



ANNUAL REPORT

2025 GROUNDWATER MONITORING REPORT

(INCLUDES THIRD QUARTER 2025
SEMIANNUAL GROUNDWATER
MONITORING REPORT)

March 1, 2026

A handwritten signature in blue ink, appearing to read "Ross Miller", written over a horizontal line.

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HAZARDOUS WASTE MANAGEMENT UNITS (HWMUs) 5 AND 16 CALENDAR YEAR 2025

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EXECUTIVE SUMMARY

This document presents the Annual Groundwater Monitoring Report for calendar year 2025 for Hazardous Waste Management Units (HWMUs) 5 and 16 located at the Radford Army Ammunition Plant (RFAAP) in Radford, Virginia. The Annual Groundwater Monitoring Report was compiled in accordance with the requirements specified in the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* (original effective date October 4, 2002; reissued August 16, 2014, with subsequent Class 1 Permit Modifications). This Annual Groundwater Monitoring Report evaluates the analytical data from Second Quarter 2025 and Third Quarter 2025 for each Unit.

The calendar year 2025 groundwater monitoring events were conducted using revised Permit-specified method detection limits (MDLs) (a.k.a., detection limits (DLs)) and quantitation limits (QLs) as presented in the Class 1 Permit Modification approved by the Virginia Department of Environmental Quality (VDEQ) in electronic correspondence dated May 5, 2021. Additionally, total silver was added to the HWMU-16 Compliance Monitoring List following detection during Third Quarter 2023 as directed by VDEQ in correspondence dated May 8, 2024. HWMU-16 total cobalt data were evaluated using the revised alternate source demonstration (ASD) for total cobalt in groundwater at HWMU-16 approved by the VDEQ in electronic correspondence dated September 13, 2021. A Unit-specific summary for the Second and Third Quarter 2025 semiannual groundwater monitoring events is provided below.

This report also serves as a response to the October 22, 2025, correspondence from VDEQ regarding review of the Semiannual Groundwater Monitoring Report for HWMUs 5 and 16 dated August 2025.

RFAAP submitted the Permit renewal application for HWMUs 5 and 16 in February 2024. Subsequent to the Third Quarter 2025 groundwater monitoring event, the VDEQ approved reissuance of the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* on September 25, 2025 (effective date October 25, 2025).

HWMU-5

HWMU-5 has been in corrective action (CA) since 2010. Semiannual CA groundwater monitoring events for HWMU-5 were conducted in accordance with Permit Module VI – *Groundwater Corrective Action & Monitoring Program for Unit 5*. Semiannual monitoring was conducted during Second and Third Quarter 2025.



Trichloroethene (TCE) was not detected at concentrations greater than the groundwater protection standard (GPS) of 5 ug/l during calendar year 2025. TCE was detected at concentrations greater than the Permit-specified QL of 1 ug/l but less than the GPS of 5 ug/l during the semiannual monitoring events in point of compliance wells 5WC21, 5WC22, and 5WC23 (Second and Third Quarter 2025). TCE was not detected at concentrations greater than the Permit-specified QL in any other wells comprising the CA monitoring network during the calendar year 2025 monitoring events. Additionally, no TCE daughter products were detected in any wells comprising the CA groundwater monitoring network for HWMU-5.

Total cobalt was detected at concentrations greater than the GPS of 7 ug/l in point of compliance well 5WC21 during Second and Third Quarter 2025, and at point of compliance well 5W7B during Third Quarter 2025 only. Total cobalt was not detected at concentrations greater than the GPS in any other wells comprising the CA monitoring network during the calendar year 2025 monitoring events.

Overall, evaluation of calendar year 2025 data for the CA Targeted Constituents and comparison with historical data indicates effective progress of groundwater CA through natural attenuation. TCE remedial endpoints have been achieved. No changes to the continuation of the groundwater CA program are anticipated at this time. Semiannual groundwater monitoring will continue at HWMU-5, with the next monitoring event scheduled for Second Quarter 2026.

The current CA groundwater monitoring program is required to continue until the TCE concentrations have remained below the GPS for a period of three consecutive years; upon which the Permittee may request to end corrective action. However, although TCE concentrations in groundwater at the Unit have been less than the GPS for over three consecutive years, total cobalt (listed in Appendix J to Permit Attachment 2 – *Groundwater Corrective Action Targeted Constituents - GPS and Semiannual Monitoring List for HWMU-5*) remains above the GPS in point of compliance wells 5WC21 and 5W7B. As a result, continued CA groundwater monitoring is required as specified in the Permit.

The original Compliance Period during which the GPS applied to HWMU-5 was 19 years, beginning on the effective date of the original Post-Closure Care Permit for HWMU-5 (October 28, 2001) and continuing until October 28, 2020. However, exceedances above the GPS value for total cobalt continued to occur at the point of compliance past the original compliance period; therefore, the VDEQ extended the



compliance period for HWMU-5 to October 28, 2030, or until VDEQ approves clean closure of the Unit.

HWMU-5 2025 groundwater monitoring results were also compared to the GPSs presented in Attachments VI.B and VI.C in the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* reissued on September 25, 2025 (effective date October 25, 2025) and no changes to the findings and conclusions presented above were found.

HWMU-16

Semiannual Compliance groundwater monitoring for HWMU-16 was conducted during Second and Third Quarter 2025. On October 26, 2018, VDEQ authorized the comparison of total cobalt results in HWMU-16 point of compliance wells to the latest VDEQ alternate concentration limit (ACL; 6 ug/l during calendar year 2025) in addition to the Permit-specified GPS of 5 ug/l. Total cobalt was detected at concentrations greater than the GPS in point of compliance well 16WC1A during Second and Third Quarter 2025, and in point of compliance well 16MW9 during Second Quarter 2025. During Second and Third Quarter 2025, total cobalt was detected at concentrations greater than the VDEQ ACL in point of compliance well 16WC1A only. Total cobalt was not detected at concentrations greater than the GPS or latest VDEQ ACL in the other wells comprising the compliance monitoring network. Additionally, the total cobalt data were evaluated using the revised ASD for total cobalt in groundwater at HWMU-16 for point of compliance wells 16MW9, 16WC1A, and 16WC1B approved by the VDEQ in electronic correspondence dated September 13, 2021. Based on the conclusions of the VDEQ-approved ASD, calendar year 2025 total cobalt concentrations detected in point of compliance wells 16MW9 and 16WC1A appear to be consistent with natural variation in local groundwater and are not indicative of a release from the Unit. Based on the VDEQ correspondence dated September 13, 2021, a separate ASD will not be required. No other constituents were detected in the upgradient well or in the point of compliance wells at concentrations greater than their respective GPS during Second or Third Quarter 2025.

Evaluation of the plume monitoring well data indicated that total barium concentrations greater than the site-specific background concentration were detected in plume monitoring wells 16-2 and 16-3 as well as spring sampling location 16SPRING during Second and Third Quarter 2025. Total barium also was detected at a concentration greater than the site-specific background concentration in plume monitoring well 16-5 during Second Quarter 2025. Higher total barium concentrations in downgradient plume monitoring wells relative to background are likely due to natural variations in trace element distribution in groundwater. Upgradient well 16C1 is



screened in limestone while downgradient plume monitoring wells 16-2, 16-3, and 16-5 are screened in shale and fault breccia. Such differing lithologic formations would be expected to contain very different trace element distributions. Similar barium concentrations were observed in the point of compliance wells. Therefore, no further action regarding the calendar year 2025 total barium concentrations detected in plume monitoring wells 16-2, 16-3, and 16-5 as well as in spring sampling location 16SPRING is recommended at this time.

The Third Quarter 2025 event also served as the annual monitoring event in which the upgradient and point of compliance wells at HWMU-16 were sampled for the 40 CFR Part 264 Appendix IX constituents listed in Permit Attachment 1, Appendix I. No 40 CFR Part 264 Appendix IX constituents (as listed in Appendix I of Permit Attachment 1) were detected at concentrations greater than their respective Permit MDLs.

The original Compliance Period during which the Groundwater Protection Standard applied to HWMU-16 was 13 years, beginning on the original effective date of the original Permit and continuing until October 30, 2015. However, due to the continued presence of hazardous waste buried within the Unit, the potential for impact to human health and the environment remains. Therefore, the VDEQ extended the compliance period for HWMU-16 to October 30, 2035, or until VDEQ approves clean closure of the Unit.

HWMU-16 2025 groundwater monitoring results were also compared to the GPSs presented in Attachment V.F-B of the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* reissued on September 25, 2025 (effective date October 25, 2025) and no changes to the findings and conclusions presented above were found.

No changes to the continuation of the groundwater program are anticipated at this time. Semiannual groundwater monitoring will continue at HWMU-16, with the next monitoring event scheduled for Second Quarter 2026.



1.0 INTRODUCTION

This document presents the Annual Groundwater Monitoring Report for calendar year 2025 for Hazardous Waste Management Units (HWMUs) 5 and 16 located at the Radford Army Ammunition Plant (RFAAP) in Radford, Virginia. The Annual Groundwater Monitoring Report was compiled in accordance with the requirements specified in the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* (Final Permit; original effective date October 4, 2002; reissued August 16, 2014; revised in VDEQ-approved Class 1 Permit Modifications dated September 12, 2014, December 1, 2016, and May 5, 2021). Calendar year 2025 groundwater monitoring events were conducted using revised detection limits (DLs) and quantitation limits (QLs) as approved by the Virginia Department of Environmental Quality (VDEQ) in electronic correspondence dated May 5, 2021. Additionally, total silver was added to the HWMU-16 Compliance Monitoring List following detection during Third Quarter 2023 as directed by VDEQ in correspondence dated May 8, 2024. The groundwater samples collected at HWMUs 5 and 16 during the Second and Third Quarter 2025 semiannual monitoring events were evaluated in accordance with the Final Permit and applicable permit modifications.

The Annual Groundwater Monitoring Report presents the following set of information for each Unit: basic information and unit identification, a description of the groundwater monitoring plan, a discussion of groundwater movement, potentiometric surface maps, a table of groundwater elevations, and evaluations of analytical data. The Report also includes long-term concentration plots for constituents of concern in accordance with section VI.J.4 (f) of the Permit and as requested by VDEQ in correspondence dated October 22, 2025.

RFAAP submitted the Permit renewal application for HWMUs 5 and 16 in February 2024. Subsequent to the Third Quarter 2025 groundwater monitoring event, the VDEQ approved reissuance of the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* on September 25, 2025 (effective date October 25, 2025).

1.1 HWMU-5

HWMU-5 is a closed lined neutralization pond. The Unit received certification for closure in 1989. The original Compliance Period during which the GPS applied to HWMU-5 was 19 years, beginning on the effective date of the original Post-Closure Care Permit for HWMU-5 (October 28, 2001) and continuing until October 28, 2020. However, exceedances above the GPS value for total cobalt continued to occur at the point of compliance past the original compliance period; therefore, the VDEQ extended the compliance period for HWMU-5 to October 28, 2030, or until VDEQ approves clean



closure of the Unit. The Second Quarter 2010 groundwater monitoring event served as the first semiannual Corrective Action (CA) groundwater monitoring event for HWMU-5 conducted in accordance with Permit Module VI – *Groundwater Corrective Action & Monitoring Program for Unit 5*.

1.2 HWMU-16

HWMU-16 is a closed hazardous waste landfill. The Unit received closure certification in 1993. The original Compliance Period during which the Groundwater Protection Standard applied to HWMU-16 was 13 years, beginning on the original effective date of the original Permit and continuing until October 30, 2015. However, due to the continued presence of hazardous waste buried within the Unit, the potential for impact to human health and the environment remains. Therefore, the VDEQ extended the compliance period for HWMU-16 to October 30, 2035, or until VDEQ approves clean closure of the Unit.



2.0 HWMU-5 ANNUAL GROUNDWATER MONITORING REPORT

2.1 Waste Management Unit Information

Unit Name: Hazardous Waste Management Unit 5 (HWMU-5)
Owner/Operator: United States Army/BAE Systems, Ordnance Systems Inc.

Unit Location: RFAAP Main Plant Area, Radford, Virginia

Class: Hazardous Waste Management Unit
Type: Closed Lined Neutralization Pond

2.2 Groundwater Monitoring Plan

Monitoring Network:

Upgradient Well: 5W8B
Point of Compliance Wells: 5W5B, 5W7B, 5WC21, 5WC22, 5WC23
Plume Monitoring Wells: 5W12A
Observation Wells: S5W5, S5W7, 5W9A, 5W10A, 5W11A, 5WCA, S5W6, S5W8, 5WC11, 5WC12

Monitoring Status: Corrective Action Monitoring Program

Calendar Year (CY) Monitoring Events:

Second Quarter 2025: June 24, 2025
Third Quarter 2025: July 28, 2025

HWMU-5 has been in corrective action (CA) since 2010. The calendar year 2025 groundwater monitoring events were conducted in accordance with Permit Module VI – *Groundwater Corrective Action & Monitoring Program for Unit 5*. Semiannual monitoring was conducted during Second and Third Quarter 2025.

2.3 Groundwater Movement

The monitoring wells at HWMU-5 are screened entirely within either weathered carbonate bedrock residuum or alluvium or across the weathered residuum/carbonate bedrock interface. The static water level measurements gathered during the 2025 semiannual monitoring events are summarized in **Table 1**. The maximum groundwater elevation fluctuation of 1.61 feet was observed at observation well 5W11A; a minimum



groundwater elevation fluctuation of 0.01 feet was observed at upgradient well 5W8B. On average, the groundwater elevation at HWMU-5 fluctuated 0.81 feet, which is less than the expected annual fluctuation (2 to 5 feet) discussed in the Permit. As shown on the HWMU-5 Potentiometric Surface Maps (**Appendix A-1**), groundwater movement beneath the site is generally to the north/northeast.

Darcian flow conditions were assumed for the alluvium, residuum, and carbonate bedrock beneath HWMU-5. As a result, the groundwater velocities were calculated by multiplying the hydraulic conductivity (determined from previously conducted slug tests) by the average hydraulic gradient across the site and dividing by an assumed effective porosity for the aquifer. The average hydraulic gradient was determined by superimposing three evenly spaced flow line vectors over the potentiometric surface map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site based on Third Quarter 2025 groundwater elevations was calculated to be 0.0259 ft/ft. Historical slug test data for the site yielded an average hydraulic conductivity of 5.25×10^{-5} ft/second. This value is consistent with literature values for carbonate rock and for clayey, silty sand and gravel alluvium and residuum (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately 2.35 ft/day or 858 ft/year based on the following:

- Average hydraulic conductivity of 5.25×10^{-5} ft/second.
- Average hydraulic gradient of 0.0259 ft/ft.
- Assumed effective porosity of 0.05, based on a representative range of porosities for carbonate rock, weathered residuum, and clayey, silty sand and gravel alluvium (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above depending on water level conditions and the distribution of solution features.

2.4 Groundwater Monitoring Activities

During Second Quarter 2025 and Third Quarter 2025, all of the wells in the CA groundwater monitoring network were sampled for the constituents listed in Appendix J to Permit Attachment 2 (*Groundwater Corrective Action Targeted Constituents - GPS and*



Semiannual Monitoring List for HWMU-5). The Second Quarter 2025 event also served as the annual monitoring event in which the point of compliance wells at HWMU-5 were sampled for the constituents listed in Appendix K to Permit Attachment 2 (*Groundwater Corrective Action Annual Monitoring List*). The calendar year 2025 groundwater monitoring events were conducted using revised DLs and QLs approved by the VDEQ in electronic correspondence dated May 5, 2021.

2.5 Groundwater Analytical Data Evaluation

The laboratory analytical results for the 2025 monitoring events are summarized in **Appendix A-2** (Groundwater Corrective Action Targeted Constituents - GPS and Semiannual Monitoring List) and in **Appendix A-3** (Groundwater Corrective Action Annual Monitoring List). Field measurements for indicator parameters are summarized in **Appendix A-4**. Historical concentrations and a long-term time concentration plot for total cobalt are included in **Appendix A-5**. The complete laboratory certificates of analysis for the 2025 monitoring events are included in **Appendix C**. Results were reported by an accredited laboratory under the Virginia Environmental Laboratory Accreditation Program (VELAP) for the analytes, methods and matrix as reported on the certificate of analysis; a copy of the laboratory VELAP accreditation certificate is presented in **Appendix C**. The analytical data were validated in accordance with SW-846, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*; data validation reports for HWMU-5 are included in **Appendix C**. Copies of field notes recorded during sample collection are included in **Appendix D**. Copies of correspondence relating to groundwater monitoring activities conducted at HWMU-5 during calendar year 2025 are included in **Appendix E**.

2.5.1 Semiannual Monitoring for Corrective Action Targeted Constituents

During the Second Quarter 2025 and Third Quarter 2025 monitoring events, groundwater samples collected from all of the wells in the CA groundwater monitoring network were analyzed for the CA Targeted Constituents listed in Appendix J to Permit Attachment 2. The CA Targeted Constituents consist of TCE and its daughter products: 1,1-dichloroethene (1,1-DCE), *cis*-1,2-dichloroethene (*c*DCE), *trans*-1,2-dichloroethene (*t*DCE), and vinyl chloride (VC). In addition, the VDEQ added total cobalt to the list of CA Targeted Constituents during a meeting with RFAAP on May 4, 2011. The laboratory analytical results for the CA Targeted Constituents are summarized in **Appendix A-2**. For constituents listed in Appendix J, the laboratory reported QLs and DLs were at or below the respective permit QL or DL presented in the Class 1 Permit Modification and approved May 5, 2021.



During Second Quarter 2025, TCE was detected in point of compliance wells 5WC21, 5WC22, and 5WC23 at concentrations of 1.3 ug/l, 1.4 ug/l and 2.6 ug/l, respectively, which are less than the Groundwater Protection Standard (GPS) of 5 ug/l (**Appendix A-2**). TCE was not detected in any of the other wells in the CA groundwater monitoring network. Additionally, the TCE daughter products were not detected in any of the wells comprising the CA groundwater monitoring network.

During Third Quarter 2025, TCE was detected in point of compliance wells 5WC21, 5WC22 and 5WC23 at concentrations of 1.3 ug/l, 1.5 ug/l and 2.6 ug/l, respectively, which are less than the GPS of 5 ug/l (**Appendix A-2**). TCE was not detected in any of the other wells in the CA groundwater monitoring network. Additionally, the TCE daughter products were not detected in any of the wells comprising the CA groundwater monitoring network.

During Second Quarter 2025, total cobalt was detected in point of compliance well 5WC21 at concentrations of 16 ug/l, which is greater than the Unit-specific GPS of 7 ug/l. Total cobalt was detected in point of compliance well 5WC22 at a concentration of 6.5 ug/l, which is greater than the QL of 5 ug/l but less than the Unit-specific GPS of 7 ug/l. Total cobalt was detected in point of compliance well 5W7B at an estimated concentration less than the QL of 5 ug/l but greater than the DL of 1 ug/l (**Appendix A-2**). Total cobalt was not detected at concentrations greater than the GPS in the other wells comprising the CA monitoring network during Second Quarter 2025.

During Third Quarter 2025, total cobalt was detected in point of compliance wells 5WC21 and 5W7B at concentrations of 14 ug/l and 7.7 ug/l, respectively, which are greater than the Unit-specific GPS of 7 ug/l. Total cobalt was detected in point of compliance well 5WC22 at an estimated concentration less than the QL of 5 ug/l but greater than the DL of 1 ug/l (**Appendix A-2**). Total cobalt was not detected at concentrations greater than the GPS in the other wells comprising the CA monitoring network during Third Quarter 2025.

2.5.2 Annual Monitoring List – Comparison to Groundwater Protection Standards

During Second Quarter 2025, groundwater samples collected from the point of compliance wells for HWMU-5 were analyzed for the constituents listed in Appendix K to Permit Attachment 2 (*Groundwater Corrective Action Annual Monitoring List*; revised in Class 1 Permit Modification approved by VDEQ on May 5, 2021). Appendix K constituents are based on the Compliance Monitoring List, plus those constituents historically detected. Annual monitoring for the constituents listed in Appendix K is



required in order to evaluate whether additional hazardous constituents that are not the targets for the current CA (e.g., TCE and its daughter products, total cobalt) are present at concentrations greater than their respective GPS for the Unit. No additional hazardous constituents that are not targets for the current CA for the Unit were detected at concentrations greater than their respective GPS during Second Quarter 2025 (**Appendix A-3**).

The Second Quarter 2025 annual groundwater monitoring event was conducted using QLs and DLs presented in the Class 1 Permit Modification approved by the VDEQ in electronic correspondence dated May 5, 2021. For all constituents, the laboratory QL was less than the respective GPS.

HWMU-5 2025 groundwater monitoring results were also compared to the GPSs presented in Attachments VI.B and VI.C in the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* reissued on September 25, 2025 (effective date October 25, 2025) and no changes to the findings and conclusions presented above were found.

2.5.3 Annual Monitoring List – Verification of Estimated Values

A footnote presented in Appendix K to Permit Attachment 2 indicates that verification is required for constituents detected at concentrations less than the QL if their associated GPSs are 1) based on background values equal to the QL, and 2) are greater than the applicable risk-based concentrations (i.e., VDEQ Alternate Concentration Limit (ACL) or USEPA Regional Screening Level (RSL)). In these instances, verification must be conducted using an alternate low-level analytical method in order to confirm or refute the observed initial detections if the QL achievable by that method is less than, or equal to, the ACL or RSL for the subject constituent. If a concentration greater than the low-level analytical method QL is observed above the ACL or RSL, then a revised background concentration will be established using the low-level analytical method, if appropriate, and the GPS for that constituent will be updated, if warranted. This applies to p-nitroaniline and nitrobenzene only.

During Second Quarter 2025, p-nitroaniline and nitrobenzene were not detected and no additional action was required.

2.5.4 2025 USEPA Regional Screening Levels (RSLs)

The USEPA periodically updates the RSLs (formerly known as RBCs). As stated in section VI.E.3 of Module VI of the Final Permit, "The Permittee shall use the most up-to-date USEPA MCL, the Department ACL, or EPA Region 3 RBC as the GPS. If USEPA



implements any changes to MCLs or RBCs, the GPS defined by that MCL or RBC will be updated to reflect the most current value established by USEPA.”

