
Toluene	NA		NA		NA		NA		NA		NA		12	U	12	U
Trichloroethene	NA		NA		NA		NA		NA		NA		12	U	12	U
Trichlorofluoromethane(Freon-11)	NA		NA		NA		NA		NA		NA		12	U	12	U
Vinyl chloride	NA		NA		NA		NA		NA		NA		12	U	12	U
Xylene, total	NA		NA		NA		NA		NA		NA		12	U	12	U
cis-1,2-Dichloroethene	NA		NA		NA		NA		NA		NA		12	U	12	U
cis-1,3-Dichloropropene	NA		NA		NA		NA		NA		NA		12	U	12	U
o-Xylene	NA		NA		NA		NA		NA		NA		12	U	12	U
trans-1,2-Dichloroethene	NA		NA		NA		NA		NA		NA		12	U	12	U
trans-1,3-Dichloropropene	NA		NA		NA		NA		NA		NA		12	U	12	U
Semivolatile Organic Compounds (UG/KG)																
1,1-Biphenyl	NA		NA		NA		NA		NA		NA		390	U	390	U
2,2'-Oxybis(1-chloropropane)	NA		NA		NA		NA		NA		NA		390	U	390	U
2,4,5-Trichlorophenol	NA		NA		NA		NA		NA		NA		980	U	980	U
2,4,6-Trichlorophenol	NA		NA		NA		NA		NA		NA		390	U	390	U
2,4-Dichlorophenol	NA		NA		NA		NA		NA		NA		390	U	390	U
2,4-Dimethylphenol	NA		NA		NA		NA		NA		NA		390	U	390	U
2,4-Dinitrophenol	NA		NA		NA		NA		NA		NA		980	U	980	U
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
2-Chloronaphthalene	NA		NA		NA		NA		NA		NA		390	U	390	U
2-Chlorophenol	NA		NA		NA		NA		NA		NA		390	U	390	U
2-Methylnaphthalene	NA		NA		NA		NA		NA		NA		390	U	390	U
2-Methylphenol	NA		NA		NA		NA		NA		NA		390	U	390	U
2-Nitroaniline	NA		NA		NA		NA		NA		NA		980	U	980	U
2-Nitrophenol	NA		NA		NA		NA		NA		NA		390	U	390	U
3,3'-Dichlorobenzidine	NA		NA		NA		NA		NA		NA		390	U	390	U

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K - Biased high
L - Biased low

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UL - Undetected, limit biased low

Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01		IS47SB02		IS47SB03		IS47SB04		IS47SB05		IS47SB06		IS47SB07		IS47SB08	
Sample ID	IS47SB010204		IS47SB020203		IS47SB030203		IS47SB040506		IS47SB050203		IS47SB060203		IS47SB070304		IS47SB080304	
Sample Date	03/28/01		03/30/01		03/29/01		03/29/01		03/29/01		03/30/01		03/20/01		03/20/01	
Chemical Name																
3- and 4-Methylphenol	NA		NA		NA		NA		NA		NA		390	U	390	U
3-Nitroaniline	NA		NA		NA		NA		NA		NA		980	U	980	U
4,6-Dinitro-2-methylphenol	NA		NA		NA		NA		NA		NA		980	U	980	U
4-Bromophenyl-phenylether	NA		NA		NA		NA		NA		NA		390	U	390	U
4-Chloro-3-methylphenol	NA		NA		NA		NA		NA		NA		390	U	390	U
4-Chloroaniline	NA		NA		NA		NA		NA		NA		390	U	390	U
4-Chlorophenyl-phenylether	NA		NA		NA		NA		NA		NA		390	U	390	U
4-Methylphenol	NA		NA		NA		NA		NA		NA		NA		NA	
4-Nitroaniline	NA		NA		NA		NA		NA		NA		980	U	980	U
4-Nitrophenol	NA		NA		NA		NA		NA		NA		980	U	980	U
Acenaphthene	NA		NA		NA		NA		NA		NA		390	U	390	U
Acenaphthylene	NA		NA		NA		NA		NA		NA		390	U	390	U
Acetophenone	NA		NA		NA		NA		NA		NA		78	J	50	J
Anthracene	NA		NA		NA		NA		NA		NA		390	U	390	U
Atrazine	NA		NA		NA		NA		NA		NA		390	U	390	U
Benzaldehyde	NA		NA		NA		NA		NA		NA		390	U	390	U
Benzo(a)anthracene	NA		NA		NA		NA		NA		NA		390	U	390	U
Benzo(a)pyrene	NA		NA		NA		NA		NA		NA		390	U	390	U
Benzo(b)fluoranthene	NA		NA		NA		NA		NA		NA		390	U	390	U
Benzo(g,h,i)perylene	NA		NA		NA		NA		NA		NA		390	U	390	U
Benzo(k)fluoranthene	NA		NA		NA		NA		NA		NA		390	U	390	U
Butylbenzylphthalate	NA		NA		NA		NA		NA		NA		67	J	390	U
Caprolactam	NA		NA		NA		NA		NA		NA		390	U	390	U
Carbazole	NA		NA		NA		NA		NA		NA		390	U	390	U
Chrysene	NA		NA		NA		NA		NA		NA		390	U	390	U
Di-n-butylphthalate	NA		NA		NA		NA		NA		NA		570		210	J
Di-n-octylphthalate	NA		NA		NA		NA		NA		NA		390	U	390	U
Dibenz(a,h)anthracene	NA		NA		NA		NA		NA		NA		390	U	390	U
Dibenzofuran	NA		NA		NA		NA		NA		NA		390	U	390	U
Diethylphthalate	NA		NA		NA		NA		NA		NA		78	J	190	J
Dimethyl phthalate	NA		NA		NA		NA		NA		NA		390	U	390	U
Fluoranthene	NA		NA		NA		NA		NA		NA		390	U	390	U
Fluorene	NA		NA		NA		NA		NA		NA		390	U	390	U
Hexachlorobenzene	NA		NA		NA		NA		NA		NA		390	U	390	U
Hexachlorobutadiene	NA		NA		NA		NA		NA		NA		390	U	390	U

NA - Not analyzed
B - Blank contamination
J - Estimated
K - Biased high
L - Biased low

U - Undetected
UL - Undetected, limit biased low

Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01		IS47SB02		IS47SB03		IS47SB04		IS47SB05		IS47SB06		IS47SB07		IS47SB08	
Sample ID	IS47SB010204		IS47SB020203		IS47SB030203		IS47SB040506		IS47SB050203		IS47SB060203		IS47SB070304		IS47SB080304	
Sample Date	03/28/01		03/30/01		03/29/01		03/29/01		03/29/01		03/30/01		03/20/01		03/20/01	
Chemical Name																
Hexachlorocyclopentadiene	NA		NA		NA		NA		NA		NA		390	U	390	U
Hexachloroethane	NA		NA		NA		NA		NA		NA		390	U	390	U
Indeno(1,2,3-cd)pyrene	NA		NA		NA		NA		NA		NA		390	U	390	U
Isophorone	NA		NA		NA		NA		NA		NA		390	U	390	U
Naphthalene	NA		NA		NA		NA		NA		NA		390	U	390	U
Nitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	NA		NA		NA		NA		NA		NA		980	U	980	U
Phenanthrene	NA		NA		NA		NA		NA		NA		390	U	390	U
Phenol	NA		NA		NA		NA		NA		NA		390	U	390	U
Pyrene	NA		NA		NA		NA		NA		NA		390	U	390	U
bis(2-Chloroethoxy)methane	NA		NA		NA		NA		NA		NA		390	U	390	U
bis(2-Chloroethyl)ether	NA		NA		NA		NA		NA		NA		390	U	390	U
bis(2-Ethylhexyl)phthalate	NA		NA		NA		NA		NA		NA		390	U	390	U
n-Nitroso-di-n-propylamine	NA		NA		NA		NA		NA		NA		390	U	390	U
n-Nitrosodiphenylamine	NA		NA		NA		NA		NA		NA		390	U	390	U
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	NA		NA		NA		NA		NA		NA		590	U	590	U
1,3-Dinitrobenzene	NA		NA		NA		NA		NA		NA		590	U	590	U
2,4,6-Trinitrotoluene	NA		NA		NA		NA		NA		NA		590	U	590	U
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		NA		390	U	390	U
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		390	U	390	U
2-Amino-4,6-dinitrotoluene	NA		NA		NA		NA		NA		NA		590	U	590	U
2-Nitrotoluene	NA		NA		NA		NA		NA		NA		590	U	590	U
3-Nitrotoluene	NA		NA		NA		NA		NA		NA		590	U	590	U
4-Amino-2,6-dinitrotoluene	NA		NA		NA		NA		NA		NA		590	U	590	U
4-Nitrotoluene	NA		NA		NA		NA		NA		NA		590	U	590	U
HMX	NA		NA		NA		NA		NA		NA		590	UL	590	UL
Nitrobenzene	NA		NA		NA		NA		NA		NA		390	U	390	U
Nitrocellulose	NA		NA		NA		NA		NA		NA		2,950	U	2,940	U
Nitroglycerin	NA		NA		NA		NA		NA		NA		59,000	U	59,000	U

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB01		IS47SB02		IS47SB03		IS47SB04		IS47SB05		IS47SB06		IS47SB07		IS47SB08	
Sample ID	IS47SB010204		IS47SB020203		IS47SB030203		IS47SB040506		IS47SB050203		IS47SB060203		IS47SB070304		IS47SB080304	
Sample Date	03/28/01		03/30/01		03/29/01		03/29/01		03/29/01		03/30/01		03/20/01		03/20/01	
Chemical Name																
Nitroguanidine	NA		NA		NA		NA		NA		NA		120,000	U	120,000	U
PETN	NA		NA		NA		NA		NA		NA		59,000	U	59,000	U
Perchlorate	NA		NA		NA		NA		NA		NA		6	U	6	U
RDX	NA		NA		NA		NA		NA		NA		590	U	590	U
Tetryl	NA		NA		NA		NA		NA		NA		590	U	590	U
Total Metals (MG/KG)																
Aluminum	NA		NA		NA		NA		NA		NA		2,540		2,620	
Antimony	NA		NA		NA		NA		NA		NA		1.7	U	1.7	U
Arsenic	NA		NA		NA		NA		NA		NA		2.1	J	2.7	
Barium	NA		NA		NA		NA		NA		NA		13.6	J	10.3	J
Beryllium	NA		NA		NA		NA		NA		NA		0.31	J	0.29	J
Cadmium	NA		NA		NA		NA		NA		NA		0.11	U	0.11	U
Calcium	NA		NA		NA		NA		NA		NA		177	J	130	J
Chromium	NA		NA		NA		NA		NA		NA		9.8		12.9	
Cobalt	NA		NA		NA		NA		NA		NA		7.2	J	3.6	J
Copper	NA		NA		NA		NA		NA		NA		6.6		6.2	
Cyanide	NA		NA		NA		NA		NA		NA		NA		NA	
Iron	NA		NA		NA		NA		NA		NA		8,640		12,900	
Lead	NA		NA		NA		NA		NA		NA		7.2		7.8	
Magnesium	NA		NA		NA		NA		NA		NA		523	J	457	J
Manganese	NA		NA		NA		NA		NA		NA		73.6		43.2	
Mercury	NA		NA		NA		NA		NA		NA		0.12	U	0.11	U
Nickel	NA		NA		NA		NA		NA		NA		3.1	J	2.6	J
Potassium	NA		NA		NA		NA		NA		NA		378	J	356	J
Selenium	NA		NA		NA		NA		NA		NA		1.1	U	1.1	U
Silver	NA		NA		NA		NA		NA		NA		0.37	U	0.36	U
Sodium	NA		NA		NA		NA		NA		NA		66.2	U	65.4	U
Thallium	NA		NA		NA		NA		NA		NA		1.2	U	1.2	U
Vanadium	NA		NA		NA		NA		NA		NA		16.8		25	
Zinc	NA		NA		NA		NA		NA		NA		12.8		13.9	
Wet Chemistry (MG/KG)																
% Moisture	NA		NA		NA		NA		NA		NA		NA		NA	
Total organic carbon (TOC)	7.4		1.8		3.4		2.1		2.9		1.5		840		740	

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12				IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,1,2,2-Tetrachloroethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,1-Dichloroethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,1-Dichloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,2,4-Trichlorobenzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,2-Dibromo-3-chloropropane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,2-Dibromoethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,2-Dichlorobenzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,2-Dichloroethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,3-Dichlorobenzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
2-Butanone	12	U	12	U	NA		NA		NA		NA		NA		NA	
2-Hexanone	12	U	12	U	NA		NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	12	U	12	U	NA		NA		NA		NA		NA		NA	
Acetone	12	U	12	U	NA		NA		NA		NA		NA		NA	
Benzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Bromodichloromethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Bromoform	12	U	12	U	NA		NA		NA		NA		NA		NA	
Bromomethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Carbon disulfide	12	U	12	U	NA		NA		NA		NA		NA		NA	
Carbon tetrachloride	12	U	12	U	NA		NA		NA		NA		NA		NA	
Chlorobenzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Chloroethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Chloroform	12	U	12	U	NA		NA		NA		NA		NA		NA	
Chloromethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Cumene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Cyclohexane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Dibromochloromethane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Dichlorodifluoromethane(Freon-12)	12	U	12	U	NA		NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12		IS47SB12		IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
Ethylbenzene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Methyl acetate	12	U	12	U	NA		NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	12	U	12	U	NA		NA		NA		NA		NA		NA	
Methylcyclohexane	12	U	12	U	NA		NA		NA		NA		NA		NA	
Methylene chloride	12	U	12		NA		NA		NA		NA		NA		NA	
Styrene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Tetrachloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Toluene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Trichloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Trichlorofluoromethane(Freon-11)	12	U	12	U	NA		NA		NA		NA		NA		NA	
Vinyl chloride	12	U	12	U	NA		NA		NA		NA		NA		NA	
Xylene, total	12	U	12	U	NA		NA		NA		NA		NA		NA	
cis-1,2-Dichloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
cis-1,3-Dichloropropene	12	U	12	U	NA		NA		NA		NA		NA		NA	
o-Xylene	12	U	12	U	NA		NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	12	U	12	U	NA		NA		NA		NA		NA		NA	
trans-1,3-Dichloropropene	12	U	12	U	NA		NA		NA		NA		NA		NA	
Semivolatile Organic Compounds (UG/KG)																
1,1-Biphenyl	410	U	390	U	NA		NA		NA		NA		NA		NA	
2,2'-Oxybis(1-chloropropane)	410	U	390	U	NA		NA		NA		NA		NA		NA	
2,4,5-Trichlorophenol	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
2,4,6-Trichlorophenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
2,4-Dichlorophenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
2,4-Dimethylphenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
2,4-Dinitrophenol	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA	
2-Chloronaphthalene	410	U	390	U	NA		NA		NA		NA		NA		NA	
2-Chlorophenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
2-Methylnaphthalene	410	U	390	U	NA		NA		NA		NA		NA		NA	
2-Methylphenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
2-Nitroaniline	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
2-Nitrophenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
3,3'-Dichlorobenzidine	410	U	390	U	NA		NA		NA		NA		NA		NA	

