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FINAL INTERIM REMEDIAL ACTION COMPLETION REPORT SITE 5 GROUNDWATER OPERABLE UNIT 2 (OU 2) ALLEGANY BALLISTICS LABORATORY ROCKET CENTER WV
9/1/2014
CH2M HILL

Final

Interim Remedial Action Completion Report
Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory
Rocket Center, West Virginia

Contract Task Order WE13

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Acronyms and Abbreviations

ABL	Allegany Ballistics Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	Contaminants of Concern
DoD	Department of Defense
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FFA	Federal Facilities Agreement
HHRA	Human Health Risk Assessment
IC	institutional control
IRACR	Interim Remedial Action Completion Report
IRP	Installation Restoration Program
LTM	Long-term monitoring
LUC	Land-use Control
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
NPL	National Priorities List
ORP	oxidation reduction potential
OU	Operable Unit
PRAP	Proposed Remedial Action Plan
PRB	Permeable Reactive Barrier
RA	Remedial Actions
RA-C	Remedial Action Construction
RA-O	Remedial Action Operations
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RI	Remedial Investigation
RIP	Remediation in Place
ROD	Record of Decision
RPM	Remedial Project Manager
SMP	Site Management Plan
TCE	Trichloroethene
TRC	Technical Review Committee
VOC	Volatile Organic Compound
WVDEP	West Virginia Department of Environmental Protection
ZVI	Zero-valent Iron

1 Overview

This Interim Remedial Action Completion Report (IRACR) documents the construction activities associated with the implementation of Remedial Actions (RA) at Site 5 – Inert Non-Ordnance Landfill (Operable Unit [OU]-2 Groundwater) at Allegany Ballistics Laboratory (ABL), Rocket Center, West Virginia. This IRACR has been prepared in accordance with the *Department of Defense (DoD)* and *United States Environmental Protection Agency (EPA) Joint Guidance on Streamlined Site Closeout and National Priorities List Deletion Process for DoD Facilities* (January 2006).

1.1 Facility Background

ABL consists of about 1,634 acres of land with about 350 buildings, and is located in Mineral County, West Virginia, approximately 10 miles southwest of Cumberland, Maryland along the West Virginia and Maryland border. The facility lies between the North Branch Potomac River, to the north and west, and Knobly Mountain, to the south and east. Since 1943, ABL has been used primarily for research, development, production, and testing of solid propellants and motors for ammunition, rockets, and armaments. The land area at ABL is divided into two distinct operating plants. Plant 1, which occupies about 1,577 acres (including a large undeveloped area), is owned by the Navy and leased to its operator, ATK Tactical Systems Company, LLC. Plant 2, which occupies the remaining 57 acres, is both owned and operated by ATK. ABL Plant 1 was listed on EPA's National Priorities List (NPL) on May 11, 1994. A Federal Facilities Agreement (FFA) for ABL was finalized between the Navy, EPA Region III, and the West Virginia Department of Environmental Protection (WVDEP) in January 1998. Site 5 is one of several Installation Restoration Program (IRP) sites being addressed under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at ABL.

1.2 Site Background

Site 5 is located on the undeveloped portion of Plant 1, just south of Plant 2 and adjacent to and east of the North Branch Potomac River (**Figure 1**). The site is comprised of a 1.3 acre former landfill that operated from the early 1960s to 1985 and accepted wastes generated by ABL that were deemed to be inert. Discarded wastes were reported to include drums that previously contained chlorinated solvents, such as trichloroethene (TCE), fluorescent tubes (potential mercury source), unknown laboratory and photographic chemicals, fiberglass and other resin-coated fibers, metal and plastic machining wastes, and construction and demolition debris. Site 5 consists of two OUs. The landfill contents and surface soil comprise OU-1. OU-2 consists of alluvial and bedrock groundwater beneath and down-gradient of the landfill.

The need for remedial action at Site 5 was first identified based on the Remedial Investigation (RI)/Human Health Risk Assessment (HHRA)/Ecological Risk Assessment (ERA) Report completed in August 1995. The report indicated that exposed landfill contents and surface soil may pose an unacceptable risk to human and ecological receptors. In addition, landfill contents were identified as the likely source for volatile organic compound (VOC) contamination in groundwater through infiltration and leaching of landfill contents. On February 12, 1997, a Record of Decision (ROD) was signed, which prescribed the construction of an impermeable landfill cap to address OU-1, primarily to reduce the potential exposure risks and to prevent groundwater, surface water, and sediment contamination from infiltration and leaching of landfill contents. The landfill construction completion was documented in the *Draft Contractor Closeout Report Landfill Cap Construction, Site 5 – Inert Landfill* (OHM, November 1997). In addition, land-use controls (LUCs) are an element of the remedial action, in order to prevent or minimize exposure of potential future on-site residents and construction workers to contaminated soil and groundwater from the landfill. .

In September 2004, a Focused RI/Feasibility Study was completed to address potential contamination in groundwater, surface water, and sediment at the site. TCE was identified as the primary risk driver in groundwater. No potentially unacceptable human health or ecological risks were identified for the OU-2 surface water and sediment.

A ROD for Site 5 (OU-2, Groundwater, Surface Water, and Sediment) was signed on February 9, 2006. The Selected Remedy documented in the ROD consisted of a permeable reactive barrier (PRB) to reduce the potential

human health exposure risks for groundwater and to prevent the migration of TCE and metals contamination in groundwater, monitored natural attenuation (MNA), land use controls (LUCs), and long term monitoring (LTM).

2 Remedial Action Objectives

The need for remedial action was identified for Site 5 OU-2 alluvial and bedrock aquifer groundwater due to potentially unacceptable human health risks to future receptors (residents and construction workers) with TCE as the primary risk driver. Iron and manganese were also identified as OU-2 contaminants of concern (COCs) for groundwater in the HHRA. No potentially unacceptable human health or ecological risks were identified for the OU-2 surface water and sediment. Therefore, the focus of the remedy for Site 5 OU-2 was on alluvial and bedrock groundwater.

2.1 Remedial Action Objectives

The site-specific Remedial Action Objectives (RAOs) as defined in the ROD are as follows:

- Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 5 at concentrations exceeding maximum contaminant level (MCL) or, in the absence of MCLs, an excess lifetime cancer risk of 1×10^{-4} or a HI = 1.
- Prevent or minimize river media from becoming impacted by the Site 5 groundwater COCs, such that resulting concentrations present an unacceptable risk to human health or the environment.
- Restore groundwater beyond the landfill boundaries to MCLs, or, in the absence of MCLs, risk-based levels.

2.2 Clean-up Standards

The clean-up standards, as documented in the ROD for Site 5 OU-2 groundwater, are presented in **Table 1**.

3 Remedial Action

3.1 Selected Remedy

The selected remedial action was designed primarily to reduce the potential human health exposure risks for groundwater and to prevent the migration of TCE and metals contamination in groundwater.

To achieve the RAOs, the remedy selected in the ROD for Site 5 OU-2 comprises the following major components:

- A PRB to treat TCE in the alluvial aquifer.
- MNA to address TCE in the alluvial aquifer outside of the influence of the PRB, TCE in the bedrock, and iron and manganese in both aquifers.
- LTM of the groundwater and river media to monitor the progress of the PRB and MNA toward meeting the RAOs and cleanup levels.
- Groundwater use restrictions to prohibit the potable use of groundwater from the alluvial and bedrock aquifers until LTM demonstrates that the RAOs and cleanup levels have been achieved.

3.2 Permeable Reactive Barrier

The PRB consists of a wall of reactive media (zero-valent iron [ZVI]) approximately 200 feet in length, 2 feet in width, and 17 feet in depth installed through the alluvial aquifer and keyed into the bedrock. The implementation of the PRB was completed in June 2006 in accordance with the *Final Pre-Construction Work Package for PRB construction at Site 5 (OU-2)* (CH2M HILL, March 2006).The PRB was placed downgradient from the landfill (**Figure 2**). As the contaminated groundwater naturally flows through the PRB, and contacts the ZVI, an electron transfer from the iron to the TCE occurs resulting in the replacement of a chlorine atom by a hydrogen atom. Once the three chlorine atoms on the TCE have been replaced, only benign compounds, ethene (and its subsequent breakdown products) and chlorine (free or as chloride salts) remain in the groundwater.

Groundwater elevation contours show that, in general, alluvial groundwater at Site 5 flows northwestward, eventually discharging to the river at the northern end of Site 5, west of alluvial monitoring well 5GW19 (**Figure 3**). As designed and constructed, the PRB is situated such that the majority of alluvial groundwater flowing from the northernmost portion of the landfill (which historically showed the highest volatile organic compounds [VOC] concentrations) passes through it prior to discharging to the river.

3.3 Monitored Natural Attenuation

The selected remedy also included MNA to address the contaminants not treated by the PRB, TCE in the portion of the alluvial aquifer that is not treated by the PRB, TCE in the bedrock aquifer, and iron and manganese in both aquifers. Existing contaminants located between the PRB and the river will also be addressed through MNA. A decline in contaminant concentrations in these areas is expected to occur primarily through MNA processes of diffusion, geochemical reactions, volatilization, advection, adsorption, and dispersion.

3.4 Long-Term Monitoring

In order to evaluate the effectiveness of the remedial action (PRB and MNA) and degradation of TCE, performance monitoring is conducted every nine months to account for seasonal variation. LTM, which began in June 1998, is ongoing and will continue until the RAOs have been achieved.

The performance monitoring consists of collection and analysis of groundwater samples from four alluvial monitoring wells (5GW13, 5GW17, 5GW18, and 5GW25) using the low-flow sampling technique. Monitoring well 5GW13 is upgradient of the PRB, well 5GW17 is to the west of the PRB, and wells 5GW18 and 5GW25 are directly downgradient of the barrier (**Figure 2**). Groundwater samples are analyzed for TCL VOCs by USEPA method SW-846 8260B and for total and dissolved iron and manganese using method SW-846 6010B.

3.5 Land Use Controls

The remedy includes institutional controls (ICs) to meet the following LUC objectives:

- Ensure no extraction of groundwater, except for monitoring purposes, in the restricted area at Site 5 (**Figure 2**), until the RAOs for OU-2 are met and risks from groundwater use are shown to be reduced to acceptable levels;
- Ensure no construction, maintenance work, or land use in the restricted area without protection from groundwater contaminants, including vapors;
- Maintain the integrity of any current or future remedial equipment or remedial monitoring operation in the restricted area.

4 Achievement of Remedial Action Objectives

A comparison of the RAOs for Site 5 to the results of the remedial action are presented on **Table 2**. The active phase of the remedial action has been completed. The Final Construction Closeout Report for Site 5 Groundwater (AGVIQ-CH2M HILL Joint Venture I, March, 2007) documents the construction of the PRB wall to treat TCE in the alluvial aquifer at Site 5. LTM is ongoing and ICs are in place. Groundwater and surface water LTM will continue to evaluate the effectiveness of the remedy and monitor the site COC concentrations. Sampling results are documented in nine month LTM Reports.

Significant progress has been made and LTM will continue until all RAOs are achieved. The ROD for Site 5 estimated approximately 16 years for complete remediation of the TCE plume after the installation of the PRB. The effectiveness of the remedy will continue to be evaluated as LTM data is collected and formally assessed during each 5-year review.

4.1 LTM Results

The LTM is conducted in accordance with requirements initially implemented through the Final Long-Term Monitoring (LTM) Plan for Sites 1, 5, and 10 (CH2M HILL, 2006). This plan has been continually revised as data

requirements change. An evaluation of the PRB and MNA effectiveness is based on data collected under the LTM plan and is discussed below.

The four monitoring wells used for LTM at Site 5 are sampled at nine-month intervals to collect data on a seasonal rotation. Groundwater from additional monitoring wells have been sampled to support the five year reviews. **Figure 4** presents the time-series groundwater TCE concentrations from May 1998 to June 2013 in four Site 5 alluvial monitoring wells.

Table 3 present the results for each long-term monitoring event through June 2013. There have been twelve sampling events since the installation of the PRB wall in 2006. Sampling results for groundwater from each well regularly monitored as part of LTM are summarized below:

- **5GW13** – The concentrations upgradient of the PRB (5GW13) are not affected by the PRB but have shown a significant reduction over time, indicating the source of TCE may be decreasing and/or the landfill cap is effectively reducing infiltration through the landfill waste. Overall, the concentrations of TCE in groundwater from 5GW13 have decreased from 81 µg/L (August 2000) to 5.6 µg/L (October 2008). TCE concentrations in groundwater from this monitoring well have not exceeded 10 µg/L since 2007. During the June 2013 monitoring event, the reported concentration of TCE was 8.49 µg/L.
- **5GW17** – The concentrations of TCE in groundwater from 5GW17, which is lateral to the PRB, have been relatively stable, with a slight decreasing trend, since 1998. Concentrations of TCE in well 5GW17 have ranged from 6.17 µg/L (detected in June 2013) to 27 µg/L (detected in February 2002).
- **5GW18** – The initial sampling event performed after the installation of the PRB for well 5GW18 indicated an initial reduction in TCE from 80 µg/L to 12 µg/L. TCE concentrations have consistently been detected at concentration of approximately 35 µg/L since 2009. Although recent sampling events indicate that concentrations in well 5GW18 are still above the MCL of 5 µg/L, the trend indicates that there is TCE reduction, which ranged from 56 to 98 µg/L over the 5 years prior to the PRB installation.
- **5GW25** – TCE has not been detected in groundwater from monitoring well 5GW25 since it was installed in 2006.

The TCE concentrations at Site 5 show an overall decreasing trend since the 1998 baseline sampling event, with a substantial decrease in the well immediately downgradient of the PRB wall (5GW18), following the installation of the PRB. **Figures 5 and 6**, showing results of the 5-year review sampling, illustrate the remedy's influence (both PRB and MNA components) on the configuration of the TCE plume and the reduction of TCE concentrations from all groundwater data collected across the site as part of the five-year review.

The geochemical data downgradient of the PRB also suggest the PRB is functioning as designed. **Table 4** shows geochemistry parameters in groundwater from four wells surrounding the PRB from October 2005 to through May 2013. The oxidation reduction potential (ORP) at both 5GW18 and 5GW25 has been between 30 and 400 millivolts lower than the respective ORP at both the upgradient and lateral wells during every sampling event since the PRB was installed. This consistent difference suggests that the PRB is fostering the reducing conditions that are amenable for TCE reduction at both locations in the PRB (ITRC, 2011). In addition, the pH is generally higher and the dissolved oxygen is generally lower in the downgradient wells; both of these observations are also common signatures of a properly-functioning ZVI PRB.

Figure 7 presents the time-series groundwater total iron concentrations from March 1998 to June 2013. Although there is no discernable trend, total iron is generally decreasing in concentrations over time. Elevated total iron in groundwater from 5GW17 in 2008 corresponds with several months of dry weather and is likely due to sample turbidity as the dissolved concentration was reported at 28.5 µg/L.

Figure 8 presents the time-series groundwater total manganese concentrations from March 1998 to June 2013. In general, concentrations appear stable around 500 µg/L in all wells expect 5GW13. The fluctuating concentrations in 5GW13 (located near the base of the landfill) appear to be related to rain events. Each low manganese concentration reported from 5GW13 correlate with periods of rain or snow melt (NOAA).

4.2 LUCs

The LUC component of the selected remedy was implemented through establishment of institutional controls prohibiting the use of untreated groundwater and preventing construction, maintenance work, and land use within the restricted area of Site 5 (CH2M HILL, January 2014). The following elements have been put into effect for LUCs:

- Five year reviews are conducted.
- Annual inspections are conducted.
- Groundwater is monitored
- Signs are posted at the site describing the land use restrictions and providing contact information
- LUCs are noted in the GIS and in local planning documents and procedures and real-estate summary maps have been annotated noting the presence of LUCs.

Inspections and Five Year Reviews have indicated that the LUCs are effective.

5 Ongoing Activities

The Navy will continue to inform the EPA and WVDEP of the post-ROD LTM activities in accordance with the LTM Plan. Statutory 5-Year Reviews will be conducted to ensure the remedy continues to provide adequate protection to human health and the environment. ICs will be maintained until RAOs for OU-2 are met and the concentrations of hazardous substances in the groundwater are at such levels to allow unrestricted use and exposure.

In accordance with Section 121(c) of CERCLA and the NCP at 40 CFR Section 300.430(f)(4)(ii), because the selected remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted access, statutory 5-year reviews will be conducted to ensure that the remedy is, or will be, protective of human health and the environment. Reviews will continue every five years until RAOs are achieved and the site is acceptable for unrestricted use. The next review is scheduled for completion in 2018.

6 Community Involvement

The Navy has implemented removal and remedial actions at several ABL sites and other remedial investigations are ongoing. In doing so, the Navy has worked closely with EPA and WVDEP and also with interested citizens who have served on ABL's Restoration Advisory Board (RAB). A Technical Review Committee (TRC) was established at ABL on February 9, 1989. The TRC eventually transitioned into a RAB which was established in April 1995. In accordance with the National Contingency Plan requirements of 40 CFR 300 and the ABL Community Involvement Plan, the Navy has provided information to the community during public meetings at key milestones, e.g. when Proposed Plans were released for public review.

A Proposed Remedial Action Plan (PRAP) was issued to invite public participation in the remedial alternative selection process for Site 5 groundwater and to fulfill the public participation requirement established under Section 117(a) of CERCLA and Section 300.430(f)(2) & (3) of National Oil Hazardous Substances Pollution Contingency Plan. The PRAP, along with other key documents such as the Focused Remedial Investigation/ Feasibility Study Report, were made available for review at the LaVale Public Library in Maryland and Fort Ashby Public Library in West Virginia. The notice of availability of the PRAP was published in 2 local newspapers. A public meeting was held on March 1, 2005 to explain the PRAP and to address public comments. Verbal questions and comments were addressed during the public meeting and there were no written comments received during the public comment period. There were no objections by the public to proceed with the selected remedy.

7 Certification Statement

This IRACR indicates the groundwater remedy at Site 5 - Inert Non-Ordnance Landfill OU-2 is operational and functional in accordance with CERCLA and progress has been made towards achieving all the RAOs identified in

the ROD (Navy, 2005). There is no human exposure to contaminated groundwater and the contamination sources are being reduced. LTM is ongoing and will continue until RAOs are achieved. Additionally, the protectiveness of the remedy will be reevaluated informally on a continual basis as LTM data are generated and formally during each 5-year Review (next scheduled review is 2018).

ABL Plant 1 was listed on EPA's NPL on May 11, 1994, EPA ID: WV0170023691. A FFA for ABL was finalized between the Navy, EPA Region III, and the WVDEP in January 1998. The EPA designation for groundwater at the Site 5 landfill is OU-2 – Site 5 Groundwater. Site 5 is one of several IRP sites being addressed under CERCLA at ABL.

The Navy is the lead agency and provides funding for site cleanups at ABL. The Navy and EPA Region III issue RODs jointly. The WVDEP is provided the opportunity to concur with the RODs at ABL. The Remedial Project Managers (RPMs) representing the Navy, EPA and WVDEP as well as consultants contracted by the Navy with CH2M HILL, make up the ABL Partnering Team.

A ROD for Site 5 (OU-2, Groundwater, Surface Water, and Sediment) was signed on February 9, 2006. The Selected Remedy documented in the ROD consisted of a PRB to reduce the potential human health exposure risks for groundwater and to prevent the migration of TCE and metals contamination in groundwater, MNA, LUCs, and LTM.

This Remediation in Place (RIP) milestone indicates that the Remedial Action Construction (RA-C) phase of the selected remedy is complete; and the remedy is operating as expected to meet project remedial action objectives in the future. The members of the Partnering Team have had the opportunity to review and comment on this document.

Site 5 groundwater will continue in Remedial Action Operations (RA-O) phase and the status will continue to be updated in the Site Management Plan (SMP) which is updated annually. Planned activities during the RA-O phase include:

- Continued performance monitoring
- Management of Land-Use-Controls (LUCs)
- Conducting Five-Year Reviews

This document is not intended to limit or restrict other potential RA-O activities such as optimizing the remedy, alternate technologies, or other post-ROD actions as determined by changing site conditions documented in future monitoring reports and Five-Year Reviews.

Mike Sydla Director Program Management Office, Information Technology (SEA 04I) Naval Sea Systems Command	Date
Paul Leonard Associate Director Office of Federal Facility Remediation and Site Assessment USEPA, Region III	Date

8 References

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Tables

TABLE 1
Remediation Goals for Groundwater COCs
Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Contaminant of Concern	Remediation Goal (µg/L)
Trichloroethene	5[1]
Iron	4,000[2]
Manganese	260[2]

Notes:

1) Maximum Contaminant Levels from USEPA Safe Drinking Water Act

2) Risk-based concentrations based on exposure to the future child resident for non-carcinogenic RBCs, and the future age-adjusted resident for carcinogenic risk-based concentrations via a combined ingestion, dermal (child only), and inhalation (adult only) scenario.

TABLE 2
Demonstration of Groundwater Remedial Action Towards Attainment of Remedial Objectives
Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Remedial Action Objective	Remedial Action Results
Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 5 at concentrations exceeding MCLs or, in the absence of MCLs, an excess lifetime cancer risk of 1×10^{-4} or a HI = 1.	LUCs are in place to prohibit the onsite use of groundwater. Inspections have verified that LUCs have been maintained and are effective.
Prevent or minimize river media from becoming impacted by the Site 5 groundwater COCs such that resulting concentrations present an unacceptable risk to human health or the environment.	LTM of the groundwater indicates the PRB and MNA are effectively reducing Site 5 groundwater COCs.
Restore groundwater beyond the landfill boundaries to MCLs, or, in the absence of MCLs, risk-based levels.	Installation of a PRB wall to address TCE in alluvial groundwater with MNA outside the influence of the PRB wall. LTM has shown that the remedy is effective in reducing contaminant concentrations. However, since contaminant concentrations remain above the remediation goals (MCL or risk based levels), additional monitoring will continue until the RAO is achieved.