At the time of the Second Quarter 2025 groundwater monitoring event, the November 2024 USEPA RSL table reflected the most current RSL values. According to the November 2024 USEPA RSL table, the tapwater RSL for diethyl ether (CAS Number 60-29-7) was 3,900 ug/l (target hazard quotient (THQ)=1.0, target risk (TR)=1E-06); the Permit-specified GPS for diethyl ether listed in Appendix K to Permit Attachment 2 is based on a previous RSL of 7,300 ug/l. The GPS comparison value for diethyl ether listed in Appendix A-2 of this report is the Permit-specified GPS of 7,300 ug/l; however, RFAAP also compared diethyl ether concentrations detected during Second Quarter 2025 to the current (as of November 2024) USEPA RSL of 3,900 ug/l.

Diethyl ether is the only constituent listed in Appendix K to Permit Attachment 2 whose GPS is based on a previous USEPA RSL that has been updated subsequent to the Permit reissuance date of August 16, 2014.

During Second Quarter 2025, diethyl ether was not detected at or above the laboratory QL of 10 ug/l. Diethyl ether was detected below the QL in point of compliance wells 5WC22 and 5WC23 at estimated concentrations of 1.1 ug/l and 6.2 ug/l, respectively. The detected diethyl ether estimated concentrations are less than the GPS listed in Appendix K to Permit Attachment 2 (7,300 ug/l) as well as the current USEPA RSL of 3,900 ug/l. Diethyl ether was not detected in any other wells comprising the CA groundwater monitoring network.

2.6 Annual Evaluation of Effectiveness of Corrective Action

In accordance with the Final Permit, RFAAP is required to perform an annual evaluation of the effectiveness of the Corrective Action Program (CAP) (monitored natural attenuation [MNA] program) for calendar year 2025. MNA is the current remedial measure implemented at the Unit to address TCE in groundwater at concentrations greater than the GPS.

As stated in the 2014-2024 Annual Groundwater Monitoring Reports for the Unit (2024 Annual Report approved in VDEQ correspondence dated April 29, 2025; **Appendix E**), TCE remedial endpoints have been achieved. During Second Quarter 2025 and Third Quarter 2025, TCE was not detected at concentrations greater than its GPS in any of the wells comprising the CA groundwater monitoring network for HWMU-5. Additionally, no daughter products of TCE were detected in any of the wells comprising the CA groundwater monitoring network for HWMU-5; therefore, TCE remedial



objectives continue to be met. In accordance with the Final Permit, calculation of the predicted MNA remedial timeframe is not applicable since TCE data remained below the GPS during the calendar year 2025 monitoring events.

Total cobalt was detected at concentrations greater than the GPS of 7 ug/l in point of compliance well 5WC21 during Second and Third Quarter 2025, and at point of compliance well 5W7B during Third Quarter 2025 only. Total cobalt was not detected at concentrations greater than the GPS in any other wells comprising the CA monitoring network during the calendar year 2025 monitoring events. Historical concentrations and a long-term time concentration plot for total cobalt concentrations detected in POC wells 5WC21, 5WC22, 5WC23, and 5W7B are included in **Appendix A-5**. As shown on the long-term time concentration plot, the total cobalt concentrations detected in well 5WC21 exhibit a decreasing trend, and the concentrations detected in wells 5WC22, 5WC23, and 5W7B exhibit no significant trend.

2.7 Recommendations

TCE concentrations at HWMU-5 remained below the GPS throughout calendar year 2025 indicating achievement of TCE remedial endpoints. The current monitoring program is required to continue until the TCE concentrations have remained below the GPS for a period of three consecutive years, upon which time the Permittee may request to end corrective action. However, although TCE concentrations in groundwater at the Unit have been less than the GPS for 12 consecutive years, total cobalt remains above the GPS in point of compliance wells 5WC21 and 5W7B. Therefore, continued CA groundwater monitoring is required as specified in the Permit.

No changes to the continuation of the groundwater CA program are anticipated at this time. Semiannual groundwater monitoring will continue at HWMU-5 in accordance with the VDEQ approved Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16 reissued on September 25, 2025 (effective date October 25, 2025). The next monitoring event is scheduled for Second Quarter 2026.



3.0 HWMU-16 ANNUAL GROUNDWATER MONITORING REPORT

3.1 Waste Management Unit Information

Unit Name: Hazardous Waste Management Unit 16 (HWMU-16)
Owner/Operator: United States Army/BAE Systems, Ordnance Systems Inc.

Unit Location: RFAAP Main Plant Area, Radford, Virginia

Class: Hazardous Waste Management Unit
Type: Closed Hazardous Waste Landfill

3.2 Groundwater Monitoring Plan

Monitoring Network:

Upgradient Well: 16C1
Point of Compliance Wells: 16WC1A, 16WC1B, 16MW8, 16MW9
Plume Monitoring Wells: 16-2, 16-3, 16-5, 16WC2B, 16SPRING
Observation Wells: 16-1, 16WC2A, 16C3, 16CDH3

Monitoring Status: Compliance Monitoring Program

CY 2025 Monitoring Events:

Second Quarter 2025: June 25-26 2025
Third Quarter 2025: July 29-30, 2025

The calendar year 2025 groundwater monitoring events for HWMU-16 were conducted in accordance with Permit Module V – *Groundwater Compliance Monitoring*. Semiannual monitoring was conducted during Second and Third Quarters 2025.

3.3 Groundwater Movement

The monitoring wells at HWMU-16 are screened entirely within either carbonate bedrock or weathered carbonate bedrock residuum, or across the residuum/bedrock interface. The static water level measurements gathered during the 2025 semiannual monitoring events are summarized in **Table 2**. The maximum groundwater elevation fluctuation of 1.7 feet was observed at point of compliance well 16MW9; the minimum groundwater elevation fluctuation of 0.00 feet was observed at observation well 16WC2B. On average, the groundwater elevation at HWMU-16 fluctuated 0.29 feet,



which is less than the range of expected annual fluctuation (2 to 4 feet) discussed in the Permit. As shown on the HWMU-16 Potentiometric Surface Maps (**Appendix B-1**), groundwater movement beneath the site is generally to the northeast.

Darcian flow conditions were assumed for the weathered residuum and carbonate bedrock beneath HWMU-16. As a result, the groundwater velocities were calculated by multiplying the hydraulic conductivity (determined from previously conducted slug tests) by the average hydraulic gradient across the site and dividing by an assumed effective porosity for the aquifer materials. The average hydraulic gradient was determined by superimposing three evenly spaced flow line vectors over the potentiometric surface map, measuring their lengths, calculating the head differential over the distances measured, and dividing the head differential by the length of the flow line vectors. The three calculated gradients were then averaged to a single value. Using this method, the average groundwater hydraulic gradient across the site based on Third Quarter 2025 groundwater elevations was calculated to be 0.0870 ft/ft. Historical slug test data for the site yielded an average hydraulic conductivity of 7.87×10^{-5} ft/second. This value is consistent with literature values for carbonate rock and for clay and silt residuum (Domenico and Schwartz, 1990).

The estimated groundwater velocity across the site was calculated to be approximately 11.83 ft/day or 4,318 ft/year based on the following:

- Average hydraulic conductivity of 7.87×10^{-5} ft/second.
- Average hydraulic gradient of 0.0870 ft/ft.
- Assumed effective porosity of 0.05, based on a representative range of porosities for carbonate rock and clay and silt residuum (Domenico and Schwartz, 1990).

The actual groundwater flow velocities in the carbonate bedrock may vary as much as one to two orders of magnitude from the velocity presented above depending on water level conditions and the distribution of solution features.

3.4 Groundwater Monitoring Activities

The groundwater samples collected from the compliance monitoring network during the 2025 semiannual monitoring events were analyzed for the constituents listed in Permit Attachment 3, Appendix E – *Groundwater Compliance Monitoring (Semiannual) Constituent List*. In addition, during Third Quarter 2025 groundwater samples were collected from the upgradient well and the point of compliance wells for annual monitoring for the constituents listed in Permit Attachment 1, Appendix I – *Annual*



Groundwater Sampling Constituent List (Appendix IX 40 CFR Part 264). The calendar year 2025 groundwater monitoring events were conducted using revised DLs and QLs as presented in the Class 1 Permit Modification approved by the VDEQ in electronic correspondence dated May 5, 2021. Additionally, total silver was added to the HWMU-16 Compliance Monitoring List following detection during Third Quarter 2023 as directed by VDEQ in correspondence dated May 8, 2024. HWMU-16 total cobalt data were evaluated using the revised ASD for total cobalt in groundwater at HWMU-16 approved by the VDEQ in electronic correspondence dated September 13, 2021.

3.5 Groundwater Analytical Data Evaluation

The laboratory analytical results for the 2025 monitoring events are included in Appendix B-2 (point of compliance wells) and in **Appendix B-3** (plume monitoring wells). The established background values and the computations used to determine the background values are included in **Appendix B-4**. Field measurements for indicator parameters are summarized in **Appendix B-5**. The complete laboratory certificates of analysis for the 2025 monitoring events are included in **Appendix C**. Results were reported by an accredited laboratory under the VELAP for the analytes, methods and matrix as reported on the certificate of analysis; a copy of the laboratory VELAP accreditation certificate is presented in **Appendix C**. The analytical data were validated in accordance with SW-846, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*; data validation reports for HWMU-16 are included in **Appendix C**. Copies of field notes recorded during sample collection are included in **Appendix D**. Copies of correspondence relating to groundwater monitoring activities conducted at HWMU-16 during calendar year 2025 are included in **Appendix E**.

3.5.1 Annual Monitoring – Permit Attachment 1, Appendix I

During the Third Quarter 2025 monitoring event, groundwater samples were collected from the upgradient well and the point of compliance wells for annual monitoring for the constituents listed in Permit Attachment 1, Appendix I – *Annual Groundwater Sampling Constituent List (Appendix IX 40 CFR Part 264)*.

Four laboratories were utilized to complete the Annual Appendix IX groundwater monitoring event. The *final revised* laboratory analytical data packages for this event were received on September 21, 2025. The laboratory DLs and QLs met the Permit-specified MDLs and QLs. Select sample results were adjusted due to final sample volume (e.g., SW-846 Method 8270E – semivolatile organic analysis).



No Appendix IX constituents were detected at estimated concentrations greater than their respective Permit DLs at HWMU-16 during the Third Quarter 2025 groundwater monitoring event and no additional action was required.

3.5.2 Comparison to Groundwater Protection Standards

As specified in the Final Permit, the calendar year 2025 groundwater analytical data for the upgradient well and the point of compliance wells were compared to the GPS for HWMU-16 listed in Appendix G of Permit Attachment 3 (modified to add 1,1-dichloroethene in Class 1 Permit Modification approved September 12, 2014; modified to add tetrahydrofuran in Class 1 Permit Modification approved December 1, 2016; modified to add vinyl chloride in Class 1 Permit Modification approved May 5, 2021; and modified to add total silver during the Permit renewal application process as directed by the VDEQ in correspondence dated May 8, 2024). In accordance with Permit Condition V.I.2, RFAAP performed a simple empirical comparison of the upgradient well and the point of compliance well data to the GPS (**Appendix B-2**). Additionally, as directed by the VDEQ in electronic correspondence dated October 26, 2018, RFAAP also compared the detected total cobalt concentrations to the latest (effective January 2, 2025) VDEQ ACL for cobalt of 6 ug/l.

Total cobalt was detected at concentrations greater than the GPS in point of compliance well 16WC1A during Second and Third Quarter 2025, and in point of compliance well 16MW9 during Second Quarter 2025. During Second and Third Quarter 2025, total cobalt was detected at concentrations greater than the VDEQ ACL in point of compliance well 16WC1A only. In addition to the GPS and latest VDEQ ACL, the total cobalt data were evaluated using the revised ASD for total cobalt in groundwater at HWMU-16 for point of compliance wells 16MW9, 16WC1A, and 16WC1B approved by the VDEQ in electronic correspondence dated September 13, 2021. Based on the conclusions of the VDEQ-approved ASD, calendar year 2025 total cobalt concentrations detected in point of compliance wells 16MW9 and 16WC1A appear to be consistent with natural variation in local groundwater and are not indicative of a release from the Unit. Therefore, a verification event was not conducted for calendar year 2025 total cobalt concentrations detected in point of compliance wells 16MW9 and 16WC1A. Based on the VDEQ correspondence dated September 13, 2021, a separate ASD will not be required.

Total cobalt was not detected at concentrations greater than the GPS or latest VDEQ ACL in the other wells comprising the compliance monitoring network.



No other constituents were detected in the upgradient well or in the point of compliance wells at concentrations greater than their respective GPS during Second or Third Quarter 2025.

A footnote presented in Appendix G of Permit Attachment 3 (*Groundwater Protection Standards: Unit 16*) indicates that verification is required for constituents detected at concentrations less than the QL if their associated GPS are equal to the QL and are greater than the applicable risk-based concentrations (i.e., ACL or RSL). In these instances, verification must be conducted using an alternate low-level analytical method in order to confirm or refute the observed initial detections if the QL achievable by that method is less than, or equal to, the ACL or RSL for the subject constituent. If a concentration greater than the low-level analytical method QL is observed, then the GPS for that constituent will be updated, if warranted. During Second Quarter 2025 and Third Quarter 2025, no constituents with GPS equal to their respective QLs and greater than the applicable risk-based concentrations were detected at concentrations less than their respective QLs; therefore, no further action was warranted. Note that results for Second Quarter 2025 are reported to at or above the QL only. The above noted review for Second Quarter 2025 was based on review of associated instrument data which includes results less than the QL. This applied to 2,4-dinitrotoluene and 2,6-dinitrotoluene.

HWMU-16 2025 groundwater monitoring results were also compared to the GPSs presented in Attachment V.F-B of the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* reissued on September 25, 2025 (effective date October 25, 2025) and no changes to the findings and conclusions presented above were found.

3.5.3 Comparison to Background Concentrations

As specified in Permit Condition V.O, the calendar year 2025 groundwater analytical data for the plume monitoring wells were compared to the background concentrations for HWMU-16 listed in Appendix F of Permit Attachment 3. In accordance with Permit Condition V.I.2, RFAAP performed a simple empirical comparison of the plume monitoring well data to the background concentrations (**Appendix B-3**).

As shown in **Appendix B-3**, total barium was detected at concentrations greater than the site-specific background concentration of 175.4 ug/l in plume monitoring wells 16-2 and 16-3 as well as spring sampling location 16SPRING during Second and Third Quarter 2025. Total barium also was detected at a concentration greater than the site-specific background concentration of 175.4 ug/l in plume monitoring well 16-5 during



Second Quarter 2025. All total barium concentrations detected in the plume monitoring locations were well below the USEPA MCL for barium of 2,000 ug/l. Higher total barium concentrations in downgradient plume monitoring wells relative to background may be the result of natural variations in trace element distribution in groundwater. As illustrated in the boring logs for the compliance network monitoring wells (Appendix H of Permit Attachment 5), upgradient well 16C1 is screened in limestone while downgradient plume monitoring wells 16-2, 16-3, and 16-5 are screened in shale and fault breccia. Such differing lithologic formations would be expected to contain different trace element distributions. Similar barium concentrations were observed in the point of compliance wells. In correspondence dated May 9, 2022, VDEQ acknowledged the presence of barium above the site-specific background concentration due to lithology. However, VDEQ may request further investigation if total barium levels in groundwater increase in the future. No further action regarding calendar year 2025 total barium concentrations detected in plume monitoring wells above the site-specific background concentration is recommended at this time.

No other constituent concentrations detected in the plume monitoring wells were greater than their respective background concentration or applicable Permit-specified QL, as listed in Permit Appendix G to Attachment 3. In accordance with the requirements of Permit Condition V.K.3, the established background values and the computations used to determine the background values are included in **Appendix B-4**.

3.6 Recommendations

No further action regarding the 2025 total barium concentrations detected in plume monitoring wells 16-2, 16-3, and 16-5 as well as in spring sampling location 16SPRING is recommended at this time.

No further action regarding the 2025 total cobalt concentrations detected in point of compliance wells 16MW9 and 16WC1A is recommended at this time based on the VDEQ-approved total cobalt ASD.

The original Compliance Period during which the Groundwater Protection Standard applied to HWMU-16 was 13 years, beginning on the original effective date of the original Permit and continuing until October 30, 2015. However, due to the continued presence of hazardous waste buried within the Unit, the potential for impact to human health and the environment remains. Therefore, the VDEQ extended the compliance period for HWMU-16 to October 30, 2035, or until VDEQ approves clean closure of the Unit.



No changes to the continuation of the groundwater program are anticipated at this time. Semiannual groundwater monitoring will continue at HWMU-16 in accordance with the VDEQ approved Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16 reissued on September 25, 2025 (effective date October 25, 2025) with the next monitoring event scheduled for Second Quarter 2026.



SIGNATURE/CERTIFICATION

Prepared by:

Name: _____ Ross G. Miller; Senior Project Geologist

Signature: _____ 

Company: _____ TRC Engineers, Inc.

Address: _____ 2200 South Main Street, Suite A

City/State/Zip: _____ Blacksburg, Virginia 24060-6600

Prepared by:

Name: _____ Will Mason-Deese Project Geologist

Signature: _____ 

Company: _____ TRC Engineers, Inc.

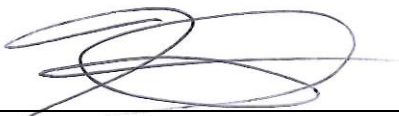
Address: _____ 2200 South Main Street, Suite A

City/State/Zip: _____ Blacksburg, Virginia 24060-6600

Virginia Professional Certification:

I certify that I have prepared or supervised preparation of the attached report, that it has been prepared in accordance with industry standards and practices, and that the information contained herein is truthful and accurate to the best of my knowledge.

Name: _____ Michael D. Lawless, Principal Geologist

Signature: _____ 

Virginia Professional Certification Type and Number: _____ PG 832

Company: _____ TRC Engineers, Inc.

Address: _____ 2200 South Main Street, Suite A

City/State/Zip: _____ Blacksburg, Virginia 24060-6600

TABLES

TABLE 1
HWMU-5
GROUNDWATER ELEVATIONS - 2025
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	June 24, 2025		July 28, 2025	
		DTW	GW ELEV	DTW	GW ELEV
5W8B	1789.58	13.72	1775.86	13.71	1775.87
5W5B	1775.13	9.20	1765.93	8.07	1767.06
5W7B	1774.78	9.38	1765.40	8.42	1766.36
5WC21	1774.43	9.35	1765.08	8.42	1766.01
5WC22	1774.45	9.22	1765.23	8.27	1766.18
5WC23	1773.84	8.62	1765.22	7.67	1766.17
5W12A	1772.46	11.30	1761.16	10.34	1762.12
S5W5	1772.31	8.16	1764.15	6.79	1765.52
S5W7	1776.08	11.11	1764.97	10.59	1765.49
5W9A	1762.20	1.44	1760.76	0.85	1761.35
5W10A	1771.40	13.10	1758.30	12.41	1758.99
5W11A	1766.20	11.02	1755.18	9.41	1756.79
5WC11	1788.92	14.55	1774.37	14.71	1774.21
5WC12	1788.96	14.97	1773.99	14.27	1774.69
5WCA	1779.05	12.65	1766.40	11.75	1767.30
S5W6	1771.43	7.15	1764.28	6.12	1765.31
S5W8	1783.68	11.38	1772.30	11.07	1772.61

NOTES:

DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

TABLE 2
HWMU-16
GROUNDWATER ELEVATIONS - 2025
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	June 26, 2025		July 29, 2025	
		DTW	GW ELEV	DTW	GW ELEV
16C1	1840.14	48.25	1791.89	48.44	1791.70
16MW8	1815.82	73.47	1742.35	73.65	1742.17
16MW9	1808.88	65.05	1743.83	63.35	1745.53
16WC1A	1812.61	67.97	1744.64	67.98	1744.63
16WC1B	1812.95	68.26	1744.69	68.28	1744.67
16-1	1815.82	48.70	1767.12	48.01	1767.81
16-2	1810.99	55.84	1755.15	55.85	1755.14
16-3	1824.77	56.58	1768.19	56.56	1768.21
16-5	1742.60	4.50	1738.10	4.32	1738.28
16WC2B	1818.71	53.75	1764.96	53.75	1764.96
16WC2A	1820.05	DRY	DRY	DRY	DRY
16C3	1822.22	65.80	1756.42	65.95	1756.27
16CDH3	1825.60	DRY	DRY	DRY	DRY
SPRING	na	na	na	na	na

NOTES:

DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

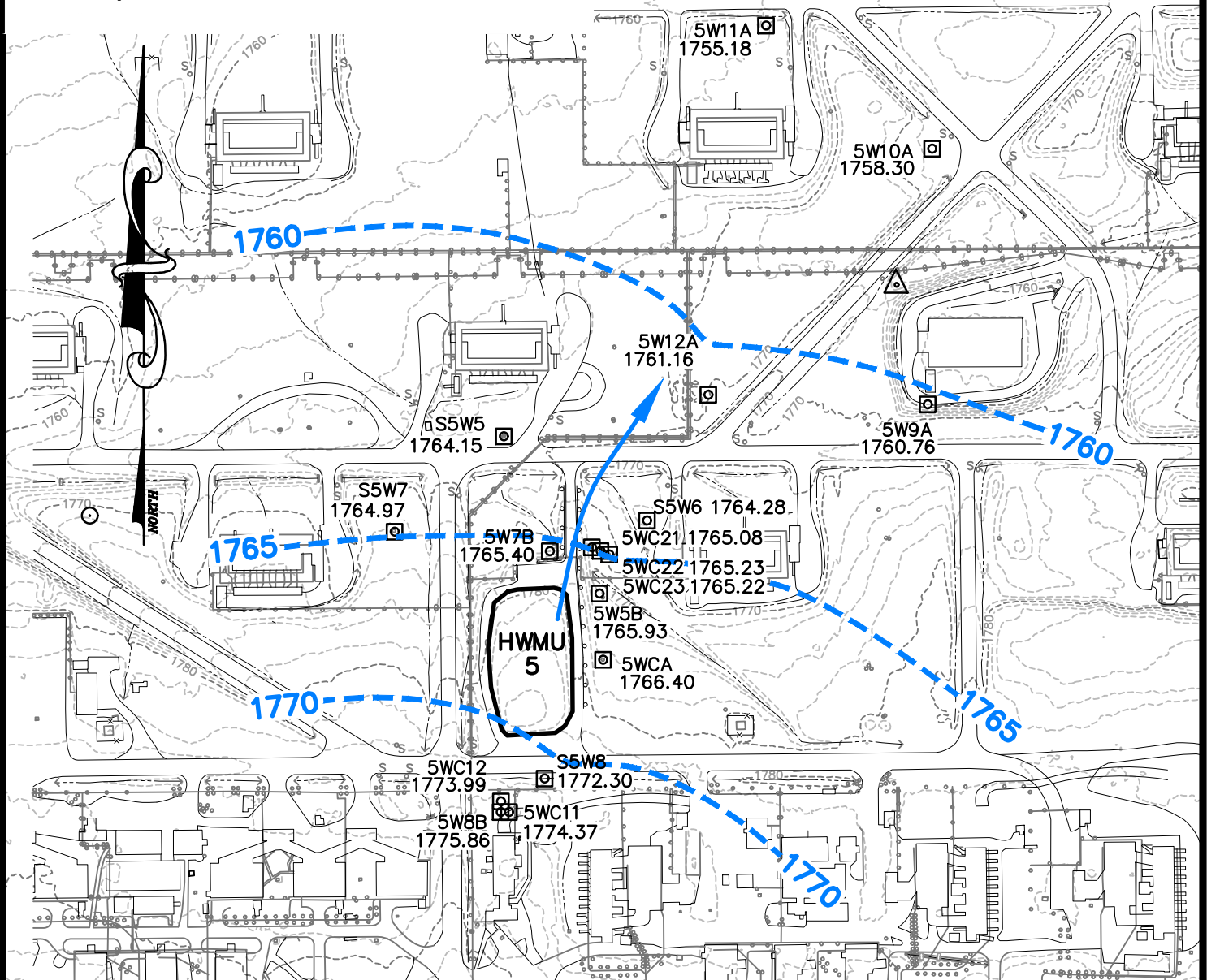
na: Not applicable.