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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12				IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
3- and 4-Methylphenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
3-Nitroaniline	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
4,6-Dinitro-2-methylphenol	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
4-Bromophenyl-phenylether	410	U	390	U	NA		NA		NA		NA		NA		NA	
4-Chloro-3-methylphenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
4-Chloroaniline	410	U	390	U	NA		NA		NA		NA		NA		NA	
4-Chlorophenyl-phenylether	410	U	390	U	NA		NA		NA		NA		NA		NA	
4-Methylphenol	NA		NA		NA		NA		NA		NA		NA		NA	
4-Nitroaniline	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
4-Nitrophenol	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
Acenaphthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Acenaphthylene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Acetophenone	58	J	45	J	NA		NA		NA		NA		NA		NA	
Anthracene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Atrazine	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzaldehyde	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(a)anthracene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(a)pyrene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(b)fluoranthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(g,h,i)perylene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Benzo(k)fluoranthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Butylbenzylphthalate	410	U	390	U	NA		NA		NA		NA		NA		NA	
Caprolactam	410	U	390	U	NA		NA		NA		NA		NA		NA	
Carbazole	410	U	390	U	NA		NA		NA		NA		NA		NA	
Chrysene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Di-n-butylphthalate	150	J	360	J	NA		NA		NA		NA		NA		NA	
Di-n-octylphthalate	410	U	390	U	NA		NA		NA		NA		NA		NA	
Dibenz(a,h)anthracene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Dibenzofuran	410	U	390	U	NA		NA		NA		NA		NA		NA	
Diethylphthalate	55	J	390	U	NA		NA		NA		NA		NA		NA	
Dimethyl phthalate	410	U	390	U	NA		NA		NA		NA		NA		NA	
Fluoranthene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Fluorene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Hexachlorobenzene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Hexachlorobutadiene	410	U	390	U	NA		NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12				IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
Hexachlorocyclopentadiene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Hexachloroethane	410	U	390	U	NA		NA		NA		NA		NA		NA	
Indeno(1,2,3-cd)pyrene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Isophorone	410	U	390	U	NA		NA		NA		NA		NA		NA	
Naphthalene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Nitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	1,000	U	980	U	NA		NA		NA		NA		NA		NA	
Phenanthrene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Phenol	410	U	390	U	NA		NA		NA		NA		NA		NA	
Pyrene	410	U	390	U	NA		NA		NA		NA		NA		NA	
bis(2-Chloroethoxy)methane	410	U	390	U	NA		NA		NA		NA		NA		NA	
bis(2-Chloroethyl)ether	410	U	390	U	NA		NA		NA		NA		NA		NA	
bis(2-Ethylhexyl)phthalate	410	U	390	U	NA		NA		NA		NA		NA		NA	
n-Nitroso-di-n-propylamine	410	U	390	U	NA		NA		NA		NA		NA		NA	
n-Nitrosodiphenylamine	410	U	390	U	NA		NA		NA		NA		NA		NA	
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	610	U	590	U	NA		NA		NA		NA		NA		NA	
1,3-Dinitrobenzene	610	U	590	U	NA		NA		NA		NA		NA		NA	
2,4,6-Trinitrotoluene	610	U	590	U	NA		NA		NA		NA		NA		NA	
2,4-Dinitrotoluene	410	U	390	U	NA		NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	410	U	390	U	NA		NA		NA		NA		NA		NA	
2-Amino-4,6-dinitrotoluene	610	U	590	U	NA		NA		NA		NA		NA		NA	
2-Nitrotoluene	610	U	590	U	NA		NA		NA		NA		NA		NA	
3-Nitrotoluene	610	U	590	U	NA		NA		NA		NA		NA		NA	
4-Amino-2,6-dinitrotoluene	610	U	590	U	NA		NA		NA		NA		NA		NA	
4-Nitrotoluene	610	U	590	U	NA		NA		NA		NA		NA		NA	
HMX	610	UL	590	UL	NA		NA		NA		NA		NA		NA	
Nitrobenzene	410	U	390	U	NA		NA		NA		NA		NA		NA	
Nitrocellulose	3,050	U	2,950	U	NA		NA		NA		NA		NA		NA	
Nitroglycerin	61,000	U	59,000	U	NA		NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SB09		IS47SB10		IS47SB11		IS47SB12		IS47SB12		IS47SB13		IS47SB14		IS47SB15	
Sample ID	IS47SB090304		IS47SB100304		IS47SB110602		IS47SB120602		IS47SB120602P		IS47SB130602		IS47SB140602		IS47SB150602	
Sample Date	03/20/01		03/20/01		06/19/02		06/19/02		06/19/02		06/19/02		06/19/02		06/20/02	
Chemical Name																
Nitroguanidine	120,000	U	120,000	U	NA		NA		NA		NA		NA		NA	
PETN	61,000	U	59,000	U	NA		NA		NA		NA		NA		NA	
Perchlorate	5	U	5	U	NA		NA		NA		NA		NA		NA	
RDX	610	U	590	U	NA		NA		NA		NA		NA		NA	
Tetryl	610	U	590	U	NA		NA		NA		NA		NA		NA	
Total Metals (MG/KG)																
Aluminum	2,380		2,180		1,970		2,200		2,170		2,110		6,840		2,050	
Antimony	1.8	U	1.8	U	0.43	B	0.41	B	0.38	B	0.62	B	0.54	B	0.37	B
Arsenic	1.2	J	3		1.5	J	1.7	J	1.7	J	1.9	J	5		1.3	J
Barium	14.8	J	18.2	J	11.7	J	10.6	J	13.3	J	12.3	J	77.5		13.9	J
Beryllium	0.19	J	0.32	J	0.23	B	0.23	B	0.23	B	0.23	B	0.41	B	0.24	B
Cadmium	0.12	U	0.12	U	0.062	U	0.069	U	0.06	U	0.063	U	0.065	U	0.065	U
Calcium	267	J	237	J	16	B	23.4	L	14.3	B	27.9	L	95,200		50.9	L
Chromium	9.8		11.4		5.6		6.3		6.8		6		14.7		7.2	
Cobalt	2.4	J	12.1		5.4	J	5.2	J	4.5	J	5.7	J	6.1	J	8.1	J
Copper	6.4		6.7		4.1	J	4.2	J	4.1	J	3.7	J	19.7		3.7	J
Cyanide	NA		NA		NA		NA		NA		NA		NA		NA	
Iron	4,620		3,290		7,590		7,720		8,320		7,320		16,300		7,620	
Lead	6.7		7.4		3.4		3.1		3		3.3		12.8		3.6	
Magnesium	551	J	557	J	309	J	346	L	341	J	304	J	34,400		371	J
Manganese	58		43.3		207	L	196		174	L	229	L	502	L	244	L
Mercury	0.12	U	0.1	U	0.049	U	0.057	U	0.048	U	0.053	U	0.04	U	0.04	U
Nickel	3.1	J	6.5	J	4.2	J	4.6	J	4.1	J	4.7	J	20.4		3.8	J
Potassium	381	J	360	J	180	J	193	J	189	J	171	J	1,630		181	J
Selenium	1.2	U	1.1	U	0.73	B	0.69	B	0.44	UL	0.77	B	0.47	UL	0.48	UL
Silver	0.39	U	0.37	U	0.14	U	0.16	U	0.14	U	0.15	U	0.15	U	0.15	U
Sodium	70.6	U	67.7	U	48.8	J	81.6	J	38.3	J	68.4	J	358	J	69	J
Thallium	1.3	U	1.2	U	0.68	UL	0.76	UL	0.66	UL	0.69	UL	0.71	UL	0.71	UL
Vanadium	18.6		21.1		9.3	J	9.7	J	10.5		9.1	J	18.5		10.4	J
Zinc	11.4		20.2		7.4		8.8		8.4		9.9		50		7.1	
Wet Chemistry (MG/KG)																
% Moisture	NA		NA		NA		NA		NA		NA		NA		NA	
Total organic carbon (TOC)	2,300		2,100		NA		NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1,1-Trichloroethane	11	U	11	U	11	U	11	U	10	U
1,1,2,2-Tetrachloroethane	11	U	11	U	11	U	11	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	11	U	11	U	11	U	11	U	10	U
1,1,2-Trichloroethane	11	U	11	U	11	U	11	U	10	U
1,1-Dichloroethane	11	U	11	U	11	U	11	U	10	U
1,1-Dichloroethene	11	U	11	U	11	U	11	U	10	U
1,2,4-Trichlorobenzene	11	U	11	U	11	U	11	U	10	U
1,2-Dibromo-3-chloropropane	11	U	11	U	11	U	11	U	10	U
1,2-Dibromoethane	11	U	11	U	11	U	11	U	10	U
1,2-Dichlorobenzene	11	U	11	U	11	U	11	U	10	U
1,2-Dichloroethane	11	U	11	U	11	U	11	U	10	U
1,2-Dichloroethene (total)	NA		NA		11	U	NA		NA	
1,2-Dichloropropane	11	U	11	U	11	U	11	U	10	U
1,3-Dichlorobenzene	11	U	11	U	11	U	11	U	10	U
1,4-Dichlorobenzene	11	U	11	U	1.1	B	11	U	10	U
2-Butanone	11	U	11	U	11	U	11	U	10	U
2-Hexanone	11	U	11	U	11	U	11	U	10	U
4-Methyl-2-pentanone	11	U	11	U	11	U	11	U	10	U
Acetone	2.5	B	2.1	B	2.7	B	3.5	B	2.8	B
Benzene	11	U	11	U	11	U	11	U	10	U
Bromodichloromethane	11	U	11	U	11	U	11	U	10	U
Bromoform	11	U	11	U	11	U	11	U	10	U
Bromomethane	11	U	11	U	11	U	11	U	10	U
Carbon disulfide	11	U	11	U	11	U	11	U	10	U
Carbon tetrachloride	11	U	11	U	11	U	11	U	10	U
Chlorobenzene	11	U	11	U	11	U	11	U	10	U
Chloroethane	11	U	11	U	11	U	11	U	10	U
Chloroform	11	U	11	U	11	U	11	U	10	U
Chloromethane	11	U	11	U	11	U	11	U	10	U
Cumene	11	U	11	U	11	U	11	U	10	U
Cyclohexane	11	U	11	U	11	U	11	U	10	U
Dibromochloromethane	11	U	11	U	11	U	11	U	10	U
Dichlorodifluoromethane(Freon-12)	11	U	11	U	11	U	11	U	10	U

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Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
Ethylbenzene	11	U	11	U	11	U	11	U	10	U
Methyl acetate	11	U	11	U	11	U	11	U	10	U
Methyl-tert-butyl ether (MTBE)	11	U	11	U	11	U	11	U	10	U
Methylcyclohexane	11	U	11	U	11	U	11	U	10	U
Methylene chloride	2.7	B	2.8	B	3.2	B	1.9	B	1.5	B
Styrene	11	U	11	U	11	U	11	U	10	U
Tetrachloroethene	11	U	2.3	J	11	U	11	U	10	U
Toluene	11	U	11	U	11	U	11	U	10	U
Trichloroethene	11	U	1.5	J	11	U	11	U	10	U
Trichlorofluoromethane(Freon-11)	11	U	11	U	11	U	11	U	10	U
Vinyl chloride	11	U	11	U	11	U	11	U	10	U
Xylene, total	11	U	11	U	11	U	11	U	10	U
cis-1,2-Dichloroethene	11	U	11	U	11	U	11	U	10	U
cis-1,3-Dichloropropene	11	U	11	U	11	U	11	U	10	U
o-Xylene	NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	11	U	11	U	11	U	11	U	10	U
trans-1,3-Dichloropropene	11	U	11	U	11	U	11	U	10	U
Semivolatile Organic Compounds (UG/KG)										
1,1-Biphenyl	350	U	350	U	350	U	350	U	350	U
2,2'-Oxybis(1-chloropropane)	350	U	350	U	350	U	350	U	350	U
2,4,5-Trichlorophenol	880	U	880	U	880	U	870	U	870	U
2,4,6-Trichlorophenol	350	U	350	U	350	U	350	U	350	U
2,4-Dichlorophenol	350	U	350	U	350	U	350	U	350	U
2,4-Dimethylphenol	350	U	350	U	350	U	350	U	350	U
2,4-Dinitrophenol	880	U	880	U	880	U	870	U	870	U
2,4-Dinitrotoluene	350	U	350	U	350	U	350	U	350	U
2,6-Dinitrotoluene	350	U	350	U	350	U	350	U	350	U
2-Chloronaphthalene	350	U	350	U	350	U	350	U	350	U
2-Chlorophenol	350	U	350	U	350	U	350	U	350	U
2-Methylnaphthalene	350	U	350	U	350	U	350	U	350	U
2-Methylphenol	350	U	350	U	350	U	350	U	350	U
2-Nitroaniline	880	U	880	U	880	U	870	U	870	U
2-Nitrophenol	350	U	350	U	350	U	350	U	350	U
3,3'-Dichlorobenzidine	350	U	350	U	350	U	350	U	350	U

NA - Not analyzed
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K - Biased high
L - Biased low

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UL - Undetected, limit biased low

Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
3- and 4-Methylphenol	NA		NA		NA		NA		NA	
3-Nitroaniline	880	U	880	U	880	U	870	U	870	U
4,6-Dinitro-2-methylphenol	880	U	880	U	880	U	870	U	870	U
4-Bromophenyl-phenylether	350	U	350	U	350	U	350	U	350	U
4-Chloro-3-methylphenol	350	U	350	U	350	U	350	U	350	U
4-Chloroaniline	350	U	350	U	350	U	350	U	350	U
4-Chlorophenyl-phenylether	350	U	350	U	350	U	350	U	350	U
4-Methylphenol	350	U	350	U	350	U	350	U	350	U
4-Nitroaniline	880	U	880	U	880	U	870	U	870	U
4-Nitrophenol	880	U	880	U	880	U	870	U	870	U
Acenaphthene	350	U	350	U	350	U	350	U	350	U
Acenaphthylene	350	U	350	U	350	U	350	U	350	U
Acetophenone	200	B	91	B	69	B	76	B	52	B
Anthracene	350	U	350	U	350	U	350	U	350	U
Atrazine	350	U	350	U	350	U	350	U	350	U
Benzaldehyde	350	U	350	U	350	U	350	U	350	U
Benzo(a)anthracene	350	U	100	J	350	U	350	U	350	U
Benzo(a)pyrene	350	U	350	U	350	U	350	U	350	U
Benzo(b)fluoranthene	350	U	130	J	350	U	350	U	350	U
Benzo(g,h,i)perylene	350	U	350	U	350	U	350	U	350	U
Benzo(k)fluoranthene	350	U	55	J	350	U	350	U	350	U
Butylbenzylphthalate	350	U	350	U	350	U	350	U	350	U
Caprolactam	350	U	350	U	350	U	350	U	350	U
Carbazole	350	U	350	U	350	U	350	U	350	U
Chrysene	350	U	120	J	350	U	350	U	350	U
Di-n-butylphthalate	350	U	350	U	350	U	350	U	350	U
Di-n-octylphthalate	350	U	350	U	350	U	350	U	350	U
Dibenz(a,h)anthracene	350	U	350	U	350	U	350	U	350	U
Dibenzofuran	350	U	350	U	350	U	350	U	350	U
Diethylphthalate	350	U	350	U	350	U	350	U	350	U
Dimethyl phthalate	350	U	350	U	350	U	350	U	350	U
Fluoranthene	350	U	150	J	350	U	350	U	350	U
Fluorene	350	U	350	U	350	U	350	U	350	U
Hexachlorobenzene	350	U	350	U	350	U	350	U	350	U
Hexachlorobutadiene	350	U	350	U	350	U	350	U	350	U