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW03															
Sample ID		AS05-5GW03-R01	AS05-5GW03P-R02	AS05-5GW03-R02	AS05-5GW03P-R03	AS05-5GW03-R03	AS05-5GW03-R04	AS05-5GW03-R05	AS05-5GW03-R06	AS05-5GW03-R07	AS05-5GW03-R08	AS05-5GW03-R09	AS05-5GW03-R10	AS05-5GW03-R11	AS05-5GW03-R12	AS05-5GW03-R16	AS05-5GW03-R23
Sample Date	**MCLs**	05/06/98	10/13/98	10/13/98	01/20/99	01/20/99	10/22/99	08/07/00	04/11/01	02/05/02	10/18/02	07/17/03	04/06/04	01/11/05	10/14/05	04/20/07	08/22/12
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	200	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	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	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U
1,1-Dichloroethene	7	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
1,2-Dichloroethane	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	2 R	5 U	5 U	5 U	5 U	NA	5 R	5 R	5 U	5 U	5 R	5 U	5 U	5 UL	5 U	5 U
Benzene	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 U
Carbon disulfide	NA	1 U	0.6 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.7 B	0.5 U	1.4 B	0.5 U	0.5 U	1 U
Chloromethane	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.47 B	0.5 UJ	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	70	NA	1	0.9 J	1 U	1 U	NA	0.7 J	0.6 J	0.8 J	1 U	1.6	0.83	0.75	2.2	0.4 J	0.89 J
cis-1,3-Dichloropropene	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	1 U	NA	NA	NA	NA	1 U	NA	NA	NA	NA	0.44 J	0.5 U	3.2	0.81 J	0.6 J	1.07
Ethylbenzene	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 R	0.5 U	0.5 U	0.5 UL	0.5 R	2 U
Methylene chloride	5	1 U	2 U	2 U	2 U	2 U	1 U	0.7 B	2 U	0.7 B	2 U	1.2 B	0.5 U	0.5 B	0.5 U	0.5 UJ	0.5 U
trans-1,2-Dichloroethene	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	4	10	9	3.5	9.4	14	4.4	6.3	11	5.2	14	6.2	7.1	16 B	5 J	9.1
Vinyl chloride	2	0.4 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	1 U	1 U	1 U	NA	NA	3 U	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
Semivolatile Organic Compounds (UG/L)																	
No Detections																	
Pesticide/Polychlorinated Biphenyls (UG/L)																	
No Detections																	
Herbicides (UG/L)																	
No Detections																	
Explosives (UG/L)																	
No Detections																	
Total Metals (UG/L)																	
Aluminum	NA	NA	302	304	4,360	2,930	79.6 B	19.2 U	NA	53.2 J	68.6 J	385 B	56.8 B	55.5 B	120 B	NA	NA
Antimony	6	2.3 U	1.9 U	1.9 U	3 U	3 U	5 U	4.9 U	NA	5 U	4.7 U	2.5 U	4.1 U	2.9 U	5 U	NA	NA
Arsenic	10	2.3 UL	3.6 U	3.6 U	4.2 B	4 U	6 U	3.8 U	NA	5.1 U	3.3 J	5 U	3.4 U	3.1 U	2.3 U	NA	NA
Barium	2000	30.7 B	36.2 B	30.1 B	118 B	80.5 B	27.8 B	34.8 J	NA	25 J	42.1 J	34.9 J	29.9 J	31.5 J	52.6 J	NA	NA
Beryllium	4	1 J	0.91 U	0.91 U	1 U	1 U	1 U	0.1 U	NA	0.1 U	0.1 U	0.08 U	0.05 U	0.4 U	0.3 U	NA	NA
Boron	NA	NA	NA	NA	NA	NA	121	NA	NA	70.2	56.3	107	67.1	56.8	108	NA	NA
Cadmium	5	0.88 B	2 B	2 B	1.2 B	1.1 B	1 B	0.4 U	NA	2.4 J	0.4 U	0.4 U	0.3 U	0.2 U	0.91 J	NA	NA
Calcium	NA	NA	74,000	65,700	74,600	84,400	61,600	88,800	NA	105,000	114,000	113,000	106,000 J	95,900	98,800	NA	NA
Chromium	100	9.6 B	6.1 U	6.1 U	8.6 B	6 B	1 U	0.7 U	NA	1.1 B	0.85 J	2.1 B	2.1 J	2 J	2 J	NA	NA
Cobalt	NA	8.1 B	5 U	5 U	4.4 B	2.1 B	1 U	1.1 U	NA	1.3 U	0.6 U	0.7 U	0.9 U	0.84 B	1.6 J	NA	NA
Copper	1300	5.5 U	60.9	5 U	23.5 B	13.9 B	32.1	2.7 B	NA	1.5 U	1.4 J	3.3 B	1.4 J	1.6 J	2 J	NA	NA
Cyanide	200	NA	NA	NA	4 U	4 U	5 U	10 U	10 U	10 U	10 U	10 UJ	10 U	5 U	5 U	NA	NA
Iron	NA	NA	667	715	11,200	6,440	41.2 B	168 B	NA	16.9 B	47.8 B	146	1,660	78.8 B	199	37.2 B	680 B
Lead	15	11.7 B	2.2 U	2.3 B	5.3	2.9 B	2 U	2 UL	NA	2.9 U	2.1 U	1.9 UL	1.7 U	1.5 U	1.3 U	NA	NA
Magnesium	NA	NA	23,100	20,800	20,800	22,700	21,200	16,100	NA	26,100	22,600	27,900	22,100	18,300	29,100	NA	NA
Manganese	NA	NA	736	653	1,430	1,210	549	69.3	NA	554	190	635	110	135	1,010	361	298
Mercury	2	0.13 UL	0.13 U	0.13 U	0.2 U	0.2 U	0.2 U	0.1 U	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	50 U	NA	NA	10 U	2.2 U	1.1 U	1.2 J	1.6 U	1.3 U	NA	NA
Nickel	NA	6.8 U	108	95.5	63.2	59.8	40.7	6 B	NA	90.2	7.3 J	16.4 J	6.8 J	2.8 J	38.3 J	NA	NA
Potassium	NA	NA	3,430 B	3,190 B	3,140 B	3,240 B	2,900 B	2,640 J	NA	2,590 J	3,030 J	3,970 J	2,700 J	2,730 J	3,530 J	NA	NA
Selenium	50	3.6 U	2.9 U	2.9 U	4 U	4 U	5 U	2.2 UL	NA	4 U	3 U	3.2 R	2.3 UL	2.7 U	2.3 U	NA	NA
Silver	NA	2.8 UL	4.5 B	2 B	2 U	2 U	1 U	0.6 U	NA	0.6 U	1 UL	0.6 U	0.9 U	0.8 U	1.8 U	NA	NA
Sodium	NA	NA	27,600	24,700	16,900	17,500	25,500	4,440 J	NA	11,200 J	7,140	16,400	9,940	7,210	17,900	NA	NA
Thallium	2	1.7 U	7.1 B	2.8 U	3 U	3 U	7 U	2.3 UL	NA	5 U	5.4 U	5.8 UL	4.1 U	5.3 U	3.8 UL	NA	NA
Tin	NA	45.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	5.8 U	5.3 U	5.3 U	10.3 B	6.3 B	2 U	1 U	NA	0.8 U	0.7 U	0.7 U	1.2 U	0.9 U	2 U	NA	NA
Zinc	NA	22.9 B	39.9	38.3	64.6	53	48	34.1	NA	42.4 B	16.2 J	11.8 J	13.2 J	32.2	15.8 J	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW03															
Sample ID		AS05-5GW03-R01	AS05-5GW03P-R02	AS05-5GW03-R02	AS05-5GW03P-R03	AS05-5GW03-R03	AS05-5GW03-R04	AS05-5GW03-R05	AS05-5GW03-R06	AS05-5GW03-R07	AS05-5GW03-R08	AS05-5GW03-R09	AS05-5GW03-R10	AS05-5GW03-R11	AS05-5GW03-R12	AS05-5GW03-R16	AS05-5GW03-R23
Sample Date	MCLs	05/06/98	10/13/98	10/13/98	01/20/99	01/20/99	10/22/99	08/07/00	04/11/01	02/05/02	10/18/02	07/17/03	04/06/04	01/11/05	10/14/05	04/20/07	08/22/12
Chemical Name																	
Dissolved Metals (UG/L)																	
Aluminum, Dissolved	NA	NA	43.3 U	43.3 U	42.7 B	33.8 B	38.4 B	19.2 U	61.5 B	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	1.9 U	1.9 U	3 U	3 U	5 U	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	6 B	3.6 U	4 U	4 U	6 U	6.2 B	3.1 B	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	28.7 B	30.1 B	25.1 B	21.9 B	27.6 B	36.1 J	29.6 J	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	0.91 U	0.91 U	1 U	1 U	1 U	0.1 U	0.5 B	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	124	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	NA	1.4 B	1.3 B	1.5 B	1 U	1 B	0.4 U	0.86 B	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	75,400	78,200	79,200	80,900	61,700	99,100	99,900	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	6.1 U	6.1 U	1 U	1 U	1 U	0.7 U	1.3 J	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	5 U	5 U	1.3 B	1 U	1 U	1.1 U	1.7 J	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	6.8 B	5 U	11.8 B	18.5 B	7.8 B	0.7 UL	2.8 J	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	NA	127	75.7 B	57.2 B	104	16 U	15.9 U	42.1 J	NA	NA	NA	NA	NA	NA	8.3 B	100 U
Lead, Dissolved	15	NA	2.2 U	2.2 U	1 U	1 U	2 U	2 U	4.6 B	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	22,200	23,200	21,600	21,400	21,300	17,800	21,600	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	613	675	833	944	537	7.7 J	71.2	NA	NA	NA	NA	NA	NA	8 J	12.6
Mercury, Dissolved	2	NA	0.13 U	0.13 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 UL	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	87.6	91.1	51.1	50.7	40.2	4.4 B	9.2 J	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	2,920 B	3,130 B	2,580 B	2,390 B	2,910 B	4,250 J	3,240 J	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	23,500	25,800	19,100	17,800	25,400	5,860	11,700	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	5.2 B	2.8 U	3 U	3 U	7 U	2.3 UL	3.9 B	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	38.4	36.7	36.5	35.4	40.5	18.6 J	44.6 B	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Alkalinity (mg/l)	NA	128	117	116	162	172	65	240	180	210	220	170	200	180	160	NA	NA
Ammonia (mg/l)	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	0.2 U	NA	0.2 U	0.2 U	0.12 L	NA	NA	0.1 U	NA	NA
Bicarbonate (mg/l)	NA	128	117	116	2 U	2 U	64.9	240	180	210	220	170	200	180	160	NA	NA
Biological oxygen demand (mg/l)	NA	2 U	2 U	2 U	1.92	2.1	1.8	2 U	NA	NA	NA	NA	NA	2 U	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	7.2	7.5	2.32	2 U	28	NA	2.6	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	5 U	5 U	7	5 U	5 U	5 U	5 U	36	5 U	5 U	5 U	5 U	5 J	7.9	NA	NA
Chloride (mg/l)	NA	7.6	16.4	16.3	16	17.7	17.7	5.2	12	19	14	26	16	9.4	20	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.02 U	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA	NA
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.03 U	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	6.2 U	6.2 U	6.2 U	5.8 U	NA	NA
Hardness (mg/l)	NA	NA	NA	NA	270	304	243	290	338	370	380	410	350	340	440	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.002 U	0.002 U	0.01 U	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	19 J	3.3 U	3.3 U	3.8 J	NA	NA
Nitrate (mg/l)	10	NA	NA	NA	0.05 U	0.05 U	0.4	1.1	NA	2.8	2.5	0.36 L	0.57	0.84	0.05 U	NA	NA
Nitrate/Nitrite (mg/l)	10	1.29	0.46	0.49	NA	NA	NA	NA	1.5	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.05 U	0.05 U	0.1 U	0.02 U	0.02 U	0.02 U	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	0.1 U	NA	0.2 U	NA	NA	NA	0.1 U	0.1 U	NA	NA	NA
Oil and Grease (mg/l)	NA	1.2	1 U	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	133	170	182	162	166	128	77	210	140	20	210	130	66	220	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	320	374	400	351	354	300	NA	460	550	340	630	430	500	460	NA	NA
Total organic carbon (TOC) (mg/l)	NA	3.3	6.2	5	10 U	10 U	100 U	1.7	1 U	0.4 U	1.54	1.6	1.9	NA	2.8 B	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	NA	50 U	50 U	NA	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA
Reactivity (MG/L)																	
No Detections																	

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW09													
Sample ID		AS05-5GW09-R01	AS05-5GW09-R02	AS05-5GW09-R03	AS05-5GW09-R04	AS05-5GW09-R05	AS05-5GW09-R06	AS05-5GW09-R07	AS05-5GW09-R08	AS05-5GW09-R09	AS05-5GW09-R10	AS05-5GW09-R11	AS05-5GW09-R12	AS05-5GW09-R16	AS05-5GW09-R23
Sample Date	**MCLs**	05/06/98	10/14/98	01/21/99	10/22/99	08/03/00	04/17/01	02/06/02	10/18/02	07/18/03	04/06/04	01/12/05	10/14/05	04/20/07	08/21/12
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1,1-Trichloroethane	200	10 U	1 U	1 U	1 U	0.5 J	1 U	1 U	1 U	0.5 U	0.5 U	0.33 J	0.5 U	0.2 J	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U
1,1-Dichloroethene	7	10 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	0.5 U	0.5 U	0.28 J	0.5 U	0.5 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
1,2-Dichloroethane	5	10 U	0.6 J	1 U	1 U	1 U	1 U	1 U	1 U	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	20 R	5 U	5 U	NA	5 R	25 R	5 U	5 U	25 R	5 U	5 U	5 UL	5 U	5 U
Benzene	5	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 U
Carbon disulfide	NA	10 U	1	1 U	1 U	1 UJ	1 U	1 U	1 U	1.7 B	0.5 U	2.2 B	0.5 U	0.5 U	1 U
Chloromethane	NA	10 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	0.5 U	0.36 B	0.5 UJ	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	70	NA	5	3.1	NA	7.1	4	3.5	4.4	3.4	2.5	4.4	3.4 J	3	1.72
cis-1,3-Dichloropropene	NA	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	10 U	NA	NA	1 U	NA	NA	NA	NA	0.5 U	0.5 U	0.94	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 R	0.5 U	0.5 U	0.5 UL	1 R	2 U
Methylene chloride	5	1 B	1 B	2 U	1 U	1.2 B	2 U	0.6 B	2 U	1.2 B	0.5 U	0.54 B	0.5 U	0.5 UJ	0.5 U
trans-1,2-Dichloroethene	100	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U
Trichloroethene	5	65 J	46	NA	52	48	46	26	59 DL	44	26 J	52 J	28	29	22.2
Vinyl chloride	2	4 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	10 U	1 U	NA	3 U	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
Semivolatile Organic Compounds (UG/L)															
No Detections															
Pesticide/Polychlorinated Biphenyls (UG/L)															
No Detections															
Herbicides (UG/L)															
No Detections															
Explosives (UG/L)															
No Detections															
Total Metals (UG/L)															
Aluminum	NA	NA	23,800	996	42.4 B	136 B	NA	17.2 U	150 J	631 B	330 K	12.6 U	18.5 B	NA	NA
Antimony	6	2.3 U	2.9 B	3 U	5 U	4.9 U	NA	5 U	4.7 U	2.5 U	4.1 U	3.4 B	5 U	NA	NA
Arsenic	10	2.3 UL	14.1	4 U	6 U	4.1 B	NA	5.1 U	2.8 U	5 U	3.4 U	3.1 U	2.3 U	NA	NA
Barium	2000	38.8 J	823	152 B	40.7 B	32.8 J	NA	47.2 J	44 J	25.1 J	24.6 J	27.5 J	28.6 J	NA	NA
Beryllium	4	0.61 U	2 B	1 U	1 U	0.1 U	NA	0.1 U	0.1 U	0.08 U	0.05 U	0.4 U	0.3 U	NA	NA
Boron	NA	NA	NA	NA	53.2	83.6	NA	36.9 J	93.9	114	101	121	81.2	NA	NA
Cadmium	5	0.65 B	0.59 U	1 U	1 U	0.4 UL	NA	1.7 U	0.4 U	0.4 U	0.35 J	0.22 J	0.39 J	NA	NA
Calcium	NA	NA	45,600	39,300	67,000	90,700	NA	55,200	119,000	120,000	187,000 J	128,000	78,500	NA	NA
Chromium	100	10.6 B	59.9	13.1	1 U	0.7 UL	NA	2.7 B	0.6 U	1.2 B	2.2 J	0.7 U	1.5 U	NA	NA
Cobalt	NA	18.1 B	20.5 B	9.9 B	6.9 B	8.8 J	NA	72.3	5 J	2.1 J	3 J	2.9 J	10.4 J	NA	NA
Copper	1300	5.5 U	38.9	13.7 B	19.1 B	0.7 U	NA	2.3 J	1.1 J	1.7 B	1.4 J	1.1 J	2 J	NA	NA
Cyanide	200	NA	NA	4 U	5 U	10 U	19	10 U	10 U	10 UJ	10 U	5 U	5 U	NA	NA
Iron	NA	NA	64,000	3,570	163	562	NA	9,400	5,040	174 B	2,810	31 B	5,850	79.7 J	3,370
Lead	15	5.1 B	29.4	1.9 B	2 U	2 U	NA	3.3	2.1 U	1.9 UL	1.7 U	1.5 U	1.3 U	NA	NA
Magnesium	NA	NA	19,400	14,400	23,500	32,400	NA	22,000	36,600	31,900	31,900	33,400	27,600	NA	NA
Manganese	NA	NA	1,550	1,510	1,760	1,990	NA	2,200	1,940	1,330	1,450	1,440	1,380	1,310	1,730
Mercury	2	0.13 UL	0.13 U	0.2 U	0.2 U	0.1 U	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Molybdenum	NA	NA	NA	NA	50 U	10 U	NA	10 U	2.2 U	1.1 U	1 U	1.6 U	1.3 U	NA	NA
Nickel	NA	33.2 J	70.3	30.8 B	33.9 B	23.6 J	NA	24.2 J	24.6 J	12.3 B	12 J	11.6 J	22.5 J	NA	NA
Potassium	NA	NA	5,250	2,190 B	2,770 B	3,980 K	NA	2,940 J	3,580 J	4,310 J	4,000 J	4,300 J	3,190 J	NA	NA
Selenium	50	3.6 U	2.9 U	4 U	5 U	2.2 U	NA	4 U	3 U	3.2 R	2.3 UL	2.7 U	2.3 U	NA	NA
Silver	NA	2.8 UL	4.8 B	2 U	1 U	0.6 UL	NA	0.6 U	1 UL	0.6 U	0.9 U	0.8 U	1.8 U	NA	NA
Sodium	NA	NA	11,900	11,700	16,900	16,700	NA	14,000	15,300	19,100	17,900	18,100	18,000	NA	NA
Thallium	2	1.7 U	11.4	3 U	7 U	2.3 U	NA	5 U	5.4 U	5.8 U	5.5 J	5.3 U	3.8 UL	NA	NA
Tin	NA	48.7 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	6.5 B	50.7	3.3 B	2 U	1 U	NA	1.2 B	0.7 U	0.7 U	1.7 J	0.9 U	2 U	NA	NA
Zinc	NA	28.1 B	153	50.7	53.2	39 B	NA	47.8	25.6	12.3 B	7 J	11.6 B	22	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW09													
Sample ID		AS05-5GW09-R01	AS05-5GW09-R02	AS05-5GW09-R03	AS05-5GW09-R04	AS05-5GW09-R05	AS05-5GW09-R06	AS05-5GW09-R07	AS05-5GW09-R08	AS05-5GW09-R09	AS05-5GW09-R10	AS05-5GW09-R11	AS05-5GW09-R12	AS05-5GW09-R16	AS05-5GW09-R23
Sample Date	**MCLs**	05/06/98	10/14/98	01/21/99	10/22/99	08/03/00	04/17/01	02/06/02	10/18/02	07/18/03	04/06/04	01/12/05	10/14/05	04/20/07	08/21/12
Chemical Name															
Dissolved Metals (UG/L)															
Aluminum, Dissolved	NA	NA	43.3 U	26.8 B	39.1 B	92 B	79.6 B	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	1.9 U	3 U	5 U	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	3.6 U	4 U	6 U	4.1 B	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	43.2 B	65.8 B	40.2 B	35.1 J	33.4 J	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	0.91 U	1 U	1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	57.5	112	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	NA	0.59 U	1 U	1 U	0.4 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	52,500	48,900	69,900	96,100	122,000	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	6.1 U	1.2 B	1 U	0.7 U	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	5 U	10.4 B	7.4 B	8.9 J	5.3 J	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	13.7 B	14.2 B	11.2 B	0.7 UL	1.7 J	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	NA	317	621	105	461	464	NA	NA	NA	NA	NA	NA	6.2 B	2,870
Lead, Dissolved	15	NA	2.2 U	1 U	2 U	4.2 B	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	18,700	18,900	24,100	30,800	36,300	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	1,470	1,640	1,790	2,110	1,990	NA	NA	NA	NA	NA	NA	1,290	1,760
Mercury, Dissolved	2	NA	0.13 U	0.2 U	0.2 U	0.1 U	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	29.2 B	26.8 B	34.8 B	29.1 J	24.1 J	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	2,820 B	2,990 B	2,810 B	4,050 J	4,550 J	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	13,800	14,400	17,100	17,600 J	19,500 J	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	3.8 B	3 U	7 U	2.3 U	3.9 U	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	40.2	50.3	47.3	33.3 B	46.7 J	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry															
Alkalinity (mg/l)	NA	136	65.8	70	64	120	170	82	170	170	200	200	100	NA	NA
Ammonia (mg/l)	NA	0.14	0.1 U	0.1 U	NA	0.22	NA	0.2 U	0.2 U	0.22	NA	NA	0.1 U	NA	NA
Bicarbonate (mg/l)	NA	136	65.8	2 U	63.9	120	170	82	170	170	200	200	100	NA	NA
Biological oxygen demand (mg/l)	NA	2 U	2 U	0.2 U	3.06	2 U	NA	NA	NA	NA	NA	2 UL	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	2 U	2 U	2.13	2.5	2 U	NA	2 U	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	5 U	8.5	5 U	5 U	5	38	10	5 U	5 UJ	5 U	5 J	5.3	NA	NA
Chloride (mg/l)	NA	16.7	27.6	31.9	28.3	24	35	45	21	57	30	20	26	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.02 U	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA	1 U	NA	NA	NA	5.8 U
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.03 U	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	1 U	NA	NA	NA	31 U	62 U	6.2 U	5.8 U	NA	NA
Hardness (mg/l)	NA	NA	NA	156	266	360	454	230	450	430	380	500	370	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	0.144	0.11	0.01 U	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	63.9 U	NA	NA	NA	130 J	52	200	72 J	NA	NA
Nitrate (mg/l)	10	NA	NA	0.05 U	0.1	0.74	NA	0.5 U	0.5 U	0.14 L	0.05 U	0.59	0.05 U	NA	NA
Nitrate/Nitrite (mg/l)	10	0.77	0.05 U	NA	NA	NA	1.4	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	0.05 U	0.05 U	0.05 U	NA	0.05 U	0.6	0.1 U	0.02 U	0.02 U	0.02 U	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	0.1 U	NA	0.2 U	NA	NA	NA	0.29	0.21	NA	NA	NA
Oil and Grease (mg/l)	NA	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	181	91	124	108	210	360	160	200	240	200	140	42	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	445	288	253	310	370	630	390	440	710	590	540	360	NA	NA
Total organic carbon (TOC) (mg/l)	NA	3.1	13.7	10 U	100 U	2.4	2.5	3.2	2.87	1.6	2.8	NA	2.2 B	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	50 U	NA	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA
Reactivity (MG/L)															
No Detections															