APPENDIX A

HWMU-5

NOTES:

1. Topographic Contour Interval 2'.
2. Two-foot contours derived from 2017 LiDAR: U.S. Geological Survey 20210629, USGS 1 Meter 17 x53&54y412 VA_FEMA NRCS_SouthCentral_2017_D17.



GRAPHIC SCALE



(IN FEET)

1 inch = 200 ft.

LEGEND

5W7B □
1765.40

MONITORING WELL
GROUNDWATER ELEVATION
(feet above mean sea level)

--1770--
→

GROUNDWATER CONTOUR
GROUNDWATER FLOW DIRECTION

HWMU-5 POTENTIOMETRIC SURFACE MAP (June 24, 2025)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. 667639



2200 South Main Street
Suite A
Blacksburg, VA 24060
540-552-0444

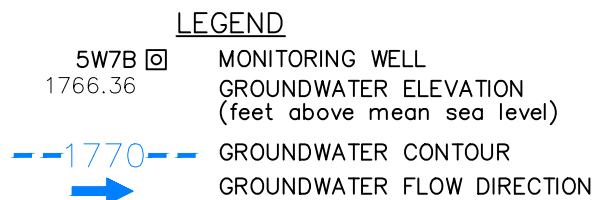
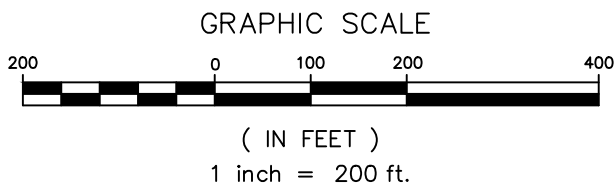
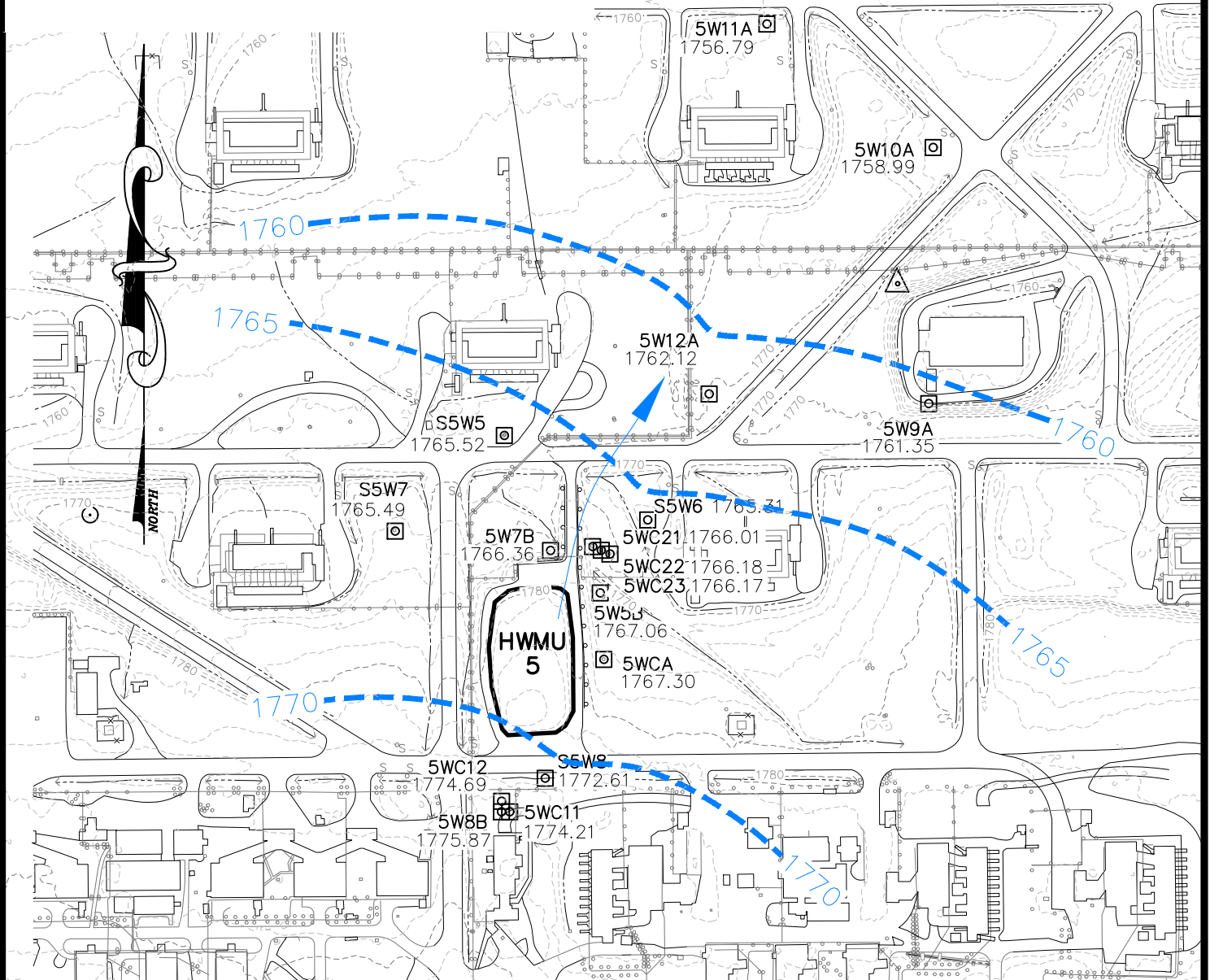
DESIGNED
DRAWN
CHECKED
DATE

BM
DLD
WMD
06/26/2025

FIGURE
1a

NOTES:

1. Topographic Contour Interval 2'.
2. Two-foot contours derived from 2017 LiDAR: U.S. Geological Survey 20210629, USGS 1 Meter 17 x53&54y412 VA_FEMA NRCS_SouthCentral_2017_D17.



HWMU-5 POTENTIOMETRIC SURFACE MAP (JuLY 28, 2025)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. 667639



2200 South Main Street
Suite A
Blacksburg, VA 24060
540-552-0444

DESIGNED
DRAWN
CHECKED
DATE

BM
CMC
WMD
1/29/2026

FIGURE
1b

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

<i>Analyte/Quarter</i>	<i>5W8B Q</i>	<i>5W5B Q</i>	<i>5W7B Q</i>	<i>5WC21 Q</i>	<i>5WC22 Q</i>	<i>5WC23 Q</i>	<i>5W12A Q</i>	<i>QL</i>	<i>Permit QL</i>	<i>GPS</i>	<i>DL</i>	<i>Permit DL</i>	<i>UNIT</i>	<i>Method</i>
Cobalt <i>CAS # 7440-48-4</i>														
Second Quarter 2025	U	U	4.4 J	16	6.5	U	U	5	5	7	1	1	ug/L	6020B
Third Quarter 2025	U	U	7.7	14	4.9 J	U	U	5	5	7	1	1	ug/L	6020B
1,1-Dichloroethene <i>CAS # 75-35-4</i>														
Second Quarter 2025	U	U	U	U	U	U	U	1	1	7	0.2	0.2	ug/L	8260D
Third Quarter 2025	U	U	U	U	U	U	U	1	1	7	0.2	0.2	ug/L	8260D
cis-1,2-Dichloroethene <i>CAS # 156-59-2</i>														
Second Quarter 2025	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/L	8260D
Third Quarter 2025	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/L	8260D
trans-1,2-Dichloroethene <i>CAS # 156-60-5</i>														
Second Quarter 2025	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/L	8260D
Third Quarter 2025	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/L	8260D
Trichloroethene <i>CAS # 79-01-6</i>														
Second Quarter 2025	U	U	U	1.3	1.4	2.6	U	1	1	5	0.3	0.3	ug/L	8260D
Third Quarter 2025	U	U	U	1.3	1.5	2.6	U	1	1	5	0.3	0.3	ug/L	8260D
Vinyl chloride <i>CAS # 75-01-4</i>														
Second Quarter 2025	U	U	U	U	U	U	U	1	1	2	0.2	0.2	ug/L	8260D
Third Quarter 2025	U	U	U	U	U	U	U	1	1	2	0.2	0.2	ug/L	8260D

See last page of this report for definitions.

***Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents***

***Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia***

Upgradient well = 5W8B

<i>Analyte/Quarter</i>	<i>5W8B Q</i>	<i>5W5B Q</i>	<i>5W7B Q</i>	<i>5WC21 Q</i>	<i>5WC22 Q</i>	<i>5WC23 Q</i>	<i>5W12A Q</i>	<i>QL</i>	<i>Permit QL</i>	<i>GPS</i>	<i>DL</i>	<i>Permit DL</i>	<i>UNIT</i>	<i>Method</i>
Definitions: <i>Results are reported to the permit detection limit. All metals reported as Total, unless specifically noted as dissolved.</i> QL Denotes laboratory quantitation limit. Permit QL Denotes permit quantitation limit. Class 1 Permit Mod approved May 5, 2021 DL Denotes laboratory detection limit. Permit DL Denotes permit detection limit. Class 1 Permit Mod approved May 5, 2021 U denotes not detected at or above the permit detection limit or QL. UA denotes not detected at or above the adjusted detection limit or adjusted QL. J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated. UN Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination. R Denotes result rejected. Q Denotes data validation qualifier. X Denotes mass spectral confirmation not obtained-result suspect. CAS# Denotes Chemical Abstract Services registration number. GPS Denotes Groundwater Protection Standards (2014) listed in Appendix J of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ in the Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002, reissued August 16, 2014). Dec 2016/May 2021 Class I Permit Mods. The first Corrective Action Monitoring Event occurred Second Quarter 2010. “–” denotes not sampled.														

See last page of this report for definitions.

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5

Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Antimony CAS # 7440-36-0													
Second Quarter 2025	-	U	U	U	U	U	2	2	6	0.6	0.6	ug/L	6020B
Arsenic CAS # 7440-38-2													
Second Quarter 2025	-	U	U	U	U	U	10	10	10	2	2	ug/L	6020B
Barium CAS # 7440-39-3													
Second Quarter 2025	-	24	21	19	31	24	10	10	2,000	1.3	1.3	ug/L	6020B
Beryllium CAS # 7440-41-7													
Second Quarter 2025	-	U	U	U	U	U	1	1	4	0.3	0.3	ug/L	6020B
Cadmium CAS # 7440-43-9													
Second Quarter 2025	-	U	U	U	U	U	1	1	5	0.2	0.2	ug/L	6020B
Chromium CAS # 7440-47-3													
Second Quarter 2025	-	U	2.4 J	U	U	U	5	5	100	1	1	ug/L	6020B
Cobalt CAS # 7440-48-4													
Second Quarter 2025	U	U	4.4 J	16	6.5	U	5	5	7	1	1	ug/L	6020B
Third Quarter 2025	U	U	7.7	14	4.9 J	U	5	5	7	1	1	ug/L	6020B
Copper CAS # 7440-50-8													
Second Quarter 2025	-	2.4 J	2.4 J	U	U	U	5	5	1,300	1.7	1.7	ug/L	6020B
Lead CAS # 7439-92-1													
Second Quarter 2025	-	U	U	U	U	U	3	3	15	1	1	ug/L	6020B
Mercury CAS # 7439-97-6													
Second Quarter 2025	-	U	U	U	U	U	2	2	2	0.2	0.2	ug/L	7470A
Nickel CAS # 7440-02-0													
Second Quarter 2025	-	U	4.7 J	9.2 J	2.8 J	U	10	10	300	2	2	ug/L	6020B
Selenium CAS # 7782-49-2													
Second Quarter 2025	-	U	U	U	U	U	10	10	50	3	3	ug/L	6020B
Silver CAS # 7440-22-4													
Second Quarter 2025	-	U	U	U	U	U	2	2	71	0.3	0.3	ug/L	6020B
Thallium CAS # 7440-28-0													
Second Quarter 2025	-	U	U	U	U	U	1	1	2	0.2	0.2	ug/L	6020B
Vanadium CAS # 7440-62-2													
Second Quarter 2025	-	U	U	U	U	U	10	10	63	2.5	2.5	ug/L	6020B

See last page of this report for definitions.

Page 1 of 3



Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5

Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Zinc CAS # 7440-66-6													
Second Quarter 2025	-	23 J	15 J	U	U	U	30	30	4700	7.3	7.3	ug/L	6020B
Acetone CAS # 67-64-1													
Second Quarter 2025	-	U J	U J	U J	U J	U J	10	10	12000	3	3	ug/L	8260D
bis(2-Ethylhexyl)phthalate CAS # 117-81-7													
Second Quarter 2025	-	U	U	U	U	U	6	6	10	1	1.5	ug/L	8270E
2-Butanone CAS # 78-93-3													
Second Quarter 2025	-	U	U	U	U	U	10	10	4900	1.7	1.7	ug/L	8260D
Chloroform CAS # 67-66-3													
Second Quarter 2025	-	2 J	1.6 J	1.2 J	1 J	1.3 J	1	1	80	0.3	0.3	ug/L	8260D
Dichlorodifluoromethane CAS # 75-71-8													
Second Quarter 2025	-	U	U	U	U	U	1	1	190	0.4	0.4	ug/L	8260D
1,2-Dichloroethane CAS # 107-06-2													
Second Quarter 2025	-	U	U	U	U	U	1	1	5	0.3	0.3	ug/L	8260D
Diethyl ether CAS # 60-29-7													
Second Quarter 2025	-	U	U	U	1.1 J	6.2 J	10	12.5	7,300	1.1	1.11	ug/L	8260D
Diethyl phthalate CAS # 84-66-2													
Second Quarter 2025	-	U	U	U	U	U	10	10	11000	2	2	ug/L	8270E
2,4-Dinitrotoluene CAS # 121-14-2													
Second Quarter 2025	-	U	U	U	U	U	10	10	10	2.1	2.1	ug/L	8270E
2,6-Dinitrotoluene CAS # 606-20-2													
Second Quarter 2025	-	U	U	U	U	U	10	10	10	2.1	2.1	ug/L	8270E
Methylene chloride CAS # 75-09-2													
Second Quarter 2025	-	U	U	U	U	U	1	1	5	0.7	0.7	ug/L	8260D
o-Nitroaniline CAS # 88-74-4													
Second Quarter 2025	-	U	U	2 J	1.5 J	2.2 J	10	10	150	1	1	ug/L	8270E
p-Nitroaniline CAS # 100-01-6													
Second Quarter 2025	-	-	U	-	-	-	2.5	20	20	1.5	1.5	ug/L	8270E
Second Quarter 2025	-	-	-	U	-	-	2.6	20	20	1.5	1.5	ug/L	8270E
Second Quarter 2025	-	U	-	-	U	U	3	20	20	1.5	1.5	ug/L	8270E

See last page of this report for definitions.

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Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5

Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Nitrobenzene CAS # 98-95-3													
Second Quarter 2025	-	U	U	-	-	-	10	10	10	0.79	0.8	ug/L	8270E
Second Quarter 2025	-	-	-	U	U	U	10	10	10	0.8	0.8	ug/L	8270E
Toluene CAS # 108-88-3													
Second Quarter 2025	-	U	U	U	U	U	1	1	1,000	0.3	0.3	ug/L	8260D
Xylenes (Total) CAS # 1330-20-7													
Second Quarter 2025	-	U	U	U	U	U	3	3	10,000	0.4	0.4	ug/L	8260D

Definitions:

Results are reported to the Permit Detection Limit. Inorganic results reported as total, unless noted as dissolved.
First Corrective Action Monitoring Event Second Quarter 2010:

QL: Denotes laboratory quantitation limit.

Permit QL: Denotes permit quantitation limit. Approved May 5, 2021

Class 1 Permit Modification approved May 5, 2021

DL: Denotes laboratory detection limit.

Permit DL: Denotes permit detection limit.

Class 1 Permit Modification approved May 5, 2021

U: Denotes not detected at or above the permit detection limit or QL.

UA: Denotes not detected at or above the adjusted detection limit or adjusted QL.

J: Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.

UN: Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.

R: Denotes result rejected.

Q: Denotes data validation qualifier.

X: Denotes mass spectral confirmation not obtained - result suspect.

CAS#: Denotes Chemical Abstract Services registration number.

GPS: Denotes Groundwater Protection Standards listed in Appendix K of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ and incorporated into the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (original effective date October 4, 2002 and reissued August 16, 2014; Dec 2016 and May 5, 2021 Class I Permit Mods);

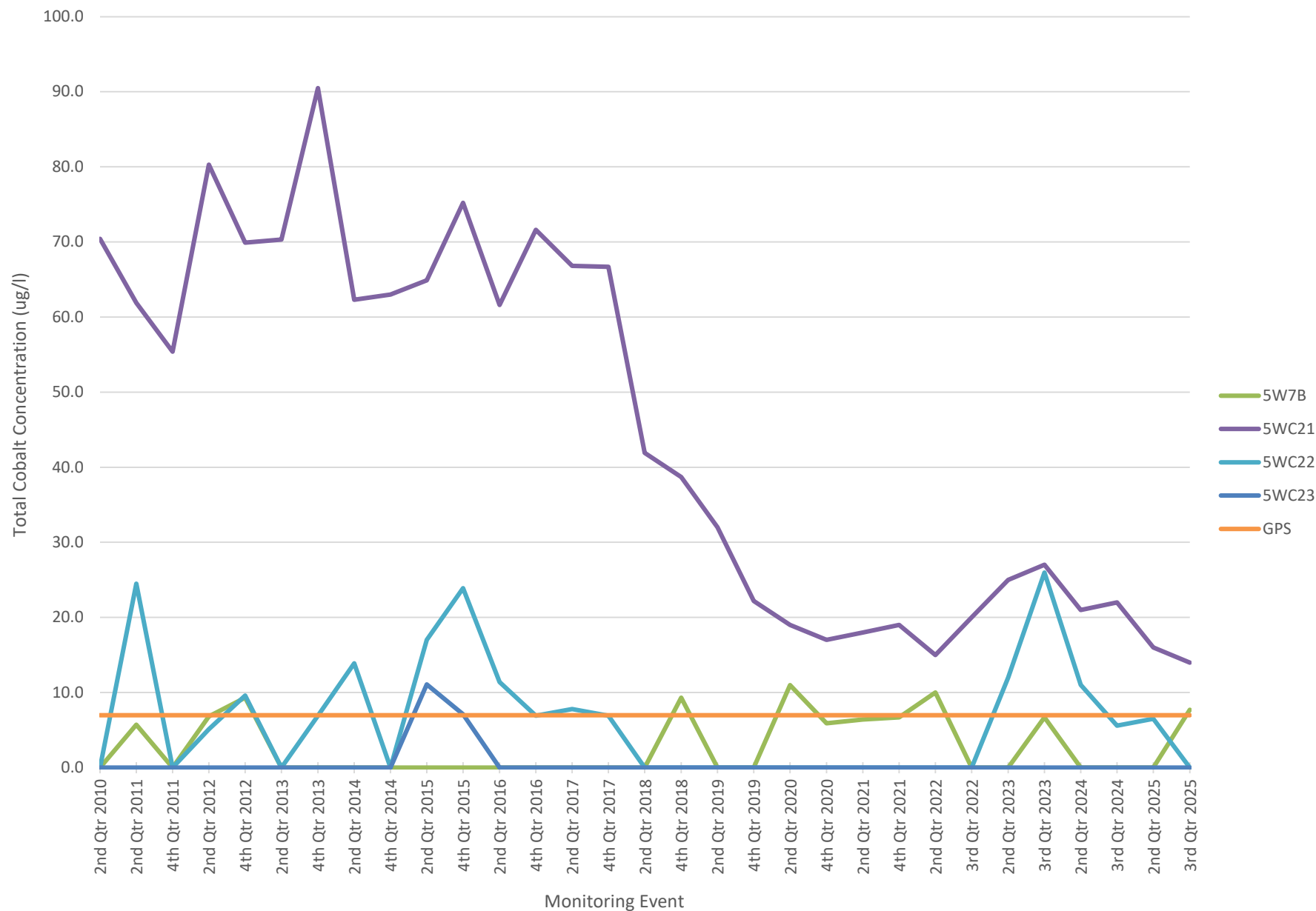
“-“: Denotes not sampled.