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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
Hexachlorocyclopentadiene	350	U	350	U	350	U	350	U	350	U
Hexachloroethane	350	U	350	U	350	U	350	U	350	U
Indeno(1,2,3-cd)pyrene	350	U	350	U	350	U	350	U	350	U
Isophorone	350	U	350	U	350	U	350	U	350	U
Naphthalene	350	U	350	U	350	U	350	U	350	U
Nitrobenzene	350	U	350	U	350	U	350	U	350	U
Pentachlorophenol	850	U	840	U	850	U	840	U	840	U
Phenanthrene	350	U	84	J	350	U	350	U	350	U
Phenol	350	U	350	U	350	U	350	U	350	U
Pyrene	350	U	48	J	350	U	350	U	76	J
bis(2-Chloroethoxy)methane	350	U	350	U	350	U	350	U	350	U
bis(2-Chloroethyl)ether	350	U	350	U	350	U	350	U	350	U
bis(2-Ethylhexyl)phthalate	62	B	350	U	350	U	350	U	350	U
n-Nitroso-di-n-propylamine	350	U	350	U	350	U	350	U	350	U
n-Nitrosodiphenylamine	350	U	350	U	350	U	350	U	350	U
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	NA		NA		NA		NA		NA	
1,3-Dinitrobenzene	NA		NA		NA		NA		NA	
2,4,6-Trinitrotoluene	NA		NA		NA		NA		NA	
2,4-Dinitrotoluene	NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA		NA	
2-Amino-4,6-dinitrotoluene	NA		NA		NA		NA		NA	
2-Nitrotoluene	NA		NA		NA		NA		NA	
3-Nitrotoluene	NA		NA		NA		NA		NA	
4-Amino-2,6-dinitrotoluene	NA		NA		NA		NA		NA	
4-Nitrotoluene	NA		NA		NA		NA		NA	
HMX	NA		NA		NA		NA		NA	
Nitrobenzene	NA		NA		NA		NA		NA	
Nitrocellulose	NA		NA		NA		NA		NA	
Nitroglycerin	NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Subsurface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	RI47SO13		RI47SO14		RI47SO15		RI47SO16			
Sample ID	IS47SB17		IS47SB18		IS47SB19		IS47SB98		IS47SB16	
Sample Date	10/10/00		10/10/00		10/10/00		10/10/00		10/10/00	
Chemical Name										
Nitroguanidine	NA		NA		NA		NA		NA	
PETN	NA		NA		NA		NA		NA	
Perchlorate	NA		NA		NA		NA		NA	
RDX	NA		NA		NA		NA		NA	
Tetryl	NA		NA		NA		NA		NA	
Total Metals (MG/KG)										
Aluminum	2,150		3,010		2,930		4,600		4,760	
Antimony	0.66	U	0.93	K	0.66	U	0.65	U	0.65	U
Arsenic	2.1	K	3	K	1.5	K	3.3	K	3.1	K
Barium	15	J	26.5		19	J	24.6	J	25.5	J
Beryllium	0.12	B	0.075	B	0.15	B	0.22	B	0.22	B
Cadmium	0.053	U	0.053	U	0.053	U	0.053	U	0.052	U
Calcium	205	B	385	J	102	B	117	B	109	B
Chromium	11.6		16.1		8.5		10.1		10.3	
Cobalt	1.7	J	2.6		2.6	J	5.4	J	5.6	J
Copper	4.7	J	8.1		3.2	J	5.7		6	
Cyanide	0.085	J	0.19	J	0.069	J	0.53	U	0.52	U
Iron	7,670		9,390		6,790		10,400		10,400	
Lead	10	K	13.8	K	6.7	K	6.9	K	6.9	K
Magnesium	191	B	482	J	267	J	421	J	417	J
Manganese	45.4	B	79.3	J	65		97.6		90.4	
Mercury	1		2.6		0.17		11		14	
Nickel	2.6	K	4.5	K	2.8	K	4.7	K	4.6	K
Potassium	182	B	218	B	165	B	250	B	247	B
Selenium	0.85	U	0.85	U	0.85	U	0.84	U	0.84	U
Silver	6.4		13.5		1.2	J	0.81	J	0.87	J
Sodium	52	U	51.5	U	51.7	U	51.3	U	51.1	U
Thallium	1.5	U	1.4	U	1.4	U	1.4	U	1.4	U
Vanadium	12		13.7		10.9		16		16.2	
Zinc	13.2	J	22.4	J	10.3	J	16.2	J	15.8	J
Wet Chemistry (MG/KG)										
% Moisture	6.2		5.3		5.6		4.9		4.5	
Total organic carbon (TOC)	NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	17 U	13 U	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,1-Dichloroethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,1-Dichloroethene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,2,4-Trichlorobenzene	17 U	13 U	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	17 U	13 U	NA	NA	NA	NA	NA
1,2-Dibromoethane	17 U	13 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	17 U	13 U	NA	NA	NA	NA	NA
1,2-Dichloroethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,2-Dichloroethene (total)	NA	NA	14 U	12 U	11 U	11 U	11 U
1,2-Dichloropropane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
1,3-Dichlorobenzene	17 U	13 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	17 U	13 U	NA	NA	NA	NA	NA
2-Butanone	17 U	13 U	14 U	12 U	11 U	11 U	11 U
2-Hexanone	17 U	13 U	14 U	12 U	11 U	11 U	11 U
4-Methyl-2-pentanone	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Acetone	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Benzene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Bromodichloromethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Bromoform	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Bromomethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Carbon disulfide	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Carbon tetrachloride	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Chlorobenzene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Chloroethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Chloroform	17 U	13 U	3 B	3 B	3 B	2 B	3 B
Chloromethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Cumene	17 U	13 U	NA	NA	NA	NA	NA

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Appendix J
Raw Data for Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
Cyclohexane	17 U	13 U	NA	NA	NA	NA	NA
Dibromochloromethane	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Dichlorodifluoromethane(Freon-12)	17 U	13 U	NA	NA	NA	NA	NA
Ethylbenzene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Methyl acetate	17 U	13 U	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	17 U	13 U	NA	NA	NA	NA	NA
Methylcyclohexane	17 U	13 U	NA	NA	NA	NA	NA
Methylene chloride	17 U	13 U	11 B	13 B	10 B	7 B	11 B
Styrene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Tetrachloroethene	17 U	13 U	2 B	4 B	2 B	11 U	11 U
Toluene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Trichloroethene	17 U	13 U	14 U	12 U	2 J	11 U	11 U
Trichlorofluoromethane(Freon-11)	17 U	13 U	NA	NA	NA	NA	NA
Vinyl chloride	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Xylene, total	17 U	13 U	14 U	12 U	11 U	11 U	11 U
cis-1,2-Dichloroethene	17 U	13 U	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
o-Xylene	17 U	13 U	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	17 U	13 U	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	17 U	13 U	14 U	12 U	11 U	11 U	11 U
Semivolatile Organic Compounds (UG/KG)							
1,1-Biphenyl	1,500 U	680 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	470 U	390 U	360 U	370 U	370 U
1,2-Dichlorobenzene	NA	NA	470 U	390 U	360 U	370 U	370 U
1,3-Dichlorobenzene	NA	NA	470 U	390 U	360 U	370 U	370 U
1,4-Dichlorobenzene	NA	NA	470 U	390 U	360 U	370 U	370 U
2,2'-Oxybis(1-chloropropane)	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2,4,5-Trichlorophenol	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
2,4,6-Trichlorophenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2,4-Dichlorophenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2,4-Dimethylphenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U

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Appendix J
Raw Data for Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
2,4-Dinitrophenol	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
2,4-Dinitrotoluene	1,500 U	680 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	1,500 U	680 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2-Chlorophenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2-Methylnaphthalene	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2-Methylphenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
2-Nitroaniline	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
2-Nitrophenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
3,3'-Dichlorobenzidine	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
3- and 4-Methylphenol	1,500 U	680 U	NA	NA	NA	NA	NA
3-Nitroaniline	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
4,6-Dinitro-2-methylphenol	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
4-Bromophenyl-phenylether	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
4-Chloro-3-methylphenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
4-Chloroaniline	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
4-Chlorophenyl-phenylether	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
4-Methylphenol	NA	NA	470 U	390 U	360 U	370 U	370 U
4-Nitroaniline	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
4-Nitrophenol	3,800 U	1,700 U	1,200 U	980 U	910 U	920 U	920 U
Acenaphthene	76 U	34 UL	470 U	76 J	360 U	370 U	370 U
Acenaphthylene	76 U	34 UL	470 U	40 J	360 U	370 U	370 U
Acetophenone	170 J	87 J	NA	NA	NA	NA	NA
Anthracene	76 U	34 UL	470 U	450	180 J	370 U	370 U
Atrazine	1,500 U	680 U	NA	NA	NA	NA	NA
Benzaldehyde	1,500 U	680 U	NA	NA	NA	NA	NA
Benzo(a)anthracene	76 U	34 UL	290 J	2,200	1,200	69 J	110 J
Benzo(a)pyrene	76 U	34 UL	280 J	1,900	1,000	57 J	89 J
Benzo(b)fluoranthene	76 U	34 UL	670	4,600	2,100	130 J	140 J
Benzo(g,h,i)perylene	76 U	34 UL	340 J	2,800	1,400	39 J	51 J
Benzo(k)fluoranthene	76 U	34 UL	170 J	1,200	780	45 J	69 J
Butylbenzylphthalate	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U

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Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
Caprolactam	1,500 U	680 U	NA	NA	NA	NA	NA
Carbazole	1,500 U	680 U	470 U	67 J	37 J	370 U	370 U
Chrysene	76 U	330	320 J	2,100	1,100	86 J	110 J
Di-n-butylphthalate	420 J	560 J	73 J	390 U	360 U	96 J	63 J
Di-n-octylphthalate	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Dibenz(a,h)anthracene	76 U	34 UL	470 U	850	350 J	370 U	370 U
Dibenzofuran	1,500 U	680 U	470 U	59 J	360 U	370 U	370 U
Diethylphthalate	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Dimethyl phthalate	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Fluoranthene	76 U	34 UL	510	1,400	1,200	140 J	230 J
Fluorene	76 U	34 UL	470 U	140 J	59 J	370 U	370 U
Hexachlorobenzene	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Hexachlorobutadiene	1,500 U	680 U	710	350 J	71 J	370 U	370 U
Hexachlorocyclopentadiene	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Hexachloroethane	1,500 U	680 U	470 U	48 J	360 U	370 U	370 U
Indeno(1,2,3-cd)pyrene	76 U	34 UL	290 J	2,600	1,100	43 J	67 J
Isophorone	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Naphthalene	76 U	34 UL	470 U	390 U	360 U	370 U	370 U
Nitrobenzene	1,500 U	680 U	NA	NA	NA	NA	NA
Pentachlorophenol	3,800 U	1,700 U	1,200 U	180 J	910 U	920 U	920 U
Phenanthrene	120	34 UL	200 J	1,300	660	78 J	170 J
Phenol	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Pyrene	76 U	350	590	3,200	1,800	110 J	180 J
bis(2-Chloroethoxy)methane	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
bis(2-Chloroethyl)ether	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
bis(2-Ethylhexyl)phthalate	1,500 U	680 U	470 U	220 B	170 B	370 U	370 U
n-Nitroso-di-n-propylamine	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
n-Nitrosodiphenylamine	1,500 U	680 U	470 U	390 U	360 U	370 U	370 U
Explosives (UG/KG)							
1,3,5-Trinitrobenzene	NA	NA	250 U	210 U	250 U	250 U	250 U
1,3-Dinitrobenzene	NA	NA	250 U	210 U	250 U	250 U	250 U

NA - Not Analyzed
B - Analyzed not detected above associated blank
J - Reported Value is estimated
N - Tentative identification, consider present
U - Analyte not detected
UL - Not detected, quantitation limit is probably higher

Appendix J
Raw Data for Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
2,4,6-Trinitrotoluene	NA	NA	250 U	210 U	250 U	250 U	250 U
2,4-Dinitrotoluene	NA	NA	250 U	210 U	250 U	250 U	250 U
2,6-Dinitrotoluene	NA	NA	250 U	210 U	250 U	250 U	250 U
2-Amino-4,6-dinitrotoluene	NA	NA	250 U	210 U	250 U	250 U	250 U
2-Nitrotoluene	NA	NA	500 U	420 U	500 U	500 U	500 U
3-Nitrotoluene	NA	NA	500 U	420 U	500 U	500 U	500 U
4-Amino-2,6-dinitrotoluene	NA	NA	250 U	210 U	250 U	250 U	250 U
4-Nitrotoluene	NA	NA	500 U	420 U	500 U	500 U	500 U
HMX	NA	NA	500 U	420 U	500 U	500 U	500 U
Nitrobenzene	NA	NA	250 U	210 U	250 U	250 U	250 U
Nitrocellulose	NA	NA	50,400 U	37,800 U	37,500 U	38,500 U	38,300 U
Nitroglycerin	NA	NA	6,300 U	5,700 U	9,300	9,100	5,200 U
Nitroguanidine	NA	NA	110 U	110 U	110 U	120 U	110 U
PETN	NA	NA	250 U	208 U	250 U	250 U	250 U
Perchlorate	6 U	9 U	NA	NA	NA	NA	NA
RDX	NA	NA	500 U	420 U	500 U	500 U	500 U
Tetryl	NA	NA	500 U	420 U	500 U	500 U	500 U
Total Metals (MG/KG)							
Aluminum	10,800	720	22,800	4,010	1,490	1,200	2,300
Antimony	6.5 U	3 U	0.59 U	1.1 J	0.69 J	0.41 U	0.45 U
Arsenic	10	2.3 J	7.4	0.99 J	0.48 U	0.5 U	0.55 U
Barium	96.3 J	7.7 J	91.7	13.9 J	6.1 J	5.4 B	9.7 J
Beryllium	3.5 J	0.12 J	0.57 J	0.1 J	0.03 J	0.03 J	0.07 J
Cadmium	3 J	0.2 U	1 J	0.63 J	0.18 J	0.07 J	0.1 J
Calcium	1,880 J	302 J	2,680	402 B	147 B	71.7 J	91.7 J
Chromium	21.5	2.6 J	40.7	14.3	4.1	3.3	5.4
Cobalt	36.7 J	4.1 J	5.6 J	1.2 J	0.56 J	0.56 J	1.7 J
Copper	34.5	5.1 J	113	33.4	3.9 J	1.9 J	3.2 J
Cyanide	NA	NA	0.29 U	0.29	0.3	0.34	0.31
Iron	24,900	2,290	36,000	5,150	1,410	1,150	2,170
Lead	55.4	22.3	289 N	74.9	13.7 N	3.5 B	7.1