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW13															
Sample ID		AS05-5GW13-R01	AS05-5GW13P-R02	AS05-5GW13-R02	AS05-5GW13P-R03	AS05-5GW13-R03	AS05-5GW13-R04	AS05-5GW13-R05	AS05-5GW13-R06	AS05-5GW13-R07	AS05-5GW13P-R08	AS05-5GW13-R08	AS05-5GW13-R09	AS05-5GW13P-R10	AS05-5GW13-R10	AS05-5GW13P-R11	AS05-5GW13-R11
Sample Date	MCLs	05/07/98	10/14/98	10/14/98	01/21/99	01/21/99	10/22/99	08/09/00	04/18/01	02/07/02	10/21/02	10/21/02	07/18/03	04/07/04	04/07/04	01/13/05	01/13/05
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	200	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	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	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	7	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.35 J
1,2-Dichloroethane	5	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	2 R	5 U	5 U	5 U	5 U	NA	5 U	25 R	5 U	5 U	5 U	25 R	5 R	5 R	5 U	5 U
Benzene	5	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	NA	1 UJ	0.7 J	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.5 B	0.5 U	0.5 U	0.5 UJ	0.5 UJ
Chloromethane	NA	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.47 B	0.45 B	0.5 UJ	0.5 UJ
cis-1,2-Dichloroethene	70	NA	4	5	3.5	3	NA	5.2	3.2	22	3.4	3.6	2.9	1.6	1.9	1.6 B	1.6 B
cis-1,3-Dichloropropene	NA	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	1 UJ	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	5	1 UJ	1 B	1 B	2 U	2 U	1 U	3.6	4.1 B	0.6 B	2 U	2 U	0.84 B	0.81	0.5 U	0.66 B	0.59 B
trans-1,2-Dichloroethene	100	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	67 J	26 B	40	37	43	61	81	62	62	70	67	44	11	15	22	22
Vinyl chloride	2	0.4 UJ	1 U	0.6 J	1 U	1 U	1 U	0.6 J	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	1 UJ	1 U	1 U	NA	NA	3 U	1 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)																	
No Detections																	
Pesticide/Polychlorinated Biphenyls (UG/L)																	
No Detections																	
Herbicides (UG/L)																	
No Detections																	
Explosives (UG/L)																	
No Detections																	
Total Metals (UG/L)																	
Aluminum	NA	NA	478	255	141 B	196 B	54.1 B	29.3 B	NA	50.4 B	356	255	527 B	32.1 B	51.5 B	12.6 U	12.6 U
Antimony	6	2.3 U	1.9 U	1.9 U	3 U	3 U	5 U	4.9 B	NA	5 U	4.7 U	4.7 U	4.9 B	4.1 U	4.1 U	4.3 B	4.2 B
Arsenic	10	2.3 UL	4.8 B	5.4 B	4 U	4 U	6 U	3.8 U	NA	5.1 U	5.1 J	2.8 U	5 U	3.4 U	3.4 U	3.1 U	3.1 U
Barium	2000	32.8 B	35.4 B	42.6 B	32.8 B	30.6 B	28.5 B	21.7 J	NA	25.7 J	37.5 J	34 J	19.1 J	16.1 J	16.9 J	17.3 J	21.5 J
Beryllium	4	0.8 B	0.91 U	0.91 U	1 U	1 U	1 U	0.12 B	NA	0.1 J	0.11 J	0.1 J	0.08 U	0.05 U	0.05 U	0.4 U	0.4 U
Boron	NA	NA	NA	NA	NA	NA	50 U	59.2	NA	47.8 J	131	131	143	167	169	213	215
Cadmium	5	1 B	0.59 U	0.59 U	1 U	1 U	1 U	0.4 UL	NA	1.7 U	0.4 U	0.4 U	1 J	0.3 U	0.3 U	0.2 U	0.29 J
Calcium	NA	NA	140,000	132,000	110,000	98,300	149,000	196,000	NA	167,000	273,000	273,000	213,000	200,000 J	228,000 J	226,000	230,000
Chromium	100	8 J	6.1 U	6.1 U	1 U	1.3 B	1 U	6.2 B	NA	7.3 B	0.6 U	0.6 U	1 B	1.3 B	1.4 B	0.81 J	1.6 J
Cobalt	NA	18.1 B	10.3 B	9.3 B	5.4 B	4.7 B	6.7 B	8.8 K	NA	7.8 J	8.8 J	7.9 J	0.7 U	0.95 J	1.2 J	1.1 J	1.4 J
Copper	1300	5.5 U	8.2 B	5.9 B	9.9 B	9.1 B	25.1	3.2 B	NA	1.5 U	2 J	462	1.5 B	0.9 U	0.9 U	0.84 J	1.3 J
Cyanide	200	NA	NA	NA	4 U	4 U	5 U	10 U	100	10 U	10 U	10 U	10 UJ	10 U	10 U	5 U	5 U
Iron	NA	NA	3,640	3,240	3,280	3,000	3,320	920 J	NA	3,890	465	283	21.3 U	18.3 U	25.2 J	13.9 U	13.9 U
Lead	15	12.4 B	2.2 U	2.2 U	1 U	1 U	2 U	2 U	NA	2.9 U	5	59	1.9 UL	1.7 U	1.7 U	1.5 U	1.5 U
Magnesium	NA	NA	24,600	23,200	16,100	14,500	25,800	42,800	NA	31,300	64,900	64,800	49,000	44,500	46,700	50,300	50,800
Manganese	NA	NA	1,270	1,200	823	693	1,430	4,510	NA	2,840	8,120	8,130	2,370	372	425	2,450	3,010
Mercury	2	0.13 UL	0.13 U	0.13 U	0.2 U	0.2 U	0.2 U	0.1 U	NA	0.2 U	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Molybdenum	NA	NA	NA	NA	NA	NA	50 U	10 U	NA	10 U	2.2 U	2.2 U	1.1 U	1 U	1 U	1.6 U	1.6 U
Nickel	NA	40.1	31.5 B	28.5 B	25.8 B	23.1 B	31.3 B	31.7 K	NA	28.2 J	20.1 J	24.2 J	14.2 B	4.4 B	4.3 B	6.6 J	7.4 J
Potassium	NA	NA	1,390 B	1,020 B	1,070 B	955 B	1,290 B	1,890 J	NA	1,400 J	2,850 J	2,890 J	3,260 J	3,240 J	3,260 J	5,550 J	3,610 J
Selenium	50	3.6 U	2.9 U	2.9 U	4 U	4 U	5 U	2.2 U	NA	4 U	3 U	3 U	3.2 R	2.3 UL	2.3 UL	2.7 U	2.7 U
Silver	NA	4.4 B	3.1 B	2.6 B	2 U	2 U	1 U	0.82 B	NA	0.6 U	1 UL	1.3 L	0.6 U	0.9 U	0.9 U	0.8 U	0.8 U
Sodium	NA	NA	12,200	11,300	12,200	10,800	13,900	14,600	NA	13,800	21,700	21,500	25,100	25,200	25,900	28,200	27,500
Thallium	2	1.7 U	4.9 B	3.1 B	3 U	3 U	7 U	2.3 UL	NA	5 U	5.4 U	5.4 U	5.8 U	6 B	7.1 B	5.3 U	5.3 U
Tin	NA	65.5 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	5.8 U	6.4 B	5.3 U	1 U	1 U	2 U	1 U	NA	0.8 U	0.7 U	0.7 U	0.7 U	1.2 U	1.2 U	0.9 U	0.9 U
Zinc	NA	89.9 B	84.8	72.1	67.2	70.5	78.9	50.7	NA	48.6 B	53.8	74.4	44.1 B	2.8 B	4.6 B	11.9 B	9.5 B

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW13															
Sample ID		AS05-5GW13-R01	AS05-5GW13P-R02	AS05-5GW13-R02	AS05-5GW13P-R03	AS05-5GW13-R03	AS05-5GW13-R04	AS05-5GW13-R05	AS05-5GW13-R06	AS05-5GW13-R07	AS05-5GW13P-R08	AS05-5GW13-R08	AS05-5GW13-R09	AS05-5GW13P-R10	AS05-5GW13-R10	AS05-5GW13P-R11	AS05-5GW13-R11
Sample Date	MCLs	05/07/98	10/14/98	10/14/98	01/21/99	01/21/99	10/22/99	08/09/00	04/18/01	02/07/02	10/21/02	10/21/02	07/18/03	04/07/04	04/07/04	01/13/05	01/13/05
Chemical Name																	
Dissolved Metals (UG/L)																	
Aluminum, Dissolved	NA	NA	3,130	43.3 U	19.9 B	23.9 B	54 B	19.2 U	47.8 J	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	1.9 U	1.9 U	3 U	3 U	5 U	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	3.6 U	3.6 U	4 U	4 U	6 U	4.9 B	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	23.8 B	25.5 B	33.4 B	29.2 B	29.4 B	20.6 J	23.7 J	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	0.91 U	0.91 U	1 U	1 U	1 U	0.1 U	0.12 J	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	NA	50 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	NA	0.59 U	0.59 U	1 U	1 U	1 U	0.4 UL	1.5 J	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	138,000	138,000	135,000	116,000	162,000	189,000	237,000	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	6.1 U	6.1 U	1 U	1 U	1 U	1.6 B	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	8.4 B	9.3 B	6.1 B	5.6 B	6.2 B	9.1 K	14.2 J	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	12.8 B	7.1 B	7.7 B	10.3 B	19.1 B	1.2 B	2.3 J	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	NA	3,410	3,310	3,550	3,110	3,590	1,350	1,130	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	2.2 U	2.2 U	1 U	1 U	2 U	2.9 K	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	23,400	23,800	20,000	17,300	28,100	39,400	54,300	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	1,290	1,280	950	825	1,550	4,050	8,030	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	0.13 U	0.13 U	0.2 U	0.2 U	0.2 U	0.13 B	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	39.2 B	28.5 B	29 B	26.2 B	32.3 B	29.5 K	32 J	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	1,190 B	1,250 B	1,380 B	1,160 B	1,390 B	1,990 J	2,460 J	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	11,800	11,900	16,500	14,200	14,900	16,200	20,000	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	5.1 B	4.7 B	3 U	3 U	7 U	2.3 U	3.9 U	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	67.1	64.2	77.4	72.9	86.6	38.7	56.3	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Alkalinity (mg/l)	NA	222	238	219	238	228	218	260	210	240	310	310	240	230	230	300	300
Ammonia (mg/l)	NA	0.1 U	0.14	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.1 U	NA	NA	NA	NA
Bicarbonate (mg/l)	NA	222	238	219	2 U	2 U	217	260	210	240	310	310	240	230	230	300	300
Biological oxygen demand (mg/l)	NA	5.3	2 U	2 U	0.2 U	0.2 U	2.04	2 U	NA	NA	NA	NA	NA	NA	NA	2 UL	2 UL
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	2 U	6.1	2.24	2.12	2 U	2 U	2 U	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	3
Chemical oxygen demand (mg/l)	NA	5 U	6.6	6.3	5 U	5 U	5 U	5 U	12	6	5 U	5 U	18 J	5 U	5 U	7.5	7.5
Chloride (mg/l)	NA	22.7	30.1	30.1	31.9	26.6	33.6	35	42	42	36	36	37	37	36	27	23
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.008	0.02 U	0.02 U	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA	1 U	NA	NA	NA	NA	5.8 U	5.8 U	5.8 U	5.8 U	6.2 U
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.005	0.03 U	0.03 U	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U	6.2 U	6.2 U	6.2 U
Hardness (mg/l)	NA	NA	NA	NA	342	304	478	670	810	555	950	950	760	730	730	840	770
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.002 U	0.13 B	0.33	0.07	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.4	5.5	33	32
Nitrate (mg/l)	10	NA	NA	NA	0.05 U	0.05 U	0.08	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.31 L	0.26	0.28	0.05 U	0.05 U
Nitrate/Nitrite (mg/l)	10	0.05 U	0.05 U	0.05 U	NA	NA	NA	NA	0.55 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	0.05 U	0.05 U	0.05 U	0.1 U	0.02 U	0.02 U	0.02 U	0.02 U
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U
Oil and Grease (mg/l)	NA	3	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	309	187	184	190	171	82.7	NA	800	320	170	200	460 L	460	480	270	310
Total dissolved solids (TDS) (mg/l)	NA	708	528	525	427	416	510	590	1,100	780	780	770	1,200	1,000	710	1,100	1,200
Total organic carbon (TOC) (mg/l)	NA	3.4	38.8	173	10 U	10 U	100 U	3	3.2	2.1	2.9	2.77	1.9	2.8	2.8	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	NA	50 U	50 U	611	0.03 U	0.031	0.025 U	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Reactivity (MG/L)																	
No Detections																	

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW13													
Sample ID		AS05-5GW13-R12	AS05-5GW13-R13	AS05-5GW13-R14	AS05-5GW13P-R15	AS05-5GW13-R15	AS05-5GW13-R16	AS05-5GW13-R17	AS05-5GW13-R18	AS05-5GW13-R19	AS05-5GW13-R20	AS05-5GW13-R21	AS05-5GW13-R22	AS05-5GW13-R23	AS05-5GW13-R24
Sample Date	**MCLs**	10/26/05	08/08/06	10/24/06	01/24/07	01/24/07	04/20/07	02/01/08	10/22/08	07/09/09	04/22/10	01/15/11	10/11/11	08/22/12	06/11/13
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1,1-Trichloroethane	200	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	2 U	1 U	4 U	4 U
1,1-Dichloroethene	7	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U
1,2,3-Trichlorobenzene	NA	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 UL	5 U	5 UL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.5 U	5 U	5 U	5 R
Benzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U
Carbon disulfide	NA	0.98 B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U
Chloromethane	NA	0.5 U	0.16 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	0.526 J	0.5 U	0.5 U	1 U	1 U
cis-1,2-Dichloroethene	70	6.4	4.6 J	9	2.1 J	2 K	1	1	2.5 J	3	1.38 J	6.02	3.43	3.1	0.914 J
cis-1,3-Dichloropropene	NA	0.5 U	0.5 UJ	0.5 U	0.11 J	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U	0.5 U
Ethylbenzene	700	0.5 U	0.5 U	0.5 U	0.21 B	0.22 B	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	0.5 UL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 UJ	5 U	1 U	5 UL	1 U	1 U	2 UJ	2 U
Methylene chloride	5	0.5 U	0.5 U	0.5 U	0.14 B	0.14 B	0.5 UJ	0.5 U	5 U	1 U	0.339 B	0.281 B	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	15	11	16	16 J	17 J	10	9 L	5.6	7.9	9.11	8.83	6.88	5.93	8.49
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	1 U	2 U	0.312 J	0.5 U	0.5 U	0.5 U
Xylene, total	10000	0.5 U	0.5 U	0.5 U	0.27 B	0.34 B	0.5 U	0.5 U	15 U	3 U	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/L)															
No Detections															
Pesticide/Polychlorinated Biphenyls (UG/L)															
No Detections															
Herbicides (UG/L)															
No Detections															
Explosives (UG/L)															
No Detections															
Total Metals (UG/L)															
Aluminum	NA	171 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	2.3 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	28.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	115	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	168,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	2.8 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	6 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	1.8 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	1,480	1,340	675	117 B	92.6 B	24.1 B	59.7 B	598	403	33.6 J	1,850	775	884	100 U
Lead	15	1.3 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	33,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	3,420	2,850	3,360	3,130	3,080	532	464	3,420	1,960	245	3,450	2,830	2,020	604
Mercury	2	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	1.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	18.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	1,820 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	2.3 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	1.8 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	20,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2	3.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	22.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW13													
Sample ID		AS05-5GW13-R12	AS05-5GW13-R13	AS05-5GW13-R14	AS05-5GW13P-R15	AS05-5GW13-R15	AS05-5GW13-R16	AS05-5GW13-R17	AS05-5GW13-R18	AS05-5GW13-R19	AS05-5GW13-R20	AS05-5GW13-R21	AS05-5GW13-R22	AS05-5GW13-R23	AS05-5GW13-R24
Sample Date	**MCLs**	10/26/05	08/08/06	10/24/06	01/24/07	01/24/07	04/20/07	02/01/08	10/22/08	07/09/09	04/22/10	01/15/11	10/11/11	08/22/12	06/11/13
Chemical Name															
Dissolved Metals (UG/L)															
Aluminum, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	NA	1,290	734	162 B	207 B	20.6 B	148	354	209	47.8 J	1,340	738	788	100 U
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	2,420	3,240	3,010	3,010	457	638	2,700	1,490	183 L	1,920	2,190	1,430	208
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry															
Alkalinity (mg/l)	NA	77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/l)	NA	0.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/l)	NA	77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BOD-5day (total) (mg/l)	NA	59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	5.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	1 U	NA	NA	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA	NA	NA
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	5.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardness (mg/l)	NA	590	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	180 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (mg/l)	10	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	280	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	810	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/l)	NA	2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics (mg/l)	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Reactivity (MG/L)															
No Detections															