Indicator Parameter Data for Monitoring Wells
Radford Army Ammunition Plant (RFAAP) - Hazardous Waste Management Unit #5
Radford, Virginia

<i>Indicator Parameter</i>	<i>Unit</i>	<i>5W8B</i>	<i>5W5B</i>	<i>5W7B</i>	<i>5WC21</i>	<i>5WC22</i>	<i>5WC23</i>	<i>5W12A</i>
<i>Second Quarter 2025</i>								
DO	mg/L	4.67	2.17	4.7	1.82	0.63	3.71	1.59
ORP	mV	153.8	87.3	110.2	56.4	24.6	19.5	46.9
pH	s.u.	4.97	5.54	5.35	6.11	6.92	7.02	6.85
Specific Conductivity	uS/cm	58	288.3	184.9	532.7	772	1006	441
Temperature	deg C	14.8	15.1	14.3	15.7	15.6	16.1	15.9
Turbidity	NTU	2.7	0.99	0.85	1.39	2.77	0.8	0.84
<i>Third Quarter 2025</i>								
DO	mg/L	3.74	1.79	1.79	1.18	0.16	0.17	1.88
ORP	mV	218.5	188.2	218.9	139.3	92.2	75.2	152.1
pH	s.u.	4.69	5.22	4.39	5.76	6.73	6.83	6.66
Specific Conductivity	uS/cm	55.9	276.1	267	513.2	807	974	425.5
Temperature	deg C	19.1	17	21.4	15.2	15.09	17.3	17.4
Turbidity	NTU	3.24	2.34	0.62	1.66	6.55	0.67	3.39

HAZARDOUS WASTE MANAGEMENT UNIT 5 (HWMU-5) SUMMARY OF TOTAL COBALT CONCENTRATIONS IN GROUNDWATER 2003-2025 RADFORD ARMY AMMUNITION PLANT, RADFORD, VIRGINIA							
Monitoring Event	Total Cobalt Concentrations in Upgradient and Point of Compliance Wells (ug/l)						
	5W8B	5W5B	5W7B	5WC21	5WC22	5WC23	GPS
1st Qtr 2003	~	~	65.7	134	10.5	~	313
2nd Qtr 2003	~	~	5.0	129	13.7	~	313
3rd Qtr 2003	~	~	~	142	10.7	~	313
4th Qtr 2003	~	~	5.1	153	8.6	~	313
1st Qtr 2004	~	~	~	149	7.9	~	313
2nd Qtr 2004	~	~	~	146	6.7	~	313
3rd Qtr 2004	~	~	~	145	21.0	~	313
4th Qtr 2004	~	~	~	159	8.1	~	313
1st Qtr 2005	~	~	~	143	5.8	~	313
2nd Qtr 2005	~	~	13.1	121	9.2	~	313
3rd Qtr 2005	~	~	21.3	115	9.1	~	313
4th Qtr 2005	~	~	22.2	108	5.2	~	313
1st Qtr 2006	~	~	19.7	98.0	5.0	~	313
2nd Qtr 2006	~	~	22.3	91.8	5.3	~	313
3rd Qtr 2006	~	~	20.0	81.2	5.0	~	313
4th Qtr 2006	~	~	27.5	91.2	5.6	~	313
1st Qtr 2007	~	~	22.7	92.7	~	~	313
2nd Qtr 2007	~	~	8.6	82.8	10.4	~	313
4th Qtr 2007	~	~	10.2	82.2	13.7	~	313
2nd Qtr 2008	~	~	11.0	62.7	16.9	~	313
4th Qtr 2008	~	~	12.4	71.2	~	~	313
2nd Qtr 2009	~	~	6.8	50.7	~	~	313
4th Qtr 2009	~	~	~	77.9	6.0	~	313
2nd Qtr 2010	~	~	~	70.4	~	~	7
4th Qtr 2010	ns	ns	ns	ns	ns	ns	7
2nd Qtr 2011	~	~	5.7	61.9	24.5	~	7
4th Qtr 2011	~	~	~	55.4	~	~	7
2nd Qtr 2012	~	~	6.8	80.3	5.1	~	7
4th Qtr 2012	~	~	9.3	69.9	9.6	~	7
2nd Qtr 2013	~	~	~	70.3	~	~	7
4th Qtr 2013	~	~	~	90.5	6.9	~	7
2nd Qtr 2014	~	~	~	62.3	13.9	~	7
4th Qtr 2014	~	~	~	63.0	~	~	7
2nd Qtr 2015	~	~	~	64.9	17.0	11.1	7
4th Qtr 2015	~	~	~	75.2	23.9	7.1	7
2nd Qtr 2016	~	~	~	61.6	11.4	~	7
4th Qtr 2016	~	~	~	71.6	6.9	~	7
2nd Qtr 2017	~	~	~	66.8	7.8	~	7
4th Qtr 2017	~	~	~	66.7	6.9	~	7
2nd Qtr 2018	~	~	~	41.9	~	~	7
4th Qtr 2018	~	~	9.3	38.7	~	~	7
2nd Qtr 2019	~	~	~	32.0	~	~	7
4th Qtr 2019	~	~	~	22.2	~	~	7
2nd Qtr 2020	~	~	11.0	19.0	~	~	7
4th Qtr 2020	~	~	5.9	17.0	~	~	7
2nd Qtr 2021	~	~	6.4	18.0	~	~	7
4th Qtr 2021	~	~	6.7	19.0	~	~	7
2nd Qtr 2022	~	~	10.0	15.0	~	~	7
3rd Qtr 2022	~	~	~	20.0	~	~	7
2nd Qtr 2023	~	~	~	25.0	12.0	~	7
3rd Qtr 2023	~	~	6.7	27.0	26.0	~	7
2nd Qtr 2024	~	~	~	21.0	11.0	~	7
3rd Qtr 2024	~	~	~	22.0	5.6	~	7
2nd Qtr 2025	~	~	~	16.0	6.5	~	7
3rd Qtr 2025	~	~	7.7	14.0	~	~	7
NOTES: Well 5W8B is the upgradient monitoring well for HWMU-5. ~: Not detected at or above the Quantitation Limit (QL) of 5 ug/l. na: Not applicable. ns: Well was not sampled for total cobalt during this event. GPS: Permit-specified Groundwater Protection Standard. Total Cobalt GPS of 313 ug/l (prior to 2nd Quarter 2010) based on VDEQ ACL as specified in Final Hazardous Waste Post-Closure Permit for HWMUs 5, 7, 10, and 16 dated October 4, 2002. Total Cobalt GPS of 7 ug/l (2nd Quarter 2010 - present) based on Unit background established in VDEQ-approved Class 3 Permit Modification dated November 5, 2009. Bold indicates detected concentration is greater than applicable Permit-specified GPS.							

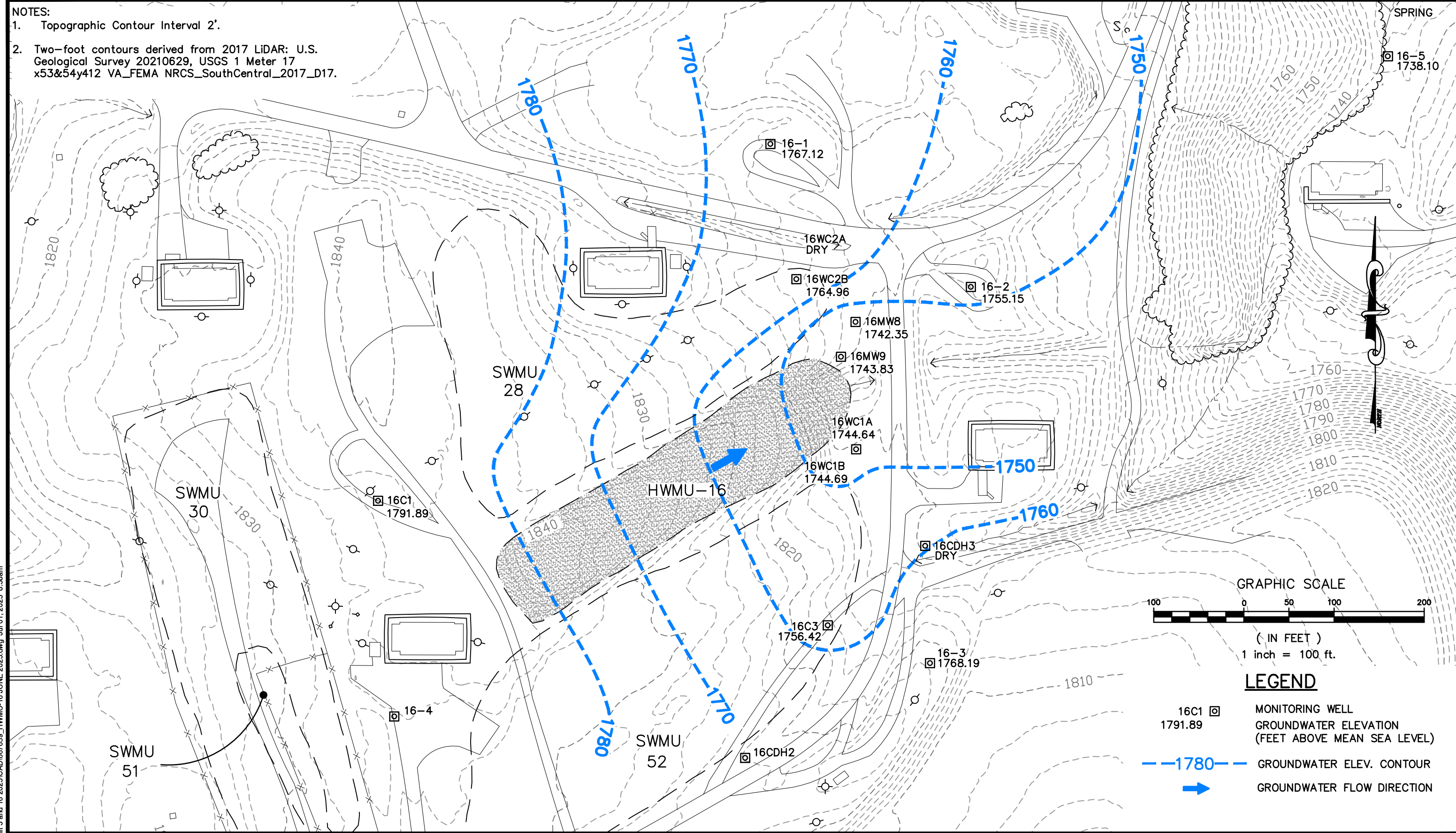
HWMU-5: Total Cobalt Concentrations in Groundwater (Second Quarter 2010 - Third Quarter 2025)



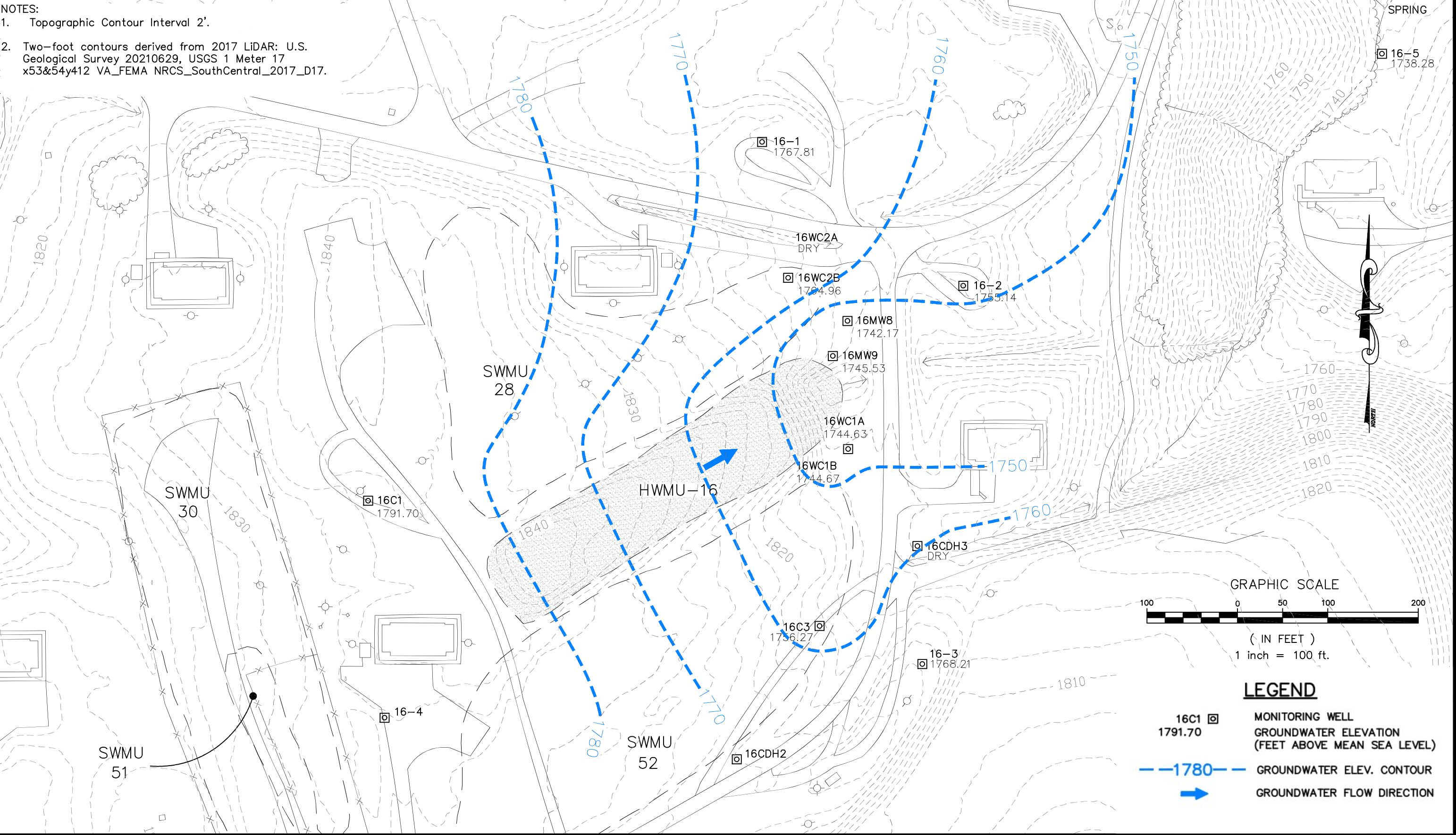
APPENDIX B

HWMU-16

NOTES:
1. Topographic Contour Interval 2'.
2. Two-foot contours derived from 2017 LiDAR: U.S. Geological Survey 20210629, USGS 1 Meter 17 x53&54y412 VA_FEMA NRCS_SouthCentral_2017_D17.



- NOTES:
- 1. Topographic Contour Interval 2'.
 - 2. Two-foot contours derived from 2017 LiDAR: U.S. Geological Survey 20210629, USGS 1 Meter 17 x53&54y412 VA_FEMA NRCS_SouthCentral_2017_D17.



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Blacksburg, VA 24060
540-552-0444

DESIGNED
DRAWN
CHECKED
DATE

BM
CMC
WMD
01/29/2026

HWMU-16 POTENTIOMETRIC SURFACE MAP - JULY 29, 2025
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. 667639

FIGURE
1b

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
Antimony CAS # 7440-36-0											
Third Quarter 2025	U	U	U	U	U	2	2	0.6	0.6	-	6020B
Arsenic CAS # 7440-38-2											
Second Quarter 2025	U	U	U	U	U	10	10			10	6020B
Third Quarter 2025	U	U	2.46 J	4.8 J	U	10	10	2	2	10	6020B
Barium CAS # 7440-39-3											
Second Quarter 2025	200	120	650	360	130	10	10			2000	6020B
Third Quarter 2025	189	126	587	366	99.1	10	10	1.3	1.3	2000	6020B
Beryllium CAS # 7440-41-7											
Second Quarter 2025	U	U	U	U	U	1	1			4	6020B
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	4	6020B
Cadmium CAS # 7440-43-9											
Second Quarter 2025	U	U	U	U	U	1	1			5	6020B
Third Quarter 2025	U	0.378 J	U	U	U	1	1	0.2	0.2	5	6020B
Chromium CAS # 7440-47-3											
Second Quarter 2025	U	U	U	U	U	5	5			100	6020B
Third Quarter 2025	U	U	U	U	1.36 J	5	5	1	1	100	6020B
Cobalt CAS # 7440-48-4											
Second Quarter 2025	U	U	5.4	12	U	5	5			5	6020B
Third Quarter 2025	U	U	4.55 J	11	U	5	5	1	1	5	6020B
Copper CAS # 7440-50-8											
Second Quarter 2025	U	16	U	U	U	5	5			1300	6020B
Third Quarter 2025	U	15.9	U	U	U	5	5	1.7	1.7	1300	6020B
Lead CAS # 7439-92-1											
Second Quarter 2025	U	U	U	U	U	3	3			15	6020B
Third Quarter 2025	U	U	U	U	U	3	3	1	1	15	6020B
Mercury CAS # 7439-97-6											
Second Quarter 2025	U	U	U	U	U	2	2			2	7470A
Third Quarter 2025	U	U	U	U	1.32 J	2	2	0.2	0.2	2	7470A
Nickel CAS # 7440-02-0											
Second Quarter 2025	U	U	12	10	U	10	10			300	6020B
Third Quarter 2025	3.64 J	2.85 J	11.5	10	U	10	10	2	2	300	6020B
Selenium CAS # 7782-49-2											
Third Quarter 2025	U	U	U	U	U	10	10	3	3	-	6020B
Silver CAS # 7440-22-4											
Second Quarter 2025	U	U	U	U	U	2	2			94	6020B
Third Quarter 2025	U	U	U	U	U	2	2	0.3	0.3	94	6020B
Thallium CAS # 7440-28-0											
Third Quarter 2025	U	U	U	U	U	1	1	0.2	0.2	-	6020B
Vanadium CAS # 7440-62-2											
Second Quarter 2025	U	U	U	U	U	10	10			151	6020B
Third Quarter 2025	U	U	U	U	U	10	10	2.5	2.5	151	6020B
Zinc CAS # 7440-66-6											
Second Quarter 2025	U	34	U	U	U	30	30			4700	6020B
Third Quarter 2025	U	32.1	U	U	U	30	30	7.3	7.3	4700	6020B
Cyanide CAS # 57-12-5											
Third Quarter 2025	U	U	U	U J	U	20	20	5	5	-	9012B
Acenaphthene CAS # 83-32-9											
Third Quarter 2025	U	U	U	U	U	10	10	0.35	0.35	-	8270E
Acenaphthylene CAS # 208-96-8											
Third Quarter 2025	U	U	U	U	U	10	10	0.48	0.48	-	8270E
Acetone CAS # 67-64-1											
Third Quarter 2025	U	U	U	U	U	10	10	2	2	-	8260D
Acetonitrile CAS # 75-05-8											
Third Quarter 2025	U	U	U	U	U	100	100	31.6	31.67	-	8260D

See last page of this report for definitions.



Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
Acetophenone											
Third Quarter 2025	U	U	U	U	U	10	10	1	1	-	8270E
2-Acetylaminofluorene											
Third Quarter 2025	U	U	U	U	U	10	10	3	3	-	8270E
Acrolein											
Third Quarter 2025	U	U	U	U	U	10	10	2.1	3.4	-	8260D
Acrylonitrile											
Third Quarter 2025	U	U	U	U	U	10	10	1.1	1.1	-	8260D
Allyl chloride											
Third Quarter 2025	U	U	U	U	U	10	10	1	1	-	8260D
4-Aminobiphenyl											
Third Quarter 2025	U	U	U	U	U	10	10	3	3	-	8270E
Aniline											
Third Quarter 2025	U	U	U	U	U	10	10	1	1.1	-	8270E
Anthracene											
Third Quarter 2025	U	U	U	U	U	10	10	0.52	0.52	-	8270E
Aramite											
Third Quarter 2025	U	U	U	U	U	10	10	3.7	3.7	-	8270E
Benzene											
Second Quarter 2025	U	U	U	U	U	1	1			5	8260D
Third Quarter 2025	0.329 J	U	0.34 J	U	U	1	1	0.3	0.3	5	8260D
Benzo[a]anthracene											
Third Quarter 2025	U	U	U	U	U	10	10	0.45	0.45	-	8270E
Benzo[b]fluoranthene											
Third Quarter 2025	U	U	U	U	U	10	10	1.2	1.2	-	8270E
Benzo[k]fluoranthene											
Third Quarter 2025	U	U	U	U	U	10	10	1.6	1.6	-	8270E
Benzo[ghi]perylene											
Third Quarter 2025	U	U	U	U	U	10	10	0.42	0.42	-	8270E
Benzo(a)pyrene											
Third Quarter 2025	U	U	U	U	U	10	10	1.5	1.5	-	8270E
1,4-Benzenediamine											
Third Quarter 2025	U J	U J	U J	U J	U J	140	150	25	26.4	-	8270E
Benzyl alcohol											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
bis(2-Chloroethoxy)methane											
Third Quarter 2025	U	U	U	U	U	1	1	0.5	0.5	-	8270E
bis(2-Chloroethyl)ether											
Third Quarter 2025	U	U	U	U	U	1	1	0.5	0.5	-	8270E
bis(2-Chloro-1-methylethyl)ether											
Third Quarter 2025	U J	U J	U J	U J	U J	10	10	0.6	0.6	-	8270E
bis(2-Ethylhexyl)phthalate											
Third Quarter 2025	U	U	U	U	U	10	10	2	2	-	8270E
Bromodichloromethane											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
Bromoform											
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
4-Bromophenyl phenyl ether											
Third Quarter 2025	U	U	U	U	U	10	10	0.56	0.56	-	8270E
2-Butanone											
Second Quarter 2025	U	U	U	U	U J	10	10			4900	8260D
Third Quarter 2025	U	U	U	U	U	10	10	1.7	1.7	4900	8260D
Butyl benzyl phthalate											
Third Quarter 2025	U	U	U	U	U	10	10	0.7	0.7	-	8270E
Carbon disulfide											
Third Quarter 2025	U	U	U	U	U	10	10	0.4	0.4	-	8260D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
Carbon tetrachloride						CAS # 56-23-5					
Second Quarter 2025	U	U	U	U	U	1	1			5	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	5	8260D
p-Chloroaniline						CAS # 106-47-8					
Third Quarter 2025	U	U	U	U	U	10	10	3	3.3	-	8270E
Chlorobenzilate						CAS # 510-15-6					
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
p-Chloro-m-cresol						CAS # 59-50-7					
Third Quarter 2025	U	U	U	U	U	10	10	1	1	-	8270E
Chloroethane						CAS # 75-00-3					
Second Quarter 2025	2.5	U	1.7	1.2	U	1	1			21000	8260D
Third Quarter 2025	2.74	U	1.85	1.53	U	1	1	0.1		21000	8260D
Chloroform						CAS # 67-66-3					
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
2-Chloronaphthalene						CAS # 91-58-7					
Third Quarter 2025	U	U	U	U	U	10	10	0.5	0.5	-	8270E
2-Chlorophenol						CAS # 95-57-8					
Third Quarter 2025	U	U	U	U	U	10	10	1	1	-	8270E
4-Chlorophenyl phenyl ether						CAS # 7005-72-3					
Third Quarter 2025	U	U	U	U	U	10	10	0.6	0.6	-	8270E
Chloroprene						CAS # 126-99-8					
Third Quarter 2025	U	U	U	U	U	10	10	0.46	0.46	-	8260D
Chrysene						CAS # 218-01-9					
Third Quarter 2025	U	U	U	U	U	10	10	0.31	0.31	-	8270E
Diallate						CAS # 2303-16-4					
Third Quarter 2025	U	U	U	U	U	10	10	3	3	-	8270E
Dibenz(a,h)anthracene						CAS # 53-70-3					
Third Quarter 2025	U	U	U	U	U	10	10	0.38	0.38	-	8270E
Dibenzofuran						CAS # 132-64-9					
Third Quarter 2025	U	U	U	U	U	10	10	0.6	0.6	-	8270E
Dibromochloromethane						CAS # 124-48-1					
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
1,2-Dibromo-3-chloropropane						CAS # 96-12-8					
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
1,2-Dibromoethane						CAS # 106-93-4					
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
Di-n-butyl phthalate						CAS # 84-74-2					
Third Quarter 2025	U	U	U	U	U	10	10	1.8	1.8	-	8270E
1,2-Dichlorobenzene						CAS # 95-50-1					
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
1,3-Dichlorobenzene						CAS # 541-73-1					
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
1,4-Dichlorobenzene						CAS # 106-46-7					
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
3,3'-Dichlorobenzidine						CAS # 91-94-1					
Third Quarter 2025	U	U	U	U	U	10	10	3	3	-	8270E
trans-1,4-Dichloro-2-butene						CAS # 110-57-6					
Third Quarter 2025	U J	U J	U J	U	U	10	10	1.5	1.5	-	8260D
Dichlorodifluoromethane						CAS # 75-71-8					
Second Quarter 2025	U	U	U	U	U	1	1			190	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	190	8260D
1,1-Dichloroethane						CAS # 75-34-3					
Second Quarter 2025	5	U	4.7	2.0	U	1	1			9.5	8260D
Third Quarter 2025	5.16	U	4.91	2.44	U	1	1	0.3	0.3	9.5	8260D
1,2-Dichloroethane						CAS # 107-06-2					
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
1,1-Dichloroethene CAS # 75-35-4											
Second Quarter 2025	U	U	U	U	U	1	1			7	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	7	8260D
trans-1,2-Dichloroethene CAS # 156-60-5											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
2,4-Dichlorophenol CAS # 120-83-2											
Third Quarter 2025	-	-	-	U	-	10	10	1.5	1.59	-	8270E
Third Quarter 2025	U	U	U	-	U	10	10	1.6	1.59	-	8270E
2,6-Dichlorophenol CAS # 87-65-0											
Third Quarter 2025	U	U	U	U	U	10	10	1.4	1.4	-	8270E
1,2-Dichloropropane CAS # 78-87-5											
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
1,3-Dichloropropane CAS # 142-28-9											
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
trans-1,3-Dichloropropene CAS # 10061-02-6											
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
Diethyl ether CAS # 60-29-7											
Second Quarter 2025	-	U J	-	16 J	U J	10	12.5			7300	8260D
Second Quarter 2025	29.9 J	-	60.4 J	-	-	10	12.5			7300	8260D
Third Quarter 2025	31.2 J	6.41 J	60.4 J	21.8	U	10	12.5	1.1	1.11	7300	8260D
Diethyl phthalate CAS # 84-66-2											
Second Quarter 2025	U	U	-	U	U	5.1	5			11000	8270E
Second Quarter 2025	-	-	U	-	-	5	5			11000	8270E
Third Quarter 2025	U	U	U	U	U	5	5	2	2	11000	8270E
O,O-Diethyl O-2-pyrazinyl CAS # 297-97-2											
Third Quarter 2025	U	-	-	-	-	10	10	2.4	2.4	-	8270E
Third Quarter 2025	-	U	U	U	U	10	10	2.41	2.4	-	8270E
Dimethoate CAS # 60-51-5											
Third Quarter 2025	U	U	U	U	U	10	10	3	3	-	8270E
Dimethyl ether CAS # 115-10-6											
Second Quarter 2025	U	U	U	U	U	10	12.5			17	8260D
Third Quarter 2025	6.43 J	U	1.16 J	0.765 J	U	10	12.5	0.3	1.11	17	8260D
p-(Dimethylamino)azobenzene CAS # 60-11-7											
Third Quarter 2025	U J	U J	U J	U J	U J	10	10	2.8	3	-	8270E
7,12-Dimethylbenz[a]anthracene CAS # 57-97-6											
Third Quarter 2025	U	U	U	U	U	10	10	1.7	1.8	-	8270E
3,3'-Dimethylbenzidine CAS # 119-93-7											
Third Quarter 2025	U	-	U	U	U	10	10	3	3.3	-	8270E
Third Quarter 2025	-	U	-	-	-	10	10	3.1	3.3	-	8270E
a,a-Dimethylphenethylamine CAS # 122-09-8											
Third Quarter 2025	U J	-	U J	-	-	10	50	2.94	5	-	8270E
Third Quarter 2025	-	-	-	U J	-	10	50	3	5	-	8270E
Third Quarter 2025	-	U J	-	-	-	10	50	2.99	5	-	8270E
Third Quarter 2025	-	-	-	-	U J	10	50	2.93	5	-	8270E
2,4-Dimethylphenol CAS # 105-67-9											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
Dimethyl phthalate CAS # 131-11-3											
Third Quarter 2025	-	-	-	U	-	1	10	0.3	0.5	-	8270E
Third Quarter 2025	-	-	-	-	U	1	10	0.293	0.5	-	8270E
Third Quarter 2025	-	U	-	-	-	1	10	0.299	0.5	-	8270E
Third Quarter 2025	U	-	U	-	-	1	10	0.294	0.5	-	8270E
m-Dinitrobenzene CAS # 99-65-0											
Third Quarter 2025	-	U	U	U	U	10	10	2.31	2.3	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	2.3	2.3	-	8270E

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
4,6-Dinitro-o-cresol	CAS # 534-52-1										
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
2,4-Dinitrophenol	CAS # 51-28-5										
Third Quarter 2025	U	-	U	-	U	10	10	5.7	6.2	-	8270E
Third Quarter 2025	-	U	-	-	-	10	10	5.8	6.2	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	5.9	6.2	-	8270E
2,4-Dinitrotoluene	CAS # 121-14-2										
Second Quarter 2025	U	U	U	U	U	10	10			10	8270E
Third Quarter 2025	U	U	U	U	U	10	10	2.1	2.1	10	8270E
2,6-Dinitrotoluene	CAS # 606-20-2										
Second Quarter 2025	U	U	U	U	U	10	10			10	8270E
Third Quarter 2025	U	U	U	U	U	10	10	2.1	2.1	10	8270E
Di-n-octyl phthalate	CAS # 117-84-0										
Third Quarter 2025	U	-	U	-	-	1	10	0.294	0.8	-	8270E
Third Quarter 2025	-	U	-	-	-	1	10	0.299	0.8	-	8270E
Third Quarter 2025	-	-	-	-	U	1	10	0.293	0.8	-	8270E
Third Quarter 2025	-	-	-	U	-	1	10	0.3	0.8	-	8270E
1,4-Dioxane	CAS # 123-91-1										
Third Quarter 2025	U	U	U	U	U	200	200	45.5	45.48	-	8260D
Diphenylamine	CAS #										
Third Quarter 2025	-	U	U	-	U	10	10	0.582	0.58	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	0.581	0.58	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.584	0.58	-	8270E
Disulfoton	CAS # 298-04-4										
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
Ethylbenzene	CAS # 100-41-4										
Second Quarter 2025	U	U	U	U	U	1	1			700	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	700	8260D
Ethyl methacrylate	CAS # 97-63-2										
Third Quarter 2025	U	U	U	U	U	10	10	0.81	0.81	-	8260D
Ethyl methanesulfonate	CAS # 62-50-0										
Third Quarter 2025	-	-	-	U	-	10	10	1.11	1.1	-	8270E
Third Quarter 2025	U	U	U	-	U	10	10	1.1	1.1	-	8270E
Famphur	CAS # 52-85-7										
Third Quarter 2025	U J	-	U J	-	U J	10	10	4.6	5	-	8270E
Third Quarter 2025	-	U J	-	U J	-	10	10	4.7	5	-	8270E
Fluoranthene	CAS # 206-44-0										
Third Quarter 2025	U	-	U	-	-	10	10	0.421	0.42	-	8270E
Third Quarter 2025	-	U	-	-	U	10	10	0.422	0.42	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.423	0.42	-	8270E
Fluorene	CAS # 86-73-7										
Third Quarter 2025	-	-	U	-	U	10	10	0.381	0.38	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	0.38	0.38	-	8270E
Third Quarter 2025	-	U	-	U	-	10	10	0.382	0.38	-	8270E
Hexachlorobenzene	CAS # 118-74-1										
Third Quarter 2025	U	-	-	-	-	10	10	0.871	0.87	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.875	0.87	-	8270E
Third Quarter 2025	-	-	U	-	-	10	10	0.872	0.87	-	8270E
Third Quarter 2025	-	U	-	-	U	10	10	0.873	0.87	-	8270E
Hexachlorobutadiene	CAS # 87-68-3										
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
Hexachlorocyclopentadiene	CAS # 77-47-4										
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
Hexachloroethane CAS # 67-72-1											
Third Quarter 2025	-	-	-	U	-	10	10	0.38	0.4	-	8270E
Third Quarter 2025	U	U	U	-	U	10	10	0.37	0.4	-	8270E
Hexachlorophene CAS # 70-30-4											
Third Quarter 2025	-	-	-	-	U	500	500	163	185	-	8270E
Third Quarter 2025	U	-	U	-	-	500	500	164	185	-	8270E
Third Quarter 2025	-	-	-	U	-	500	500	167	185	-	8270E
Third Quarter 2025	-	U	-	-	-	500	500	166	185	-	8270E
Hexachloropropene CAS # 1888-71-7											
Third Quarter 2025	-	U	U	U	U	10	10	2.01	2	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	2	2	-	8270E
2-Hexanone CAS # 591-78-6											
Third Quarter 2025	U	U	U	U	U	10	10	2	2	-	8260D
Indeno[1,2,3-cd]pyrene CAS # 193-39-5											
Third Quarter 2025	-	U	-	U	U	10	10	0.151	0.15	-	8270E
Third Quarter 2025	U	-	U	-	-	10	10	0.15	0.15	-	8270E
Isobutyl alcohol CAS # 78-83-1											
Third Quarter 2025	U	U	U	U	U	200	200	11.6	11.6	-	8260D
Isodrin CAS # 465-73-6											
Third Quarter 2025	U	U	U	-	U	10	10	1.1	1.1	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	1.11	1.1	-	8270E
Isophorone CAS # 78-59-1											
Third Quarter 2025	U	-	U	-	U	10	10	0.46	0.5	-	8270E
Third Quarter 2025	-	U	-	U	-	10	10	0.47	0.5	-	8270E
Isosafrole CAS # 120-58-1											
Third Quarter 2025	U	U	U	U	U	5	10	1.5	1.6	-	8270E
Kepone CAS # 143-50-0											
Third Quarter 2025	U	-	-	-	-	50	50	25	25	-	8270E
Third Quarter 2025	-	U	U	-	U	50	50	25.1	25	-	8270E
Third Quarter 2025	-	-	-	U	-	50	50	25.2	25	-	8270E
Methacrylonitrile CAS # 126-98-7											
Third Quarter 2025	U	U	U	U	U	100	100	9.75	9.75	-	8260D
Methapyrilene CAS # 91-80-5											
Third Quarter 2025	U J	U J	U J	U J	U J	10	10	2.8	3	-	8270E
Bromomethane CAS # 74-83-9											
Third Quarter 2025	U	U	U	U	U	1	1	0.542	0.542	-	8260D
Chloromethane CAS # 74-87-3											
Second Quarter 2025	U	U	U	U	U	1	1			190	8260D
Third Quarter 2025	0.189 J	U	U	U	U	1	1	0.1		190	8260D
3-Methylcholanthrene CAS # 56-49-5											
Third Quarter 2025	-	-	-	U	-	10	10	0.95	1	-	8270E
Third Quarter 2025	-	U	-	-	-	10	10	0.93	1	-	8270E
Third Quarter 2025	U	-	U	-	U	10	10	0.92	1	-	8270E
Iodomethane CAS # 74-88-4											
Third Quarter 2025	U	U	U	U	U	10	10	0.58	0.58	-	8260D
Methyl methacrylate CAS # 80-62-6											
Third Quarter 2025	U	U	U	U	U	10	10	3.58	3.58	-	8260D
Methyl methane sulfonate CAS # 66-27-3											
Third Quarter 2025	U	-	U	-	U	10	10	0.92	1	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.95	1	-	8270E
Third Quarter 2025	-	U	-	-	-	10	10	0.93	1	-	8270E
2-Methylnaphthalene CAS # 91-57-6											
Third Quarter 2025	U	-	-	-	-	10	10	0.29	0.29	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	0.291	0.29	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.292	0.29	-	8270E

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
Methyl parathion CAS # 298-00-0											
Third Quarter 2025	U	-	-	-	-	10	10	2.9	3.2	-	8270E
Third Quarter 2025	-	U	U	U	U	10	10	3	3.2	-	8270E
4-Methyl-2-pentanone CAS # 108-10-1											
Third Quarter 2025	U	U	U	U	U	10	10	2	2	-	8260D
2-Methylphenol CAS # 95-48-7											
Third Quarter 2025	-	U	-	-	-	10	10	0.964	0.96	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	0.961	0.96	-	8270E
Third Quarter 2025	-	-	U	-	U	10	10	0.963	0.96	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.91	0.96	-	8270E
3 & 4-Methylphenol CAS #											
Third Quarter 2025	U	-	-	-	-	20	20	2.47	2.47	-	8270E
Third Quarter 2025	-	-	-	U	-	20	20	2.3	2.47	-	8270E
Third Quarter 2025	-	U	U	-	U	20	20	2.48	2.47	-	8270E
Dibromomethane CAS # 74-95-3											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
Methylene chloride CAS # 75-09-2											
Second Quarter 2025	U	U	U	U	U	1	1			13.95	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.7	0.7	13.95	8260D
Naphthalene CAS # 91-20-3											
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	-	8260D
1,4-Naphthoquinone CAS # 130-15-4											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
1-Naphthylamine CAS # 134-32-7											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
2-Naphthylamine CAS # 91-59-8											
Third Quarter 2025	-	-	-	U	-	10	10	6.6	7	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	6.5	7	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	6.4	7	-	8270E
o-Nitroaniline CAS # 88-74-4											
Third Quarter 2025	-	-	-	U	-	10	10	1.01	1	-	8270E
Third Quarter 2025	U	U	U	-	U	10	10	1	1	-	8270E
m-Nitroaniline CAS # 99-09-2											
Third Quarter 2025	-	U	-	U	-	10	10	1.9	2	-	8270E
Third Quarter 2025	U	-	U	-	U	10	10	1.8	2	-	8270E
p-Nitroaniline CAS # 100-01-6											
Third Quarter 2025	U	U	U	U	U	10	10	1.4	1.5	-	8270E
Nitrobenzene CAS # 98-95-3											
Third Quarter 2025	-	U	U	-	U	10	10	0.602	0.6	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.604	0.6	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	0.601	0.6	-	8270E
o-Nitrophenol CAS # 88-75-5											
Third Quarter 2025	-	U	-	-	-	10	10	1.28	1.27	-	8270E
Third Quarter 2025	U	-	U	-	U	10	10	1.27	1.27	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	1.2	1.27	-	8270E
p-Nitrophenol CAS # 100-02-7											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
4-Nitroquinoline-1-oxide CAS # 56-57-5											
Third Quarter 2025	U J	U J	U J	U J	U J	50	50	5	5	-	8270E
N-Nitrosodi-n-butylamine CAS # 924-16-3											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
N-Nitrosodiethylamine CAS # 55-18-5											
Third Quarter 2025	-	-	-	U	-	10	10	3.02	3	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	3	3	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	3.01	3	-	8270E

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
N-Nitrosodimethylamine CAS # 62-75-9											
Third Quarter 2025	-	U J	U J	U J	U J	10	10	2.01	2	-	8270E
Third Quarter 2025	U J	-	-	-	-	10	10	2	2	-	8270E
N-Nitrosodiphenylamine CAS # 86-30-6											
Third Quarter 2025	U	-	-	-	-	10	10	0.581	0.58	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	0.582	0.58	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.584	0.58	-	8270E
N-Nitrosodipropylamine CAS # 621-64-7											
Third Quarter 2025	-	U	-	U	-	10	10	0.47	0.5	-	8270E
Third Quarter 2025	U	-	U	-	U	10	10	0.46	0.5	-	8270E
N-Nitrosomethylethylamine CAS # 10595-95-6											
Third Quarter 2025	-	-	-	U	-	10	10	0.95	1	-	8270E
Third Quarter 2025	-	U	-	-	-	10	10	0.93	1	-	8270E
Third Quarter 2025	U	-	U	-	U	10	10	0.92	1	-	8270E
N-Nitrosomorpholine CAS # 59-89-2											
Third Quarter 2025	-	U	U	-	U	10	10	3.01	3	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	3.02	3	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	3	3	-	8270E
N-Nitrosopiperidine CAS # 100-75-4											
Third Quarter 2025	U	U	U	-	U	10	10	1.1	1.1	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	1.11	1.1	-	8270E
N-Nitrosopyrrolidine CAS # 930-55-2											
Third Quarter 2025	-	U	-	U	-	10	10	0.47	0.5	-	8270E
Third Quarter 2025	U	-	U	-	U	10	10	0.46	0.5	-	8270E
5-Nitroso-o-toluidine CAS # 99-55-8											
Third Quarter 2025	U	-	-	-	-	10	10	2	2	-	8270E
Third Quarter 2025	-	U	U	U	U	10	10	2.01	2	-	8270E
Parathion CAS # 56-38-2											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
Pentachlorobenzene CAS # 608-93-5											
Third Quarter 2025	U	-	U	-	-	10	10	1.6	1.6	-	8270E
Third Quarter 2025	-	U	-	U	U	10	10	1.61	1.6	-	8270E
Pentachloroethane CAS # 76-01-7											
Third Quarter 2025	U	U	U	U	U	10	10	1.7	1.7	-	8260D
Pentachloronitrobenzene CAS # 82-68-8											
Third Quarter 2025	U	-	-	U	-	10	10	0.95	1	-	8270E
Third Quarter 2025	-	U	U	-	-	10	10	0.93	1	-	8270E
Third Quarter 2025	-	-	-	-	U	10	10	0.98	1	-	8270E
Pentachlorophenol CAS # 87-86-5											
Third Quarter 2025	U	-	-	U	-	10	10	3	3	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	3.01	3	-	8270E
Phenacetin CAS # 62-44-2											
Third Quarter 2025	U	-	U	-	-	10	10	1.4	1.4	-	8270E
Third Quarter 2025	-	U	-	U	U	10	10	1.41	1.4	-	8270E
Phenanthrene CAS # 85-01-8											
Third Quarter 2025	U	-	U	-	-	10	10	0.521	0.52	-	8270E
Third Quarter 2025	-	U	-	-	U	10	10	0.522	0.52	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.523	0.52	-	8270E
Phenol CAS # 108-95-2											
Third Quarter 2025	-	-	U	-	-	10	10	0.772	0.77	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	0.73	0.77	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	0.771	0.77	-	8270E
Third Quarter 2025	-	U	-	-	U	10	10	0.773	0.77	-	8270E

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	Permit OL	DL	Permit DL	GPS	Method
Phorate CAS # 298-02-2											
Third Quarter 2025	-	U	U	-	U	10	10	2.51	2.5	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	2.5	2.5	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	2.52	2.5	-	8270E
2-Picoline CAS # 931-19-1											
Third Quarter 2025	U J	U J	U J	U J	U J	10	10	1	1	-	8270E
Pronamide CAS # 23950-58-5											
Third Quarter 2025	U	U	U	U	U	10	10	1.4	1.5	-	8270E
2-Propanol CAS # 67-63-0											
Third Quarter 2025	U	U	U	U	U	100	100	50	50	-	8260D
Propionitrile CAS # 107-12-0											
Third Quarter 2025	U	U	U	U	U	100	100	10.2	10.22	-	8260D
Pyrene CAS # 129-00-0											
Third Quarter 2025	U	U	U	U	U	10	10	0.41	0.41	-	8270E
Pyridine CAS # 110-86-1											
Third Quarter 2025	U J	U J	U J	U J	U J	10	10	1.8	2	-	8270E
Safrole CAS # 94-59-7											
Third Quarter 2025	U	U	U	U	U	10	10	2.2	2.2	-	8270E
Styrene CAS # 100-42-5											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
Sulfotep CAS # 3689-24-5											
Third Quarter 2025	U	U	U	U	U	10	10	2.4	2.4	-	8270E
1,2,4,5-Tetrachlorobenzene CAS # 95-94-3											
Third Quarter 2025	U	U	U	U	U	10	10	2	2	-	8270E
1,1,1,2-Tetrachloroethane CAS # 630-20-6											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
1,1,1,2,2-Tetrachloroethane CAS # 79-34-5											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
Tetrachloroethene CAS # 127-18-4											
Second Quarter 2025	U	U	U	U	U	1	1			5	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	5	8260D
Tetrahydrofuran CAS # 109-99-9											
Second Quarter 2025	26	U	U	U	U J	25	25			3400	8260D
Third Quarter 2025	27.4	U	U	U	U	25	25	2	2	3400	8260D
2,3,4,6-Tetrachlorophenol CAS # 58-90-2											
Third Quarter 2025	-	-	-	U	-	10	10	1.7	1.8	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	1.8	1.8	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	1.81	1.8	-	8270E
Toluene CAS # 108-88-3											
Second Quarter 2025	U	U	U	U	U	1	1			1000	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	1000	8260D
o-Toluidine CAS # 95-53-4											
Third Quarter 2025	U	U	U	-	U	10	10	3.7	4	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	3.8	4	-	8270E
1,2,4-Trichlorobenzene CAS # 120-82-1											
Third Quarter 2025	U	U	U	U	U	1	1	0.6	0.6	-	8260D
1,1,1-Trichloroethane CAS # 71-55-6											
Second Quarter 2025	U	U	U	U	U	1	1			200	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	200	8260D
1,1,2-Trichloroethane CAS # 79-00-5											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
Trichloroethene CAS # 79-01-6											
Second Quarter 2025	U	U	U	U	U	1	1			5	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	5	8260D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia
Upgradient well = 16C1

All Results in ug/L.