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Appendix J
Raw Data for Site 47 Sediment Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SD05	IS47SD06	SD-01	SD-02		SD-03	SD-04
Sample ID	IS47SD05	IS47SD06	RI47SD01	RI47SD02	RI47SD99	RI47SD03	RI47SD04
Sample Date	03/20/01	03/20/01	07/14/99	07/14/99	07/14/99	07/14/99	07/14/99
Chemical Name							
Magnesium	1,040 J	158 J	1,830	479 J	241 J	171 J	276 J
Manganese	143	10.6	119	20.4	7.3	5.2	11.9
Mercury	0.74	0.2 U	2.9	3.8	1.2	0.35	0.21
Nickel	27.1 J	2.6 J	22.1	6.1 B	2.3 B	1.5 B	2.8 B
Potassium	441 J	93.1 J	1,370	254 J	206 J	172 J	245 J
Selenium	4.2 U	1.9 U	0.72 U	0.58 U	0.48 U	0.5 U	0.55 U
Silver	21.4	0.64 U	814	40.5	10.4	4.9	3.6
Sodium	292 J	116 U	275 J	35.1 U	29.1 U	30 U	33.3 U
Thallium	4.5 U	2.1 U	1 U	0.82 U	0.68 U	0.7 U	0.78 U
Vanadium	50.7	5.5 J	55.1	16.6	5.2 J	3.1 J	5.9 J
Zinc	287	45	372	43.9 B	15.7 B	7.6 B	14.4 B
Wet Chemistry (MG/KG)							
% Solids	NA	NA	70.7	85	92.3	90.9	91.3
Total organic carbon (TOC)	91,000	1,900	NA	NA	NA	NA	NA
pH	NA	NA	5.45	5.78	5.6	5.19	4.86

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Appendix J
Raw Data for Site 47 Sewer Sediment
IHDIV-NSWC
Indian Head, Maryland

Station ID	IW-91	
Sample ID	IS47IW91	
Sample Date	07/14/99	
Chemical Name		
Volatile Organic Compounds (UG/KG)		
1,1,1-Trichloroethane	16	U
1,1,2,2-Tetrachloroethane	16	U
1,1,2-Trichloroethane	16	U
1,1-Dichloroethane	16	U
1,1-Dichloroethene	16	U
1,2-Dichloroethane	16	U
1,2-Dichloroethene (total)	16	U
1,2-Dichloropropane	16	U
2-Butanone	16	U
2-Hexanone	16	U
4-Methyl-2-pentanone	16	U
Acetone	16	U
Benzene	16	U
Bromodichloromethane	16	U
Bromoform	16	U
Bromomethane	16	U
Carbon disulfide	16	U
Carbon tetrachloride	16	U
Chlorobenzene	16	U
Chloroethane	16	U
Chloroform	4	B
Chloromethane	16	U
Dibromochloromethane	16	U
Ethylbenzene	16	U
Methylene chloride	13	B
Styrene	16	U
Tetrachloroethene	2	B
Toluene	16	U
Trichloroethene	16	U
Vinyl chloride	16	U
Xylene, total	16	U
cis-1,3-Dichloropropene	16	U
trans-1,3-Dichloropropene	16	U
Semivolatile Organic Compounds (UG/KG)		
1,2,4-Trichlorobenzene	550	U
1,2-Dichlorobenzene	550	U
1,3-Dichlorobenzene	550	U
1,4-Dichlorobenzene	550	U
2,2'-Oxybis(1-chloropropane)	550	U
2,4,5-Trichlorophenol	1,400	U
2,4,6-Trichlorophenol	550	U
2,4-Dichlorophenol	550	U
2,4-Dimethylphenol	550	U
2,4-Dinitrophenol	1,400	U
2-Chloronaphthalene	550	U
2-Chlorophenol	550	U
2-Methylnaphthalene	550	U
2-Methylphenol	550	U

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Appendix J
Raw Data for Site 47 Sewer Sediment
IHDIV-NSWC
Indian Head, Maryland

Station ID	IW-91	
Sample ID	IS47IW91	
Sample Date	07/14/99	
Chemical Name		
2-Nitroaniline	1,400	U
2-Nitrophenol	550	U
3,3'-Dichlorobenzidine	550	U
3-Nitroaniline	1,400	U
4,6-Dinitro-2-methylphenol	1,400	U
4-Bromophenyl-phenylether	550	U
4-Chloro-3-methylphenol	550	U
4-Chloroaniline	550	U
4-Chlorophenyl-phenylether	550	U
4-Methylphenol	550	U
4-Nitroaniline	1,400	U
4-Nitrophenol	1,400	U
Acenaphthene	550	U
Acenaphthylene	550	U
Anthracene	550	U
Benzo(a)anthracene	550	U
Benzo(a)pyrene	550	U
Benzo(b)fluoranthene	90	J
Benzo(g,h,i)perylene	550	U
Benzo(k)fluoranthene	550	U
Butylbenzylphthalate	550	U
Carbazole	550	U
Chrysene	56	J
Di-n-butylphthalate	550	U
Di-n-octylphthalate	550	U
Dibenz(a,h)anthracene	550	U
Dibenzofuran	550	U
Diethylphthalate	550	U
Dimethyl phthalate	550	U
Fluoranthene	86	J
Fluorene	550	U
Hexachlorobenzene	550	U
Hexachlorobutadiene	550	U
Hexachlorocyclopentadiene	550	U
Hexachloroethane	550	U
Indeno(1,2,3-cd)pyrene	550	U
Isophorone	550	U
Naphthalene	550	U
Pentachlorophenol	1,400	U
Phenanthrene	550	U
Phenol	550	U
Pyrene	74	J
bis(2-Chloroethoxy)methane	550	U
bis(2-Chloroethyl)ether	550	U
bis(2-Ethylhexyl)phthalate	310	B
n-Nitroso-di-n-propylamine	550	U
n-Nitrosodiphenylamine	550	U
Explosives (UG/KG)		
1,3,5-Trinitrobenzene	250	U
1,3-Dinitrobenzene	250	U

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Appendix J
Raw Data for Site 47 Sewer Sediment
IHDIV-NSWC
Indian Head, Maryland

Station ID	IW-91	
Sample ID	IS47IW91	
Sample Date	07/14/99	
Chemical Name		
2,4,6-Trinitrotoluene	250	U
2,4-Dinitrotoluene	250	U
2,6-Dinitrotoluene	250	U
2-Amino-4,6-dinitrotoluene	250	U
2-Nitrotoluene	500	U
3-Nitrotoluene	500	U
4-Amino-2,6-dinitrotoluene	250	U
4-Nitrotoluene	500	U
HMX	500	U
Nitrobenzene	250	U
Nitrocellulose	54,600	U
Nitroglycerin	3,700,000	
Nitroguanidine	120	U
PETN	250	U
RDX	500	U
Tetryl	500	U
Total Metals (MG/KG)		
Aluminum	14,300	
Antimony	0.95	J
Arsenic	8.8	
Barium	318	
Beryllium	0.89	J
Cadmium	2.7	
Calcium	4,780	
Chromium	43.6	
Cobalt	17.7	
Copper	109	
Cyanide	0.37	U
Iron	38,900	
Lead	5,760	J
Magnesium	3,290	
Manganese	1,300	
Mercury	80.2	
Nickel	30.5	
Potassium	8,760	
Selenium	0.74	U
Silver	406	
Sodium	1,410	
Thallium	1	U
Vanadium	42.6	
Zinc	582	
Wet Chemistry (MG/KG)		
% Solids	61.1	
pH	9.6	

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Appendix J
Raw Data for Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,1,2,2-Tetrachloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,1-Dichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,1-Dichloroethene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,2,4-Trichlorobenzene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
1,2-Dichloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,2-Dichloroethene (total)	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,2-Dichloropropane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
1,3-Dichlorobenzene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
1,4-Dichlorobenzene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2-Butanone	NA	26 U	11 U	11 U	2 JB	10 U	11 U	1,300 U	11 U	10 U	11 U
2-Hexanone	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
4-Methyl-2-pentanone	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Acetone	NA	13 U	5 U	3 U	14 B	9 U	6 U	3,600 U	2 U	5 J	11 U
Benzene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Bromodichloromethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Bromoform	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Bromomethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Carbon disulfide	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	1 J	2 J
Carbon tetrachloride	NA	41	11 U	5 J	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chlorobenzene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chloroethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chloroform	NA	68	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Chloromethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Cumene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U

NA - Not analyzed
B - Blank contamination
J - Estimated
K - Value may be biased high

L - Value may be biased low
R - Unreliable result
U - not detected
UJ - Undetected, estimated limit
UL - Undetected, limit biased low

Appendix J
Raw Data for Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	4 U	11 U	1 U	11 U	10 U	11 U	1,300 U	11 U	1 U	2 U
Styrene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Tetrachloroethene	NA	3,100	6 J	2 J	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Toluene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Trichloroethene	NA	32	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Xylene, total	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	26 U	11 U	11 U	11 U	10 U	11 U	1,300 U	11 U	10 U	11 U
Semi-volatile Organic Compounds (UG/KG)											
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2,4,5-Trichlorophenol	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
2,4,6-Trichlorophenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2,4-Dichlorophenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2,4-Dimethylphenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2,4-Dinitrophenol	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
2,4-Dinitrotoluene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2,6-Dinitrotoluene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2-Chloronaphthalene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U

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Appendix J
Raw Data for Site 47 Surface Soil Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
2-Chlorophenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2-Methylnaphthalene	430 U	440 U	350 U	350 U	430 U	340 U	20 J	340 U	350 U	350 U	350 U
2-Methylphenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
2-Nitroaniline	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
2-Nitrophenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
3,3'-Dichlorobenzidine	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
4,6-Dinitro-2-methylphenol	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
4-Bromophenyl-phenylether	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
4-Chloro-3-methylphenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
4-Chloroaniline	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
4-Chlorophenyl-phenylether	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
4-Methylphenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
4-Nitroaniline	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
4-Nitrophenol	1,100 U	1,100 U	840 U	840 U	1,000 U	830 U	840 U	830 U	850 U	840 U	850 U
Acenaphthene	54 J	51 J	30 J	350 U	430 U	340 U	52 J	340 U	350 U	350 U	350 U
Acenaphthylene	150 J	180 J	26 J	31 J	430 U	340 U	100 J	340 U	350 U	350 U	350 U
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	410 J	430 J	100 J	73 J	430 U	340 U	240 J	340 U	350 U	350 U	350 U
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	610	570	290 J	170 J	430 U	22 J	660	19 J	350 U	23 J	350 U
Benzo(a)pyrene	570	560	230 J	150 J	430 U	340 U	540	340 U	350 U	19 J	350 U
Benzo(b)fluoranthene	1,000	1,200	420	250 J	430 U	24 J	850	19 J	20 J	32 J	350 U
Benzo(g,h,i)perylene	220 J	210 J	120 J	100 J	430 U	340 U	170 J	340 U	350 U	19 J	350 U
Benzo(k)fluoranthene	1,100	900	260 J	320 J	430 U	28 J	470	26 J	19 J	53 J	350 U
Butylbenzylphthalate	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	59 J	88 J	75 J	36 J	430 U	340 U	88 J	340 U	350 U	350 U	350 U
Chrysene	680	600	390	250 J	38 J	27 J	820	28 J	22 J	35 J	350 U
Di-n-butylphthalate	430 U	440 U	59 U	59 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Di-n-octylphthalate	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Dibenz(a,h)anthracene	200 J	220 J	92 J	70 J	430 U	340 U	120 J	340 U	350 U	350 U	350 U

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Appendix J
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Indian Head, Maryland

Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Dibenzofuran	43 J	35 J	20 J	350 U	430 U	340 U	32 J	340 U	350 U	350 U	350 U
Diethylphthalate	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Dimethyl phthalate	430 U	440 U	350 U	22 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Fluoranthene	1,000	860	570	300 J	37 J	43 J	1,200	31 J	28 J	41 J	350 U
Fluorene	120 J	95 J	36 J	24 J	430 U	340 U	94 J	340 U	350 U	350 U	350 U
Hexachlorobenzene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Hexachlorobutadiene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Hexachlorocyclopentadiene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Hexachloroethane	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Indeno(1,2,3-cd)pyrene	420 J	470	170 J	120 J	430 U	340 U	240 J	340 U	350 U	22 J	350 U
Isophorone	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Naphthalene	430 U	440 U	350 U	350 U	430 U	340 U	19 J	340 U	350 U	350 U	350 U
Nitrobenzene	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Pentachlorophenol	71 J	86 J	840 U	840 U	1,000 U	830 U	150 J	830 U	850 U	840 U	850 U
Phenanthrene	780	600	400	200 J	430 U	20 J	820	340 U	350 U	350 U	350 U
Phenol	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Pyrene	880	700	480	250 J	26 J	40 J	1,100	30 J	29 J	37 J	350 U
bis(2-Chloroethoxy)methane	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
bis(2-Chloroethyl)ether	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
bis(2-Ethylhexyl)phthalate	34 U	440 U	120 U	94 U	84 U	340 U	67 U	340 U	350 U	350 U	350 U
n-Nitroso-di-n-propylamine	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
n-Nitrosodiphenylamine	430 U	440 U	350 U	350 U	430 U	340 U	350 U	340 U	350 U	350 U	350 U
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrocellulose	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroguanidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PETN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)											
Aluminum	2,450 J	1,600 J	2,710	2,770	1,040	2,700	1,990	2,740	2,420	2,950	2,080
Antimony	6.7 UJ	6.7 UJ	5.3 U	5.3 U	606 U	5.2 U	5.3 U	5.2 U	5.3 U	5.2 U	5.3 U
Arsenic	0.8 UJ	0.81 UJ	1.5 B	2.4	0.79 U	2.3	1.8 B	1.9 B	2.4	1.7 B	1.6 B
Barium	11.1 B	9.3 B	21.3 B	21.5 B	4.7 B	17.3 B	18.7 B	18.9 B	17.2 B	17.9 B	14.7 B
Beryllium	0.27 U	0.27 U	0.21 U	0.21 U	0.26 U	0.25 B	0.21 U	0.23 B	0.23 B	0.21 U	0.21 U
Cadmium	1.3 U	1.3 U	4.3	4.6	1.3 U	1 U	1.1 U	1 U	1.1	1 U	1.1 U
Calcium	495 B	298 B	350 B	362 B	74.1 B	274 B	317 B	255 B	619 B	231 B	199 B
Chromium	9.1	7	2.6	13.4	2.9	7.8	11.8	7.3	6.9	6.9	5.2
Cobalt	4 U	4 U	2.5 B	3.6 B	3.9 B	5.9 B	4.6 B	6.8 B	5.3 B	5.9 B	5 B
Copper	13.8	9.8	9.5	6.7	2.6 U	4.8 B	14.9	4.7 B	3.6 B	3.7 B	3.4 B
Cyanide	1.7 U	1.4 U	1.3 U	1.3 U	1.6 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Iron	5,150 J	3,550 J	6,790	7,150	1,170	7,960	8,110	6,990	6,460	5,590	4,970
Lead	61.4 J	52.4 J	22.3 J	30.2 J	3.7 U	9.1 J	48.5 J	8.9 J	12.3 J	12.3 J	13.1 J
Magnesium	408 B	307 B	286 B	282 B	141 B	278 B	321 B	277 B	372 B	243 B	212 B
Manganese	49.4	18.1	59.3 J	72.7 J	4.7 J	98.2 J	146 J	161 J	164 J	136 J	141 J
Mercury	2.7 J	2.1 J	0.34	3.8	0.36	0.09 U	0.54	1.6	0.4	15.9	0.11
Nickel	5 B	4 U	3.2 U	3.4 J	3.9 U	3.1 U	3.8 U	4.1 U	3.2 U	3.1 UJ	3.2 UJ
Potassium	247 U	247 U	194 U	241 B	241 U	192 U	193 U	193 U	196 U	193 U	195 U
Selenium	0.54 U	0.54 U	1.1 U	1.1 U	1.3 U	1 U	1.1 U	1 U	1.1 U	1 U	1.1 U
Silver	65.3 J	28.9 J	11.4 J	9.5 J	1.3 UJ	1 UJ	15.5 J	1.9 J	1.1 UJ	3.4	13.4
Sodium	12.1 U	12.1 U	32.9 B	37.7 B	33.5 B	25.6 B	25.6 B	22.2 B	24.6 B	22.2 B	21 B
Thallium	0.8 U	0.81 U	0.63 U	0.63 U	0.79 U	0.63 U	0.63 U	0.63 U	0.64 U	0.63 U	0.63 U
Vanadium	14.2	10.6 B	9.2 B	9.5 B	3.5 B	11.4	13.5	9.7 B	8.9 B	8.5 B	6.7 B