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW17															
Sample ID		AS05-5GW17-R01	AS05-5GW17-R02	AS05-5GW17-R03	AS05-5GW17P-R04	AS05-5GW17-R04	AS05-5GW17P-R05	AS05-5GW17-R05	AS05-5GW17-R06	AS05-5GW17-R07	AS05-5GW17-R08	AS05-5GW17P-R09	AS05-5GW17-R09	AS05-5GW17-R10	AS05-5GW17-R11	AS05-5GW17-R12	AS05-5GW17-R13
Sample Date	**MCLs**	03/07/98	10/15/98	01/21/99	10/25/99	10/25/99	08/10/00	08/10/00	04/06/01	02/06/02	10/18/02	07/17/03	07/17/03	04/06/04	01/12/05	10/14/05	08/08/06
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	200	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	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	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ
1,1-Dichloroethene	7	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ
1,2-Dichloroethane	5	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	10 U	5 U	5 U	NA	5 U	5 R	5 R	5 U	5 U	5 U	5 R	5 R	5 U	5 U	5 UL	5 U
Benzene	5	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	NA	10 U	1	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	1.1 B	1.4 B	0.5 U	0.5 UJ	0.5 U	0.5 U
Chloromethane	NA	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.49 B	0.5 UJ	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	NA	2	1.7	NA	1.3	1.3	1.3	0.9 J	1.8	1.1	1.2	1.1	2.8	5.2	4.5	3.6
cis-1,3-Dichloropropene	NA	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 R	0.5 R	0.5 U	0.5 U	0.5 UL	0.5 U
Methylene chloride	5	10 U	0.6 B	2 U	NA	2 U	2 UJ	2 UJ	0.6 B	0.6 B	2 U	1 B	1 B	0.5 U	0.59 B	0.5 U	0.5 UJ
trans-1,2-Dichloroethene	100	NA	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	23	11 B	19	NA	17	11	10	17	27	19	23	22	14	21	19 B	21
Vinyl chloride	2	10 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	10 U	1 U	NA	NA	NA	1 U	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)																	
No Detections																	
Pesticide/Polychlorinated Biphenyls (UG/L)																	
No Detections																	
Herbicides (UG/L)																	
No Detections																	
Explosives (UG/L)																	
No Detections																	
Total Metals (UG/L)																	
Aluminum	NA	9,860	23,300	3,780	NA	546	348	412	NA	61.4 J	2,110	1,560	2,990	3,380 K	779 J	328	NA
Antimony	6	2.3 U	1.9 U	3 U	NA	5 U	4.9 U	4.9 U	NA	5 U	4.7 U	2.5 U	2.5 U	4.1 U	3.5 B	5 U	NA
Arsenic	10	7.8 B	10.5	4 U	NA	6 U	3.8 U	3.8 U	NA	5.1 U	5.3 J	5 U	5 U	3.4 U	3.1 U	2.3 U	NA
Barium	2000	365	563	316	NA	85 B	87.7 J	99.8 J	NA	38.9 J	360	74.4 J	171 J	198 J	59.9 J	38.3 J	NA
Beryllium	4	0.97 B	1.5 B	1 U	NA	1 U	0.1 U	0.1 U	NA	0.1 U	0.21 J	0.08 U	0.08 U	0.15 J	0.4 U	0.3 U	NA
Boron	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA	27.7 J	3 U	20.4 L	21.6 L	21.1	21.3	14.7 J	NA
Cadmium	5	0.27 U	0.59 U	1 U	NA	2.6 B	0.4 UL	0.4 UL	NA	1.7 U	0.4 U	0.4 U	0.4 U	0.59 J	0.25 J	0.46 J	NA
Calcium	NA	51,400	58,800	48,400	NA	56,700	60,600	58,700	NA	66,100	78,700	76,400	73,200	83,600 J	78,000	79,400	NA
Chromium	100	17.8 K	31.2	8.8 B	NA	1 U	6.4 B	7.1 J	NA	3.4 B	6.7 J	10.4	7.4 J	10.5	5.8 J	2.4 J	NA
Cobalt	NA	12 J	21.5 B	4.1 B	NA	1 U	3.5 B	4 B	NA	2.1 J	5.9 J	2 J	2.6 J	6.9 J	4.3 J	5.9 J	NA
Copper	1300	14.2 B	55.2	19.9 B	NA	25.7 E	2.2 B	1.5 B	NA	1.5 U	44.3	2.7 B	5.6 B	5.7 J	1.3 J	4.5 J	NA
Cyanide	200	NA	NA	4 U	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 UJ	10 U	5 U	5 U	NA
Iron	NA	11,700	31,200	7,180	NA	962	609 J	786 J	NA	50.6 B	4,040	1,920	7,580	6,190	1,860 J	729	2,210
Lead	15	8.6 B	12.1	4.6	NA	7.8	2 U	2 U	NA	2.9 U	5.4	1.9 UL	1.9 UL	1.7 U	1.5 U	1.3 U	NA
Magnesium	NA	14,200	17,900	12,500	NA	14,400	15,600	15,100	NA	17,400	21,900	22,300	21,700	23,900	22,300	22,900	NA
Manganese	NA	540	901	457	NA	411	597	579	NA	535	614	387	350	814	693	883	319
Mercury	2	0.7	0.18 B	0.2 U	NA	0.2 U	0.1 U	0.1 U	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA
Molybdenum	NA	NA	NA	NA	NA	50 U	10 U	10 U	NA	10 U	2.2 U	1.1 U	1.1 U	1.6 J	1.6 U	1.3 U	NA
Nickel	NA	25.9 K	49.9	16.6 B	NA	9 B	15.3 J	16 J	NA	9.4 J	25.4 J	22.7 J	22.5 J	34.2 J	27.8 J	24.6 J	NA
Potassium	NA	2,920 J	4,300 B	1,250 B	NA	863 B	902 J	926 J	NA	698 J	1,250 J	1,110 J	1,420 J	1,530 J	1,030 J	930 J	NA
Selenium	50	3.6 U	2.9 U	4 U	NA	5 U	2.2 U	2.2 U	NA	4 U	3 U	3.2 R	3.2 R	2.3 UL	2.7 U	2.3 U	NA
Silver	NA	2.8 UL	8.6 B	2 U	NA	1 U	0.96 B	0.6 U	NA	0.6 U	1.6 L	0.6 U	0.6 U	0.9 U	0.8 U	1.8 U	NA
Sodium	NA	8,910	10,300	9,620	NA	10,500 E	7,970	7,630	NA	9,780	8,070	8,260 K	8,080 K	8,480	8,200	8,890	NA
Thallium	2	5 B	9.1 B	3 U	NA	7 U	2.3 UL	2.3 UL	NA	5 U	5.4 U	5.8 UL	5.8 UL	5.7 J	5.3 U	3.8 UL	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	22.2 J	40.5 B	6.1 B	NA	2 U	1 U	1 U	NA	1.5 B	2.4 J	2.4 B	4.8 J	6.1 J	1.4 J	2 U	NA
Zinc	NA	64 B	139	51.3	NA	33.2	30.6	28.6	NA	15.2 B	40.5	21.4	27.8	32.2	28	25	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW17															
Sample ID		AS05-5GW17-R01	AS05-5GW17-R02	AS05-5GW17-R03	AS05-5GW17P-R04	AS05-5GW17-R04	AS05-5GW17P-R05	AS05-5GW17-R05	AS05-5GW17-R06	AS05-5GW17-R07	AS05-5GW17-R08	AS05-5GW17P-R09	AS05-5GW17-R09	AS05-5GW17-R10	AS05-5GW17-R11	AS05-5GW17-R12	AS05-5GW17-R13
Sample Date	MCLs	03/07/98	10/15/98	01/21/99	10/25/99	10/25/99	08/10/00	08/10/00	04/06/01	02/06/02	10/18/02	07/17/03	07/17/03	04/06/04	01/12/05	10/14/05	08/08/06
Chemical Name																	
Dissolved Metals (UG/L)																	
Aluminum, Dissolved	NA	83.7 B	66.3 B	30.9 B	62.1 B	NA	19.2 U	19.2 U	50.8 B	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	5 J	1.9 U	3 U	5 U	NA	4.9 U	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	4.4 B	4.7 B	4 U	6 U	NA	3.8 U	3.8 U	3.4 B	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	63.9 J	62 B	53.8 B	184 B	NA	67.3 J	67.9 J	57.1 J	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	0.61 U	0.91 U	1 U	1 U	NA	0.1 U	0.1 U	0.33 B	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	50 U	50 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	0.27 U	0.59 U	1 U	1 U	NA	0.4 UL	0.4 UL	0.65 B	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	55,800	55,500	49,600	59,000	NA	63,700	64,100	71,000	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	6.6 UL	6.1 U	1 U	1 U	NA	2.7 B	2.3 B	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	5.7 U	5 U	1 U	1 U	NA	3.3 B	2.9 B	1.8 J	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	5.5 U	18.2 B	13.5 B	32.4 E	NA	0.7 U	0.7 U	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	124 B	30.1 B	60.3 B	7,310	NA	15.9 U	15.9 U	46.2 J	NA	NA	NA	NA	NA	NA	NA	64.3 J
Lead, Dissolved	15	2.2 B	2.2 U	1.2 B	3.2	NA	2 U	2 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	14,400	14,700	12,600	8,550	NA	16,200	16,400	19,500	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	393	443	356	432	NA	644	636	502	NA	NA	NA	NA	NA	NA	NA	287
Mercury, Dissolved	2	0.13 U	0.13 U	0.2 U	1.3	NA	0.17 B	0.1 U	0.2 UL	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	6.8 U	8.8 U	5.8 B	2 U	NA	11.8 K	11.7 K	12.1 K	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	760 J	636 B	716 B	577 B	NA	928 J	913 J	885 B	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	9,610	10,200	10,900	7,470 E	NA	8,780	8,600	10,100	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	1.7 U	2.8 U	3 U	7 U	NA	2.3 UL	2.3 UL	5.2 K	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	24.8 B	25.4	28.1	27.2	NA	16.9 J	16.2 J	40.3 B	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Alkalinity (mg/l)	NA	68.8	74.9	80	NA	62	99	98	69	86	78	60	66	68	76	71	NA
Ammonia (mg/l)	NA	0.1 U	0.1 U	0.1 U	NA	0.1 U	0.2 U	0.2 U	NA	0.2 U	0.3	0.1 UL	0.1 UL	NA	NA	0.1 U	NA
Bicarbonate (mg/l)	NA	68.8	74.9	2 U	NA	61.9	99	98	69	86	78	60	66	68	76	71	NA
Biological oxygen demand (mg/l)	NA	2 U	2 U	0.2 U	NA	4.26	2.6	2 U	NA	NA	NA	NA	NA	NA	2 UL	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	3.19	2 U	2 U	27	NA	2 U	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4	NA	NA
Chemical oxygen demand (mg/l)	NA	5 U	18.9	5 U	NA	5 U	5 U	5 U	26	7	5 U	5 U	5 U	5 U	5 U	5.3	NA
Chloride (mg/l)	NA	19.7	19.2	33.7	NA	17.7	20	20	14	19	16	15	16	19	15	20	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.006	0.02 U	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004	0.03 U	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 U	6.2 U	62 U	6.2 U	5.8 U	NA
Hardness (mg/l)	NA	NA	NA	171	NA	201	220	210	258	240	1 U	280	290	310	290	350	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.002 U	0.14	0.01 U	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80 J	50 J	46	43	34 J	NA
Nitrate (mg/l)	10	NA	NA	0.05 U	NA	0.05 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.14 L	0.14 L	0.05 U	0.27	0.05 U	NA
Nitrate/Nitrite (mg/l)	10	1.12	0.62	NA	NA	NA	NA	NA	0.55 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.02 U	0.02 U	0.02 U	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	0.1 U	0.1 U	NA	NA
Oil and Grease (mg/l)	NA	1.7	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	135	115	82.3	NA	88.6	120	130	180	160	150	190	180	230	110	200	NA
Total dissolved solids (TDS) (mg/l)	NA	344	334	237	NA	230	240	250	360	380	290	480	540	400	470	380	NA
Total organic carbon (TOC) (mg/l)	NA	2.4	8.3	10 U	NA	100 U	1.1	1.1	27	0.95	0.99	1 U	1 U	1.2	NA	1.4 B	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	50 U	NA	50 U	0.03 U	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.07	0.05 U	0.05 U	NA
Reactivity (MG/L)																	
No Detections																	

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW17															
Sample ID		AS05-5GW17-R14	AS05-5GW17-R15	AS05-5GW17P-R16	AS05-5GW17-R16	AS05-5GW17-R17	AS05-5GW17PDB-R18	AS05-5GW17-R18	AS05-5GW17RPP-R18	AS05-5GW17P-R19	AS05-5GW17-R19	AS05-5GW17-R20	AS05-5GW17-R21	AS05-5GW17P-R22	AS05-5GW17-R22	AS05-5GW17-R23	AS05-5GW17-R24
Sample Date	**MCLs**	10/24/06	01/24/07	04/19/07	04/19/07	02/01/08	10/12/08	10/21/08	10/21/08	07/09/09	07/09/09	04/21/10	01/15/11	10/11/11	10/11/11	08/22/12	06/11/13
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	200	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	2 U	1 U	1 U	4 U	4 U
1,1-Dichloroethene	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U
1,2,3-Trichlorobenzene	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 UL	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U	5 U	2.5 U	5 U	5 U	5 U	5 U
Benzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.125 U	0.5 U	0.5 U	0.25 U	0.25 U
Carbon disulfide	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U
Chloromethane	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U
cis-1,2-Dichloroethene	70	4.1	4	4	4	2	3 J	3.9 J	NA	3.3	3.3	2.58 J	4.25 J	2.17	2.1	6.44	3.12
cis-1,3-Dichloropropene	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.25 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	700	0.5 U	2.6	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	0.5 R	0.5 U	0.5 R	0.5 R	0.5 UJ	5 U	5 U	NA	1 U	1 U	5 U	1 U	1 U	1 U	2 U	2 U
Methylene chloride	5	0.5 U	0.1 B	0.5 UJ	0.5 UJ	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.346 B	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	0.5 U	0.5 U	0.3 J	5 U	5 U	NA	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	20	20 J	15 J	16	10	13	14	NA	13	12	8.63	14	7.55	7.19	11.8	6.17
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	NA	1 U	1 U	2 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	0.5 U	4.2	0.5 U	0.5 U	0.5 U	15 U	15 U	NA	3 U	3 U	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/L)																	
No Detections																	
Pesticide/Polychlorinated Biphenyls (UG/L)																	
No Detections																	
Herbicides (UG/L)																	
No Detections																	
Explosives (UG/L)																	
No Detections																	
Total Metals (UG/L)																	
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	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	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	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	NA	NA	NA	NA	NA
Copper	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	927	137 B	2,200	1,890	80,300	NA	196 B	100 U	3,990	6,150	448	2,840	15,100 J	10,400 J	628	2,570
Lead	15	NA	NA	NA	NA	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	NA	NA	NA	NA	NA
Manganese	NA	511	360 J	725	756	199	NA	482	17.1 B	547	470	131	193	105	92	1,580	103
Mercury	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	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	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	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	NA	NA	NA	NA	NA
Thallium	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	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	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW17															
Sample ID		AS05-5GW17-R14	AS05-5GW17-R15	AS05-5GW17P-R16	AS05-5GW17-R16	AS05-5GW17-R17	AS05-5GW17PDB-R18	AS05-5GW17-R18	AS05-5GW17RPP-R18	AS05-5GW17P-R19	AS05-5GW17-R19	AS05-5GW17-R20	AS05-5GW17-R21	AS05-5GW17P-R22	AS05-5GW17-R22	AS05-5GW17-R23	AS05-5GW17-R24
Sample Date	**MCLs**	10/24/06	01/24/07	04/19/07	04/19/07	02/01/08	10/12/08	10/21/08	10/21/08	07/09/09	07/09/09	04/21/10	01/15/11	10/11/11	10/11/11	08/22/12	06/11/13
Chemical Name																	
Dissolved Metals (UG/L)																	
Aluminum, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	11.5 U	15.3 U	22.9 J	23.3 J	28.5 B	NA	100 U	NA	81.8 J	242	419	162	15.4 J	17.2 J	119 J	66.8 J
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	522	509 J	696	717	115	NA	492	NA	567	530	262 L	188	39.1	45.6	1,110	92.2
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA																
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardness (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Reactivity (MG/L)																	
No Detections																	

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW18															
Sample ID		AS05-5GW18-R01	AS05-5GW18-R02	AS05-5GW18-R03	AS05-5GW18P-R04	AS05-5GW18-R04	AS05-5GW18-R05	AS05-5GW18P-R06	AS05-5GW18-R06	AS05-5GW18-R07	AS05-5GW18-R08	AS05-5GW18-R09	AS05-5GW18-R10	AS05-5GW18-R11	AS05-5GW18-R12	AS05-5GW18-R13	AS05-5GW18-R14
Sample Date	**MCLs**	03/07/98	10/15/98	01/21/99	10/25/99	10/25/99	08/10/00	04/19/01	04/19/01	02/06/02	10/18/02	07/17/03	04/06/04	01/12/05	10/14/05	08/08/06	10/24/06
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	200	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	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	NA	NA	NA	0.63 B	0.5 U	0.43 J	0.5 U	0.5 UJ	0.5 U
1,1-Dichloroethene	7	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U
1,2-Dichloroethane	5	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	10 U	5 U	5 U	5 U	5 U	5 R	50 R	50 R	5 U	5 U	130 R	5 U	5 U	5 UL	5 U	5 UL
Benzene	5	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	NA	10 U	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	5.1 B	0.5 U	1.5 B	0.5 U	0.5 U	0.12 J
Chloromethane	NA	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.43 B	0.5 UJ	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	NA	17	14	3.2	3	9.9	9.6	11	24	7.7	12	7.7	13	12 J	19	15
cis-1,3-Dichloropropene	NA	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13 R	0.5 U	0.5 U	0.5 UL	0.5 U	0.5 U
Methylene chloride	5	10 U	1 B	2 U	2 U	2 U	2 UJ	2 U	2 U	0.9 B	2 U	0.8 B	0.5 U	0.63 B	0.5 U	0.5 UJ	0.5 U
trans-1,2-Dichloroethene	100	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.35 J	0.5 UJ	0.5 U	0.15 J
Trichloroethene	5	41	70	NA	20	19	77	46	48	44	57 DL	83	56	98	80	12	64
Vinyl chloride	2	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	10 U	1 U	NA	NA	NA	1 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)																	
No Detections																	
Pesticide/Polychlorinated Biphenyls (UG/L)																	
No Detections																	
Herbicides (UG/L)																	
No Detections																	
Explosives (UG/L)																	
No Detections																	
Total Metals (UG/L)																	
Aluminum	NA	343	339	421	362	307	19.2 U	48 B	34.3 B	17.2 U	1,130	336 B	132 B	40.2 B	236	NA	NA
Antimony	6	2.3 U	1.9 U	3 U	5 U	5 U	4.9 B	3.1 U	3.1 U	5 U	4.7 U	2.5 U	4.1 U	2.9 U	5 U	NA	NA
Arsenic	10	2.3 UL	3.6 U	4 U	6 U	6 U	5.5 B	2.5 U	2.5 U	5.1 U	6 J	5 U	3.4 U	3.1 U	2.3 U	NA	NA
Barium	2000	93.6 J	194 B	292	234	250	36 J	25.1 B	26.8 B	76 J	364	36 J	27.3 J	23.6 J	29.6 J	NA	NA
Beryllium	4	0.61 U	0.91 U	1 U	1 U	1 U	0.1 U	0.72 J	0.73 B	0.1 U	0.27 J	0.08 U	0.05 U	0.4 U	0.3 U	NA	NA
Boron	NA	NA	NA	NA	50 U	50 U	50 U	50 R	50 R	13.8 J	3 U	15 L	13.7 J	24	29.1 L	NA	NA
Cadmium	5	0.87 B	0.59 U	1 U	1 U	1 U	0.4 UL	0.4 U	0.4 U	1.7 U	0.4 U	0.4 U	0.3 U	0.2 U	0.3 U	NA	NA
Calcium	NA	83,700	78,500	70,200	58,500	60,900	111,000	106,000	110,000	93,600	85,600	161,000	160,000 J	145,000	133,000	NA	NA
Chromium	100	6.6 U	6.1 U	1.5 B	5.1 B	3.4 B	5.2 B	0.8 U	0.8 U	1.5 B	4.2 J	1.7 B	1.5 J	1.7 J	2.6 J	NA	NA
Cobalt	NA	5.7 U	5 U	1 U	1 U	1 U	1.1 U	1.3 B	1 U	1.3 U	3.1 J	0.7 U	0.9 U	0.8 U	1.4 U	NA	NA
Copper	1300	5.5 U	5 U	14.5 B	41.3 E	32.4 E	1.7 B	3.1 J	0.8 U	1.5 U	9.8 J	0.7 U	0.9 U	1.2 J	1.6 J	NA	NA
Cyanide	200	NA	NA	4 U	5 U	5 U	10 U	11	11	10 U	10 U	10 UJ	10 U	5 U	5 U	NA	NA
Iron	NA	4,430 J	6,380	14,100	12,100	11,900	1,470 J	1,690	1,740	4,280	31,600	574	693	246 B	1,310	33,200	27,300
Lead	15	15 B	2.2 U	3.6	20.3	90.6	2 U	2.5 U	2.5 U	3.3	6	1.9 UL	1.7 U	1.5 U	1.3 U	NA	NA
Magnesium	NA	11,000	11,500	9,510	8,500	8,860	15,600	15,200	15,900	12,900	12,100	24,000	23,900	22,600	21,300	NA	NA
Manganese	NA	548	632	726	444	463	91.8	371	394	448	790	56.5	64.9	20.2	57.1	796	1,070
Mercury	2	0.17 UL	0.13 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Molybdenum	NA	NA	NA	NA	50 U	50 U	10 U	10 R	10 R	10 U	2.2 U	1.1 U	1 U	1.6 U	1.3 U	NA	NA
Nickel	NA	6.8 U	8.8 U	2.8 B	5.4 B	4.2 B	10.5 J	1.7 U	3.3 B	2.1 U	6.5 J	4.8 B	5.4 J	2.7 J	4.4 B	NA	NA
Potassium	NA	858 J	570 B	710 B	636 B	589 B	468 J	457 J	504 J	451 J	774 J	550 J	424 J	445 J	521 J	NA	NA
Selenium	50	3.6 U	2.9 U	4 U	5 U	5 U	2.2 U	3.2 U	3.2 U	4 U	3 U	3.2 R	2.3 UL	2.7 U	2.3 U	NA	NA
Silver	NA	2.8 UL	2.9 B	2 U	1 U	1 U	0.92 B	1.3 U	1.3 U	0.6 U	1.2 L	0.6 U	0.9 U	0.8 U	1.8 U	NA	NA
Sodium	NA	8,100 J	7,370	7,960	7,290 E	7,560 E	9,640	10,200	10,700	8,470	6,200 L	11,700	12,700	14,100	14,500	NA	NA
Thallium	2	1.7 U	3.3 B	3 U	7 U	7 U	2.3 UL	3.9 U	3.9 U	5 U	5.4 U	5.8 UL	5.6 J	5.3 U	3.8 UL	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	5.8 U	5.3 U	1.4 B	2 U	2 U	1 U	34.9 U	34.9 U	0.89 B	2.3 J	0.7 U	1.2 U	0.9 U	2 U	NA	NA
Zinc	NA	21.9 B	12.9 B	27.3	44.3	59.6	30.6	26.7 R	61 R	8.9 B	29.3	5.2 B	3.6 J	8.2 B	8.3 B	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW18															
Sample ID		AS05-5GW18-R01	AS05-5GW18-R02	AS05-5GW18-R03	AS05-5GW18P-R04	AS05-5GW18-R04	AS05-5GW18-R05	AS05-5GW18P-R06	AS05-5GW18-R06	AS05-5GW18-R07	AS05-5GW18-R08	AS05-5GW18-R09	AS05-5GW18-R10	AS05-5GW18-R11	AS05-5GW18-R12	AS05-5GW18-R13	AS05-5GW18-R14
Sample Date	**MCLs**	03/07/98	10/15/98	01/21/99	10/25/99	10/25/99	08/10/00	04/19/01	04/19/01	02/06/02	10/18/02	07/17/03	04/06/04	01/12/05	10/14/05	08/08/06	10/24/06
Chemical Name																	
Dissolved Metals (UG/L)																	
Aluminum, Dissolved	NA	48.1 B	415	22.5 B	35 B	NA	19.2 U	48 B	34.3 B	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	4 J	1.9 U	3 U	5 U	NA	4.9 U	3.1 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	2.3 UL	3.6 U	4 U	6 U	NA	4.1 B	2.5 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	93.6 J	159 B	273	66 B	NA	33.3 J	25.1 B	26.8 B	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	0.61 U	0.91 U	1 U	1 U	NA	0.1 U	0.72 J	0.73 B	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	50 U	50 R	50 R	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	0.64 B	0.59 U	1 U	1 U	NA	0.4 UL	0.4 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	90,900	90,600	82,300	57,600	NA	122,000	106,000	110,000	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	6.6 U	6.1 U	1 U	1 U	NA	2.7 B	0.8 U	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	5.7 B	5 U	1 U	1 U	NA	1.1 U	1.3 B	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	5.5 U	7.2 B	8.5 B	19.2 J	NA	0.7 U	3.1 J	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	3,570 J	4,410	8,940	16 U	NA	495	1,690	1,740	NA	NA	NA	NA	NA	NA	32,400	19,900
Lead, Dissolved	15	10.1 B	2.2 U	1 U	2 U	NA	2 U	2.5 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	12,300	13,400	11,200	14,600	NA	17,100	15,200	15,900	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	592	714	967	412	NA	99.7	371	394	NA	NA	NA	NA	NA	NA	776	1,070
Mercury, Dissolved	2	0.17 UL	0.13 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	7.9 J	8.8 U	1.3 B	7 B	NA	6.4 B	1.7 U	3.3 B	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	640 B	355 B	682 B	753 B	NA	578 J	457 J	504 J	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	8,700	8,340	9,620	10,500 E	NA	11,700	10,200	10,700	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	1.7 U	4.7 B	3 U	7 U	NA	2.3 UL	3.9 U	3.9 U	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	17.7 B	21	26.5	22.1	NA	17.3 J	26.7 R	61 R	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Alkalinity (mg/l)	NA	139	157	168	128	128	120	130	130	160	170	160	150	150	180	NA	NA
Ammonia (mg/l)	NA	0.13	0.42	0.1 U	0.1 U	0.1 U	0.2 U	NA	NA	0.2 U	0.7	0.1 UL	NA	NA	0.1 U	NA	NA
Bicarbonate (mg/l)	NA	139	157	2 U	127	127	120	130	130	160	170	160	150	150	180	NA	NA
Biological oxygen demand (mg/l)	NA	8.7	2 U	0.2 U	4.92	4.74	2 U	NA	NA	NA	NA	NA	NA	7.3	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	2	2 U	2 U	2.47	2 U	2.1	NA	3.2	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	11.6	6	5 U	5 U	5 U	5 U	18	23	5 U	5 U	5 U	5 U	5 J	5.3	NA	NA
Chloride (mg/l)	NA	9.2	9.6	12.4	5 U	5 U	21	16	16	23	11	23	21	20	16	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.004 U	0.02 U	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA																
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.011	0.03 U	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U	6.2 U	6.2 U	5.8 U	NA	NA
Hardness (mg/l)	NA	NA	NA	213	179	186	340	330	340	290	260	500	560	470	490	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.02 U	0.02 U	0.8	0.16	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19 J	11	14	38 J	NA	NA
Nitrate (mg/l)	10	NA	NA	0.05 U	0.25	0.05 U	0.5 U	NA	NA	0.5 U	0.5 U	0.35 L	0.46	0.22	0.28	NA	NA
Nitrate/Nitrite (mg/l)	10	0.18	0.14	NA	NA	NA	NA	0.55 U	0.55 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA	0.05 U	0.2	0.1 U	0.02 U	0.02 U	0.02 U	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.2 U	0.2 U	NA	NA	NA	0.1 U	0.1 U	NA	NA	NA
Oil and Grease (mg/l)	NA	3	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	140	64.8	86.9	47.3	27.6	250	220	200	160	190	280	370	170	43	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	332	280	261	210	210	370	380	390	390	260	760	640	660	460	NA	NA
Total organic carbon (TOC) (mg/l)	NA	2.5	31.9	10 U	100 U	100 U	1.3	1.2	1.2	0.89	2.52	1 U	1.3	NA	1.6 B	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	50 U	643	50 U	0.03 U	0.025 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA
Reactivity (MG/L)																	
No Detections																	