<i>Analyte/Quarter</i>	<i>16C1</i>	<i>16MW8</i>	<i>16MW9</i>	<i>16WC1A</i>	<i>16WC1B</i>	<i>OL</i>	<i>Permit OL</i>	<i>DL</i>	<i>Permit DL</i>	<i>GPS</i>	<i>Method</i>
Trichlorofluoromethane <i>CAS # 75-69-4</i>											
Second Quarter 2025	U	U	U	U	U	1	1			1000	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	1000	8260D
2,4,5-Trichlorophenol <i>CAS # 95-95-4</i>											
Third Quarter 2025	U	-	-	-	-	10	10	2	2	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	1.9	2	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	2.01	2	-	8270E
2,4,6-Trichlorophenol <i>CAS # 88-06-2</i>											
Third Quarter 2025	-	U	U	-	U	10	10	1.81	1.8	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	1.7	1.8	-	8270E
Third Quarter 2025	U	-	-	-	-	10	10	1.8	1.8	-	8270E
1,2,3-Trichloropropane <i>CAS # 96-18-4</i>											
Third Quarter 2025	U	U	U	U	U	1	1	0.3	0.3	-	8260D
1,1,2-Trichloro-1,2,2-Trifluoroethane <i>CAS # 76-13-1</i>											
Second Quarter 2025	U	U	U	U	U	1	1			59000	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4	59000	8260D
O,O,O-Triethyl phosphorothioate <i>CAS # 126-68-1</i>											
Third Quarter 2025	U	-	-	-	-	10	10	2.6	2.6	-	8270E
Third Quarter 2025	-	U	U	-	U	10	10	2.61	2.6	-	8270E
Third Quarter 2025	-	-	-	U	-	10	10	2.62	2.6	-	8270E
sym-Trinitrobenzene <i>CAS # 99-35-4</i>											
Third Quarter 2025	U	U	U	U	U	10	10	2.8	3	-	8270E
Vinyl acetate <i>CAS # 108-05-4</i>											
Third Quarter 2025	U	U	U	U	U	10	10	3.29	3.29	-	8260D
Vinyl chloride <i>CAS # 75-01-4</i>											
Second Quarter 2025	U	U	U	U	U	1	1			2	8260D
Third Quarter 2025	U	U	U	U	U	1	1	0.2	0.2	2	8260D
Xylenes (Total) <i>CAS # 1330-20-7</i>											
Second Quarter 2025	U	U	U	U	U	3	3			10000	8260D
Third Quarter 2025	U	U	U	U	U	3	3	0.4	0.4	10000	8260D
m,p-Xylene <i>CAS # 179601-23-1</i>											
Third Quarter 2025	U	U	U	U	U	2	2	0.4	0.4		8260D
o-Xylene <i>CAS # 95-47-6</i>											
Third Quarter 2025	U	U	U	U	U	1	1	0.4	0.4		8260D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	Permit QL	DL	Permit DL	GPS	Method
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Definitions:

All inorganics reported as total unless noted.

The following definitions apply to results reported for Appendix IX monitoring events.

All Appendix IX monitoring results for compliance wells are reported to the detection limit.

Appendix IX Monitoring Events:

3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009, 2Q 2010, 2Q 2011, 2Q 2012, 2Q2013, 2Q2014, 2Q2015, 2Q2016, 2Q2017, 2Q2018, 2Q2019, 2Q2020, 4Q2021, 3Q2022, 3Q2023, 3Q2024, 3Q2025

QL Denotes laboratory quantitation limit. Reported laboratory QLs less than the permit QL may be substituted as the permit QL on the

Permit QL Denotes permit required quantitation limit. Class 1 permit mod 5/5/21, 2024 (silver)

U denotes not detected at or above the permit required detection limit.

UA denotes not detected at or above the adjusted detection limit.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.

UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.

R Denotes result rejected.

Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.

Background Denotes background concentrations listed in Appendix G to Attachment 3 in the Final Hazardous

Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (rev 2014, 2016, 202, 2024), where applicable.

CAS# Denotes Chemical Abstract Services registration number.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 3 in the Final Hazardous

Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014, 2016, 2021, 2024).

NS denotes not sampled. **NA** denotes not analyzed.

“--” denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

The following definitions apply to results reported for non-Appendix IX monitoring events.

All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

All inorganics reported as total unless noted.

Permit QL Denotes permit required quantitation limit. Class 1 Permit Modification 5/5/21, 2024 (silver).

U Denotes analyte not detected at or above QL.

UA Denotes analyte not detected at or above adjusted sample QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.

UN Denotes analyte concentration is less than five times the blank concentration. Not reliably detected due to blank contamination.

R Denotes result rejected.

Q Denotes data validation qualifier.

Background Denotes background concentrations listed in Appendix G to Attachment 3 in the Final Hazardous

Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002), (revised 2014, 2016, 2021, 2024), where applicable.

CAS# Denotes Chemical Abstract Services registration number.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 3 in the Final Hazardous

Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014, 2016, 2021, 2024).

**Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells**

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analyte/Quarter	16C1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Permit QL	Background	Method
Arsenic CAS # 7440-38-2										
Second Quarter 2025	U	U	U	U	U	U	10	10	1	6020B
Third Quarter 2025	U	U	U	U	U	U	10	10	1	6020B
Barium CAS # 7440-39-3										
Second Quarter 2025	200	250	770	180	120	230	10	10	175.4	6020B
Third Quarter 2025	189	240	730	170	110	220	10	10	175.4	6020B
Beryllium CAS # 7440-41-7										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.7	6020B
Third Quarter 2025	U	U	U	U	U	U	1	1	0.7	6020B
Cadmium CAS # 7440-43-9										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.2	6020B
Third Quarter 2025	U	U	U	U	U	U	1	1	0.2	6020B
Chromium CAS # 7440-47-3										
Second Quarter 2025	U	U	U	U	U	U	5	5	6.2	6020B
Third Quarter 2025	U	U	U	U	U	U	5	5	6.2	6020B
Cobalt CAS # 7440-48-4										
Second Quarter 2025	U	U	U	U	U	U	5	5	5	6020B
Third Quarter 2025	U	U	U	U	U	U	5	5	5	6020B
Copper CAS # 7440-50-8										
Second Quarter 2025	U	U	U	U	U	U	5	5	13	6020B
Third Quarter 2025	U	U	U	U	U	U	5	5	13	6020B
Lead CAS # 7439-92-1										
Second Quarter 2025	U	U	U	U	U	U	3	3	10	6020B
Third Quarter 2025	U	U	U	U	U	U	3	3	10	6020B
Mercury CAS # 7439-97-6										
Second Quarter 2025	U	U	U	U	U	U	2	2	0.2	7470A
Third Quarter 2025	U	U	U	U	U	U	2	2	0.2	7470A
Nickel CAS # 7440-02-0										
Second Quarter 2025	U	U	U	U	U	U	10	10	16	6020B
Third Quarter 2025	3.64 J	U	U	U	U	U	10	10	16	6020B
Silver CAS # 7440-22-4										
Second Quarter 2025	U	U	U	U	U	U	2	2	2	6020B
Third Quarter 2025	U	U	U	U	U	U	2	2	2	6020B
Vanadium CAS # 7440-62-2										
Second Quarter 2025	U	U	U	U	U	U	10	10	151	6020B
Third Quarter 2025	U	U	U	U	U	U	10	10	151	6020B
Zinc CAS # 7440-66-6										
Second Quarter 2025	U	U	U	U	U	U	30	30	51	6020B
Third Quarter 2025	U	U	U	U	U	U	30	30	51	6020B
Benzene CAS # 71-43-2										
Second Quarter 2025	U	U	U	U	U	U	1	1	1	8260D
Third Quarter 2025	0.329 J	U	U	U	U	U	1	1	1	8260D
2-Butanone CAS # 78-93-3										
Second Quarter 2025	U	U J	U	U	U	U	10	10	1.1	8260D
Third Quarter 2025	U	U	U	U	U	U	10	10	1.1	8260D

**Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells**

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analyte/Quarter	16C1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Permit QL	Background	Method
Carbon tetrachloride CAS # 56-23-5										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.2	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	0.2	8260D
Chloroethane CAS # 75-00-3										
Second Quarter 2025	2.5	U	U	U	U	U	1	1	20.7	8260D
Third Quarter 2025	2.74	U	U	U	U	U	1	1	20.7	8260D
Dichlorodifluoromethane CAS # 75-71-8										
Second Quarter 2025	U	U	U J	U	U	U	1	1	46.5	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	46.5	8260D
1,1-Dichloroethane CAS # 75-34-3										
Second Quarter 2025	5	U	U	U	U	U	1	1	9.5	8260D
Third Quarter 2025	5.16	U	U	U	U	U	1	1	9.5	8260D
1,1-Dichloroethene CAS # 75-35-4										
Second Quarter 2025	U	U	U	U	U	U	1	1	1	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	1	8260D
Diethyl ether CAS # 60-29-7										
Second Quarter 2025	29.9 J	-	-	-	-	-	10	12.5	75.5	8260D
Second Quarter 2025	-	U J	U J	U J	U J	U J	10	12.5	75.5	8260D
Third Quarter 2025	31.2 J	U	U	U	U	U	10	12.5	75.5	8260D
Diethyl phthalate CAS # 84-66-2										
Second Quarter 2025	-	U	-	-	-	U	5	5	5	8270E
Second Quarter 2025	U	-	U	U	U	-	5.1	5	5	8270E
Third Quarter 2025	U	U	U	U	U	U	5	5	5	8270E
Dimethyl ether CAS # 115-10-6										
Second Quarter 2025	U	U	U	U	U	U	10	12.5	17.0	8260D
Third Quarter 2025	6.43 J	U	U	U	U	U	10	12.5	17.0	8260D
2,4-Dinitrotoluene CAS # 121-14-2										
Second Quarter 2025	U	U	U	U	U	U	10	10	10	8270E
Third Quarter 2025	U	U	U	U	U	U	10	10	10	8270E
2,6-Dinitrotoluene CAS # 606-20-2										
Second Quarter 2025	U	U	U	U	U	U	10	10	10	8270E
Third Quarter 2025	U	U	U	U	U	U	10	10	10	8270E
Ethylbenzene CAS # 100-41-4										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.1	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	0.1	8260D
Chloromethane CAS # 74-87-3										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.3	8260D
Third Quarter 2025	0.189 J	U	U	U	U	U	1	1	0.3	8260D
Methylene chloride CAS # 75-09-2										
Second Quarter 2025	U	U	U	U	U	U	1	1	13.95	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	13.95	8260D
Tetrachloroethene CAS # 127-18-4										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.7	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	0.7	8260D

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analyte/Quarter	16C1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Permit QL	Background	Method
Tetrahydrofuran CAS # 109-99-9										
Second Quarter 2025	26	U J	U	U	U	U	25	25	25	8260D
Third Quarter 2025	27.4	U	U	U	U	U	25	25	25	8260D
Toluene CAS # 108-88-3										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.1	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	0.1	8260D
1,1,1-Trichloroethane CAS # 71-55-6										
Second Quarter 2025	U	U	U	U	U	U	1	1	9.2	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	9.2	8260D
Trichloroethene CAS # 79-01-6										
Second Quarter 2025	U	U	U	U	U	U	1	1	0.1	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	0.1	8260D
Trichlorofluoromethane CAS # 75-69-4										
Second Quarter 2025	U	U	U	U	U	U	1	1	11.3	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	11.3	8260D
1,1,2-Trichloro-1,2,2-Trifluoroethane CAS # 76-13-1										
Second Quarter 2025	U	U	U	U	U	U	1	1	1.2	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	1.2	8260D
Vinyl chloride CAS # 75-01-4										
Second Quarter 2025	U	U	U	U	U	U	1	1	1	8260D
Third Quarter 2025	U	U	U	U	U	U	1	1	1	8260D
Xylenes (Total) CAS # 1330-20-7										
Second Quarter 2025	U	U	U	U	U	U	3	3	0.2	8260D
Third Quarter 2025	U	U	U	U	U	U	3	3	0.2	8260D

All plume monitoring wells reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring event where results are reported for the upgradient well to at or above the detection limit (DL). All inorganics reported as total unless noted.

Q Donotes data validation qualifier.

QL Denotes permit required quantitation limit.

U Denotes analyte not detected at or above QL. 5/5/21 Class 1 Permit Mod; VDEQ correspondence dated 05/08/2024 (total silver)

UA Denotes analyte not detected at or above adjusted sample QL.

J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above

QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.

UN Denotes analyte concentration is less than five times the blank concentration.

Not reliably detected due to blank contamination.

R Denotes result rejected.

Q Donotes data validation qualifier.

Background Denotes background concentrations listed in Appendix F to Attachment 3 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002), (revised 2014, Dec 1, 2016, May 5, 2021, 2024 where applicable).

CAS# Denotes Chemical Abstract Services registration number.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014, 2016, 2021, 2024 (silver).

APPENDIX B-4

ESTABLISHED BACKGROUND VALUES AND COMPUTATIONS FOR HWMU-16

- It was not understood why the majority of fluorescein detections were considered false positive detections. The basis of this observation is unclear considering a lack of background and laboratory confirmation results.
- It was not apparent why certain samples were selected for laboratory confirmation and others were not. There was no apparent consistency in the selection of samples for laboratory confirmation.
- Samples were submitted for confirmation laboratory analyses three months or more following the collection of the samples in the field. No information was provided regarding the custody and/or storage of the samples. The samples were submitted to the analytical laboratory with incomplete chain-of-custody (COC), and the COC documentation was not completed by the laboratory.

In summary, the data from the study do not provide the basis for meaningful interpretation. Any attempt to formulate conclusions from the data as presented regarding the presence of preferred or predominant groundwater flow patterns is not warranted or recommended.

3.3 HWMU-16 GROUNDWATER MONITORING ANALYTE LIST

The groundwater monitoring analyte list for HWMU-16 is presented in **Table 1 (Appendix B)**. The list represents the subset of the constituents listed in Appendix III of 40 CFR Part 261 that previously have been detected in the groundwater and/or that are reasonably expected to be in or derived from waste contained in HWMU-16. As discussed in Section 3.5.2 below, 12 inorganic constituents and two explosive/propellant constituents have been detected in the groundwater monitoring network for HWMU-16 at statistically significant concentrations above the Unit's calculated background concentrations. The inorganic constituents may be derived from the aquifer formation materials; however, the two explosive/propellant constituents (2,4-Dinitrotoluene and 2,6-Dinitrotoluene) are byproducts of wastes derived from explosives. Therefore, the two explosive/propellant constituents detected could only be from HWMU-16.

The concentration limits established for the hazardous constituents also are listed in **Table 1**. The concentration limits represent either background concentrations calculated for the constituents in this GWQAR, Maximum Concentrations of Constituents for Ground-water Protection listed in Table 1 of 40 CFR 264.94, USEPA Drinking Water Standard Maximum Contaminant Levels (MCLs), or alternate concentration limits (ACLs) established by the VDEQ (July 1998). Certain organic constituents on the list do not have USEPA MCLs or VDEQ ACLs; they also do not have calculated background concentrations because they have not been detected in the Unit's upgradient well. Therefore, the concentration limits for these constituents are equal to their respective method detection limits.

As Alliant discussed with the VDEQ in the past, the reliability of previous laboratory analytical data - particularly dissolved metals data - appeared to be questionable in some cases. In an April 9, 1996 letter to C. Jake (Alliant), the VDEQ agreed that only total metals concentrations in groundwater would be measured, as described in a USEPA Region III guidance on groundwater sampling in karst terrain. Therefore, all references to metals concentrations in this GWQAR refer to total metals concentrations.

3.4 HWMU-16 GROUNDWATER BACKGROUND CONCENTRATIONS

Background concentrations were calculated for each constituent in the groundwater monitoring program using the analytical data from 1996 through 1998 for upgradient well 16C1.

The background concentration calculations were based on site wide 95% confidence, 95% coverage upper prediction intervals. The calculated background concentrations are listed in Table 2 (Appendix B). The background concentrations were used to construct the outermost closing contours on the Isoconcentration Maps (Appendix A).

3.5 HWMU-16 STATISTICAL ANALYSIS

Statistical evaluations for HWMU-16 are performed annually and submitted to the VDEQ in accordance with the annual reporting requirements specified in 40 CFR 265.94. As part of this GWQAR, statistical evaluations were performed on Fourth Quarter 1998 analytical data in accordance with the procedures and guidance provided in the following documents:

- Title 40 of the Code of Federal Regulations, 40 CFR 264.97 and 264.98;
- VDEQ Guidance for statistical analysis titled "Data Analysis Plan," undated;
- Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, April 1989;
- Addendum to Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, July 1992; and
- Statistical Methods for Groundwater Monitoring, Gibbons, R.D., 1994.

Statistical threshold values were computed for the 54 constituents for which HWMU-16 is currently monitored based on the concentrations of those constituents in upgradient (background) well 16C1. All data starting with First Quarter 1996 to Fourth Quarter 1998 were used for this purpose. The 1996 through 1998 monitoring data have been submitted previously to the VDEQ by Alliant in quarterly monitoring reports; therefore, the data are not listed in this GWQAR. Statistical comparisons were performed for the Fourth Quarter 1998 data set. Comparison statistical analyses were performed for all constituents which were detected in any downgradient well during that event.

3.5.1 Background Data and Statistical Comparisons

Statistical analyses were performed using the analytical results from upgradient well 16C1 data as background data. Based on the percentage of non-detects and the distribution of the background data, methods of statistical comparisons varied. Background average, standard deviation and other descriptive statistical data were computed for all constituents and are presented in Appendix C.

The constituents listed below were 100% non-detected in the background data. The background threshold levels (BTLs) for these constituents were established as equal to their detection limits (DL). Detections of these constituents in the downgradient wells during Fourth Quarter 1998 were compared to these BTLs.

Background Threshold Level (BTL) = Detection Limit (DL)				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Antimony	12	100	3	3
Arsenic	12	100	1	1
Bromoform	12	100	0.3	0.3
Carbon tetrachloride	12	100	0.2	0.2
Chlorobenzene	12	100	0.1	0.1
Chloromethane	12	100	0.3	0.3
Cyanide	12	100	10	10

Background Threshold Level (BTL) = Detection Limit (DL)				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Di-n-butyl phthalate	12	100	5	5
1,2-Dichloroethane	12	100	0.1	0.1
trans-1,2-Dichloroethene	12	100	0.1	0.1
1,4-Dichlorobenzene	12	100	0.1	0.1
Ethylbenzene	12	100	0.1	0.1
Mercury	12	100	0.2	0.2
Methyl ethyl ketone	12	100	1.1	1.1
Selenium	12	100	1	1
1,1,2,2-Tetrachloroethane	12	100	0.3	0.3
1,1,2-Trichloroethane	12	100	0.5	0.5
Trichloroethene	12	100	0.1	0.1
Toluene	12	100	0.1	0.1
2378-TCDF	12	100	0.0485 ppt	0.0485 ppt
12378-PECDF	12	100	0.0439 ppt	0.0439 ppt
23478-PECDF	12	100	0.0417 ppt	0.0417 ppt
123478-HXCDF	12	100	0.0390 ppt	0.0390 ppt
123678-HXCDF	12	100	0.0377 ppt	0.0377 ppt
234678-HXCDF	12	100	0.0428 ppt	0.0428 ppt
123789-HXCDF	12	100	0.0415 ppt	0.0415 ppt
1234678-HPCDF	12	100	0.0615 ppt	0.0615 ppt
1234789-HPCDF	12	100	0.0709 ppt	0.0709 ppt
OCDF	12	100	0.1307 ppt	0.1307 ppt

Non-parametric prediction intervals were computed for all of the constituents for which the data from background well 16C1 satisfied one of the following two criteria, per VDEQ regulations and guidance as well as USEPA guidance:

- Percentage of non-detects was greater than or equal to 50 and less than 100; or
- Percentage of non-detects was less than 50, but data was not normally distributed in original or log-transformed mode.