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Station ID	47SA01		47SA02		47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample ID	47SA01D	47SA01	47SA02	47SA02D	47SA03	47SA04	47SA05	47SA06	47SA07	47SA08	47SA09
Sample Date	08/31/92	09/02/92	08/28/92	08/28/92	09/02/92	08/31/92	08/31/92	09/04/92	08/31/92	08/28/92	08/28/92
Chemical Name											
Zinc	85.5 J	58.8 J	40.5 J	40.3 J	4.1 UJ	10.7 J	51.3 J	13 UJ	14.8 J	8.2 J	9.7 UJ
Wet Chemistry (MG/KG)											
% Solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Site 47 RI Report
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Station ID	47SA10		47SA11		47SA12		IS47SS14				IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47	
Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47SS20	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																						
Volatile Organic Compounds (UG/KG)																						
1,1,1-Trichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,1,2,2-Tetrachloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,1,2-Trichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,1-Dichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,1-Dichloroethene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,2,4-Trichlorobenzene	350	U	350	U	390	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,2-Dibromo-3-chloropropane	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,2-Dibromoethane	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,2-Dichlorobenzene	350	U	350	U	390	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,2-Dichloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,2-Dichloroethene (total)	11	U	11	U	7	J	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,3-Dichlorobenzene	350	U	350	U	390	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
1,4-Dichlorobenzene	350	U	350	U	390	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
2-Butanone	11	U	11	U	3	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
2-Hexanone	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
4-Methyl-2-pentanone	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Acetone	2	U	11	U	64	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Benzene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Bromodichloromethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Bromoform	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Bromomethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Carbon disulfide	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Carbon tetrachloride	11	U	11	U	99		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Chlorobenzene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Chloroethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Chloroform	11	U	11	U	180		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Chloromethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Cumene	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Cyclohexane	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Dibromochloromethane	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U

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Station ID	47SA10		47SA11		47SA12		IS47SS14				IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47	
Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47SS20	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																						
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Ethylbenzene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Methyl acetate	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Methylcyclohexane	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Methylene chloride	2	U	2	U	6	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Styrene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Tetrachloroethene	11	U	11	U	140		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Toluene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Trichloroethene	11	U	11	U	39		19	U	19	U	14	U	29		17	U	14	U	12	U	11	U
Trichlorofluoromethane(Freon-11)	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Vinyl chloride	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Xylene, total	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
cis-1,2-Dichloroethene	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
cis-1,3-Dichloropropene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
o-Xylene	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
trans-1,2-Dichloroethene	NA		NA		NA		19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
trans-1,3-Dichloropropene	11	U	11	U	11	U	19	U	19	U	14	U	13	U	17	U	14	U	12	U	11	U
Semi-volatile Organic Compounds (UG/KG)																						
1,1-Biphenyl	NA		NA		NA		620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
1,2,4-Trichlorobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichlorobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,3-Dichlorobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
2,2'-Oxybis(1-chloropropane)	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2,4,5-Trichlorophenol	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
2,4,6-Trichlorophenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2,4-Dichlorophenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2,4-Dimethylphenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2,4-Dinitrophenol	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
2,4-Dinitrotoluene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	NA		NA	
2,6-Dinitrotoluene	350	U	350	U	250	J	620	U	610	U	460	U	450	U	740	U	630	U	NA		NA	
2-Chloronaphthalene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U

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Station ID	47SA10		47SA11		47SA12		IS47SS14				IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47	
Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47SS20	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																						
2-Chlorophenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2-Methylnaphthalene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2-Methylphenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
2-Nitroaniline	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
2-Nitrophenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
3,3'-Dichlorobenzidine	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
3- and 4-Methylphenol	NA		NA		NA		620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
3-Nitroaniline	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
4,6-Dinitro-2-methylphenol	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
4-Bromophenyl-phenylether	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
4-Chloro-3-methylphenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
4-Chloroaniline	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
4-Chlorophenyl-phenylether	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
4-Methylphenol	350	U	350	U	390	U	NA		NA		NA		NA		NA		NA		NA		NA	
4-Nitroaniline	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
4-Nitrophenol	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
Acenaphthene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	1,900		18	U
Acenaphthylene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	19		18	U
Acetophenone	NA		NA		NA		120	J	81	J	95	J	70	J	91	J	630	U	74	J	71	J
Anthracene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	19		18	U
Atrazine	NA		NA		NA		620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Benzaldehyde	NA		NA		NA		98	J	99	J	95	J	97	J	740	U	630	U	180	J	94	J
Benzo(a)anthracene	53	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	2,000		18	U
Benzo(a)pyrene	44	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	1,600		18	U
Benzo(b)fluoranthene	69	J	19	J	20	J	31	U	30	U	23	U	23	U	37	U	31	U	1,500		18	U
Benzo(g,h,i)perylene	27	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	19		18	U
Benzo(k)fluoranthene	71	J	22	J	35	J	31	U	30	U	23	U	23	U	37	U	31	U	1,000		18	U
Butylbenzylphthalate	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Caprolactam	NA		NA		NA		620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Carbazole	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Chrysene	80	J	350	U	23	J	31	U	30	U	23	U	23	U	37	U	31	U	3,100		18	U
Di-n-butylphthalate	350	U	350	U	390	U	340	J	160	J	270	J	130	J	180	J	140	J	160	J	100	J
Di-n-octylphthalate	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Dibenz(a,h)anthracene	19	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	19		18	U

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Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47SS20	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																						
Dibenzofuran	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Diethylphthalate	350	U	350	U	390	U	620	U	470	J	460	U	520		740	U	630	U	390	U	41	J
Dimethyl phthalate	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Fluoranthene	100	J	30	J	29	J	31	U	30	U	23	U	23	U	37	U	31	U	2,200		320	
Fluorene	350	U	350	R	390	R	31	U	30	U	23	U	23	U	37	U	31	U	4,500		18	U
Hexachlorobenzene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Hexachlorobutadiene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Hexachlorocyclopentadiene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Hexachloroethane	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Indeno(1,2,3-cd)pyrene	39	J	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	19		18	U
Isophorone	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Naphthalene	350	U	350	U	390	U	31	U	30	U	23	U	23	U	37	U	31	U	19		18	U
Nitrobenzene	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	NA		NA	
Pentachlorophenol	850	U	850	U	940	U	1,500	U	1,500	U	1,100	U	1,100	U	1,900	U	1,600	U	970	R	910	U
Phenanthrene	45	J	350	U	390	U	31	U	460		23	U	23	U	5,700		72		33,000		140	
Phenol	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Pyrene	93	J	22	J	21	J	31	U	30	U	23	U	23	U	37	U	31	U	3,500		29	
bis(2-Chloroethoxy)methane	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
bis(2-Chloroethyl)ether	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
bis(2-Ethylhexyl)phthalate	350	U	350	U	390	U	620	U	140	J	3,300		780		740	U	630	U	390	U	67	J
n-Nitroso-di-n-propylamine	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
n-Nitrosodiphenylamine	350	U	350	U	390	U	620	U	610	U	460	U	450	U	740	U	630	U	390	U	360	U
Explosives (UG/KG)																						
1,3,5-Trinitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
1,3-Dinitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
2,4,6-Trinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		390	U	360	U
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		390	U	360	U
2-Amino-4,6-dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
2-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
3-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
4-Amino-2,6-dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
4-Nitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U

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Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47SS20	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																						
HMX	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	UL
Nitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		390	U	360	U
Nitrocellulose	NA		NA		NA		NA		NA		NA		NA		NA		NA		2,900	R	2,720	U
Nitroglycerin	NA		NA		NA		NA		NA		NA		NA		NA		NA		58,000	U	54,000	U
Nitroguanidine	NA		NA		NA		NA		NA		NA		NA		NA		NA		120,000	U	110,000	U
PETN	NA		NA		NA		NA		NA		NA		NA		NA		NA		58,000	U	54,000	U
Perchlorate	NA		NA		NA		9	U	9	U	7	U	6	U	10	U	9	U	NA		NA	
RDX	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
Tetryl	NA		NA		NA		NA		NA		NA		NA		NA		NA		580	U	540	U
Total Metals (MG/KG)																						
Aluminum	1,840		2,670		1,500		14,100		10,500		2,330		3,640		5,780		3,860		2,890		2,330	
Antimony	5.4	U	5.3	U	5.9	U	2.8	U	2.6	U	2	U	2	U	3.3	U	2.8	U	1.7	U	1.6	U
Arsenic	2.6		2.6		0.7	U	5.9		5.2		1.2	U	1.6	J	2.8	J	5.8		8.3		14.8	
Barium	12.3	B	25.1	B	7.9	B	90.1		74.9		18.4	J	12.5	J	41.9	J	30.4	J	11.6	J	8.9	J
Beryllium	0.21	U	0.21	U	0.23	U	0.65	J	0.55	J	0.17	J	0.14	J	1.3	J	0.4	J	0.15	J	0.13	J
Cadmium	1.1	U	1.1	U	1.2	U	0.86	J	1	J	0.13	U	0.14	U	0.8	J	0.48	J	0.12	U	0.11	U
Calcium	172	B	1,340		133	B	4,500		4,250		603	J	488	J	673	J	1,220	J	238	J	229	J
Chromium	5.8		6.3		3.2		31.1		24.1		5.7		7		18.9		10		7.1		6.2	
Cobalt	5.5	B	5.7	B	3.5	U	9.6	J	7.8	J	1.6	J	2	J	7	J	6.7	J	3.2	J	2	J
Copper	3		3.7	B	2.3	U	37.7		31.5		6.8		3.4	J	11	J	11.1		4.5	J	3.6	J
Cyanide	1.3	U	1.3	U	1.4	U	NA		NA		NA		NA		NA		NA		NA		NA	
Iron	4,960		6,440		858		25,400		18,000		4,440		1,940		2,640		9,890		7,330		7,140	
Lead	15.2	J	9.3	J	5.1	J	109		96.6		34.3		14.1		25.1		21.6		26.5		14.8	
Magnesium	170	B	581	B	123	B	2,510		1,860		483	J	262	J	399	J	700	J	325	J	265	J
Manganese	156	J	232	J	3.8	J	312		281		119		7.2		15.1		193		113		85.7	
Mercury	0.1		0.97		0.22		2		1.6		0.19		0.45		3.3		0.19	U	0.12	U	0.1	U
Nickel	3.2	UJ	3.2	U	3.5	U	29.6		21.2		4.6	J	3.7	J	9.9	J	6	J	3.3	J	2.3	J
Potassium	197	U	196	U	215	U	779	J	683	J	210	J	227	J	259	J	299	J	206	J	138	J
Selenium	1.1	U	1.1	U	1.2	U	1.8	U	1.7	U	1.3	U	1.3	U	2.1	U	1.8	U	1.1	U	1	U
Silver	2.9		1.1	UJ	3.9	J	212		110		0.43	U	3.5		33.3		0.59	U	0.37	U	0.34	U
Sodium	25.4	B	25.5	B	48	B	200	J	165	J	208	J	78.1	U	128	U	162	J	66.9	U	61.7	U
Thallium	0.64	U	0.64	U	0.7	U	1.9	U	1.8	U	1.4	U	1.4	U	2.3	U	1.9	U	1.2	U	1.1	U
Vanadium	7.6	B	9.5	B	2.7		54.2		44.3		14.9		8.2	J	23		23.6		19.1		17.4	

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Station ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47	
Sample ID	47SA10		47SA11		47SA12		IS47SS14		IS47SS14P		IS47SS15		IS47SS16		IS47SS17		IS47SS18		IS47SS19		IS47SS20	
Sample Date	08/28/92		08/28/92		08/31/92		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01		03/20/01	
Chemical Name																				
Zinc	7.4	UJ	9.3	UJ	8.3	UJ	263		238		34.5		12.4		42.9		114		23.4		15	
Wet Chemistry (MG/KG)																				
% Solids	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Total organic carbon (TOC)	NA		NA		NA		57,000		5,900		3,400		9,600		49,000		21,000		24,000		9,800	
pH	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