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW18										
Sample ID		AS05-5GW18-R15	AS05-5GW18-R16	AS05-5GW18-R17	AS05-5GW18PDB-R18	05-5GW18RPP-	AS05-5GW18P-R18	AS05-5GW18-R18	AS05-5GW18-R19	AS05-5GW18P-R20	AS05-5GW18-R20	AS05-5GW18-R21
Sample Date	**MCLs**	01/24/07	04/20/07	02/01/08	10/21/08	10/21/08	10/22/08	10/22/08	07/09/09	04/21/10	04/21/10	01/15/11
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	200	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.25 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	2 U
1,1-Dichloroethene	7	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.5 U
1,2,3-Trichlorobenzene	NA	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.25 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 U	5 U	5 U	5 U	NA	5 U	5 U	5 U	5 U	5 U	2.5 U
Benzene	5	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.125 U
Carbon disulfide	NA	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.5 U
Chloromethane	NA	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.636 J
cis-1,2-Dichloroethene	70	17 K	13	11	7.6	NA	9.7	9.9	6.6	4.72 J	4.79 J	7.38
cis-1,3-Dichloropropene	NA	0.5 U	0.5 U	0.5 UJ	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.25 U
Dichlorodifluoromethane (Freon-12)	NA	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.25 U
Ethylbenzene	700	0.5 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U	0.25 U
Methyl acetate	NA	0.5 U	5 J	0.5 UJ	5 U	NA	5 U	5 U	1 U	5 U	5 U	1 U
Methylene chloride	5	0.11 B	0.5 UJ	0.5 U	5 U	NA	5 U	5 U	1 U	0.671 B	0.442 B	0.561 B
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	0.3 J	0.77 J	NA	5 U	5 U	0.31 J	5 U	5 U	0.899 J
Trichloroethene	5	34 J	32	39	11	NA	15	15	35	38.2	38.2	33.1
Vinyl chloride	2	0.5 U	1	3	2.8 J	NA	2.4 J	2.4 J	0.55 J	2 U	2 U	1.14 J
Xylene, total	10000	0.5 U	0.5 U	0.5 U	15 U	NA	15 U	15 U	3 U	NA	NA	NA
Semivolatile Organic Compounds (UG/L)												
No Detections												
Pesticide/Polychlorinated Biphenyls (UG/L)												
No Detections												
Herbicides (UG/L)												
No Detections												
Explosives (UG/L)												
No Detections												
Total Metals (UG/L)												
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	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	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	10,400	14,000	20,700	NA	10,200	12,200	12,400	5,400	165 J	123 J	3,440
Lead	15	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	491	487	383	NA	330	412	414	175	22.7 B	23.6 B	348
Mercury	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	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	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	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	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	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

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW18										
Sample ID		AS05-5GW18-R15	AS05-5GW18-R16	AS05-5GW18-R17	AS05-5GW18PDB-R18	05-5GW18RPP-	AS05-5GW18P-R18	AS05-5GW18-R18	AS05-5GW18-R19	AS05-5GW18P-R20	AS05-5GW18-R20	AS05-5GW18-R21
Sample Date	**MCLs**	01/24/07	04/20/07	02/01/08	10/21/08	10/21/08	10/22/08	10/22/08	07/09/09	04/21/10	04/21/10	01/15/11
Chemical Name												
Dissolved Metals (UG/L)												
Aluminum, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	10,900	9,630	11,300	NA	NA	12,100	12,700	1,670	104	68.5 J	2,930
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	506	492	471	NA	NA	413	426	141	22.5 B	23.2 B	340
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA											
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardness (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Reactivity (MG/L)												
No Detections												

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

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R - Unreliable Result

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UJ - Analyte not detected, quantitation limit may be inaccurate

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MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW18					5GW19									
Sample ID		AS05-5GW18-R22	AS05-5GW18P-R23	AS05-5GW18-R23	AS05-5GW18P-R24	AS05-5GW18-R24	AS05-5GW19-R05	AS05-5GW19-R06	AS05-5GW19-R07	AS05-5GW19-R08	AS05-5GW19-R09	AS05-5GW19-R10	AS05-5GW19-R11	AS05-5GW19-R12	AS05-5GW19-R16	AS05-5GW19-R23
Sample Date	**MCLs**	10/11/11	08/21/12	08/21/12	06/11/13	06/11/13	08/09/00	04/05/01	02/04/02	10/15/02	07/16/03	04/01/04	01/10/05	10/13/05	04/19/07	08/22/12
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,1-Trichloroethane	200	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	1 U	4 U	4 U	4 U	4 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U
1,1-Dichloroethene	7	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 R	5 U	5 U	5 R	5 U	5 U	5 UL	5 U	5 U
Benzene	5	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 U
Carbon disulfide	NA	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	4.8 B	0.5 U	1.9 B	0.5 U	0.5 U	1 U
Chloromethane	NA	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.41 B	0.5 UJ	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	70	5.38	6.42	6.35	4.08	3.86	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	1 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	1 U	2 U	2 U	2 U	2 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 R	2 U
Methylene chloride	5	1 U	0.5 U	0.5 U	0.5 U	0.5 U	4.1	0.7 B	0.7 B	2 U	0.5 B	0.72 B	0.5 UJ	0.5 U	0.5 UJ	0.5 U
trans-1,2-Dichloroethene	100	1	0.996 J	0.973 J	0.56 J	0.581 J	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	28.9	34.2	36.9	34.4	34.8	1 U	1 U	2	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	2	0.885 J	0.718 J	0.74 J	0.541 J	0.478 J	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	NA	NA	NA	NA	NA	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
Semivolatile Organic Compounds (UG/L)																
No Detections																
Pesticide/Polychlorinated Biphenyls (UG/L)																
No Detections																
Herbicides (UG/L)																
No Detections																
Explosives (UG/L)																
No Detections																
Total Metals (UG/L)																
Aluminum	NA	NA	NA	NA	NA	NA	16,300	NA	447	4,600	4,850	11,200	5,630 K	3,110	NA	NA
Antimony	6	NA	NA	NA	NA	NA	4.9 U	NA	5 U	4.7 U	2.5 U	4.1 U	2.9 U	5 U	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	7.4 B	NA	5.1 U	2.8 U	5 U	5.4 J	3.1 U	2.3 U	NA	NA
Barium	2000	NA	NA	NA	NA	NA	366	NA	101 J	228	157 J	283	156 J	111 J	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	1.1 J	NA	0.1 U	0.47 B	0.097 B	0.28 J	0.4 U	0.3 U	NA	NA
Boron	NA	NA	NA	NA	NA	NA	50 U	NA	17.5 J	26.9 J	16.5 L	22 B	14.6 J	13.9 J	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	0.4 UL	NA	1.7 U	0.4 U	0.4 U	0.35 J	0.2 U	0.3 U	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	31,400	NA	25,900	32,400	47,000	66,200	43,800	42,300	NA	NA
Chromium	100	NA	NA	NA	NA	NA	33.8	NA	3 J	52.8	9.5 J	19.7	8.2 J	4.6 B	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	41.4 J	NA	1.3 U	12.8 J	4.8 J	14 J	5.4 B	3.1 J	NA	NA
Copper	1300	NA	NA	NA	NA	NA	37.2	NA	1.5 U	39.8 *	5.8 B	13.2 J	5.2 J	2.6 B	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	10 U	1	10 U	10 U	10 UJ	10 U	5 U	5 U	NA	NA
Iron	NA	2,760	3,520 J	2,770 J	447	550	28,500 J	NA	730	7,420	4,410	12,400	4,640 J	2,380	77.2 J	2,780
Lead	15	NA	NA	NA	NA	NA	29.9	NA	2.9 U	12.3	2.7 J	11.3	3.7	1.4 J	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	8,710	NA	5,780	7,680	9,500	12,600	9,320	9,860	NA	NA
Manganese	NA	184	135	130	33.6	43.1	2,900	NA	145	1,710	520	1,580	649	319	288	459
Mercury	2	NA	NA	NA	NA	NA	0.21 B	NA	0.2 U	0.2 U	0.1 U	0.11 J	0.1 U	0.1 U	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	10 U	NA	10 U	5.5 J	1.1 U	1.7 J	1.4 U	1.3 U	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	61.2	NA	3 J	55.4	13.6 J	35.1 J	12.6 J	7.5 B	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	2,840 J	NA	548 J	1,330 J	1,820 J	2,970 J	1,980 J	1,490 J	NA	NA
Selenium	50	NA	NA	NA	NA	NA	2.2 U	NA	4 U	4.1 L	3.2 U	2.3 U	2.7 U	2.3 U	NA	NA
Silver	NA	NA	NA	NA	NA	NA	0.84 B	NA	0.6 U	1 UL	0.6 U	0.9 U	0.8 U	1.8 U	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	3,470 B	NA	3,320 J	3,960 J	4,420 J	3,580 J	3,810 J	4,840 J	NA	NA
Thallium	2	NA	NA	NA	NA	NA	2.3 UL	NA	5 U	5.4 U	5.8 UL	4.1 U	5.3 U	3.8 UL	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	32.9 J	NA	0.89 J	9.4 J	8.9 J	21.3 J	9.5 J	5.1 J	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	150	NA	34.2 B	108 J	19.5 B	55.9	23.2	16.2 J	NA	NA
Dissolved Metals (UG/L)																
Aluminum, Dissolved	NA	NA	NA	NA	NA	NA	19.2 U	58.1 B	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	NA	NA	NA	NA	6.2 B	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	3.8 U	3.4 K	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	NA	NA	NA	NA	75.6 J	78.5 J	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	NA	NA	NA	NA	0.1 U	0.21 B	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	50 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW18					5GW19									
Sample ID		AS05-5GW18-R22	AS05-5GW18P-R23	AS05-5GW18-R23	AS05-5GW18P-R24	AS05-5GW18-R24	AS05-5GW19-R05	AS05-5GW19-R06	AS05-5GW19-R07	AS05-5GW19-R08	AS05-5GW19-R09	AS05-5GW19-R10	AS05-5GW19-R11	AS05-5GW19-R12	AS05-5GW19-R16	AS05-5GW19-R23
Sample Date	**MCLs**	10/11/11	08/21/12	08/21/12	06/11/13	06/11/13	08/09/00	04/05/01	02/04/02	10/15/02	07/16/03	04/01/04	01/10/05	10/13/05	04/19/07	08/22/12
Chemical Name																
Cadmium, Dissolved	5	NA	NA	NA	NA	NA	0.4 UL	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA	NA	NA	26,900	29,200	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	1.7 B	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA	NA	NA	1.1 B	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	NA	NA	NA	NA	0.7 U	1.8 J	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	876	1,170	1,130	127 J	61.6 J	15.9 U	41.5 J	NA	NA	NA	NA	NA	NA	16.7 J	100 U
Lead, Dissolved	15	NA	NA	NA	NA	NA	2 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA	NA	NA	5,800	5,990	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	141	122	123	28.5	27	117	13.4 J	NA	NA	NA	NA	NA	NA	2.7 J	26.6
Mercury, Dissolved	2	NA	NA	NA	NA	NA	0.1 U	0.2 UL	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA	NA	NA	8.3 B	2.4 J	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA	NA	NA	637 J	585 J	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA	NA	NA	3,940 B	3,540 J	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	NA	NA	NA	NA	2.3 UL	5.8 K	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA	NA	NA	14.5 B	35 B	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	43	45	46	48	48	57	460	52	NA	NA
Ammonia (mg/l)	NA	NA	NA	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	NA	NA	0.62 B	NA	NA
Bicarbonate (mg/l)	NA	NA	NA	NA	NA	NA	43	45	46	48	48	57	460	52	NA	NA
Biological oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	2 U	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	6.69	2 U	2 U	NA	2 U	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	5 U	56	5 U	8	5 U	5 U	5 J	5 U	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	NA	4	3.5	5	5	4.9	6.5	4.7	6	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.005	0.02 U	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.03 U	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.2 U	6.2 U	6.2 U	5.8 U	NA	NA
Hardness (mg/l)	NA	NA	NA	NA	NA	NA	110	100	88	110	160	180	150	170	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	0.002 U	0.014	0.01 U	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	53 J	3.3 U	4.6	3.3 U	NA	NA
Nitrate (mg/l)	10	NA	NA	NA	NA	NA	0.58	NA	0.5 U	0.6	0.59 L	0.99	1.1	0.77 B	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	NA	NA	NA	NA	NA	0.88	NA	0.7	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	NA	NA	NA	0.05	NA	0.05 U	0.11	0.1 U	0.02 U	0.02 U	0.02 U	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	NA	NA	NA	51	450	98	95	120	100	90	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	NA	NA	NA	NA	NA	100	170 L	210	740	330	130	220 J	190	NA	NA
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	NA	NA	1 U	10	1.3	0.84	2.6	1 U	NA	1 U	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	NA	NA	NA	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA
Reactivity (MG/L)																
No Detections																

Notes:

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW20										5GW21							
Sample ID		AS05-5GW20-R05	AS05-5GW20-R06	AS05-5GW20-R07	AS05-5GW20-R08	AS05-5GW20-R09	AS05-5GW20-R10	AS05-5GW20-R11	AS05-5GW20-R12	AS05-5GW20-R16	AS05-5GW20-R23	AS05-5GW21-R05	AS05-5GW21-R06	AS05-5GW21-R07	AS05-5GW21-R08	AS05-5GW21P-R09	AS05-5GW21-R09	AS05-5GW21-R10	AS05-5GW21-R11
Sample Date	**MCLs**	08/09/00	04/04/01	02/06/02	10/18/02	07/17/03	04/06/04	01/12/05	10/14/05	04/20/07	08/22/12	08/08/00	04/04/01	02/04/02	10/15/02	07/16/03	07/16/03	04/05/04	01/12/05
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
1,1,1-Trichloroethane	200	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	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	0.92 B	0.5 U	0.5 U	0.5 U	0.5 U	4 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	7	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 UJ	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 U	5 R	5 U	5 U	25 R	5 U	5 U	5 UL	5 U	5 U	5 R	5 R	5 U	5 U	5 R	5 R	5 U	5 U
Benzene	5	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	NA	1 U	1 U	1 U	1 U	3.8 B	0.5 U	0.5 UJ	0.5 U	0.5 U	1 U	1 UJ	1 U	1 U	1 U	3.2 B	2.1 B	0.5 U	0.5 UJ
Chloromethane	NA	1 U	1 U	1 U	1 U	0.5 U	0.37 B	0.5 UJ	0.5 U	0.5 U	1 U	1 UJ	1 U	1 U	1 U	0.5 U	0.5 U	0.43 B	0.5 UJ
cis-1,2-Dichloroethene	70	0.7 J	0.9 J	2.3	0.85 J	3.8	3.1	2.5	2.2	1	0.393 J	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	NA	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	2.5 R	0.5 U	0.5 U	0.5 UL	0.5 R	2 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	5	3.6	0.6 B	0.6 B	2 U	1.1 B	0.5 U	0.63 B	0.5 U	0.5 UJ	0.5 U	1.9 B	0.6 B	0.9 B	2 U	0.61 B	1 B	0.79 B	0.54 B
trans-1,2-Dichloroethene	100	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	3.6	14	28	15	32	30	24	24	14	12.1	1 U	1 U	4.7	1 U	0.6	0.61	0.5 U	0.32 B
Vinyl chloride	2	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)																			
No Detections																			
Pesticide/Polychlorinated Biphenyls (UG/L)																			
No Detections																			
Herbicides (UG/L)																			
No Detections																			
Explosives (UG/L)																			
No Detections																			
Total Metals (UG/L)																			
Aluminum	NA	7,090	NA	185 J	2,080	1,300	471 K	232 B	4,060	NA	NA	1,930	NA	88.8 B	242	755	916	162 B	510 B
Antimony	6	5.7 B	NA	5 U	4.7 U	2.5 U	4.1 U	2.9 U	5 U	NA	NA	4.9 U	NA	5 U	4.7 U	2.5 U	2.5 U	4.1 U	2.9 U
Arsenic	10	4.8 B	NA	5.1 U	4.2 J	5 U	3.4 U	3.1 U	2.3 U	NA	NA	6.4 B	NA	5.1 U	2.8 U	5 U	5 U	3.4 U	3.1 U
Barium	2000	185 J	NA	103 J	153 J	109 J	110 J	114 J	186 J	NA	NA	117 J	NA	102 J	110 J	100 J	97.2 J	85.3 J	105 J
Beryllium	4	0.54 J	NA	0.1 U	0.18 J	0.08 U	0.05 U	0.4 U	0.3 U	NA	NA	0.24 B	NA	0.1 U	0.17 B	0.08 U	0.08 U	0.05 U	0.4 U
Boron	NA	50 U	NA	27.7 J	3 U	15 UL	11.8 J	11.2 J	7.8 J	NA	NA	NA	NA	17.5 J	44.8 J	25 K	24.9 L	23.3 B	20.7
Cadmium	5	0.4 UL	NA	1.7 U	0.4 U	0.4 U	0.3 U	0.2 U	0.3 U	NA	NA	0.4 U	NA	1.7 U	0.4 U	0.4 U	0.4 U	0.3 U	0.2 U
Calcium	NA	42,900	NA	58,100	62,200	64,200	67,300 J	68,200	67,900	NA	NA	55,000	NA	68,300	70,300	63,900	62,800	64,800	74,100
Chromium	100	15.9	NA	2.6 B	3.4 J	3.6 J	1.8 J	1.5 J	7 J	NA	NA	6.3 B	NA	3.2 J	0.6 U	14.2	6 J	0.91 B	1.2 J
Cobalt	NA	15.2 J	NA	1.3 U	5.5 J	0.7 U	1 J	0.8 U	4.4 J	NA	NA	2.5 B	NA	1.3 U	0.6 U	0.7 U	0.7 U	1 J	0.98 B
Copper	1300	15 J	NA	1.5 U	8.7 J	2 B	0.9 U	1.8 J	5.4 J	NA	NA	7.7 B	NA	1.5 U	2.8 J	1.9 B	1.6 B	1.3 J	0.82 J
Cyanide	200	10 U	1	10 U	10 U	10 UJ	10 U	5 U	5 U	NA	NA	10 U	1	20	10 U	10 UJ	10 UJ	10 U	5 U
Iron	NA	14,500 J	NA	218	3,870	475	468	256 B	4,470	236	4,090	6,030 J	NA	239	440	1,270	1,110	288	926 J
Lead	15	10.2	NA	2.9 U	4.5	1.9 UL	1.7 U	1.5 U	3.1	NA	NA	4.9 B	NA	2.9 U	2.2 J	1.9 UL	1.9 UL	1.7 U	1.5 U
Magnesium	NA	10,200	NA	7,760	8,990	8,950	9,270	9,500	10,600	NA	NA	6,970	NA	8,090	8,420	7,580	7,610	7,530	8,720
Manganese	NA	672	NA	19	254	13.1 J	18.1	8.3 J	199	33.6	111	108	NA	18.8	22.1	26.9	28.6	29	26
Mercury	2	0.1 U	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA	0.1 U	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U
Molybdenum	NA	10 U	NA	10 U	2.2 U	1.1 U	1 U	1.6 U	1.3 U	NA	NA	NA	NA	10 U	2.2 U	1.8 J	1.1 U	1 U	1.6 U
Nickel	NA	27.2 J	NA	2.1 U	8.4 J	4.5 B	5.1 J	3.9 J	8.9 J	NA	NA	13.8 B	NA	2.1 U	8.2 J	10.4 J	5.4 J	2.2 B	1.7 J
Potassium	NA	2,160 J	NA	347 J	891 J	424 J	417 J	427 J	1,530 J	NA	NA	866 J	NA	173 J	282 J	331 J	314 J	192 J	322 J
Selenium	50	2.2 U	NA	4 U	3 U	3.2 R	2.3 UL	2.7 U	2.3 U	NA	NA	2.5 B	NA	4 U	3.4 L	3.2 U	3.2 U	2.3 U	2.7 U
Silver	NA	0.6 U	NA	0.6 U	1 UL	0.6 U	0.9 U	0.8 U	1.8 U	NA	NA	0.6 U	NA	0.6 U	1.4 L	0.6 U	0.6 U	0.9 U	0.8 U
Sodium	NA	4,480 B	NA	6,380	3,970 J	6,030 K	5,980	5,760	6,350	NA	NA	7,000	NA	6,710	7,140	6,170 K	6,060 K	5,470	8,140
Thallium	2	2.3 UL	NA	5 U	5.4 U	5.8 UL	6.5 J	5.3 U	3.8 UL	NA	NA	3.5 B	NA	5 U	5.4 U	5.8 UL	5.8 UL	4.1 U	5.3 U
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	12.4 J	NA	1.1 B	2.9 J	0.73 B	1.2 U	0.9 U	6.1 J	NA	NA	4.6 B	NA	0.8 U	1.2 J	1.4 B	1.3 B	1.2 U	0.99 J
Zinc	NA	72.4	NA	12.5 B	32.7	19.6 J	1.9 J	6.5 B	17.6 J	NA	NA	43.5	NA	28.1 B	45.6 J	8.1 B	9.8 B	8.9 B	4.8 B
Dissolved Metals (UG/L)																			
Aluminum, Dissolved	NA	19.2 U	259	NA	NA	NA	NA	NA	NA	NA	NA	19.2 U	49.7 B	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	3.8 U	2.6 K	NA	NA	NA	NA	NA	NA	NA	NA	7.7 B	2.5 U	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	82.9 J	92.6 J	NA	NA	NA	NA	NA	NA	NA	NA	89.4 J	106 J	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	0.1 U	0.26 B	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.28 B	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	50 U	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	50 U	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW20										5GW21							
Sample ID		AS05-5GW20-R05	AS05-5GW20-R06	AS05-5GW20-R07	AS05-5GW20-R08	AS05-5GW20-R09	AS05-5GW20-R10	AS05-5GW20-R11	AS05-5GW20-R12	AS05-5GW20-R16	AS05-5GW20-R23	AS05-5GW21-R05	AS05-5GW21-R06	AS05-5GW21-R07	AS05-5GW21-R08	AS05-5GW21P-R09	AS05-5GW21-R09	AS05-5GW21-R10	AS05-5GW21-R11
Sample Date	**MCLs**	08/09/00	04/04/01	02/06/02	10/18/02	07/17/03	04/06/04	01/12/05	10/14/05	04/20/07	08/22/12	08/08/00	04/04/01	02/04/02	10/15/02	07/16/03	07/16/03	04/05/04	01/12/05
Chemical Name																			
Cadmium, Dissolved	5	0.4 UL	0.58 B	NA	NA	NA	NA	NA	NA	NA	NA	0.4 U	0.56 B	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	38,200	51,000	NA	NA	NA	NA	NA	NA	NA	NA	61,800	67,200	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	2.2 B	4.6 J	NA	NA	NA	NA	NA	NA	NA	NA	0.8 B	1 J	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	1.8 B	1	NA	NA	NA	NA	NA	NA	NA	NA	1.1 U	1.6 J	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	0.7 U	4.7 B	NA	NA	NA	NA	NA	NA	NA	NA	0.7 UL	3.2 J	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	15.9 U	455	NA	NA	NA	NA	NA	NA	5.2 U	63.9 J	15.9 U	79.5 J	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	2 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2.5 U	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	8,480	6,680	NA	NA	NA	NA	NA	NA	NA	NA	7,430	8,340	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	46.6	29.7	NA	NA	NA	NA	NA	NA	0.57 U	2.96 J	24.7	18.2	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	0.1 U	0.2 UL	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.2 UL	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	6.2 B	6.1 J	NA	NA	NA	NA	NA	NA	NA	NA	4 B	3.6 J	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	853 J	388 J	NA	NA	NA	NA	NA	NA	NA	NA	256 B	277 J	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	5,320	5,170	NA	NA	NA	NA	NA	NA	NA	NA	7,870	9,150	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	2.3 U	4.7 K	NA	NA	NA	NA	NA	NA	NA	NA	2.3 UL	4.1 K	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	11.3 B	34 B	NA	NA	NA	NA	NA	NA	NA	NA	21	44.9	NA	NA	NA	NA	NA	NA
Wet Chemistry																			
Alkalinity (mg/l)	NA	74	63	70	88	91	84	67	94	NA	NA	100	110	100	110	90	89	88	87
Ammonia (mg/l)	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.1 UL	NA	NA	0.1 U	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.1 U	NA	NA
Bicarbonate (mg/l)	NA	74	63	70	88	91	84	66	94	NA	NA	100	110	100	110	90	89	88	87
Biological oxygen demand (mg/l)	NA	3.9	NA	NA	NA	NA	NA	2 UL	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	2 UL
BOD-5day (total) (mg/l)	NA	NA	2 U	2 U	28	2.9	24	NA	2 U	NA	NA	NA	2 U	2 U	3.65	2 U	2 U	2.8	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Chemical oxygen demand (mg/l)	NA	5 U	30	5 U	62	5 U	5 U	5 U	5 U	NA	NA	5 U	33	5 U	5 U	5 U	5 U	5 U	5 U
Chloride (mg/l)	NA	12	7.7	13	7	9.6	6	8.3	8.6	NA	NA	28	28	34	27	14	14	27 B	24
Ethane (mg/l)	NA	NA	0.004 U	0.004 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.02 U	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	NA	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA	1 U	NA	NA	NA	5.8 U	5.8 U	5.8 U	5.8 U
Ethene (mg/l)	NA	NA	0.004 U	0.004 U	0.03 U	NA	NA	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.03 U	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	6.2 U	6.2 U	6.2 U	5.8 U	NA	NA	1 U	NA	NA	NA	6.2 U	6.2 U	6.2 U	6.2 U
Hardness (mg/l)	NA	150	160	180	190	200	200	210	250	NA	NA	170	200	200	210	190	190	170	220
Methane (mg/l)	NA	NA	0.002 U	0.002 U	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.002 U	0.002 U	0.01 U	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	4.7 B	3.3 U	3.3 U	3.3 U	NA	NA	1 U	NA	NA	NA	4.5 B	10 B	3.3 U	3.3 U
Nitrate (mg/l)	10	0.51	NA	0.5 U	2.9	1.1 L	0.92	1.9	0.81	NA	NA	0.5 U	NA	0.5 U	0.5 U	0.1 UL	0.1 UL	0.06	0.06
Nitrate/Nitrite (mg/l)	10	NA	0.61	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.55 U	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	0.05 U	NA	0.05 U	0.05 U	0.1 U	0.02 U	0.02 U	0.02 U	NA	NA	0.09	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.02 U	0.02 U
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	110	96	82	92	100	77	55	NA	NA	62	75	80	39	84	85	89	69
Total dissolved solids (TDS) (mg/l)	NA	150	200 L	280	200	320	260	320	240	NA	NA	210	260 L	1,300	290	170	290	210	330
Total organic carbon (TOC) (mg/l)	NA	1 U	1 U	0.8	0.97	1 U	1 U	NA	1 U	NA	NA	1 U	1.3	1.2	0.46	1.1	1 U	1 U	NA
Total recoverable phenolics (mg/l)	NA	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U
Reactivity (MG/L)																			
No Detections																			