The background threshold levels for these constituents were set as equal to their upper prediction limits (UPLs). The background and relevant statistical data for these constituents are summarized below. The confidence level and false positive rate were calculated based on the number of background data points available and number of future comparisons. For all constituents, the confidence level was determined to be equal to 0.933, and the false positive rate was equal to 0.067. Since the upper control limit of a non-parametric interval cannot be adjusted for multiple comparisons and inadequate number of background data, the number of resampling events required was adjusted to account for the high error rates inherent in those situations. The number of confirmation resamples required for all constituents is 2. The background and relevant statistical data for these constituents are summarized below. Associated statistical computations are presented in **Appendix C**.

BTL = Upper Prediction Limit of Non-parametric Prediction Interval w/false positive rate=0.067				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Beryllium	12	75	0.2	0.7
Cadmium	12	75	0.1	0.2
Cobalt	12	75	1	5
Copper	12	50	1	13
1,1-Dichloroethane	12	0	0.2	9.5
2,4-Dinitrotoluene	12	92	0.08	0.10

BTL = Upper Prediction Limit of Non-parametric Prediction Interval w/false positive rate=0.067				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
2,6-Dinitrotoluene	12	75	0.08	0.11
Lead	12	42	1	10
Nickel	12	92	15	16
Silver	12	75	0.2	0.5
Thallium	12	67	1	6
TOC	12	75	1000	7000
1,1,1-Trichloroethane	12	17	0.3	9.2
Vanadium	12	83	4	151
Vinyl Chloride	12	92	0.1	0.1
Xylene (total)	12	92	0.1	0.2
Zinc	12	50	5	51

Chromium exhibited normally distributed data (excluding non-detects) with between 25% and 50% non-detects in the background well. The mean and standard deviation of the background data for chromium were adjusted using Cohen's Maximum Likelihood Estimator Method (1959, 1961). A one-sided parametric prediction interval was then computed for chromium based on the adjusted mean and standard deviation. The Upper Prediction Limit was set as the BTL for chromium. The background and relevant statistical data for chromium are summarized below. Cohen's adjustment computations and prediction interval computations are presented in Appendix C.

BTL = Upper Prediction Limit of Prediction Interval w/false positive rate=0.05 Original Mean = 3.54, Original SD = 1.933 Adjusted Mean = 3.642, Adjusted SD = 1.95				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Chromium	12	25	1	6.2

The following constituents exhibited normally distributed background data with less than 25% non-detects. One sided parametric prediction intervals were computed on the background data for all of these constituents. The UPLs for these constituents were set as their respective BTLs, with one exception. For pH, a two-sided parametric prediction interval was computed; therefore, the BTL for pH consisted of a range between the lower prediction limit (LPL) and the upper prediction limit. The background concentration calculations were based on a site wide 95% confidence, 95% coverage upper prediction intervals. When adjusted for multiple comparisons of the background data, the minimum required false positive rate was below 1% (0.01). A 99% confidence level (0.01 false positive rate) was used for all individual comparisons, which with the most conservative assumptions provided a site-wide false positive rate of >0.05 for all constituents. The background and relevant statistical data for these constituents are summarized below. The prediction interval computations for these constituents are presented in Appendix C.

BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05 (individual comparisons false positive rate=0.01) BTL for pH = LPL - UPL of two-sided Prediction Interval				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Barium	12	0	2	175.4
Dichlorodifluoromethane	12	8	0.3	46.5
Tetrachloroethene	12	17	0.1	0.7
TOX	12	17	5	42.2

BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05 (individual comparisons false positive rate=0.01) BTL for pH = LPL - UPL of two-sided Prediction Interval				
Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Trichlorofluoromethane	12	0	0.5	11.3
Specific Conductivity	8	0	1 µS/cm	672 µS/cm
pH	8	0	0.1 pH units	5.7 to 7.9 pH units

3.5.2 Results of Statistical Comparisons

The following table lists the constituents which were detected during the Fourth Quarter 1998 event at concentrations exceeding their respective background threshold levels (BTLs), and the downgradient wells in which they were detected.

Parameter	Monitoring Well(s)
Arsenic	16-5, 16WC2B
Barium	16-2, 16-3, 16-5, 16WC1A, 16WC1B, 16WC2B, 16SPRING
Beryllium	16WC1B, 16WC2B
Cadmium	16WC1B
Chromium	16-3, 16-5, 16WC1B, 16WC2B
Cobalt	16-5, 16WC1B, 16WC2B
Copper	16-5, 16WC1B, 16WC2B
Lead	16WC1B
Mercury	16WC1B
Nickel	16-5, 16WC1A, 16WC2B
Selenium	16-5, 16WC1B, 16WC2B
Zinc	16WC1B
2,4-Dinitrotoluene	16-3, 16-5, 16WC1B, 16WC2B, 16SPRING
2,6-Dinitrotoluene	16WC1A, 16WC1B

Any HWMU-16 target constituents not listed above were not detected in the downgradient monitoring wells at concentrations exceeding their respective BTLs.

3.6 HWMU-16 PLUME DELINEATIONS

In accordance with VDEQ instructions presented during the May 19, 1999 meeting between Alliant and the VDEQ, Isoconcentration Maps were produced to depict constituent plumes in the groundwater beneath the site (Appendix A). In order to evaluate the shape and position of constituent plumes over time, historical Isoconcentration Maps were developed using the historical maximum concentrations for the constituents monitored at the site for the time periods of 1992 through 1995 and 1996 through 1998. The historical maximum concentrations for these time periods are listed in Tables 3 and 4, respectively (Appendix B).

Groundwater analytical data collected prior to 1992 were not included in the evaluation of historical maximum concentrations. The data collected prior to 1992 are considered unreliable due to "order-of-magnitude" variations in parameter concentrations from quarter to quarter, as well as a general lack of laboratory QA/QC. Additionally, the groundwater monitoring analyte lists prior to 1992 did not include many of the parameters on the current groundwater monitoring analyte list for HWMU-16.

TABLE 2
HWMU-16
Calculated Background Values

Constituent	Background Concentration (µg/l unless otherwise noted)
Antimony	3
Arsenic	1
Barium	175.4
Beryllium	0.7
Cadmium	0.2
Chromium	6.2
Cobalt	5
Copper	13
Lead	10
Mercury	0.2
Nickel	16
Selenium	1
Silver	0.5
Thallium	6
Vanadium	151
Zinc	51
Bromoform	0.3
Carbon Tetrachloride	0.2
Chlorobenzene	0.1
Chloromethane	0.3
1,4-Dichlorobenzene	0.1
Dichlorodifluoromethane	46.5
1,1-Dichloroethane	9.5
1,2-Dichloroethane	0.1
trans-1,2-Dichloroethene	0.1
Ethylbenzene	0.1
Methyl Ethyl Ketone	1.1
1,1,2,2-Tetrachloroethane	0.3
Tetrachloroethene	0.7
Toluene	0.1
1,1,1-Trichloroethane	9.2
1,1,2-Trichloroethane	0.5
Trichloroethene	0.1
Trichlorofluoromethane	11.3
Vinyl Chloride	0.1
Xylenes (total)	0.2

TABLE 2
HWMU-16
Calculated Background Values

Constituent	Background Concentration (µg/l unless otherwise noted)
Di-n-butylphthalate	5
2,4-Dinitrotoluene	0.10
2,6-Dinitrotoluene	0.11
2378-TCDF	0.0485 ppt
12378-PECDF	0.0439 ppt
23478-PECDF	0.0417 ppt
123478-HXCDF	0.0390 ppt
123678-HXCDF	0.0377 ppt
234678-HXCDF	0.0428 ppt
123789-HXCDF	0.0415 ppt
1234678-HPCDF	0.0615 ppt
1234789-HPCDF	0.0709 ppt
OCDF	0.1307 ppt
Cyanide	10
Total Organic Carbon (x4)	7000
Total Organic Halides (x4)	42.2
Specific Conductivity	672 µS/cm
pH	5.7 to 7.9 pH units

Appendix IX Constituents Detected Since Permit Issuance
HWMUs 5, 7, 10, and 16
Radford Army Ammunition Plant

Unit	Quarter Initially Detected	Constituent	Background-- Calculated or QL?	Background (ug/L)	GPS Required? (261 Appendix VIII)	Proposed GPS (ug/L)	Source
HWMU-5	Fourth Quarter 2003	Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
		2-Nitroaniline	QL	20	no	NA	NA
		4-Nitroaniline	QL	20	yes	20	Background/QL
	Third Quarter 2006	Nitrobenzene	QL	10	yes	10	Background/QL
		Dichlorodifluoromethane	QL	1	yes	125.2	VDEQ ACL
HWMU-7	Third Quarter 2003	Copper	Calculated	49	no	NA	NA
	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
HWMU-10	First Quarter 2003	Cobalt	QL	5	no	NA	NA
	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
		2-Propanol	QL	50	no	NA	NA
HWMU-16	Second Quarter 2003	Chloroethane	Calculated	20.7	yes	20.7	Background/QL
		Diethyl Ether	Calculated	75.5	no	NA	NA
		Dimethyl Ether	Calculated	17.0	no	NA	NA
	Third Quarter 2003	Methylene Chloride	Calculated	13.95	no*	NA	NA
	Second Quarter 2004	1,1,2-Trichloro-1,2,2-trifluoroethane	Calculated	1.2	no*	NA	NA

HWMU-5: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.1.g.), GPS are proposed for those additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chromium, 4-nitroaniline, nitrobenzene, and dichlorodifluoromethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and 2-nitroaniline).

HWMU-7: Background concentrations for the additional Appendix IX constituents detected in the downgradient point of compliance wells (copper and zinc) were previously calculated and submitted to the VDEQ in the August 1998 *Groundwater Quality Assessment Report for HWMU-7* prepared by ERM, Inc. In accordance with the Permit (Condition V.J.2.g.), no GPS are proposed for the additional Appendix IX constituents (copper and zinc), as they are not listed in Appendix VIII of 40 CFR Part 261.

HWMU-10: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.3.g.), no GPS are proposed for the additional Appendix IX constituents (cobalt, vanadium, acetone, and 2-propanol), as they are not listed in Appendix VIII of 40 CFR Part 261.

HWMU-16: Background concentrations for additional Appendix IX constituents chloroethane, diethyl ether, dimethyl ether, and methylene chloride were calculated using data collected from upgradient well 16C1 during the period from Third Quarter 2003 through Third Quarter 2004. The background concentration for additional Appendix IX constituent 1,1,2-trichloro-1,2,2-trifluoroethane was calculated using data collected from upgradient well 16C1 during the period from Second Quarter 2004 through Third Quarter 2006. In accordance with the Permit (Condition V.J.4.g.), GPS are proposed for additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chloroethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and dimethyl ether).

*Methylene chloride and 1,1,2-trichloro-1,2,2-trifluoroethane should not be added to the Groundwater Monitoring List for HWMU-16, as these constituents were only detected in the upgradient well for the Unit, and not in the downgradient point of compliance wells.

Statistical Computations – RAAP HWMU-16 – 1,1,2-Trichloro-1,2,2-Trifluoroethane

In accordance with the facility permit and VHWMR, statistical background concentration is being established for 1,1,1-Trichloro-1,2,2-Trifluoroethane. Inter-well upper prediction limits (UPL) were calculated on the background data for this target parameter in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Background data for this target parameter consisted of all data for the background well 16C1 collected from 2nd quarter 2004 through 3rd quarter 2006.

Discussion of Tests for Normality

The power of a statistical tool to account for false positive and false negative results, while accurately detecting true statistical variations for a facility under scrutiny depends on numerous factors, one of which is the distribution of the data. A great number of statistical tools are based on the assumption that data are normally distributed. Hence the distribution of the sample population for parameters evaluated under this statistical analysis is first determined. Sample populations are tested for normal distribution using several normality tests. "Groundwater Information Tracking System with Statistical Analysis Capability" (GRITS/STAT) v5.0 was the software used to run these statistical tests. GRITS/STAT is an analytical software package provided by the USEPA. The distributions of the data sets were verified in the original mode as well as in log-transformed mode. The normality of the data set was evaluated using the Shapiro-Wilk test for normality.

Discussion of Prediction Interval Tests

Normality tests are performed prior to running parametric tests (tests that require that the data be normal). Results of the normality tests show that the background data for 1,1,2-Trichloro-1,2,2-Trifluoroethane is non-normally distributed. Non-parametric UPL (NUPL) was constructed on the background data for this parameter. The confidence levels of NUPLs are typically approximate and estimated to be around 91%.

Summary of UPL

Parameter	Background Data Distribution	Type of UPL	Multiple Comparisons/year	UPL (µg/l)
1,1,2-Trichloro-1,2,2-Trifluoroethane	Non-Normal	NUPL	N/A	1.2

Statistical Computations – RAAP HWMU-16

In accordance with the facility permit and VHWMR, statistical background concentrations are being established for the four new target parameters chloroethane, diethyl ether, dimethyl ether and methylene chloride. These four target parameters were added to the facility monitoring program during the 3rd quarter 2003 monitoring event. Inter-well upper prediction limits (UPL) were calculated on the background data for the target parameters in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Background data for these target parameters consisted of all data for the background well 16C1 collected from 3rd quarter 2003 through 3rd quarter 2004.

Discussion of Tests for Normality

The power of a statistical tool to account for false positive and false negative results, while accurately detecting true statistical variations for a facility under scrutiny depends on numerous factors, one of which is the distribution of the data. A great number of statistical tools are based on the assumption that data are normally distributed. Hence the distribution of the sample population for parameters evaluated under this statistical analysis is first determined. Sample populations were tested for normal distribution using several normality tests. "Groundwater Information Tracking System with Statistical Analysis Capability" (GRITS/STAT) v5.0 was the software used to run these statistical tests. GRITS/STAT is an analytical software package provided by the USEPA. The distributions of the data sets were verified in the original mode as well as in log-transformed mode. The normality of the data sets was evaluated using the Shapiro-Wilk test for normality.

Discussion of Prediction Interval Tests

Normality tests are performed prior to running parametric tests (tests that require that the data be normal). A 99% confidence parametric inter-well UPL was computed for each of the four target parameters that showed normally distributed background data. Results of the normality tests show that the background data for chloroethane, diethyl ether and methylene chloride are normally distributed, and the background data for dimethyl ether is non-normally distributed. Non-parametric UPL (NUPL) was constructed on the background data for dimethyl ether, and parametric UPLs (PUPL) were constructed on the background data for chloroethane, diethyl ether and methylene chloride. No adjustments to the error rates were made to the NUPLs for multiple comparisons. Adjustment for 10 comparisons per year (considering 10 compliance monitoring wells at the facility and 4 quarters of data for each year, and considering historic detects, 10 is considered a representative number for multiple comparisons per year) was made to the PUPLs. The confidence levels of NUPLs are well less than 95%. Any statistically significant increase (SSI) must be confirmed by verification sampling.

Summary of UPLs

Parameter	Background Data Distribution	Type of UPL	Multiple Comparisons/year	UPL (µg/l)
Chloroethane	Normal	PUPL	10	20.7
Diethyl ether	Normal	NUPL	10	75.5
Dimethyl ether	Non-normal	PUPL	N/A	17.0
Methylene Chloride	Normal	PUPL	10	13.95

RAAP-HWMU-16 - Statistical Analysis - Notes

1) Y2K Correction dates are as shown in table below.

Actual Event	Date Used in Stat Software
2000-Qtr1	12/13/1999
2000-Qtr2	12/14/1999
2000-Qtr3	12/15/1999
2000-Qtr4	12/16/1999
2001-Qtr1	12/17/1999
2003-Qtr3	12/18/1999
2003-Qtr4	12/19/1999
2004-Qtr1	12/20/1999
2004-Qtr2	12/21/1999
2004-Qtr3	12/22/1999

Interwell Tests:

2) Background data for target parameters chloroethane, diethyl ether, dimethyl ether and methylene chloride were evaluated using Shapiro-Wilk test. Background data showed normal distribution for chloroethane, diethyl ether and methylene chloride. Parametric interwell 99% confidence upper prediction limits were computed for parameters with normally distributed background data. Dimethyl ether background data was non-normally distributed. Therefore non-parametric Upper Prediction Limit (UPL) was computed for dimethyl ether.

3) No adjustments for multiple comparisons could be made for non-parametric UPLs. Adjustments were made to the parametric UPLs for 10 future comparisons per year to account for multiple compliance monitoring wells and quarterly event data. Any Statistically significant increase (SSI) must be confirmed by verification sampling.

Normality Tests

Report Printed: 02-02-2005 13:49

Facility:RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141
County:PULASKI

Contact:

Phone:() -

Permit Type:Detection

Constituent:ClEthane Chloroethane

CAS Number: 75-00-3

MCL: 0.000 ppb

ACL: 0.000 ppb

Detect Limit: 2.000 ppb

Start Date:Mar 31 1996

End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position:Upgradient Observations:5

Scale	Minimum	Maximum	Mean	Std Dev
Original:	1.000	6.400	4.340	2.078
Log:	0.000	1.856	1.303	0.749

Pooled Statistics

Observations: 5

Statistic	Original Scale	Log Scale
Mean:	4.340	1.303
Std Dev:	2.078	0.749
Skewness:	-0.810	-1.296*
Kurtosis:	-0.555	-0.011
Minimum:	1.000	0.000
Maximum:	6.400	1.856
CV:	0.479	0.575

Shapiro-Wilk Statistics

Scale	Test Statistic	5% Critical Value	1% Critical Value
Original:	0.9037	0.7620	0.6860

Log: 0.7615* 0.7620 0.6860

* Indicates statistically significant evidence of non-normality.
GRIT/STAT Version 5.0

Parametric Prediction Interval
Report Printed February 2, 2005

Page 1

Facility: Haz. Waste Unit 16 - RAAP
Parameter: Chloroethane (CAS Number: 75-00-3)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n):	5
Shapiro-Wilk (W):	0.9037
Critical W, $\alpha=0.01$:	0.6860
Mean:	4.340 ppb
Std Dev:	2.078 ppb
DF:	4
Conf. Level (1- α):	0.9500 0.99
Future Samples (k):	10
$t_{\left[\frac{1-\alpha}{k} \right]}$:	7.1732
Kappa:	7.8579
UL:	20.669 ppb
LL:	$-\infty$

Normality Tests

Report Printed: 02-02-2005 13:49

Facility:RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141
County:PULASKI

Contact:

Phone:() -

Permit Type:Detection

Constituent:DEthEth Diethyl ether

CAS Number: - -

MCL: 0.000 ppb

ACL: 0.000 ppb

Detect Limit: 24.000 ppb

Start Date:Mar 31 1996

End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position:Upgradient Observations:5

Scale	Minimum	Maximum	Mean	Std Dev
Original:	12.000	30.000	21.200	6.907
Log:	2.485	3.401	3.007	0.355

Pooled Statistics

Observations: 5

Statistic	Original Scale	Log Scale
Mean:	21.200	3.007
Std Dev:	6.907	0.355
Skewness:	-0.122	-0.491
Kurtosis:	-1.140	-1.024
Minimum:	12.000	2.485
Maximum:	30.000	3.401
CV:	0.326	0.118

Shapiro-Wilk Statistics

	Test	5% Critical	1% Critical
Scale	Statistic	Value	Value
Original:	0.9768	0.7620	0.6860

Log: 0.9507 0.7620 0.6860

* Indicates statistically significant evidence of non-normality.
GRIT/STAT Version 5.0

Parametric Prediction Interval
Report Printed February 2, 2005

Page 1

Facility: Haz. Waste Unit 16 - RAAP
Parameter: Diethyl ether (CAS Number: - -)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n):	5
Shapiro-Wilk (W):	0.9768
Critical W, $\alpha=0.01$:	0.6860
Mean:	21.200 ppb
Std Dev:	6.907 ppb
DF:	4
Conf. Level (1- α):	0.9500 0.99
Future Samples (k):	10
$t_{\left[\frac{1-\alpha}{k} \right]}$:	7.1732
Kappa:	7.8579
UL:	75.470 ppb
LL:	$-\infty$

Normality Tests

Report Printed: 02-02-2005 13:53

Facility:RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141
County:PULASKI

Contact:

Phone:() -

Permit Type:Detection

Constituent:DMethEth Dimethyl ether

CAS Number: - -

MCL: 0.000 ppb

ACL: 0.000 ppb

Detect Limit: 24.000 ppb

Start Date:Mar 31 1996

End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position:Upgradient Observations:5

Scale	Minimum	Maximum	Mean	Std Dev
Original:	12.000	17.000	13.000	2.236
Log:	2.485	2.833	2.555	0.156

Pooled Statistics

Observations: 5

Statistic	Original Scale	Log Scale
Mean:	13.000	2.555
Std Dev:	2.236	0.156
Skewness:	1.500*	1.500*
Kurtosis:	0.250	0.250
Minimum:	12.000	2.485
Maximum:	17.000	2.833
CV:	0.172	0.061

Shapiro-Wilk Statistics

	Test	5% Critical	1% Critical
Scale	Statistic	Value	Value
Original:	0.5521*	0.7620	0.6860

Log: 0.5521* 0.7620 0.6860

* Indicates statistically significant evidence of non-normality.

GRIT/STAT Version 5.0

Nonparametric Prediction Interval
Report Printed February 2, 2005

Page 1

Facility: Haz. Waste Unit 16 - RAAP
Parameter: Dimethyl ether (CAS Number: - -)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n):	5
Conf. Level (1- α):	33.330%
UL:	17.000 ppb
LL:	0.000

Normality Tests

Report Printed: 02-02-2005 13:54

Facility:RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141
County:PULASKI

Contact:

Phone:() -

Permit Type:Detection

Constituent:MeCl Dichloromethane (Methylene chloride)

CAS Number: 75-09-2

MCL: 0.000 ppb

ACL: 0.000 ppb

Detect Limit: 2.000 ppb

Start Date:Mar 31 1996

End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position:Upgradient Observations:5

Scale	Minimum	Maximum	Mean	Std Dev
Original:	4.100	6.800	5.800	1.037
Log:	1.411	1.917	1.743	0.197

Pooled Statistics

Observations: 5

Statistic	Original Scale	Log Scale
Mean:	5.800	1.743
Std Dev:	1.037	0.197
Skewness:	-0.925	-1.088*
Kurtosis:	-0.436	-0.263
Minimum:	4.100	1.411
Maximum:	6.800	1.917
CV:	0.179	0.113

Shapiro-Wilk Statistics

	Test	5% Critical	1% Critical
Scale	Statistic	Value	Value
Original:	0.8964	0.7620	0.6860

Log: 0.8519 0.7620 0.6860

* Indicates statistically significant evidence of non-normality.