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Station ID	SS20		IS47SS21		IS47SS22		SS-01		SS-02		SS-03		SS-04		SS-05		SS-06		SS-07		
Sample ID	IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04		RI47SS05		RI47SS06		RI47SS07		RI47SS99	
Sample Date	03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																					
Volatile Organic Compounds (UG/KG)																					
1,1,1-Trichloroethane	11	U	17	U	17	U	1	L	1	L	1	L	2	L	11	U	11	U	11	U	11	U
1,1,2,2-Tetrachloroethane	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	11	U	17	U	17	U	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
1,1-Dichloroethane	11	U	17	U	17	UJ	2	L	1	L	2	L	2	L	11	U	11	U	11	U	11	U
1,1-Dichloroethene	11	U	17	U	17	UJ	1	L	11	UL	1	L	2	L	11	U	11	U	11	U	11	U
1,2,4-Trichlorobenzene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dibromo-3-chloropropane	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dibromoethane	11	U	17	U	17	U	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichlorobenzene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloroethane	11	U	17	U	17	UJ	1	L	11	UL	1	L	1	L	11	U	11	U	11	U	11	U
1,2-Dichloroethene (total)	NA		NA		NA		3	L	2	L	3	L	3	L	11	U	11	U	11	U	11	U
1,2-Dichloropropane	11	U	17	U	17	U	1	L	11	UL	1	L	2	L	11	U	11	U	11	U	11	U
1,3-Dichlorobenzene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
2-Butanone	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
2-Hexanone	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
4-Methyl-2-pentanone	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Acetone	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Benzene	11	U	17	U	17	U	1	B	1	B	1	B	2	B	11	U	11	U	11	U	11	U
Bromodichloromethane	11	U	17	U	17	U	11	UL	11	UL	11	UL	1	L	11	U	11	U	11	U	11	U
Bromoform	11	U	17	U	17	U	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Bromomethane	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Carbon disulfide	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Carbon tetrachloride	11	U	17	U	17	U	1	L	11	UL	1	L	2	L	11	U	11	U	11	U	11	U
Chlorobenzene	11	U	17	U	17	UJ	1	L	11	UL	1	L	2	L	11	U	11	U	11	U	11	U
Chloroethane	11	U	17	U	17	UJ	11	UL	1	L	1	L	2	L	11	U	11	U	11	U	11	U
Chloroform	11	U	17	U	17	UJ	4	B	3	B	4	B	4	B	2	B	2	B	2	B	2	B
Chloromethane	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Cumene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
Cyclohexane	11	U	17	U	17	U	NA		NA		NA		NA		NA		NA		NA		NA	
Dibromochloromethane	11	U	17	U	17	U	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U

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Indian Head, Maryland

Station ID	SS20		IS47SS21		IS47SS22		SS-01		SS-02		SS-03		SS-04		SS-05		SS-06		SS-07			
Sample ID	IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04		RI47SS05		RI47SS06		RI47SS07		RI47SS99	
Sample Date	03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																						
Dichlorodifluoromethane(Freon-12)	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
Ethylbenzene	11	U	17	U	17	UJ	1	B	11	UL	1	B	1	B	11	U	11	U	11	U	11	U
Methyl acetate	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
Methylcyclohexane	11	U	17	U	17	U	NA		NA		NA		NA		NA		NA		NA		NA	
Methylene chloride	11	U	17	U	17	UJ	19	B	18	B	20	B	21	B	7	B	8	B	7	B	7	B
Styrene	11	U	17	U	17	UJ	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Tetrachloroethene	11	U	17	U	17	UJ	2	B	2	B	2	B	3	B	11	U	11	U	11	U	11	U
Toluene	11	U	17	U	17	UJ	2	B	1	B	2	B	2	B	11	U	11	U	11	U	11	U
Trichloroethene	11	U	17	U	17	U	1	L	11	UL	1	L	2	L	11	U	11	U	11	U	11	U
Trichlorofluoromethane(Freon-11)	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
Vinyl chloride	11	U	17	U	17	UJ	1	L	1	L	1	L	2	L	11	U	11	U	11	U	11	U
Xylene, total	11	U	17	U	17	UJ	4	B	11	UL	3	B	4	B	11	U	11	U	11	U	11	U
cis-1,2-Dichloroethene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
cis-1,3-Dichloropropene	11	U	17	U	17	U	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
o-Xylene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	11	U	17	U	17	UJ	NA		NA		NA		NA		NA		NA		NA		NA	
trans-1,3-Dichloropropene	11	U	17	U	17	U	11	UL	11	UL	11	UL	12	UL	11	U	11	U	11	U	11	U
Semi-volatile Organic Compounds (UG/KG)																						
1,1-Biphenyl	370	U	580	U	570	U	NA		NA		NA		NA		NA		NA		NA		NA	
1,2,4-Trichlorobenzene	NA		NA		NA		350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
1,2-Dichlorobenzene	NA		NA		NA		350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
1,3-Dichlorobenzene	NA		NA		NA		350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
1,4-Dichlorobenzene	NA		NA		NA		350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2,2'-Oxybis(1-chloropropane)	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2,4,5-Trichlorophenol	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
2,4,6-Trichlorophenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2,4-Dichlorophenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2,4-Dimethylphenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2,4-Dinitrophenol	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
2,4-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
2-Chloronaphthalene	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U

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Sample ID	IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04		RI47SS05		RI47SS06		RI47SS07		RI47SS99	
Sample Date	03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																					
2-Chlorophenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2-Methylnaphthalene	370	U	580	U	570	U	350	U	360	U	120	J	400	U	380	U	370	U	350	U	350	U
2-Methylphenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
2-Nitroaniline	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
2-Nitrophenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
3,3'-Dichlorobenzidine	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
3- and 4-Methylphenol	370	U	580	U	570	U	NA		NA		NA		NA		NA		NA		NA		NA	
3-Nitroaniline	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
4,6-Dinitro-2-methylphenol	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
4-Bromophenyl-phenylether	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
4-Chloro-3-methylphenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
4-Chloroaniline	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
4-Chlorophenyl-phenylether	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
4-Methylphenol	NA		NA		NA		350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
4-Nitroaniline	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
4-Nitrophenol	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
Acenaphthene	19	U	64		29	U	350	U	360	U	480		400	U	380	U	98	J	350	U	350	U
Acenaphthylene	19	U	56		29	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Acetophenone	59	J	99	J	120	J	NA		NA		NA		NA		NA		NA		NA		NA	
Anthracene	19	U	29	U	29	U	49	J	59	J	750		61	J	380	U	100	J	350	U	350	U
Atrazine	370	U	580	U	570	U	NA		NA		NA		NA		NA		NA		NA		NA	
Benzaldehyde	370	U	580	U	570	U	NA		NA		NA		NA		NA		NA		NA		NA	
Benzo(a)anthracene	19	U	29	U	170	K	280	J	350	J	1,800		180	J	130	J	460		160	J	77	J
Benzo(a)pyrene	19	U	29	U	29	U	190	J	280	J	950		110	J	170	J	320	J	120	J	51	J
Benzo(b)fluoranthene	19	U	29	U	29	U	400		620		2,300		270	J	320	J	640		280	J	89	J
Benzo(g,h,i)perylene	19	U	29	U	29	U	150	J	240	J	510		92	J	120	J	210	J	69	J	350	U
Benzo(k)fluoranthene	19	U	29	U	29	U	94	J	190	J	790		61	J	100	J	290	J	88	J	45	J
Butylbenzylphthalate	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Caprolactam	370	U	580	U	570	U	NA		NA		NA		NA		NA		NA		NA		NA	
Carbazole	370	U	580	U	570	U	45	J	67	J	450		43	J	380	U	110	J	350	U	350	U
Chrysene	19	U	29	U	29	U	300	J	360	J	1,600		190	J	150	J	450		190	J	84	J
Di-n-butylphthalate	220	J	430	J	420	J	350	U	360	U	350	U	45	J	110	J	120	J	37	J	350	U
Di-n-octylphthalate	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Dibenz(a,h)anthracene	19	U	29	U	29	U	350	U	360	U	180	J	400	U	380	U	63	J	350	U	350	U

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Sample ID	IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04		RI47SS05		RI47SS06		RI47SS07		RI47SS99	
Sample Date	03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																					
Dibenzofuran	370	U	580	U	570	U	350	U	360	U	350		400	U	380	U	53	J	350	U	350	U
Diethylphthalate	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	82	J	350	U	350	U
Dimethyl phthalate	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	100	J	350	U
Fluoranthene	170		67		29	U	650		660		2,300		420		160	J	880		310	J	130	J
Fluorene	19	U	73		29	U	350	U	360	U	530		46	J	380	U	68	J	350	U	350	U
Hexachlorobenzene	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Hexachlorobutadiene	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Hexachlorocyclopentadiene	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Hexachloroethane	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Indeno(1,2,3-cd)pyrene	19	U	29	U	29	U	140	J	200	J	500		88	J	130	J	220	J	84	J	350	U
Isophorone	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Naphthalene	19	U	29	U	56	K	350	U	360	U	110	J	400	U	380	U	43	J	350	U	350	U
Nitrobenzene	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	930	U	1,500	U	1,400	U	890	U	910	U	880	U	1,000	U	950	U	930	U	890	U	880	U
Phenanthrene	130		550		29	U	400		370		2,400		360	J	90	J	750		180	J	84	J
Phenol	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Pyrene	19	U	180		29	U	490		630		2,200		300	J	130	J	640		260	J	120	J
bis(2-Chloroethoxy)methane	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
bis(2-Chloroethyl)ether	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
bis(2-Ethylhexyl)phthalate	370	U	580	U	570	U	41	B	320	B	350	U	400	U	110	B	200	B	350	U	350	U
n-Nitroso-di-n-propylamine	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
n-Nitrosodiphenylamine	370	U	580	U	570	U	350	U	360	U	350	U	400	U	380	U	370	U	350	U	350	U
Explosives (UG/KG)																					
1,3,5-Trinitrobenzene	560	U	880	U	860	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
1,3-Dinitrobenzene	560	U	880	U	860	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
2,4,6-Trinitrotoluene	560	U	880	U	860	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
2,4-Dinitrotoluene	370	U	580	U	570	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
2,6-Dinitrotoluene	370	U	580	U	570	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
2-Amino-4,6-dinitrotoluene	560	U	880	U	860	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
2-Nitrotoluene	560	U	880	U	860	U	450	U	480	U	480	U	500	U	480	U	500	U	480	U	500	U
3-Nitrotoluene	560	U	880	U	860	U	450	U	480	U	480	U	500	U	480	U	500	U	480	U	500	U
4-Amino-2,6-dinitrotoluene	560	U	880	U	860	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
4-Nitrotoluene	560	U	880	U	860	U	450	U	480	U	480	U	500	U	480	U	500	U	480	U	500	U

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Sample ID	IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04		RI47SS05		RI47SS06		RI47SS07		RI47SS99	
Sample Date	03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name																						
HMX	560	UL	880	UL	860	UL	450	U	480	U	480	U	500	U	480	U	500	U	480	U	500	U
Nitrobenzene	370	U	580	U	570	U	230	U	240	U	240	U	250	U	240	U	250	U	240	U	250	U
Nitrocellulose	2,790	U	4,350	U	4,340	U	38,100	U	34,600	U	35,600	U	40,300	U	37,000	U	58,600		35,600	U	36,300	U
Nitroglycerin	56,000	U	88,000	U	86,000	U	5,200	U	19,000		5,300	U	6,000	U	23,000		5,400	U	12,000		5,000	U
Nitroguanidine	110,000	U	180,000	U	170,000	U	110	U	110	U	120	U	120	U	120	U	120	U	110	U	120	U
PETN	56,000	U	88,000	U	86,000	U	227	U	238	U	238	U	250	U	238	U	250	U	238	U	250	U
Perchlorate	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
RDX	560	U	880	U	860	U	450	U	480	U	480	U	500	U	480	U	500	U	480	U	500	U
Tetryl	560	U	880	U	860	U	450	U	480	U	480	U	500	U	480	U	500	U	480	U	500	U
Total Metals (MG/KG)																						
Aluminum	1,970		3,760		2,840		4,620		4,150		3,130		5,010		3,020		3,090		3,570		1,520	
Antimony	1.7	U	3	J	3.7	J	0.4	UL	0.61	L	0.42	UL	0.45	UL	0.47	UL	0.42	L	0.39	UL	0.41	UL
Arsenic	16.2		4.1		3.4	J	1.7	J	2.7		2.6		3		1.7	J	1.6	J	2.1		0.68	J
Barium	8.3	J	14.7	J	25.6	J	24.2	J	60.5		20.3	J	21.3	J	44.6		22.2	J	21.7	J	15.9	J
Beryllium	0.12	J	0.22	J	0.26	J	0.25	J	0.41	J	0.21	J	0.28	J	0.19	J	0.16	J	0.18	J	0.07	J
Cadmium	0.11	U	0.17	U	0.23	J	0.15	J	3.6		0.46	J	0.07	J	1.6		0.57	J	0.22	J	0.19	J
Calcium	254	J	740	J	719	J	690	B	6,000		451	B	274	B	919	B	588	B	295	J	228	B
Chromium	5.1		9.2		4.8		11		26.6		9.5		10.5		11.8		12.1		12.1		5.1	
Cobalt	1.8	J	4.1	J	4.8	J	4.5	J	5.9	J	5.2	J	6.5	J	3.4	J	2.5	J	2.3	J	1.3	J
Copper	3.9	B	11.3		12.2		9.1		57.1		9.4		7.3		13.3		10.9		7.8		5	
Cyanide	NA		NA		NA		0.19	U	0.21	U	0.22	U	0.22	U	0.3		0.34		0.28		0.28	
Iron	5,640		12,800		5,880		10,100		12,600		9,470		10,500		7,750		7,320		9,110		3,740	
Lead	13.5		37.6		52.4		35.3	K	982	K	51.4	K	7.5	K	561	K	1,310	K	94.3	K	41.3	K
Magnesium	232	J	428	J	313	J	589	J	2,030		403	J	486	J	502	J	486	J	376	J	154	J
Manganese	70.7		134		113		180		418		244		212		152		118		79.6		60.2	
Mercury	0.11	U	0.16	U	0.17	U	0.51		47.4		0.2		0.14		0.94		5.5		3.7		1.4	
Nickel	1.9	J	5.9	J	7.7	J	7	B	20.4		5.6	B	5.3	B	6.6	J	7.7		6	B	4.5	B
Potassium	117	J	255	J	275	J	407	J	255	J	285	J	411	J	299	J	318	J	271	J	137	J
Selenium	1.1	U	1.7	U	1.7	U	0.49	U	0.5	U	0.51	U	0.55	U	0.58	U	0.5	U	0.47	U	0.5	U
Silver	0.35	U	0.55	U	0.55	U	3.3		40.3		2.9		0.29	J	259		474		22.3		8	
Sodium	63.4	U	99.7	U	99.4	U	29.7	U	196	J	36.6	J	33.3	U	49.3	J	30.4	U	37.5	J	36.1	J
Thallium	1.2	U	1.8	U	1.8	U	0.69	U	0.7	U	0.72	U	0.78	U	0.81	U	0.71	U	0.67	U	0.71	U
Vanadium	13.4		27.6		16.3	J	16.3		17.8		14.1		16		15.2		13.8		14.8		8.4	J

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Appendix J
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Indian Head, Maryland