Notes:

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW21			5GW22											
Sample ID		AS05-5GW21-R12	AS05-5GW21-R16	AS05-5GW21-R23	AS05-5GW22-R05	AS05-5GW22-R06	AS05-5GW22P-R07	AS05-5GW22-R07	AS05-5GW22-R08	AS05-5GW22-R09	AS05-5GW22P-R10	AS05-5GW22-R10	AS05-5GW22-R11	AS05-5GW22-R12	AS05-5GW22-R16	AS05-5GW22-R23
Sample Date	MCLs	10/14/05	04/20/07	08/22/12	08/08/00	04/19/01	02/07/02	02/07/02	10/21/02	07/18/03	04/07/04	04/07/04	01/13/05	10/26/05	04/20/07	08/22/12
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,1-Trichloroethane	200	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.28 J	0.5 U	0.2 J	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	0.5 U	0.5 U	4 U	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U
1,1-Dichloroethene	7	0.5 U	0.5 U	1 U	1 UJ	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U
1,2,3-Trichlorobenzene	NA	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 UL	5 U	5 U	5 R	50 R	5 U	5 U	5 U	130 R	50 R	50 R	5 U	5 UL	5 U	5 U
Benzene	5	0.5 U	0.5 U	0.25 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 U
Carbon disulfide	NA	0.5 U	0.5 U	1 U	1 UJ	1 U	1 U	1 U	1 U	2.5 B	0.5 U	0.5 U	0.5 UJ	2 B	0.5 U	1 U
Chloromethane	NA	0.5 U	0.5 U	1 U	1 UJ	1 U	1 U	1 U	1 U	0.5 U	0.47 B	0.57 B	0.5 UJ	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	70	0.5 UL	0.5 U	0.5 U	13	14	20	20	14	13	9.2	9.4	21 B	18	9	2.48
cis-1,3-Dichloropropene	NA	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	0.5 UL	0.5 R	2 U	NA	NA	NA	NA	NA	13 R	0.5 U	0.5 U	0.5 U	0.5 UL	2 R	2 U
Methylene chloride	5	0.5 U	0.5 UJ	0.5 U	1.6 B	2 U	0.6 B	0.5 B	2 U	0.88 B	0.5 U	0.5 U	0.66 B	0.5 U	0.5 UJ	0.5 U
trans-1,2-Dichloroethene	100	0.5 UL	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.35 J	0.5 U	0.57	0.5 U	0.5 U	0.5 U
Trichloroethene	5	0.63 B	0.2 J	0.389 J	82	96	150	130	120	130	93	93	120	110 J	71	47.1
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10000	0.5 U	0.5 U	NA	1 U	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
Semivolatile Organic Compounds (UG/L)																
No Detections																
Pesticide/Polychlorinated Biphenyls (UG/L)																
No Detections																
Herbicides (UG/L)																
No Detections																
Explosives (UG/L)																
No Detections																
Total Metals (UG/L)																
Aluminum	NA	1,880	NA	NA	6,060	52.6 J	567	360	12,300	2,110	1,760 K	1,160 K	2,280 K	3,720 J	NA	NA
Antimony	6	5 U	NA	NA	4.9 U	3.1 U	5 U	5.3 J	4.7 U	2.5 U	4.1 U	4.1 U	2.9 U	5 U	NA	NA
Arsenic	10	2.3 U	NA	NA	3.8 U	2.5 U	5.1 U	5.1 U	15.5	5 U	3.4 U	3.4 U	3.1 U	2.3 UL	NA	NA
Barium	2000	122 J	NA	NA	233	110 J	107 J	89.5 J	2,650	269	201	209	379	601	NA	NA
Beryllium	4	0.3 U	NA	NA	0.5 B	0.75 B	0.1 U	0.1 U	1.3 J	0.08 U	0.05 U	0.05 U	0.4 U	0.3 U	NA	NA
Boron	NA	16.8 L	NA	NA	NA	50 U	10 U	10 U	3 U	18.1 L	15.3	14.4 J	14.4 J	13.7 J	NA	NA
Cadmium	5	0.3 U	NA	NA	0.4 U	0.4 U	1.7 U	1.7 U	0.84 J	0.4 U	0.3 U	0.3 U	0.2 U	0.3 U	NA	NA
Calcium	NA	67,400	NA	NA	44,800	64,000	62,100	55,900	72,300	60,200	119,000 J	65,500 J	82,900	82,900	NA	NA
Chromium	100	4.2 J	NA	NA	12.2 B	0.8 U	5.1 B	4.4 B	31.3	5.9 B	5.2 B	3.5 B	2.7 J	11.4	NA	NA
Cobalt	NA	2.9 J	NA	NA	27 J	1 U	2.9 J	2.7 J	62.6	2.1 J	1.8 J	1.8 J	2.7 J	7.8 J	NA	NA
Copper	1300	2.9 J	NA	NA	7.5 B	0.8 U	1.5 U	1.5 U	35.8	2.5 B	2.3 J	0.9 U	1.8 J	4.8 B	NA	NA
Cyanide	200	5 U	NA	NA	10 U	11	10 U	10 U	10 U	10 UJ	10 U	10 U	5 U	5 U	NA	NA
Iron	NA	3,760	1,090	3,270	11,900 J	14.7 U	1,130	668	29,700	1,970	2,420 B	2,490 B	2,270 J	5,720	1,610	2,190
Lead	15	1.3 U	NA	NA	14	2.5 U	2.9 U	2.9 U	47.1	1.9 UL	1.7 U	1.7 U	1.5 U	3.3 B	NA	NA
Magnesium	NA	8,120	NA	NA	7,030	8,670	8,740	7,810	11,500	8,210	10,900	8,730	11,300	11,700	NA	NA
Manganese	NA	117	69.2	6.6	1,350	65.1	177	154	3,180	96.1	53.8	68.6	113	393	81.6	88.7
Mercury	2	0.1 U	NA	NA	0.22 B	0.2 U	0.2 U	0.2 U	0.44	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Molybdenum	NA	1.3 U	NA	NA	NA	10 R	10 U	10 U	2.2 U	1.1 U	1 U	1 U	1.6 U	1.7 B	NA	NA
Nickel	NA	5.6 J	NA	NA	33 J	2.2 B	5.7 B	4.6 B	62	6.8 B	6.7 B	5.9 B	4.5 J	13.5 J	NA	NA
Potassium	NA	653 J	NA	NA	1,690 J	372 J	504 J	458 J	1,810 J	864 J	712 J	640 J	982 J	1,270 J	NA	NA
Selenium	50	2.3 U	NA	NA	2.2 UL	3.2 U	4 U	4 U	3.2 J	3.2 R	2.3 UL	2.3 UL	2.7 U	2.3 UL	NA	NA
Silver	NA	1.8 U	NA	NA	0.6 U	1.3 U	0.6 U	0.6 U	1.8 L	0.6 U	0.9 U	0.9 U	0.8 U	1.8 UL	NA	NA
Sodium	NA	8,880	NA	NA	5,240	7,450	6,460	6,140	7,150	7,660	7,710	7,440	8,760	8,860	NA	NA
Thallium	2	3.8 UL	NA	NA	2.3 UL	3.9 U	5 U	5 U	5.4 U	5.8 U	6.6 B	4.1 U	5.3 U	3.8 U	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	3.3 J	NA	NA	11.6 J	34.9 U	0.8 U	0.8 U	19.3 J	3.2 B	4.2 J	2.4 J	3.3 J	6.8 J	NA	NA
Zinc	NA	12.8 J	NA	NA	85.7	46.6 R	22.2 B	20.1 B	136	14.4 B	8.8 B	8.3 J	12.5 B	19.8 B	NA	NA
Dissolved Metals (UG/L)																
Aluminum, Dissolved	NA	NA	NA	NA	19.2 U	52.6 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	NA	NA	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	3.8 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	NA	NA	82.9 J	110 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	NA	NA	0.1 U	0.75 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	50 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW21			5GW22											
Sample ID		AS05-5GW21-R12	AS05-5GW21-R16	AS05-5GW21-R23	AS05-5GW22-R05	AS05-5GW22-R06	AS05-5GW22P-R07	AS05-5GW22-R07	AS05-5GW22-R08	AS05-5GW22-R09	AS05-5GW22P-R10	AS05-5GW22-R10	AS05-5GW22-R11	AS05-5GW22-R12	AS05-5GW22-R16	AS05-5GW22-R23
Sample Date	**MCLs**	10/14/05	04/20/07	08/22/12	08/08/00	04/19/01	02/07/02	02/07/02	10/21/02	07/18/03	04/07/04	04/07/04	01/13/05	10/26/05	04/20/07	08/22/12
Chemical Name																
Cadmium, Dissolved	5	NA	NA	NA	0.4 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA	49,400	64,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	0.96 B	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA	3.4 B	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	NA	NA	0.7 UL	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	NA	5.2 J	90.3 J	15.9 U	14.7 U	NA	NA	NA	NA	NA	NA	NA	NA	464	61.3 J
Lead, Dissolved	15	NA	NA	NA	2 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA	6,920	8,670	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	2.3 J	37	284	65.1	NA	NA	NA	NA	NA	NA	NA	NA	23.2	4.9
Mercury, Dissolved	2	NA	NA	NA	0.1 U	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA	8.3 B	2.2 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA	754 B	372 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA	6,270	7,450	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	NA	NA	2.3 UL	3.9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA	29.7	46.6 R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																
Alkalinity (mg/l)	NA	260	NA	NA	83	77	98	100	100	82	90	87	91	100	NA	NA
Ammonia (mg/l)	NA	0.1 U	NA	NA	0.2 U	NA	0.2 U	0.2 U	0.64	0.1 U	NA	NA	NA	0.1 U	NA	NA
Bicarbonate (mg/l)	NA	260	NA	NA	83	77	98	100	100	82	90	87	91	100	NA	NA
Biological oxygen demand (mg/l)	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	NA	2 UL	NA	NA	NA
BOD-5day (total) (mg/l)	NA	2.2	NA	NA	NA	2.1	2 U	2 U	10	2 U	2 U	2 U	NA	67	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	13	NA	NA	5 U	18	5	6	18	5 UJ	5 U	5 U	5 J	5 U	NA	NA
Chloride (mg/l)	NA	24	NA	NA	20	18	18	17	17	11	12	11	15	13	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.004 U	0.02 U	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	6.2 U	NA	NA	1 U	NA	NA	NA	NA	5.8 U	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA
Ethene (mg/l)	NA	NA	NA	NA	NA	0.004 U	0.004 U	0.004 U	0.03 U	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	5.8 U	NA	NA	1 U	NA	NA	NA	NA	6.2 U	6.2 U	6.2 U	6.2 U	5.8 U	NA	NA
Hardness (mg/l)	NA	240	NA	NA	140	200	190	170	230	190	210	190	310	270	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	0.002 U	0.002 U	0.002 U	0.01 U	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	3.3 U	NA	NA	1.2	NA	NA	NA	NA	5.2 B	3.3 U	3.3 U	3.3 U	3.3 U	NA	NA
Nitrate (mg/l)	10	0.05 U	NA	NA	1.3	NA	0.5 U	0.5 U	0.5 U	0.34 L	0.21	0.22	0.52	0.12	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	NA	NA	NA	0.55 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	0.02 U	NA	NA	0.17	NA	0.05 U	0.05 U	0.05 U	0.1 U	0.02 U	0.02 U	0.02 U	0.02 U	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	91	NA	NA	71	99	100	110	96	95	110	110	78	170	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	76	NA	NA	170	260	290	290	210	320	10,000	480	410	380	NA	NA
Total organic carbon (TOC) (mg/l)	NA	1 B	NA	NA	1 U	1 U	2.2	1.7	0.89	1 U	1 U	1 U	NA	1 U	NA	NA
Total recoverable phenolics (mg/l)	NA	0.05 U	NA	NA	0.03 U	0.025 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA
Reactivity (MG/L)																
No Detections																

Notes:

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW24			5GW24					5GW25							
Sample ID		AS05-5GW24-R05	AS05-5GW24-R06	AS05-5GW24-R07	AS05-5GW24-R08	AS05-5GW24-R09	AS05-5GW24-R10	AS05-5GW24-R11	AS05-5GW24-R12	AS05-5GW25-R13	AS05-5GW25P-R13	AS05-5GW25P-R14	AS05-5GW25-R14	AS05-5GW25-R15	AS05-5GW25-R16	AS05-5GW25P-R17	AS05-5GW25-R17
Sample Date	**MCLs**	08/07/00	04/09/01	02/05/02	10/15/02	07/29/03	04/02/04	01/07/05	10/25/05	08/08/06	08/08/06	10/24/06	10/24/06	01/24/07	04/19/07	01/31/08	01/31/08
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	200	1 U	1 U	1 U	1 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	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	NA	NA	NA	NA	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	0.5 U
1,1-Dichloroethene	7	1 U	1 U	1 U	1 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	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5	1 U	1 U	1 U	1 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	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 R	5 U	5 U	5 U	5 R	5 U	5 U	5 UL	4.8 J	6.1	5.8 L	6 L	5 U	5 U	5 U	5 U
Benzene	5	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.28 J	0.32 J	0.23 K	0.2 J	0.3 J	0.3 J
Carbon disulfide	NA	2.1 B	1 U	1 U	1 U	6 B	0.5 U	0.5 UJ	0.5 U	0.21 J	0.21 J	0.15 J	0.15 J	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	NA	1 U	1 U	1 U	1 U	0.5 U	0.39 B	0.5 UJ	0.5 U	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	0.5 U	0.24 K	0.4 J	1	1
cis-1,3-Dichloropropene	NA	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	NA	NA	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	0.5 U
Ethylbenzene	700	1 U	1 U	1 U	1 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	0.34 B	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	NA	NA	0.5 R	0.5 U	0.5 U	0.5 UL	0.95	1.3	0.5 U	0.5 U	0.5 U	0.5 R	0.5 UJ	0.5 UJ
Methylene chloride	5	0.6 B	1.8 B	2.6 B	2 U	0.85 B	0.78 B	0.66 B	0.5 U	0.19 B	0.21 B	0.5 U	0.5 U	0.12 B	0.5 UJ	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 UL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.57	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 J	0.5 U	0.5 U	0.5 U
Vinyl chloride	2	1 U	1 U	1 U	1 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	0.5 U	0.5 U
Xylene, total	10000	1 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.55 B	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)																	
No Detections																	
Pesticide/Polychlorinated Biphenyls (UG/L)																	
No Detections																	
Herbicides (UG/L)																	
No Detections																	
Explosives (UG/L)																	
No Detections																	
Total Metals (UG/L)																	
Aluminum	NA	94.1 B	NA	134 J	356	391 B	102 B	17.9 U	20.3 U	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	4.9 U	NA	5 U	4.7 U	2.5 U	4.1 U	6.4 U	3 U	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	5 B	NA	5.1 U	2.8 U	5 U	3.4 U	5.3 U	2.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	72.3 J	NA	62.5 J	74.1 J	67.1 J	52.8 J	54.2 J	107 J	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	0.11 B	NA	0.1 U	0.18 B	0.08 U	0.05 U	0.4 U	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	26.3 J	44.8 J	21.2 L	18.3	16.2	23.7 K	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	0.42 B	NA	1.7 U	0.4 U	0.4 U	0.3 U	0.3 U	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	124,000	NA	115,000	117,000	105,000	96,800	108,000	151,000	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	0.96 B	NA	0.92 B	3.2	4.5 B	1.3 B	1.5 U	0.7 U	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	1.1 U	NA	1.3 U	0.6 U	0.7 U	1.1 J	1.5 U	0.6 U	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	3.3 B	NA	2.2 J	3.6 J	6.3 B	2.2 B	2.4 B	1.8 J	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	10 U	10 U	10 U	10 U	10 UJ	10 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	405 J	NA	261	461	549	177	52.7 J	14.2 U	34,000	36,700	12,200	13,000	3,570	4,610	4,240	3,880
Lead	15	2.1 B	NA	2.9 U	2.2 J	1.9 UL	1.7 U	1.6 U	1.6 U	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	21,200	NA	26,800	26,200	14,900	12,900	15,900	27,000	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	44.3	NA	17	35.5	16.7 K	8.4 B	2.4 J	0.65 B	2,460	2,480	922	980	789	762	651	662
Mercury	2	0.1 U	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	10 U	2.2 U	1.1 U	1 U	1.6 U	1.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	2.8 B	NA	2.1 U	7.3 J	3.9 B	2 B	1.1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	2,980 J	NA	1,150 J	1,530 J	4,230 J	3,840 J	1,950 J	2,130 J	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	2.2 UL	NA	4 U	3 UL	3.2 U	2.3 U	4.1 J	2.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	0.6 U	NA	0.6 U	1 UL	0.6 U	0.9 U	1.2 U	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	6,070	NA	5,420 J	4,780 J	12,500	15,900	6,810	116,000	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2	2.3 UL	NA	5 U	5.4 U	5.8 U	4.1 U	6.5 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	1 U	NA	0.8 U	0.7 U	0.7 U	1.2 U	1.7 U	1.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	31.4	NA	22.1 B	30.3 J	11.3 B	7.3 J	6.5 B	4.7 B	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																	
Aluminum, Dissolved	NA	19.2 U	26.6 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	4.9 U	3.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	3.8 U	3.2 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	72.7 J	72.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	51.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW24			5GW24					5GW25							
Sample ID		AS05-5GW24-R05	AS05-5GW24-R06	AS05-5GW24-R07	AS05-5GW24-R08	AS05-5GW24-R09	AS05-5GW24-R10	AS05-5GW24-R11	AS05-5GW24-R12	AS05-5GW25-R13	AS05-5GW25P-R13	AS05-5GW25P-R14	AS05-5GW25-R14	AS05-5GW25-R15	AS05-5GW25-R16	AS05-5GW25P-R17	AS05-5GW25-R17
Sample Date	**MCLs**	08/07/00	04/09/01	02/05/02	10/15/02	07/29/03	04/02/04	01/07/05	10/25/05	08/08/06	08/08/06	10/24/06	10/24/06	01/24/07	04/19/07	01/31/08	01/31/08
Chemical Name																	
Cadmium, Dissolved	5	0.4 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	132,000	121,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	0.7 U	0.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	1.1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	0.7 UL	1.4 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	15.9 U	14.7 U	NA	NA	NA	NA	NA	NA	4,820	4,730	5,020	5,110	3,050	3,880	3,910	3,960
Lead, Dissolved	15	3.5	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	22,500	19,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	16.2	2.6 B	NA	NA	NA	NA	NA	NA	2,050	2,070	949	963	788	792	662	668
Mercury, Dissolved	2	0.11 B	1.2 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	2 U	1.8 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	4,330 J	4,160 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	6,600	11,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	2.3 UL	5.5 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	8.9 J	27 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry																	
Alkalinity (mg/l)	NA	350	287	230	280	250	240	250	79	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/l)	NA	0.2 U	NA	0.2 U	0.2 U	0.1 U	NA	NA	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/l)	NA	340	290	230	280	NA	240	250	79	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand (mg/l)	NA	2 U	NA	NA	NA	NA	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	4.5	2 U	2 U	2 U	2 U	NA	77	NA	NA	NA	NA	NA	NA	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	1.8	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	5 U	31	5 U	5 U	6.7	5 U	5.1	7.9	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	10	28	24	13	14 K	29	11	280	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (mg/l)	NA	NA	0.004	0.004 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	1 U	NA	NA	NA	5.8 U	5.8 U	5.8 U	6.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (mg/l)	NA	NA	0.004	0.004 U	0.03 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	1 U	NA	NA	NA	6.2 U	6.2 U	6.2 U	5.8 U	NA	NA	NA	NA	NA	NA	NA	NA
Hardness (mg/l)	NA	400	380	400	400	330	290	360	560	NA	NA	NA	NA	NA	NA	NA	NA
Methane (mg/l)	NA	NA	0.02	0.002 U	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	1.1	NA	NA	NA	4.7 B	3.3 U	3.3 U	3.3 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (mg/l)	10	1.8	NA	0.5 U	0.5 U	0.65	1.1	1.6	0.71	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	0.05 U	NA	0.05 U	0.05 U	0.1 U	0.02 U	0.02 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen (mg/l)	NA	NA	0.2 U	NA	NA	NA	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	77	88	73	92	110	48	38	77	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	NA	450	540	540	440	10 U	410	900	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/l)	NA	1.2	1.1	1.5	1.15	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics (mg/l)	NA	0.03 U	0.025 U	0.025 U	NA	0.05 U	0.05 U	0.05 U	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA
Reactivity (MG/L)																	
No Detections																	

Notes:

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW25				5GW25					
Sample ID		AS05-5GW25PDB-R18	AS05-5GW25-R18	S05-5GW25RPP-R1	AS05-5GW25-R19	AS05-5GW25-R20	AS05-5GW25P-R21	AS05-5GW25-R21	AS05-5GW25-R22	AS05-5GW25-R23	AS05-5GW25-R24
Sample Date	**MCLs**	10/21/08	10/21/08	10/21/08	07/09/09	04/21/10	01/15/11	01/15/11	10/11/11	08/22/12	06/11/13
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,1,1-Trichloroethane	200	5 U	5 U	NA	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	5 U	5 U	NA	1 U	5 U	2 U	2 U	1 U	4 U	4 U
1,1-Dichloroethene	7	5 U	5 U	NA	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	5	5 U	5 U	NA	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	5 U	5 U	NA	5 U	5 U	2.5 U	2.5 U	5 U	5 U	5 U
Benzene	5	5 U	5 U	NA	0.39 J	0.385 J	0.544 J	0.544 J	0.544 J	0.638	0.514
Carbon disulfide	NA	5 U	5 U	NA	1 U	0.592 J	0.5 U	0.5 U	0.5 U	1 U	1 U
Chloromethane	NA	5 U	5 U	NA	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U
cis-1,2-Dichloroethene	70	2.7 J	2.3 J	NA	3.1	3.88 J	5.11	4.93 J	5.83	6.82	6.19
cis-1,3-Dichloropropene	NA	5 U	5 U	NA	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	5 U	5 U	NA	1 U	5 U	0.25 U	0.25 U	1 U	0.5 U	0.5 U
Ethylbenzene	700	5 U	5 U	NA	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	5 U	5 U	NA	1 U	5 U	1 U	1 U	1 U	2 U	2 U
Methylene chloride	5	5 U	5 U	NA	1 U	0.306 B	0.593 B	0.25 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	5 U	5 U	NA	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	5 U	5 U	NA	0.34 J	0.268 J	0.268 J	0.3 J	0.298 J	0.5 U	0.5 U
Vinyl chloride	2	5 U	5 U	NA	1 U	2 U	0.25 U	0.25 U	0.5 U	0.264 J	0.5 U
Xylene, total	10000	15 U	15 U	NA	3 U	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/L)											
No Detections											
Pesticide/Polychlorinated Biphenyls (UG/L)											
No Detections											
Herbicides (UG/L)											
No Detections											
Explosives (UG/L)											
No Detections											
Total Metals (UG/L)											
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	5,250	3,610	4,580	4,580	5,150	5,170	7,010	8,150	3,100
Lead	15	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	660	508	657	616	586	562	500	401	328
Mercury	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	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	50	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	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	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, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, Dissolved	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Dissolved	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3

Groundwater Detected Analytical Results - May 1998 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station ID		5GW25				5GW25					
Sample ID		AS05-5GW25PDB-R18	AS05-5GW25-R18	S05-5GW25RPP-R1	AS05-5GW25-R19	AS05-5GW25-R20	AS05-5GW25P-R21	AS05-5GW25-R21	AS05-5GW25-R22	AS05-5GW25-R23	AS05-5GW25-R24
Sample Date	**MCLs**	10/21/08	10/21/08	10/21/08	07/09/09	04/21/10	01/15/11	01/15/11	10/11/11	08/22/12	06/11/13
Chemical Name											
Cadmium, Dissolved	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	NA	NA	3,780	NA	4,140	4,210	4,040	4,020	4,510	3,320	2,650
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	NA	NA	627	NA	639	611 L	591	582	481	385	339
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry											
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bicarbonate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BOD-5day (total) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardness (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate/Nitrite (mg/l)	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total dissolved solids (TDS) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total recoverable phenolics (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Reactivity (MG/L)											
No Detections											

Notes:

Shading indicates detections

NA - Not analyzed

* - Duplicate analysis was not within control limits (unvalidated data)

B - Analyte not detected above the level reported in blanks

D - Result of a dilution (unvalidated)

E - Concentration exceeds calibration range of instrument (unvalidated data)

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

TABLE 4

Field-Measured Parameters for Site 5 Monitoring Wells - October 2005 to June 2013

Interim Remedial Action Completion Report, Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory, Rocket Center,

West Virginia

Monitoring Well	October 2005					August 2006					April 2007					January 2008				
	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)
5GW13	6.51	1.21	0	14.01	8	5.87	0.9	0	29.21	103	6.8	1.99	4.11	13.2	152	6.43	1.45	3.99	10.79	132
5GW17	5.05	0.515	0	14.921	198	5.25	0.58	0.13	25.1	93	5.6	0.535	4.3	NM	237	5.22	0.487	2.94	12.25	236
5GW18	6.13	0.704	0	16.57	128	6.71	0.694	0	25.56	17	6.87	0.745	3.65	11.12	-35	6.17	0.666	0.48	11.29	-74
5GW25	--	--	--	--	--	6.47	0.641	0	28.71	68	7.56	0.425	3.34	12.01	-157	6.94	0.412	0.66	12.88	-133

Monitoring Well	October 2008					July 2009					April 2010					January 2011				
	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)
5GW13	6.81	1.45	0.37	13.62	13	6.98	0.866	16.98	14.8	186	6.32	1.140	0.39	12.13	209	6.38	0.803	0.40	11.4	8.0
5GW17	5.53	0.449	0.52	14.07	103	5.46	0.340	11.63	13.4	237	5.81	0.462	0.07	14.16	184	5.62	0.432	1.12	12.0	98.5
5GW18	6.9	0.467	0.55	14.52	-162	6.62	0.468	3.90	18.0	53.6	6.36	0.682	0.00	12.7	42	6.39	0.510	0.90	11.20	-37.1
5GW25	7.36	0.324	0.35	15.51	-200	7.22	0.379	8.09	15.3	-52	7.24	0.451	0.20	11.6	-188	7.22	0.314	0.36	12.1	-180.3

Monitoring Well	October 2011					August 2012					June 2013				
	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature (°C)	ORP (mV)
5GW13	6.40	1.240	0.58	14.4	85.0	--	--	--	--	--	6.95	1.09	0	18.05	140
5GW17	5.69	0.537	2.30	14.34	273	--	--	--	--	--	6.21	0.464	0	14.39	162
5GW18	6.43	0.621	3.24	15.55	24	6.35	0.609	0.0	14.96	-5	6.68	0.550	0	15.38	83
5GW25	7.22	0.437	0.31	15.52	-130.0	--	--	--	--	--	7.91	0.654	0	16.87	-164

mS/cm - millisiemens per centimeter
DO - dissolved oxygen
mg/l - milligrams per liter
°C - degrees celcius
ORP - oxidation reduction potential
mV - millivolts

Figures

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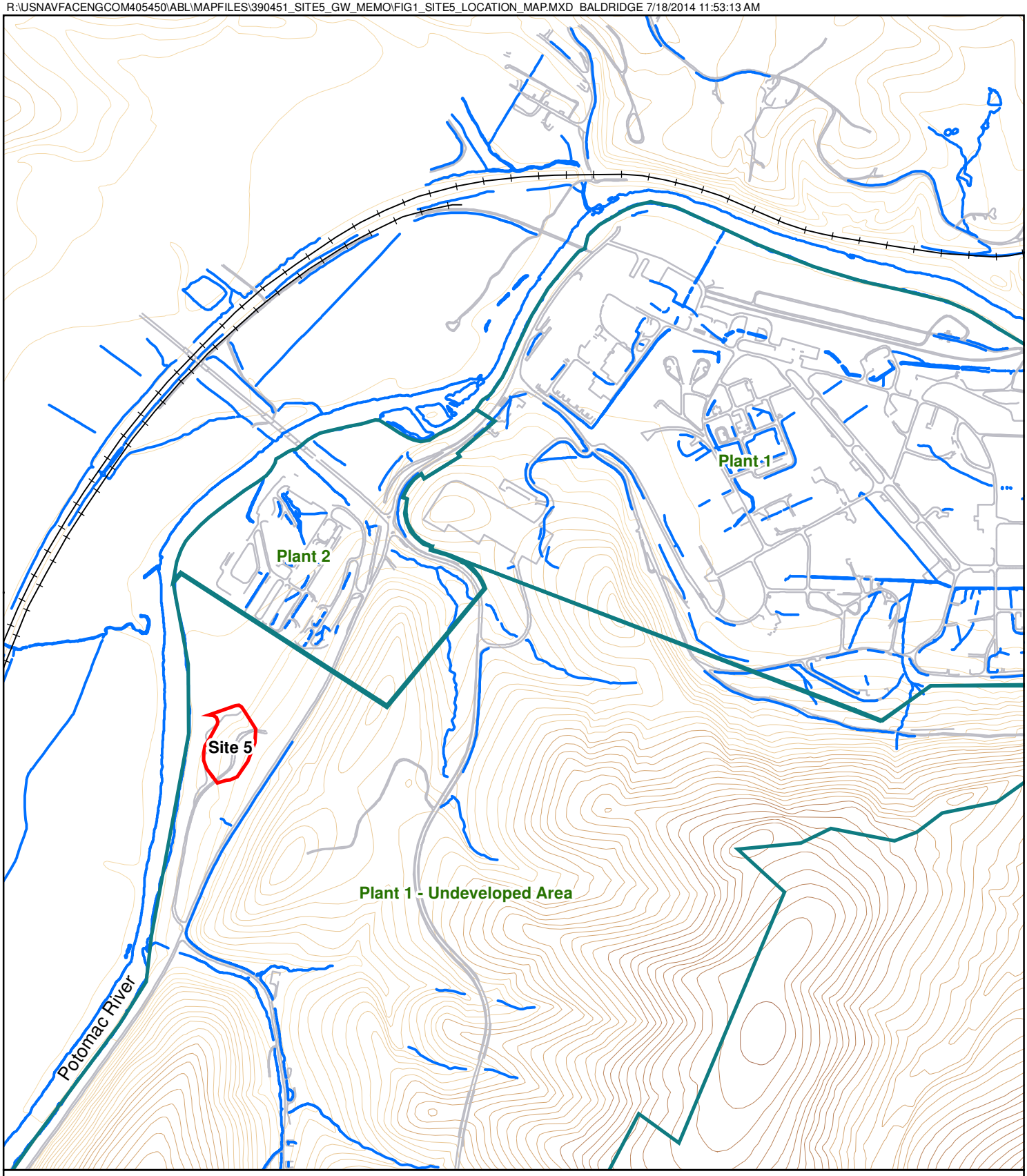

Legend
- Elevation Contours
- Water Bodies
- Paved Roads
- Rail Roads
- IR Sites
- Activity Boundary

N

0 500 1,000 Feet

1 inch = 1,000 feet

Figure 1
Site Location Map
Interim Remedial Action Completion Report
Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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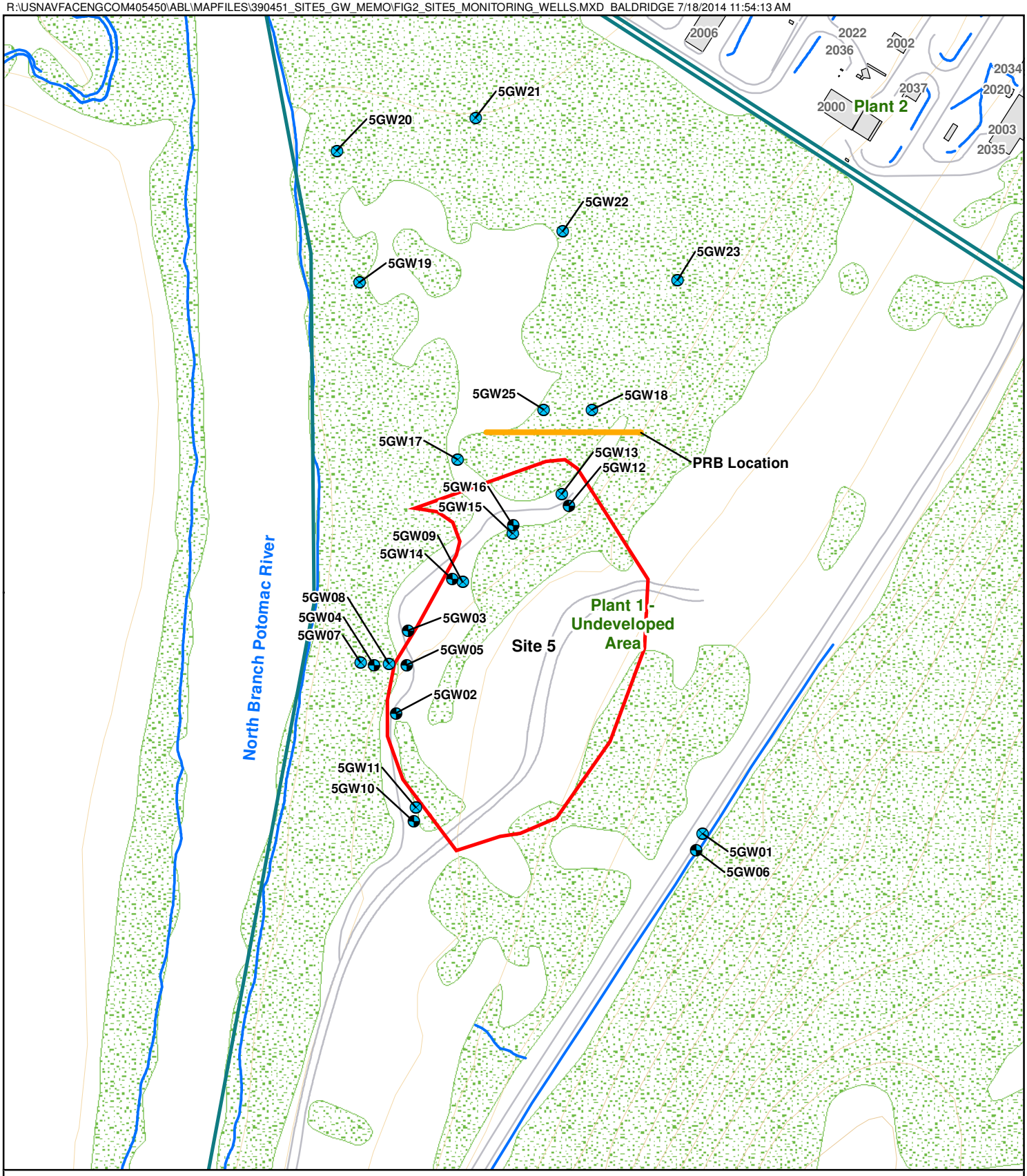
R:\USNAVFACENGCOM405450\ABL\MAPFILES\390451_SITE5_GW_MEMO\FIG2_SITE5_MONITORING_WELLS.MXD BALDRIDGE 7/18/2014 11:54:13 AM



Legend

- Monitoring Well - Bedrock
- Monitroing Well - Alluvial
- PRB
- Water Bodies
- Elevation Contours
- Paved Roads
- IR Sites
- Activity Boundary
- Structures

N

0 100 200 Feet

1 inch = 200 feet

Figure 2
Site 5 Map
Interim Remedial Action Completion Report
Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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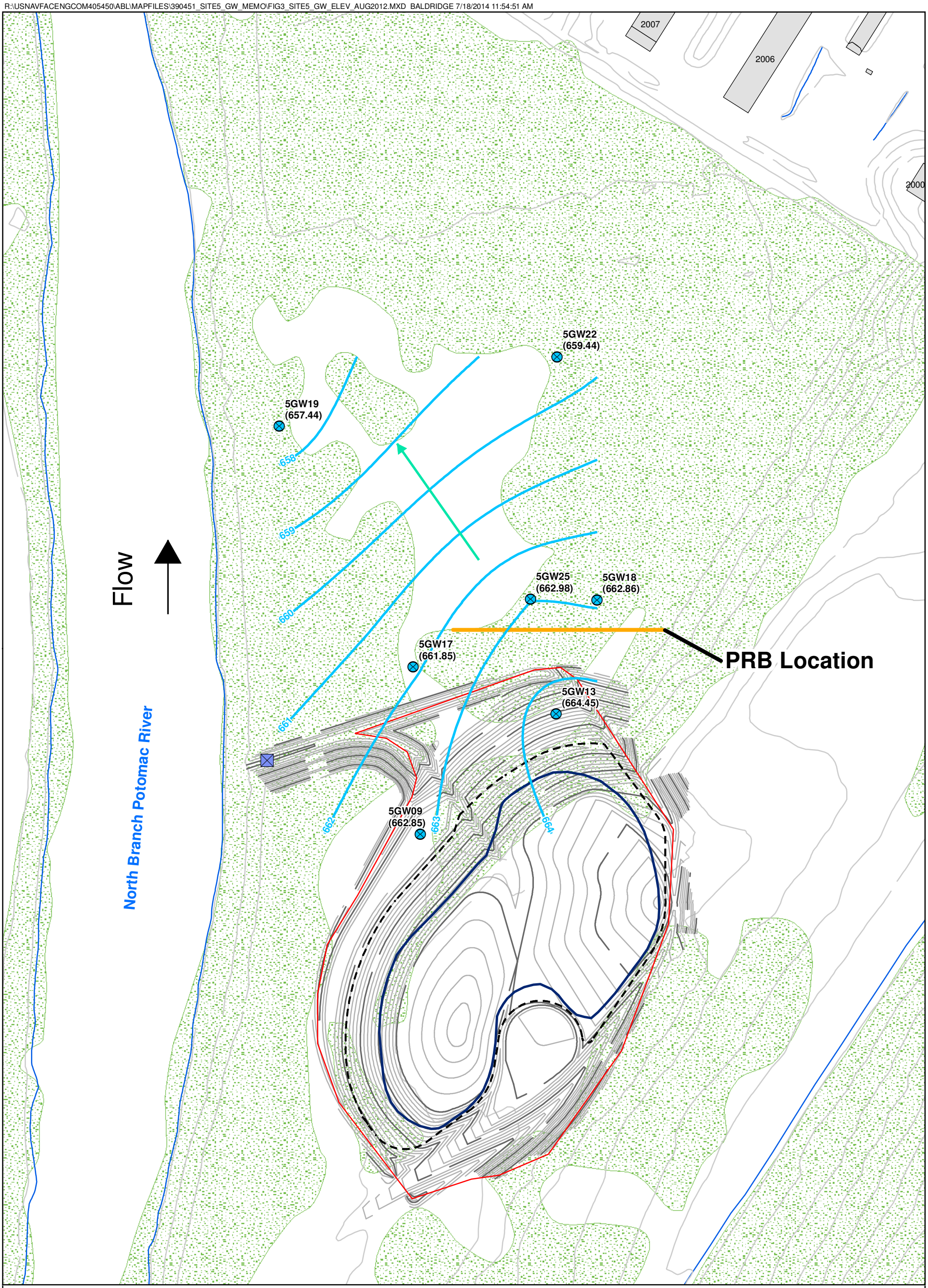