Station ID	SS20		IS47SS21		IS47SS22		SS-01		SS-02		SS-03		SS-04		SS-05		SS-06		SS-07		
Sample ID	IS47SS20P		IS47SS21		IS47SS22		RI47SS01		RI47SS02		RI47SS03		RI47SS04		RI47SS05		RI47SS06		RI47SS07		RI47SS99
Sample Date	03/20/01		03/20/01		03/20/01		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99		07/14/99
Chemical Name																					
Zinc	12		23.3		32.1		42.9	B	762		26.7	B	20.6	B	235		96.8		102		58.4	B
Wet Chemistry (MG/KG)																					
% Solids	NA		NA		NA		93.6		92.1		94.6		82.7		88.5		89.9		93.6		95.4
Total organic carbon (TOC)	13,000		64,000		88,000		NA		NA		NA		NA		NA		NA		NA		NA
pH	NA		NA		NA		7.2		7.62		7.03		5.79		7.02		6.1		5.53		5.38

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Station ID	SS-08		SS-09		SS-10		SS-11		SS-12	
Sample ID	RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1,1-Trichloroethane	11	U	11	U	1	L	12	U	11	U
1,1,2,2-Tetrachloroethane	11	U	11	U	11	UL	12	U	11	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	11	U	11	U	11	UL	12	U	11	U
1,1-Dichloroethane	11	U	11	U	1	L	12	U	11	U
1,1-Dichloroethene	11	U	11	U	11	UL	12	U	11	U
1,2,4-Trichlorobenzene	NA		NA		NA		NA		NA	
1,2-Dibromo-3-chloropropane	NA		NA		NA		NA		NA	
1,2-Dibromoethane	NA		NA		NA		NA		NA	
1,2-Dichlorobenzene	NA		NA		NA		NA		NA	
1,2-Dichloroethane	11	U	11	U	1	L	12	U	11	U
1,2-Dichloroethene (total)	11	U	11	U	2	L	12	U	11	U
1,2-Dichloropropane	11	U	11	U	1	L	12	U	11	U
1,3-Dichlorobenzene	NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	NA		NA		NA		NA		NA	
2-Butanone	11	U	11	U	11	UL	12	U	11	U
2-Hexanone	11	U	11	U	11	UL	12	U	11	U
4-Methyl-2-pentanone	11	U	11	U	11	UL	12	U	11	U
Acetone	11	U	11	U	11	UL	12	U	11	U
Benzene	11	U	11	U	1	B	12	U	11	U
Bromodichloromethane	11	U	11	U	11	UL	12	U	11	U
Bromoform	11	U	11	U	11	UL	12	U	11	U
Bromomethane	11	U	11	U	11	UL	12	U	11	U
Carbon disulfide	11	U	11	U	11	UL	12	U	11	U
Carbon tetrachloride	11	U	11	U	1	L	12	U	11	U
Chlorobenzene	11	U	11	U	1	L	12	U	11	U
Chloroethane	11	U	11	U	1	L	12	U	11	U
Chloroform	2	B	2	B	4	B	3	B	2	B
Chloromethane	11	U	11	U	11	UL	12	U	11	U
Cumene	NA		NA		NA		NA		NA	
Cyclohexane	NA		NA		NA		NA		NA	
Dibromochloromethane	11	U	11	U	11	UL	12	U	11	U

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Station ID	SS-08		SS-09		SS-10		SS-11		SS-12	
Sample ID	RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name										
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		NA		NA	
Ethylbenzene	11	U	11	U	11	UL	12	U	11	U
Methyl acetate	NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		NA	
Methylcyclohexane	NA		NA		NA		NA		NA	
Methylene chloride	7	B	6	B	18	B	8	B	7	B
Styrene	11	U	11	U	11	UL	12	U	11	U
Tetrachloroethene	11	U	11	U	2	B	12	U	11	U
Toluene	11	U	11	U	2	B	12	U	11	U
Trichloroethene	11	U	11	U	1	L	12	U	11	U
Trichlorofluoromethane(Freon-11)	NA		NA		NA		NA		NA	
Vinyl chloride	11	U	11	U	1	L	12	U	11	U
Xylene, total	11	U	11	U	11	UL	12	U	11	U
cis-1,2-Dichloroethene	NA		NA		NA		NA		NA	
cis-1,3-Dichloropropene	11	U	11	U	11	UL	12	U	11	U
o-Xylene	NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	NA		NA		NA		NA		NA	
trans-1,3-Dichloropropene	11	U	11	U	11	UL	12	U	11	U
Semi-volatile Organic Compounds (UG/KG)										
1,1-Biphenyl	NA		NA		NA		NA		NA	
1,2,4-Trichlorobenzene	350	U	360	U	370	U	390	U	370	U
1,2-Dichlorobenzene	350	U	360	U	370	U	390	U	370	U
1,3-Dichlorobenzene	350	U	360	U	370	U	390	U	370	U
1,4-Dichlorobenzene	350	U	360	U	370	U	390	U	370	U
2,2'-Oxybis(1-chloropropane)	350	U	360	U	370	U	390	U	370	U
2,4,5-Trichlorophenol	880	U	910	U	940	U	970	U	930	U
2,4,6-Trichlorophenol	350	U	360	U	370	U	390	U	370	U
2,4-Dichlorophenol	350	U	360	U	370	U	390	U	370	U
2,4-Dimethylphenol	350	U	360	U	370	U	390	U	370	U
2,4-Dinitrophenol	880	U	910	U	940	U	970	U	930	U
2,4-Dinitrotoluene	NA		NA		NA		NA		NA	
2,6-Dinitrotoluene	NA		NA		NA		NA		NA	
2-Chloronaphthalene	350	U	360	U	370	U	390	U	370	U

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Station ID	SS-08		SS-09		SS-10		SS-11		SS-12	
Sample ID	RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name										
2-Chlorophenol	350	U	360	U	370	U	390	U	370	U
2-Methylnaphthalene	350	U	360	U	370	U	390	U	370	U
2-Methylphenol	350	U	360	U	370	U	390	U	370	U
2-Nitroaniline	880	U	910	U	940	U	970	U	930	U
2-Nitrophenol	350	U	360	U	370	U	390	U	370	U
3,3'-Dichlorobenzidine	350	U	360	U	370	U	390	U	370	U
3- and 4-Methylphenol	NA		NA		NA		NA		NA	
3-Nitroaniline	880	U	910	U	940	U	970	U	930	U
4,6-Dinitro-2-methylphenol	880	U	910	U	940	U	970	U	930	U
4-Bromophenyl-phenylether	350	U	360	U	370	U	390	U	370	U
4-Chloro-3-methylphenol	350	U	360	U	370	U	390	U	370	U
4-Chloroaniline	350	U	360	U	370	U	390	U	370	U
4-Chlorophenyl-phenylether	350	U	360	U	370	U	390	U	370	U
4-Methylphenol	350	U	360	U	370	U	390	U	370	U
4-Nitroaniline	880	U	910	U	940	U	970	U	930	U
4-Nitrophenol	880	U	910	U	940	U	970	U	930	U
Acenaphthene	38	J	360	U	120	J	390	U	370	U
Acenaphthylene	350	U	360	U	370	U	390	U	370	U
Acetophenone	NA		NA		NA		NA		NA	
Anthracene	49	J	360	U	230	J	390	U	370	U
Atrazine	NA		NA		NA		NA		NA	
Benzaldehyde	NA		NA		NA		NA		NA	
Benzo(a)anthracene	240	J	69	J	750		130	J	74	J
Benzo(a)pyrene	210	J	55	J	580		90	J	47	J
Benzo(b)fluoranthene	360		84	J	1,000		190	J	130	J
Benzo(g,h,i)perylene	130	J	360	U	390		80	J	41	J
Benzo(k)fluoranthene	130	J	360	U	310	J	66	J	370	U
Butylbenzylphthalate	350	U	360	U	370	U	390	U	370	U
Caprolactam	NA		NA		NA		NA		NA	
Carbazole	45	J	360	U	170	J	390	U	370	U
Chrysene	240	J	66	J	780		140	J	84	J
Di-n-butylphthalate	350	U	59	J	370	U	390	U	370	U
Di-n-octylphthalate	350	U	360	U	370	U	390	U	370	U
Dibenz(a,h)anthracene	350	U	360	U	96	J	390	U	370	U

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Sample ID	RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name										
Dibenzofuran	350	U	360	U	82	J	390	U	370	U
Diethylphthalate	350	U	360	U	370	U	390	U	370	U
Dimethyl phthalate	350	U	360	U	370	U	390	U	370	U
Fluoranthene	490		170	J	1,200		260	J	190	J
Fluorene	350	U	360	U	140	J	390	U	370	U
Hexachlorobenzene	350	U	360	U	370	U	390	U	370	U
Hexachlorobutadiene	350	U	360	U	370	U	390	U	370	U
Hexachlorocyclopentadiene	350	U	360	U	370	U	390	U	370	U
Hexachloroethane	350	U	360	U	370	U	390	U	370	U
Indeno(1,2,3-cd)pyrene	130	J	360	U	350	J	390	U	39	J
Isophorone	350	U	360	U	370	U	390	U	370	U
Naphthalene	350	U	360	U	44	J	390	U	370	U
Nitrobenzene	NA		NA		NA		NA		NA	
Pentachlorophenol	880	U	910	U	940	U	970	U	930	U
Phenanthrene	250	J	100	J	1,100		100	J	100	J
Phenol	350	U	360	U	370	U	390	U	370	U
Pyrene	370		110	J	1,200		220	J	120	J
bis(2-Chloroethoxy)methane	350	U	360	U	370	U	390	U	370	U
bis(2-Chloroethyl)ether	350	U	360	U	370	U	390	U	370	U
bis(2-Ethylhexyl)phthalate	350	U	360	U	370	U	390	U	370	U
n-Nitroso-di-n-propylamine	350	U	360	U	370	U	390	U	370	U
n-Nitrosodiphenylamine	350	U	360	U	370	U	390	U	370	U
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	240	U	240	U	230	U	240	U	240	U
1,3-Dinitrobenzene	240	U	240	U	230	U	240	U	240	U
2,4,6-Trinitrotoluene	240	U	240	U	230	U	240	U	240	U
2,4-Dinitrotoluene	240	U	240	U	230	U	240	U	240	U
2,6-Dinitrotoluene	240	U	240	U	230	U	240	U	240	U
2-Amino-4,6-dinitrotoluene	240	U	240	U	230	U	240	U	240	U
2-Nitrotoluene	480	U	480	U	450	U	480	U	480	U
3-Nitrotoluene	480	U	480	U	450	U	480	U	480	U
4-Amino-2,6-dinitrotoluene	240	U	240	U	230	U	240	U	240	U
4-Nitrotoluene	480	U	480	U	450	U	480	U	480	U

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Sample ID	RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name										
HMX	480	U	480	U	450	U	480	U	480	U
Nitrobenzene	240	U	240	U	230	U	240	U	240	U
Nitrocellulose	36,400	U	37,400	U	38,400	U	40,800	U	39,400	U
Nitroglycerin	5,100	U	5,300	U	5,500	U	5,800	U	5,400	U
Nitroguanidine	120	U	120	U	120	U	120	U	110	U
PETN	238	U	238	U	227	U	238	U	250	U
Perchlorate	NA		NA		NA		NA		NA	
RDX	480	U	480	U	450	U	480	U	480	U
Tetryl	480	U	480	U	450	U	480	U	480	U
Total Metals (MG/KG)										
Aluminum	3,220		6,140		7,390		4,130		3,300	
Antimony	0.4	UL	0.41	UL	0.59	L	0.52	L	0.42	UL
Arsenic	0.49	U	0.71	J	3.9		2.2		1.6	J
Barium	17.4	J	22.9	J	36.4	J	21.8	J	14.9	J
Beryllium	0.08	J	0.11	J	0.31	J	0.22	J	0.17	J
Cadmium	0.12	J	0.07	J	1.1		0.09	J	0.1	J
Calcium	577	B	123	B	1,090		399	B	892	B
Chromium	5.5		7.3		32.5		9.7		8.6	
Cobalt	0.92	J	1.3	J	4	J	3.8	J	2.5	J
Copper	4.1	J	4	J	21.3		6.4		5.6	
Cyanide	0.26		0.28		0.22	U	0.24	U	0.25	U
Iron	3,600		4,180		19,500		8,290		7,590	
Lead	12.1	K	8.9	K	89.2	K	13.5	K	19.5	K
Magnesium	293	J	356	J	770	J	489	J	682	J
Manganese	39.2		40.9		265		138		100	
Mercury	0.5	B	0.2		0.99		0.08		0.65	
Nickel	5.3	J	5.8	B	11.4		6	J	8.9	
Potassium	217	J	350	J	378	J	347	J	266	J
Selenium	0.49	U	0.5	U	0.52	U	0.46	U	0.52	U
Silver	4.3		1.2	J	5.9		0.39	J	1.2	J
Sodium	52.7	J	30	U	70.8	J	27.9	U	32.5	J
Thallium	0.7	U	0.7	U	0.73	U	0.65	U	0.73	U
Vanadium	9.5		13.2		24.2		14.7		13.3	

NA - Not analyzed
B - Blank contamination
J - Estimated
K - Value may be biased high

L - Value may be biased low
R - Unreliable result
U - not detected
UJ - Undetected, estimated limit
UL - Undetected, limit biased low

Appendix J
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Station ID	SS-08		SS-09		SS-10		SS-11		SS-12	
Sample ID	RI47SS08		RI47SS09		RI47SS10		RI47SS11		RI47SS12	
Sample Date	07/14/99		07/14/99		07/14/99		07/14/99		07/14/99	
Chemical Name										
Zinc	12.9	B	12.5	B	255		19.9	B	21.7	B
Wet Chemistry (MG/KG)										
% Solids	95		91.7		89.3		85.6		90.4	
Total organic carbon (TOC)	NA		NA		NA		NA		NA	
pH	5.68		4.81		7.1		5.86		7.67	

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Station ID	IS47SW01		IS47SW02		IS47SW02		IS47SW05		IS47SW06		IS47SW07		IS47SW07		IS47SW08	
Sample ID	IS47SW01		IS47SW02		IS47SW02P		IS47SW050602		IS47SW060602		IS47SW070602		IS47SW070602P		IS47SW080602	
Sample Date	03/19/01		03/19/01		03/19/01		06/17/02		06/17/02		06/20/02		06/20/02		06/20/02	
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,1-Trichloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	NA		NA		NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U	10	U	NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,1-Dichloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,2,3-Trichlorobenzene	NA		NA		NA		3	U	3	U	3	U	3	U	3	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	3	U	3	U	3	U	3	U	3	U
1,2,4-Trimethylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U	NA		NA		NA		NA		NA	
1,2-Dibromoethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,2-Dichlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,2-Dichloroethane	10	U	10	U	10	U	3	U	3	U	3	U	3	U	3	U
1,2-Dichloropropane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,3,5-Trimethylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
1,3-Dichlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
1,3-Dichloropropane	NA		NA		NA		3	U	3	U	3	U	3	U	3	U
1,4-Dichlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
2-Butanone	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2-Hexanone	10	U	10	U	10	U	NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Acetone	10	UJ	10	UJ	10	UJ	NA		NA		NA		NA		NA	
Benzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Bromochloromethane	NA		NA		NA		NA		NA		NA		NA		NA	
Bromodichloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Bromoform	10	U	10	U	10	U	2	U	2	U	2	U	1	JB	2	U
Bromomethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Carbon disulfide	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Carbon tetrachloride	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Chlorobenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Chloroethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Chloroform	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U