Legend

- Monitoring Well
- Stormwater Sampling Location
- Alluvial Groundwater Flow
- Water Table Elevation Contour
- PRB
- Edge of Waste
- Edge of Landfill Cap
- Water Body
- Buildings
- Site 5 Boundary
- Vegetation

N

0 50 100 Feet

1 inch = 100 feet

Figure 3
Site 5 Water Table Elevations – August 2012
Interim Remedial Action Completion Report
Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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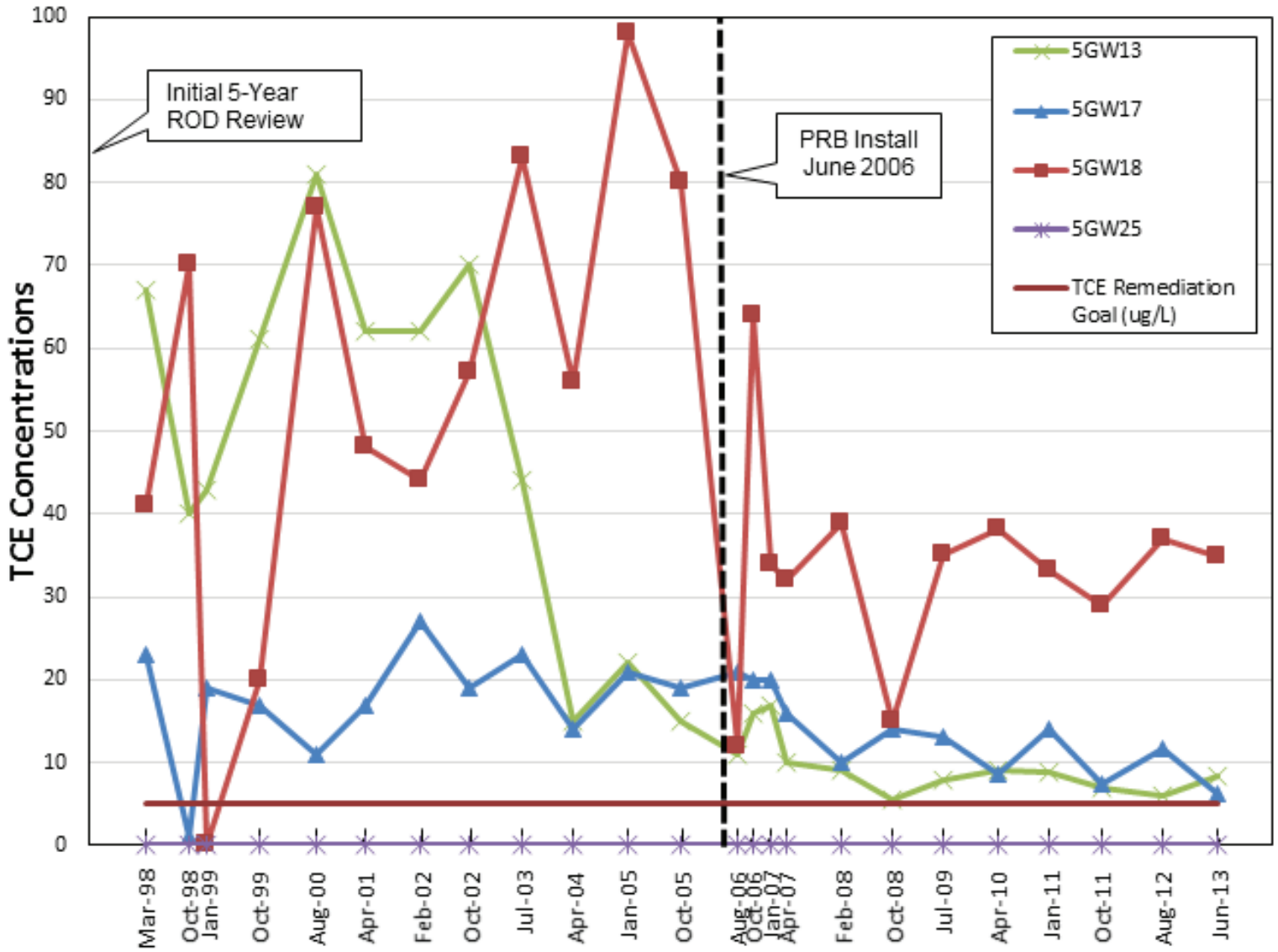

FIGURE 4

Site 5 TCE Concentration Trend Graph from March 1998 to June 2013

Interim Remedial Action Completion Report

Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

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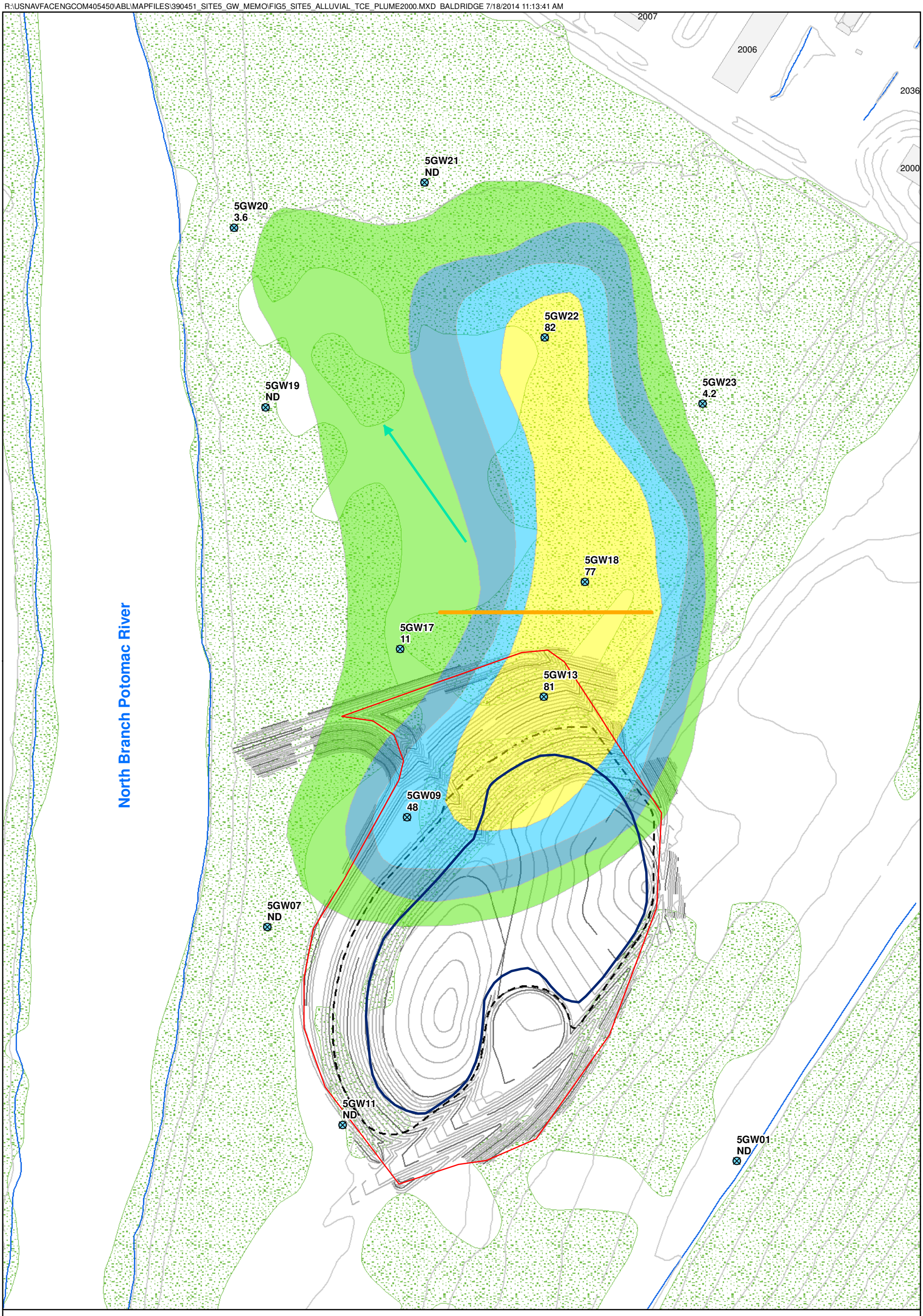

Legend

- Monitoring Well - Alluvial
- Alluvial Groundwater Flow
- PRB*
- Edge of Waste
- Edge of Landfill Cap
- Buildings
- Site 5 Boundary
- Vegetation

Estimated TCE Plume

- 5 - 20 µg/L
- 20 - 40 µg/L
- 40 - 60 µg/L
- 60 - 85 µg/L

* PRB installed in June 2006

N

0 50 100 Feet

1 inch = 100 feet

Figure 5
Alluvial Aquifer Site 5 Plume - August 2000
Interim Remedial Action Completion Report
Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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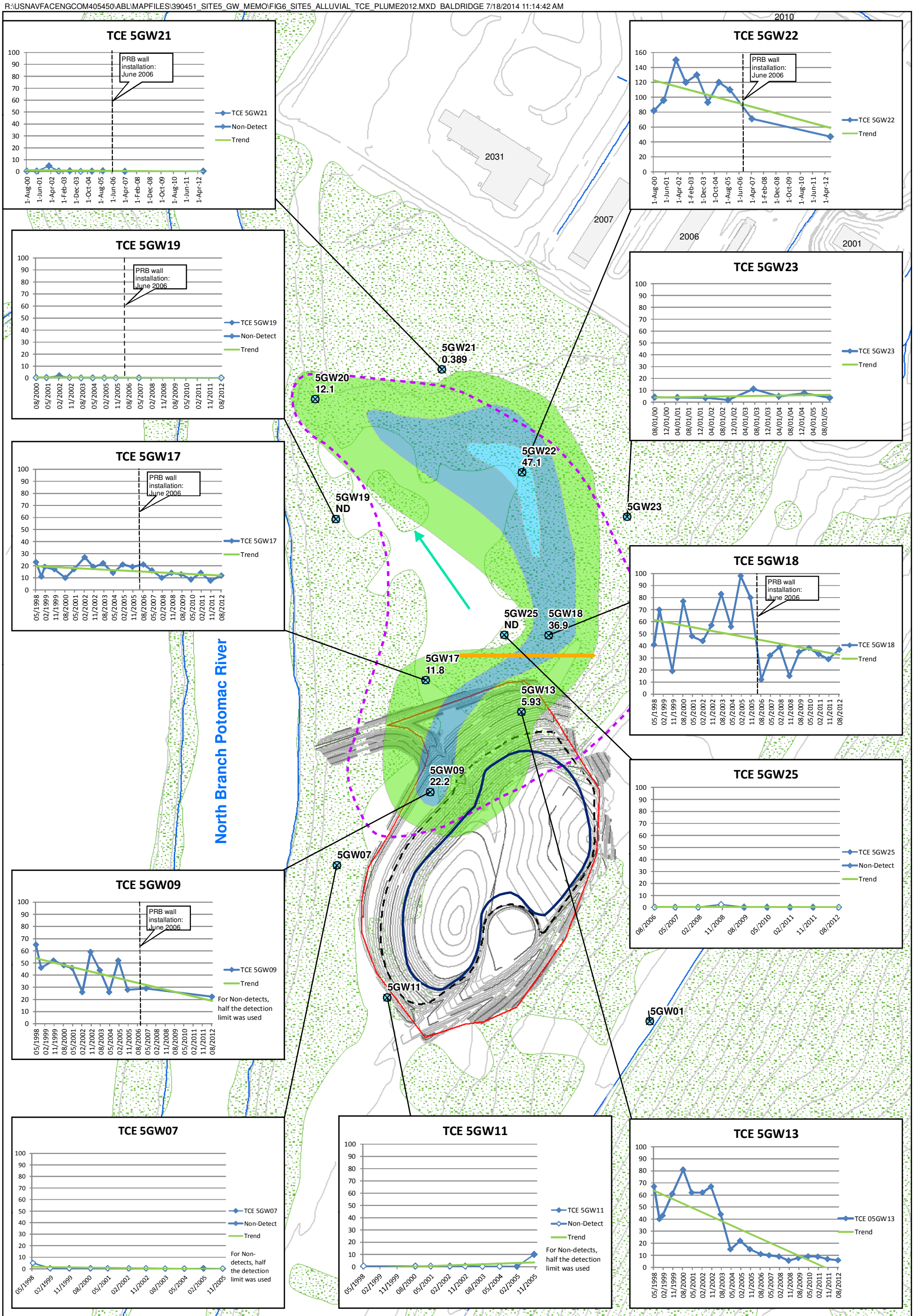

Legend

- Monitoring Well - Alluvial
- Alluvial Groundwater Flow
- PRB*
- Edge of Waste
- Edge of Landfill Cap
- Buildings
- Vegetation
- Site 5 Boundary
- Area of Restricted Groundwater Use

Estimated TCE Plume

- 5 - 20 µg/L
- 20 - 40 µg/L
- 40 - 60 µg/L

* PRB installed in June 2006

N

0 75 150 Feet

1 inch = 150 feet

Figure 6
Alluvial Aquifer Site 5 Plume - August 2012
Interim Remedial Action Completion Report
Site 5 Groundwater, OU-2
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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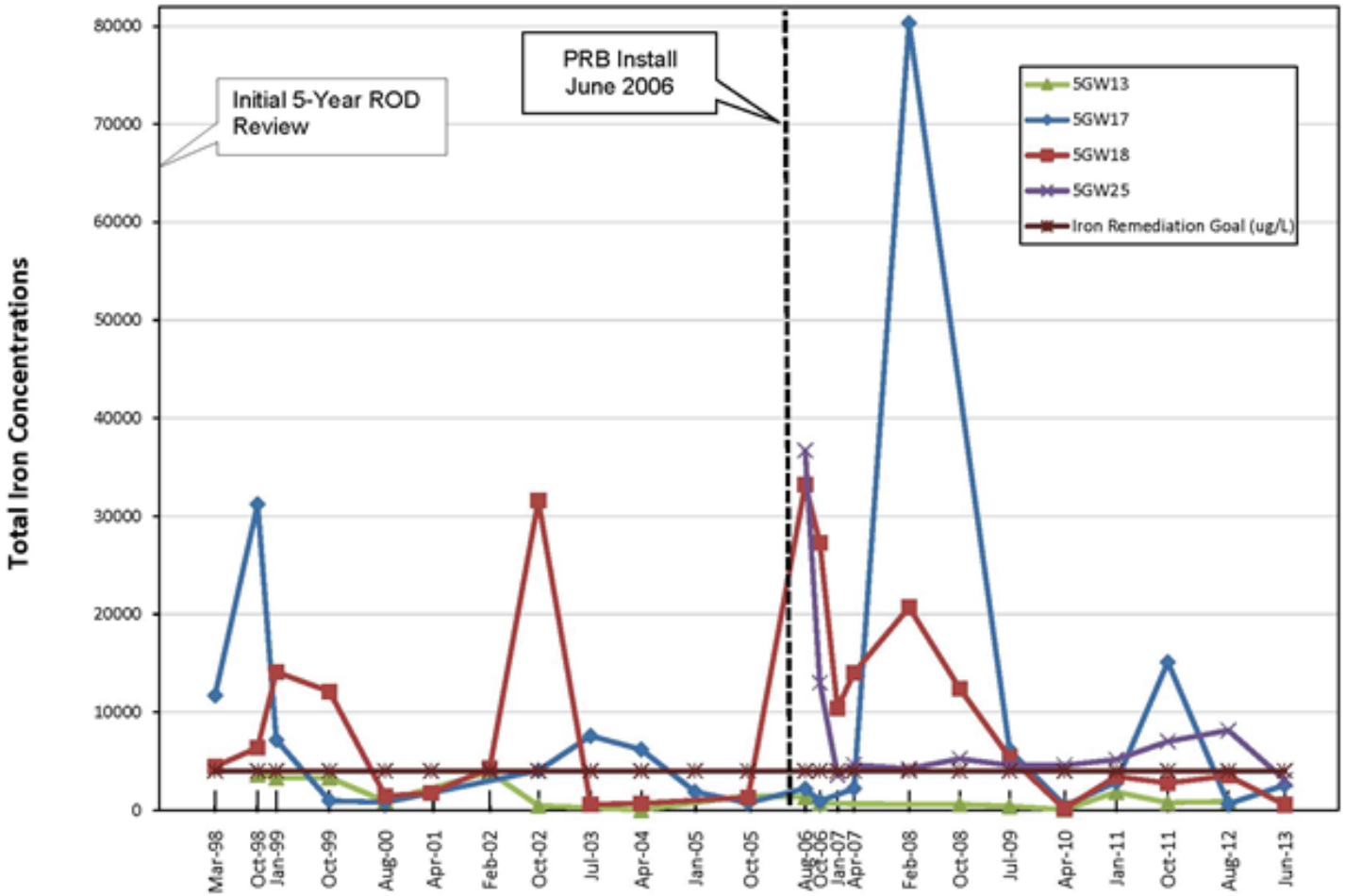

FIGURE 7

Site 5 Iron Concentration Trend Graph from March 1998 to June 2013

Interim Remedial Action Completion Report

Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

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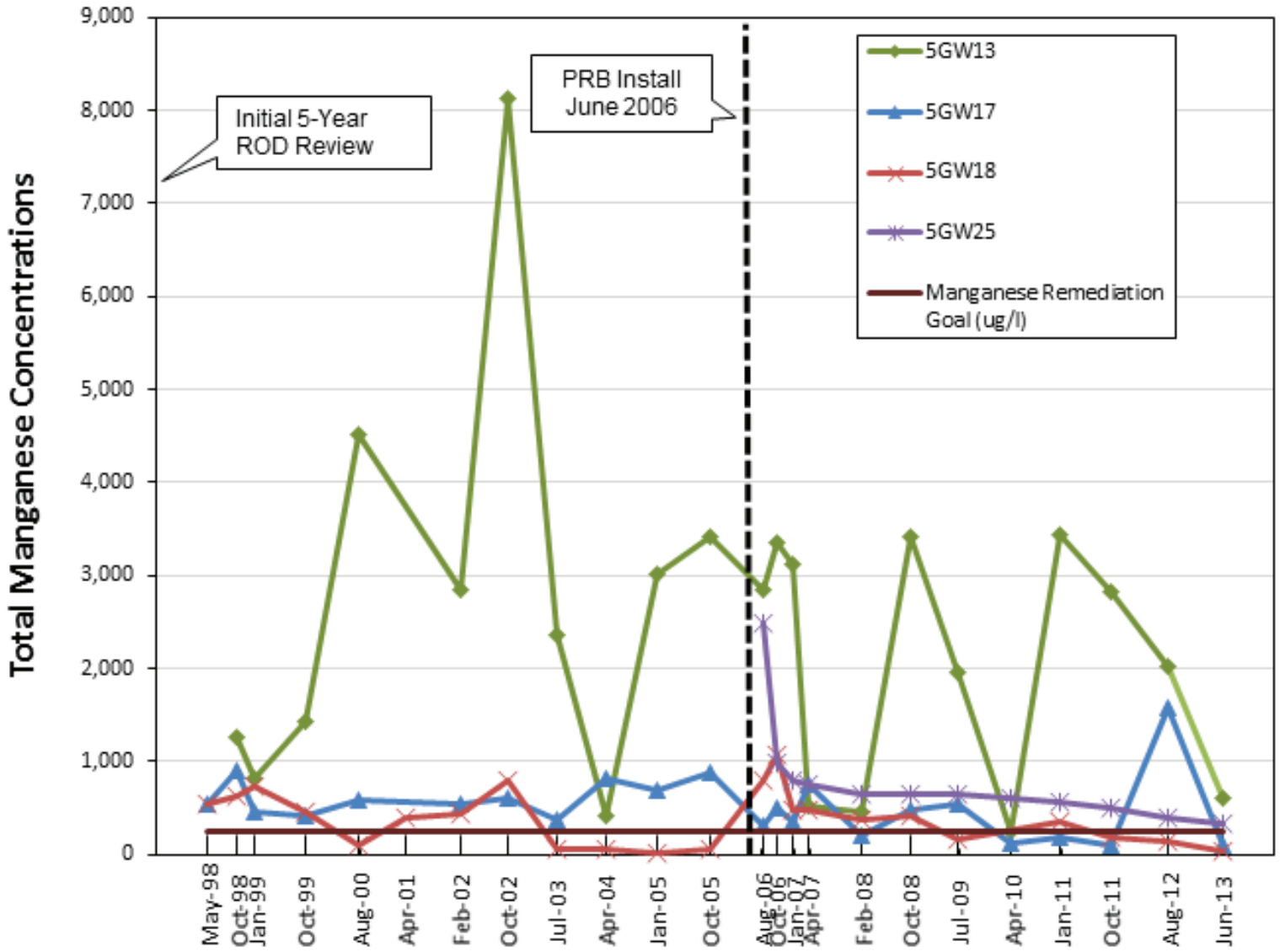

FIGURE 8

Site 5 Manganese Concentration Trend Graph from March 1998 to June 2013

Interim Remedial Action Completion Report

Site 5 Groundwater, OU-2

Allegany Ballistics Laboratory

Rocket Center, West Virginia

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