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Appendix J
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Station ID	IS47SW01		IS47SW02		IS47SW02		IS47SW05		IS47SW06		IS47SW07		IS47SW07		IS47SW08	
Sample ID	IS47SW01		IS47SW02		IS47SW02P		IS47SW050602		IS47SW060602		IS47SW070602		IS47SW070602P		IS47SW080602	
Sample Date	03/19/01		03/19/01		03/19/01		06/17/02		06/17/02		06/20/02		06/20/02		06/20/02	
Chemical Name																
Chloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Cumene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Cyclohexane	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Dibromochloromethane	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Ethylbenzene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Hexachlorobutadiene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
Methyl acetate	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Methylcyclohexane	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Methylene chloride	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Naphthalene	NA		NA		NA		3	U	3	U	3	U	3	U	3	U
Styrene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Tetrachloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Toluene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Trichloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Trichlorofluoromethane(Freon-11)	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Vinyl chloride	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Xylene, total	10	U	10	U	10	U	NA		NA		NA		NA		NA	
cis-1,2-Dichloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
m- and p-Xylene	NA		NA		NA		4	U	4	U	4	U	4	U	4	U
n-Butylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
n-Propylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
o-Xylene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
p-Isopropyltoluene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
sec-Butylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
tert-Butylbenzene	NA		NA		NA		2	U	2	U	2	U	2	U	2	U
trans-1,2-Dichloroethene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	2	U	2	U	2	U	2	U	2	U
Semi-volatile Organic Compounds (UG/L)																
1,1-Biphenyl	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2,2'-Oxybis(1-chloropropane)	10	U	10	U	10	U	NA		NA		NA		NA		NA	

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Appendix J
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Station ID	IS47SW01		IS47SW02		IS47SW02		IS47SW05		IS47SW06		IS47SW07		IS47SW07		IS47SW08	
Sample ID	IS47SW01		IS47SW02		IS47SW02P		IS47SW050602		IS47SW060602		IS47SW070602		IS47SW070602P		IS47SW080602	
Sample Date	03/19/01		03/19/01		03/19/01		06/17/02		06/17/02		06/20/02		06/20/02		06/20/02	
Chemical Name																
2,4,5-Trichlorophenol	25	U	25	U	25	U	NA		NA		NA		NA		NA	
2,4,6-Trichlorophenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2,4-Dichlorophenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2,4-Dimethylphenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2,4-Dinitrophenol	25	U	25	U	25	U	NA		NA		NA		NA		NA	
2-Chloronaphthalene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2-Chlorophenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2-Methylnaphthalene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2-Methylphenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
2-Nitroaniline	25	U	25	U	25	U	NA		NA		NA		NA		NA	
2-Nitrophenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
3,3'-Dichlorobenzidine	10	U	10	U	10	U	NA		NA		NA		NA		NA	
3- and 4-Methylphenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
3-Nitroaniline	25	U	25	U	25	U	NA		NA		NA		NA		NA	
4,6-Dinitro-2-methylphenol	25	U	25	U	25	U	NA		NA		NA		NA		NA	
4-Bromophenyl-phenylether	10	U	10	U	10	U	NA		NA		NA		NA		NA	
4-Chloro-3-methylphenol	10	U	10	U	10	U	NA		NA		NA		NA		NA	
4-Chloroaniline	10	U	10	U	10	U	NA		NA		NA		NA		NA	
4-Chlorophenyl-phenylether	10	U	10	U	10	U	NA		NA		NA		NA		NA	
4-Nitroaniline	25	U	25	U	25	U	NA		NA		NA		NA		NA	
4-Nitrophenol	25	U	25	U	25	U	NA		NA		NA		NA		NA	
Acenaphthene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Acenaphthylene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Acetophenone	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Anthracene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Atrazine	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Benzaldehyde	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Benzo(a)anthracene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Benzo(a)pyrene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Benzo(b)fluoranthene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Benzo(g,h,i)perylene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Benzo(k)fluoranthene	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Butylbenzylphthalate	10	U	10	U	10	U	NA		NA		NA		NA		NA	
Caprolactam	10	R	10	R	10	R	NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Surface Water Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SW01		IS47SW02		IS47SW02		IS47SW05	IS47SW06	IS47SW07		IS47SW08
Sample ID	IS47SW01		IS47SW02		IS47SW02P		IS47SW050602	IS47SW060602	IS47SW070602	IS47SW070602P	IS47SW080602
Sample Date	03/19/01		03/19/01		03/19/01		06/17/02	06/17/02	06/20/02	06/20/02	06/20/02
Chemical Name											
Carbazole	10	U	10	U	10	U	NA	NA	NA	NA	NA
Chrysene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Di-n-butylphthalate	2.5	J	2.5	J	1.2	J	NA	NA	NA	NA	NA
Di-n-octylphthalate	10	U	10	U	10	U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Dibenzofuran	10	U	10	U	10	U	NA	NA	NA	NA	NA
Diethylphthalate	10	U	10	U	10	U	NA	NA	NA	NA	NA
Dimethyl phthalate	10	U	10	U	10	U	NA	NA	NA	NA	NA
Fluoranthene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Fluorene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Hexachlorobenzene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Hexachlorobutadiene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Hexachloroethane	10	U	10	U	10	U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Isophorone	10	U	10	U	10	U	NA	NA	NA	NA	NA
Naphthalene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Pentachlorophenol	25	U	25	U	25	U	NA	NA	NA	NA	NA
Phenanthrene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Phenol	10	U	10	U	10	U	NA	NA	NA	NA	NA
Pyrene	10	U	10	U	10	U	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	10	U	10	U	10	U	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	10	U	10	U	10	U	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	1.4	J	2.3	J	10	U	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	10	U	10	U	10	U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	10	U	10	U	10	U	NA	NA	NA	NA	NA
Explosives (UG/L)											
2,4-Dinitrotoluene	10	U	10	U	10	U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Nitrobenzene	10	U	10	U	10	U	NA	NA	NA	NA	NA
Perchlorate	10	U	10	U	10	U	NA	NA	NA	NA	NA

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Station ID	IS47SW01		IS47SW02		IS47SW02		IS47SW05		IS47SW06		IS47SW07		IS47SW07		IS47SW08	
Sample ID	IS47SW01		IS47SW02		IS47SW02P		IS47SW050602		IS47SW060602		IS47SW070602		IS47SW070602P		IS47SW080602	
Sample Date	03/19/01		03/19/01		03/19/01		06/17/02		06/17/02		06/20/02		06/20/02		06/20/02	
Chemical Name																
Total Metals (UG/L)																
Aluminum	333		226		131	J	NA		NA		NA		NA		NA	
Antimony	7.5	U	7.5	U	7.5	U	NA		NA		NA		NA		NA	
Arsenic	4.5	U	5.2	J	4.5	U	NA		NA		NA		NA		NA	
Barium	43.9	J	21.6	J	17.9	J	NA		NA		NA		NA		NA	
Beryllium	0.23	J	0.1	U	0.1	U	NA		NA		NA		NA		NA	
Cadmium	0.5	U	0.5	U	0.5	U	NA		NA		NA		NA		NA	
Calcium	7,280		5,620		4,780	J	NA		NA		NA		NA		NA	
Chromium	0.88	J	0.5	U	0.5	U	NA		NA		NA		NA		NA	
Cobalt	14.2	J	3.8	J	3	J	NA		NA		NA		NA		NA	
Copper	1.2	U	5	J	2.8	J	NA		NA		NA		NA		NA	
Iron	2,860	J	2,960	J	2,460	J	NA		NA		NA		NA		NA	
Lead	1.5	U	1.5	U	1.5	U	NA		NA		NA		NA		NA	
Magnesium	2,650	J	1,890	J	1,610	J	NA		NA		NA		NA		NA	
Manganese	259		222		186		NA		NA		NA		NA		NA	
Mercury	0.2	UL	0.2	UL	0.2	UL	NA		NA		NA		NA		NA	
Nickel	6.8	J	3.6	J	3	J	NA		NA		NA		NA		NA	
Potassium	1,520	J	2,940	J	2,390	J	NA		NA		NA		NA		NA	
Selenium	4.8	U	4.8	U	4.8	U	NA		NA		NA		NA		NA	
Silver	1.6	U	1.6	U	1.6	U	NA		NA		NA		NA		NA	
Sodium	23,300	J	58,600	J	48,600	J	NA		NA		NA		NA		NA	
Thallium	5.2	U	5.2	U	5.2	U	NA		NA		NA		NA		NA	
Vanadium	0.8	U	0.8	U	0.8	U	NA		NA		NA		NA		NA	
Zinc	53.6	J	123	J	50.1	J	NA		NA		NA		NA		NA	
Wet Chemistry (MG/L)																
Total organic carbon (TOC)	3.2		11		2.9		NA		NA		NA		NA		NA	

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Appendix J
Raw Data for Site 47 Surface Water Samples
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Station ID	IS47SW10				IS47SW11		IS47SW12		RI47SW03		RI47SW04	
Sample ID	IS47SW100902		IS47SW100902P		IS47SW110902		IS47SW120902		IS47SW03		IS47SW04	
Sample Date	09/25/02		09/25/02		09/25/02		09/25/02		10/29/01		10/29/01	
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,1,2,2-Tetrachloroethane	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
1,1,2-Trichloroethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,1-Dichloroethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,1-Dichloroethene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,2,3-Trichlorobenzene	0.5	U	0.5	U	0.5	U	0.5	U	3	U	3	U
1,2,4-Trichlorobenzene	0.5	U	0.5	U	0.5	U	0.5	U	3	U	3	U
1,2,4-Trimethylbenzene	NA		NA		NA		NA		2	U	2	U
1,2-Dibromo-3-chloropropane	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
1,2-Dibromoethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,2-Dichlorobenzene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,2-Dichloroethane	0.5	U	0.5	U	0.5	U	0.5	U	3	U	3	U
1,2-Dichloropropane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,3,5-Trimethylbenzene	NA		NA		NA		NA		2	U	2	U
1,3-Dichlorobenzene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
1,3-Dichloropropane	NA		NA		NA		NA		3	U	3	U
1,4-Dichlorobenzene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
2-Butanone	5	R	5	R	5	R	5	R	NA		NA	
2-Hexanone	5	U	5	U	5	U	5	U	NA		NA	
4-Methyl-2-pentanone	5	U	5	U	5	U	5	U	NA		NA	
Acetone	3.1	J	3.4	J	5	R	3.1	J	NA		NA	
Benzene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Bromochloromethane	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
Bromodichloromethane	0.5	U	0.5	U	0.5	U	0.1	J	2	U	2	U
Bromoform	0.12	B	0.5	U	0.27	B	0.56	B	2	U	2	U
Bromomethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Carbon disulfide	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
Carbon tetrachloride	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Chlorobenzene	0.5	U	0.1	B	0.5	U	0.5	U	2	U	2	U
Chloroethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Chloroform	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U

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Appendix J
Raw Data for Site 47 Surface Water Samples
Site 47 RI Report
IHDIV-NSWC
Indian Head, Maryland

Station ID	IS47SW10				IS47SW11		IS47SW12		RI47SW03		RI47SW04	
Sample ID	IS47SW100902		IS47SW100902P		IS47SW110902		IS47SW120902		IS47SW03		IS47SW04	
Sample Date	09/25/02		09/25/02		09/25/02		09/25/02		10/29/01		10/29/01	
Chemical Name												
Chloromethane	0.19	B	0.16	B	0.16	B	0.17	B	2	U	2	U
Cumene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Cyclohexane	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
Dibromochloromethane	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Dichlorodifluoromethane(Freon-12)	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Ethylbenzene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Hexachlorobutadiene	NA		NA		NA		NA		2	U	2	U
Methyl acetate	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
Methyl-tert-butyl ether (MTBE)	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
Methylcyclohexane	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
Methylene chloride	0.93	B	0.97	B	0.86	B	0.79	B	2	U	2	U
Naphthalene	NA		NA		NA		NA		3	U	3	U
Styrene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Tetrachloroethene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Toluene	0.24	B	0.38	B	0.23	B	0.18	B	2	U	2	U
Trichloroethene	0.5	U	0.12	B	0.5	U	0.5	U	2	U	2	U
Trichlorofluoromethane(Freon-11)	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Vinyl chloride	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Xylene, total	0.5	U	0.5	U	0.5	U	0.5	U	NA		NA	
cis-1,2-Dichloroethene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
cis-1,3-Dichloropropene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
m- and p-Xylene	NA		NA		NA		NA		4	U	4	U
n-Butylbenzene	NA		NA		NA		NA		2	U	2	U
n-Propylbenzene	NA		NA		NA		NA		2	U	2	U
o-Xylene	NA		NA		NA		NA		2	U	2	U
p-Isopropyltoluene	NA		NA		NA		NA		2	U	2	U
sec-Butylbenzene	NA		NA		NA		NA		2	U	2	U
tert-Butylbenzene	NA		NA		NA		NA		2	U	2	U
trans-1,2-Dichloroethene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
trans-1,3-Dichloropropene	0.5	U	0.5	U	0.5	U	0.5	U	2	U	2	U
Semi-volatile Organic Compounds (UG/L)												
1,1-Biphenyl	NA		NA		NA		NA		NA		NA	
2,2'-Oxybis(1-chloropropane)	NA		NA		NA		NA		NA		NA	

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Station ID	IS47SW10		IS47SW11	IS47SW12	RI47SW03	RI47SW04
Sample ID	IS47SW100902	IS47SW100902P	IS47SW110902	IS47SW120902	IS47SW03	IS47SW04
Sample Date	09/25/02	09/25/02	09/25/02	09/25/02	10/29/01	10/29/01
Chemical Name						
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA

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Sample ID	IS47SW100902	IS47SW100902P	IS47SW110902	IS47SW120902	IS47SW03	IS47SW04
Sample Date	09/25/02	09/25/02	09/25/02	09/25/02	10/29/01	10/29/01
Chemical Name						
Carbazole	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA
Explosives (UG/L)						
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA
Perchlorate	NA	NA	NA	NA	NA	NA

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Sample ID	IS47SW100902	IS47SW100902P	IS47SW110902	IS47SW120902	IS47SW03	IS47SW04
Sample Date	09/25/02	09/25/02	09/25/02	09/25/02	10/29/01	10/29/01
Chemical Name						
Total Metals (UG/L)						
Aluminum	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA
Wet Chemistry (MG/L)						
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA

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