GRIT/STAT Version 5.0

Parametric Prediction Interval
Report Printed February 2, 2005

Page 1

Facility: Haz. Waste Unit 16 - RAAP
Parameter: Dichloromethane (Methylene chloride) (CAS Number: 75-09-2)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n):	5
Shapiro-Wilk (W):	0.8964
Critical W, $\alpha=0.01$:	0.6860
Mean:	5.800 ppb
Std Dev:	1.037 ppb
DF:	4
Conf. Level (1- α):	0.9500 0.99
Future Samples (k):	10
$t_{\left[\frac{1-\alpha}{k} \right]}$:	7.1732
Kappa:	7.8579
UL:	13.947 ppb
LL:	$-\infty$

**Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia**

Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW3	16MW9	16WC1A	16WC1B	QL	GPS	Method
Chloroethane CAS # 75-00-3								
Third Quarter 2003	6.4	U	4.8	U	U	1	20.7	8260B
Fourth Quarter 2003	5.7	U	2.6	1.1	U	1	20.7	8260B
First Quarter 2004	U J	U J	U J	U J	U J	1	20.7	8260B
Second Quarter 2004	4.4	U	2.4	0.63 J	U	1	20.7	8260B
Third Quarter 2004	4.2	U	2	U	U	1	20.7	8260B
Fourth Quarter 2004	4.9	U	2.5	U	U	1	20.7	8260B
First Quarter 2005	7.6 J	U J	3.7 J	U J	U J	1	20.7	8260B
Second Quarter 2005	U J	U	U J	U	U	1	20.7	8260B
Third Quarter 2005	4.7 J	U J	U	U J	U J	1	20.7	8260B
Fourth Quarter 2005	4.6 J	U	2.6 J	U	U	1	20.7	8260B
First Quarter 2006	5.3	U	U	U	U	1	20.7	8260B
Second Quarter 2006	5 J	U	2 J	U	U	1	20.7	8260B
Third Quarter 2006	5	U	0.7 J	0.7 J	U	1	20.7	8260B
Fourth Quarter 2006	5.8	U	1	U	U	1	20.7	8260B
First Quarter 2007	6.1	U	1	U	U	1	20.7	8260B
Second Quarter 2007	5.2	U	1.4	U	U	1	20.7	8260B
Diethyl ether CAS # 60-29-7								
Third Quarter 2003	12 J	U	12 J	U	U	12	-	8260B
Fourth Quarter 2003	30	U	14	U	U	12	-	8260B
First Quarter 2004	24	U	U	U	U	12	-	8260B
Second Quarter 2004	23 J	U J	13 J	U J	U J	12	-	8260B
Third Quarter 2004	17	U	U	U	U	12	-	8260B
Fourth Quarter 2004	24	U J	U	U	U J	12	-	8260B
First Quarter 2005	29	U	14	U	U	12	-	8260B
Second Quarter 2005	20	U J	9.2	U J	U J	12	-	8260B
Third Quarter 2005	30	U	15	U	U	12	-	8260B
Fourth Quarter 2005	25	U	18	U	U	12	-	8260B
First Quarter 2006	19	U	U	U	U	12	-	8260B
Second Quarter 2006	17	U	U	U	U	12.5	-	8260B
Third Quarter 2006	33	1.5 J	4.3 J	4.6 J	U	12.5	-	8260B
Fourth Quarter 2006	20	U	U	U	U	12.5	-	8260B
First Quarter 2007	21	U	U	U	U	12.5	-	8260B
Second Quarter 2007	17 J	1.5 J	5.7 J	2.1 J	U J	12.5	-	8260B
Dimethyl ether CAS # 115-10-6								
Third Quarter 2003	6.6 J	U	9.9 J	U	U	12	-	8260B
Fourth Quarter 2003	U	U	U	U	U	12	-	8260B
First Quarter 2004	17 J	U J	13 J	U J	U J	12	-	8260B
Second Quarter 2004	U J	U J	6.6 J	U J	U J	12	-	8260B
Third Quarter 2004	U J	U J	U J	U J	U J	12	-	8260B
Fourth Quarter 2004	16 J	U J	12 J	U	U J	12	-	8260B
First Quarter 2005	26	U	25	U	U	12	-	8260B
Second Quarter 2005	15	U	14	U	U	12	-	8260B
Third Quarter 2005	13	U	U	U	U	12	-	8260B
Fourth Quarter 2005	U	U	U	U	U	12	-	8260B
First Quarter 2006	U	U	U	U	U	12	-	8260B
Second Quarter 2006	U	U	U	U	U	12.5	-	8260B
Third Quarter 2006	11 J	U J	3.2 J	2.8 J	U J	12.5	-	8260B
Fourth Quarter 2006	U	U	U	U	U	12.5	-	8260B
First Quarter 2007	U	U	U	U	U	12.5	-	8260B
Second Quarter 2007	11 J	U	7 J	2.6 J	1.2 J	12.5	-	8260B

See last page of this report for definitions.

**Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia**

Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method
Methylene chloride CAS # 75-09-2								
Third Quarter 2003	4.1	U	U	U	U	1	13.95	8260B
Fourth Quarter 2003	6.8	U	U	U	U	1	13.95	8260B
First Quarter 2004	6.4	U	U	U	U	1	13.95	8260B
Second Quarter 2004	5.7	U	U	U	U	1	13.95	8260B
Third Quarter 2004	6	U A	U A	U A	U A	1	13.95	8260B
Fourth Quarter 2004	6.4	U	U	U	U	1	13.95	8260B
First Quarter 2005	6.8 J	U	U	U	U	1	13.95	8260B
Second Quarter 2005	6.3	U	U	U	U	1	13.95	8260B
Third Quarter 2005	6.2	U	U	U	U	1	13.95	8260B
Fourth Quarter 2005	4.7	U	U	U	U	1	13.95	8260B
First Quarter 2006	4.9	U	U	U	U	1	13.95	8260B
Second Quarter 2006	7	U	U	U	U	1	13.95	8260B
Third Quarter 2006	U N	U N	U N	U N	U N	1	13.95	8260B
Fourth Quarter 2006	U A	U	U	U A	U	1	13.95	8260B
First Quarter 2007	6.3	U	U	U	U	1	13.95	8260B
Second Quarter 2007	3.4	U	U	U	U	1	13.95	8260B
1,1,2-Trichloro-1,2,2-Trifluoroethane CAS # 76-13-1								
Third Quarter 2003	U	U	U	U	U	1	-	8260B
Second Quarter 2004	1.2	U J	U J	U J	U J	1	-	8260B
Third Quarter 2004	U	U	U	U	U	1	-	8260B
Fourth Quarter 2004	U	U	U	U	U	1	-	8260B
First Quarter 2005	1	U	U	U	U	1	-	8260B
Second Quarter 2005	U	U	U	U	U	1	-	8260B
Third Quarter 2005	U	U	U	U	U	1	-	8260B
Fourth Quarter 2005	U	U	U	U	U	1	-	8260B
First Quarter 2006	U	U	U	U	U	1	-	8260B
Second Quarter 2006	U	U	U	U	U	1	-	8260B
Third Quarter 2006	U	U	U	U	U	1	-	8260B
Fourth Quarter 2006	U	U	U	U	U	1	-	8260B
First Quarter 2007	U	U	U	U	U	1	-	8260B
Second Quarter 2007	U	U	U	U	U	1	-	8260B

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1

All Results in ug/L.

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	OL	GPS	Method
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Definitions: QL Denotes permit required quantitation limit. U Denotes analyte not detected at or above QL. UA Denotes analyte not detected at or above adjusted sample QL. J Denotes associated result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated. UN Denotes analyte concentration is less than the quantitation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when results are reported to at or above the project detection limit. R Denotes result rejected. Q Denotes data validation qualifier. CAS# Denotes Chemical Abstract Services registration number. X Denotes mass spectral confirmation not obtained-result suspect.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).

NS denotes not sampled. **NA** denotes not analyzed. "—" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:

-Appendix IX Groundwater Monitoring Events:

Third Quarter 2003, Second Quarter 2004, Second Quarter 2005, Third Quarter 2006, Second Quarter 2007

For Appendix IX monitoring events, all results evaluated to detection limit. See laboratory data deliverable for detection limit.

-9/30/2003: Verification sampling event for 16C1 (heptachlor) and 16C1B (Endrin). Verification results: all results reported not detected to detection limit. Original results 0.067 µg/l and 0.39 µg/l, respectively. Confirmation results reported in this table.

-9/30/2003: Verification sampling event for 16C1 (chloroethane, ethyl ether, methyl ether, methylene chloride) and 16MW9 (chloroethane, ethyl ether, methyl ether). Verification results: all results confirmed original analysis. Original results reported in this table.

-June 21, 2004: Verification event for 8260B 16C1 (1,1-dichloroethene and 1,1,2-trichloro-1,2,2-trifluoroethane).

Verification results: all not detected except 1,1,2-trichloro-1,2,2-trifluoroethane added to quarterly analyte list beginning 3Q 2004.

Due to laboratory error, Appendix IX results for semivolatiles (Method 8270C) will be presented in 3Q 2004. Verification event results for 16WC1B and 16C1 (8081A) — all verification results were not confirmed.

-07/27-28/2005. Verification event for 16WC1B (Mercury Method 7470A.) Not detected in verification sample.

Also, verification event for 16C1, 16WC1B-8081A. and 16C1, 16MW9, 16WC1A-ethanol. All verification results not detected. Verification results used.

-06/19/2007. Verification event for 16WC1B and 16MW9 thallium Not detected in verification sample. Verification results used.

Ross Miller

From: Flint, Jeremy <Jeremy.Flint@ATK.COM>
Sent: Friday, January 20, 2012 2:23 PM
To: Powers, Loretta
Cc: Janet Frazier; Kathy Olsen; Mike Lawless; Ross Miller
Subject: FW: VA1210020730, RAAP, Additional App. IX GW Mont Results PCC HWMU 5,7,10,16, Final Notification

Loretta,

Please file the attached e-mail as an answer to ATK letter number 11-815-106

Thank You
Jeremy Flint
Lead Compliance Engineer
Environmental Affairs Department
Alliant Techsystems Inc.
P.O. Box 1
Radford, VA 24143
Phone: 540 - 639 - 7668
Fax: 540 - 639 - 8109

"Together Everyone Accomplishes More." (TEAM)

From: Maiden, Vince (DEQ) [<mailto:Vincent.Maiden@deq.virginia.gov>]
Sent: Friday, January 20, 2012 10:26 AM
To: Flint, Jeremy
Cc: McKenna, Jim; Schneider, Jutta (DEQ)
Subject: VA1210020730, RAAP, Additional App. IX GW Mont Results PCC HWMU 5,7,10,16, Final Notification

Jeremy:

The Department has received the referenced August 1, 2011 document. The notification indicates the benzene was confirmed in 16MW and recommended that this constituent be added to the compliance monitoring list for HWMU-16. In addition, the facility recommended that the background for benzene be established at the LOQ of 1µg/l and the groundwater protection standard be set at 5µg/l based on the MCL. The Department agrees with the recommendations. It appears that these changes were included in the permit renewal application dated September 15, 2011. The Department will formally address those changes along with others in the permit renewal process. If you have any questions please feel free to contact me.

Vincent Maiden
Corrective Action Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
629 East Main Street or P.O. Box 1105
Richmond, VA 23218 Richmond, VA 23219
(276) 676-4867
Vincent.Maiden@deq.virginia.gov



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

Office of Waste Permitting and Compliance

Land Protection and Remediation Division

September 12, 2014

VIA ELECTRONIC MAIL

Mr. Jay Stewart
Environmental Manager
BAE Systems, Ordnance Systems, Inc.
Radford Army Ammunition Plant
4050 Pepper's Ferry Road
Radford, Virginia 24141

Re: Radford Army Ammunition Plant, Radford, VA
EPA ID No.VA1210020730, Approval of Class 1 Permit Modifications
Hazardous Waste Management Units 5 and 16, Post Closure-Care Permit

Dear Mr. Stewart:

Enclosed are the final Class 1 Modifications to the Hazardous Waste Permit for Post Closure-Care of two hazardous waste management units (HWMUs) 5 and 16 at the Radford Army Ammunition Plant (RAAP), Radford, Virginia facility. The final Class 1 Modifications to the Permit have been approved.

The Virginia Department of Environmental Quality (DEQ) received the Class 1 Permit groundwater related modification request addressing the HWMU 16 that was communicated to the DEQ in an e-mail dated August 13, 2014, from the RAAP, Radford, Virginia facility. RAAP requested that 1,1-dichloroethene (1,1-DCE) be added to the Groundwater Compliance Monitoring Constituent List for HWMU-16.

1,1-DCE was detected in the most recent annual groundwater sampling event required under the Post-Closure Permit, and in a letter dated July 21, 2014, the VDEQ supported the RAAP's July 1, 2014, proposal that 1,1-DCE be added to the Groundwater Compliance Monitoring Constituent List and also the setting of the background value for 1,1-DCE at the Limit of Quantitation (LOQ) value of 1

ug/l and the Groundwater Protection Standard (GPS) at the USEPA Maximum Contaminant Level (MCL) of 7 ug/l.

In the e-mail letter dated August 13, 2014, RAAP submitted the following requested changes to the facility's hazardous waste Post Closure-Care Permit as marked-up files comprising the Class 1 Permit modification:

- ◆ Permit Attachment 3, Appendix E (HWMU-16 Groundwater Compliance Monitoring Constituent List) from the Post-Closure Care Permit to add 1,1-DCE to the groundwater Compliance Monitoring Program for HWMU-16, and
- ◆ Permit Attachment 3, Appendix G (HWMU-16 Groundwater Protection Standards) from the Post-Closure Care Permit to add 1,1-DCE to the groundwater Compliance Monitoring Program for HWMU-16.

The requested changes represent a Class 1 permit modification under 40 CFR § 270.42, Appendix I.C.2 – *Changes in groundwater sampling or analysis procedures or monitoring schedule, with prior approval of the Director.*

Based on the above justification, this August 13, 2014, e-mailed letter requesting changes in the groundwater compliance monitoring program including the addition of 1,1-DCE and its associated background concentration and GPS; the RAAP has established sufficient documentation for approval of all requested changes. In accordance with the VHWMR, under 40 CFR § 270.42, Appendix I, Section C.2 and based upon the accuracy of the information contained in the Permittee's correspondence dated August 13, 2014, the requested Class 1 modifications to the permit are approved.

Enclosed are the final modified pages in electronic format to be inserted into the RAAP's copy of the hazardous waste permit.

All conditions and requirements of the facility Permit shall remain in effect for the duration of the Permit unless the existing Permit is modified, revoked and reissued, or terminated in accordance with 40 CFR § 124.5, and 40 CFR § 270.41 through 270.42, or continued in accordance with 9 VAC 20-60-270.B.5.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate a legal appeal by filing a notice of appeal with:

David K. Paylor, Director
Department of Environmental Quality
629 East Main Street
P.O. Box 1105
Richmond, VA 23218

In the event that this decision is served to you by mail, the date of service will be calculated as three days after the postmark date. Please refer to Part 2A of the Rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specifications

of the Circuit Court to which the appeal is taken, and additional requirements concerning appeals from decisions of administrative agencies.

This above Class 1 permit modification under 40 CFR § 270.42(a)(1) requires the Permittee to send a notice of the modification to all persons on the facility mailing list (attached) within 90 days after the change is put into effect. In addition, RAAP must provide documentation to this Office regarding compliance with the public notice requirement. Please submit evidence of this mailing (return receipts, copy of the notification letter) when it is available.

If you should have any questions regarding these matters, please contact Russell McAvoy, Jr., PE, Environmental Engineer Senior, at (804) 698-4194 or by e-mail at russell.mcavoy@deq.virginia.gov.

Sincerely,



Leslie A. Romanchik
Hazardous Waste Program Manager
Office of Waste Permitting and Compliance

Enclosures: Facility Mailing List, Modified Permit Pages

cc: Andrea Barbieri – EPA, Region III (3LC50) e/enclosures
Jutta Schneider – DEQ, CO
Kurt Kochan – DEQ, CO
Aziz Farahmand – DEQ, BRRO
Elizabeth Lohman – DEQ, BRRO
Julia King–Collins – DEQ, CO
Central Hazardous Waste Files



COMMONWEALTH of VIRGINIA

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Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4020
1-800-592-5482

July 19, 2016

Mr. Jay Stewart
Environmental Manager
BAE Systems, Ordnance Systems Inc.
4050 Pepper's Ferry Road
Radford, Virginia 24141

VIA ELECTRONIC MAIL

**Re: Annual Corrective Action Groundwater Monitoring Event Notification - HWMU-5
Semiannual Detection Notification – HWMU-16
Notification of Groundwater Verification Sampling Results for Post Closure Care Permit
HWMUs 5 & 16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. Stewart:

This letter acknowledges the receipt and review of the Annual Corrective Action Groundwater Monitoring Event - HWMU-5, Semiannual Detection Notification – HWMU-16 dated June 14, 2016, and Notification of Groundwater Verification Sampling Results for Post Closure Care Permit HWMUs 5 & 16 dated June 5, 2015, submitted to the Virginia Department of Environmental Quality, Office of Remediation Programs (Department) by BAE Systems on behalf of the Radford Army Ammunitions Plant (RFAAP).

It appears that no new targeted constituents were detected during the groundwater monitoring activities conducted during the Second Quarter of 2016 for HWMUs 5. However, total cobalt was detected in Point of Compliance (POC) monitoring wells 16WC1B and 16WC9 at concentrations of 35 micrograms per liter (ug/L) and 5.5 ug/L, respectively. These concentrations are greater than the Groundwater Protection Standard (GPS) of 5 ug/L for total cobalt for this unit. RAAP had previously submitted an Alternate Source Demonstration (ASD) to the Department indicating that the detections of cobalt in this well were due to natural variation. As the report points out, the Department requested a minimum of one year of additional monitoring of this well prior to making a decision on this ASD request. Further, tetrahydrofuran and cyanide were detected in POC monitoring well 16WC8 and tetrahydrofuran, vinyl chloride, and cyanide were detected in POC monitoring well 16WC1A.

EPA ID#: VA1210020730
Radford Army Ammunitions Plant
Radford, Virginia
July 19, 2016

Tetrahydrofuran was detected in the verification sample from 16WC1A at an estimated concentration of 2.2 ug/l, which is greater than the detection limit of 2.0 ug/l; therefore, the original estimated tetrahydrofuran concentration of 4.6 ug/l was confirmed. A Class 1 Permit Modification to add tetrahydrofuran to the Groundwater Compliance Monitoring List for the Unit is required. The Department concurs with RFAAP that the background value for tetrahydrofuran is the permit specified QL of 25 ug/l and that the Groundwater Protection Standard (GPS) be the May 2016 USEPA Regional Screening Level (RSL) of 3,400 ug/l since there is no USEPA Maximum Contaminant Level (MCL) or VDEQ Alternate Concentration Limit (ACL) for tetrahydrofuran.

On June 16, 2016, verification samples were collected from HWMU-16 POC monitoring well 16MW9 to confirm or refute the initial sampling results of cobalt at concentrations greater than the unit specific GPS of 5 ug/L. Total cobalt was detected at concentrations greater than the GPS during the verification sampling. The Department understands that for confirmation, a split sample and split sample duplicate were collected and sent to different laboratories to verify the initial detection. The sample and sample duplicate result concentrations from Test America, the primary laboratory, were 4.7 ug/l and 4.8 ug/l, respectively, which are less than the GPS of 5 ug/l. The split sample and split sample duplicate result concentrations from Eurofins were 5.6 ug/l and 6.0 ug/l, respectively, which are greater than the GPS of 5 ug/l. The Department respectfully disagrees with the Facility and considers this a confirmed detection.

RFAAP should continue to collect data as previously discussed for the Alternate Source Demonstration (ASD) for the cobalt detected above the applicable Groundwater Protection Standard in point of compliance well 16WC1B at HWMU-16 and now 16MW9.

As previously discussed, the Department acknowledges the presence of barium above the site-specific background concentration. The Department recognizes the variability of the lithology in the area of HWMU-16 that could potentially account for the natural variation of this trace element. No further investigation is required at this time; however, the Department may request further investigation if the barium levels in groundwater increase in the future.

EPA ID#: VA1210020730
Radford Army Ammunitions Plant
Radford, Virginia
July 19, 2016

If you have any additional technical questions, you may contact me at 703-583-3825 or by email at Kurt.Kochan@deq.virginia.gov.

Sincerely,



Kurt W. Kochan
Corrective Action Project Manager
Office of Remediation Programs

cc: RFAAP Correspondence File
Brett Fisher, VDEQ-CO
Russ McAvoy, VDEQ-CO
Cassie McGoldrick, EPA Region 3
Jim McKenna, ACO Staff
Matt Albers, BAE
Aziz Farahmand, VDEQ-BRRO
Mike Lawless, DAA



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Matthew J. Strickler
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David K. Paylor
Director

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May 3, 2021

Mr. Jim McKenna
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

VIA ELECTRONIC MAIL

**Re: 2020 Annual Groundwater Monitoring Report for
Hazardous Waste Management Units 5 & 16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. McKenna:

This letter acknowledges the receipt and review of the 2020 Annual Groundwater Monitoring Report for Hazardous Waste Management Units (HWMU) 5 & 16 dated February 2021, submitted to the Virginia Department of Environmental Quality (Department or DEQ), Office of Remediation Programs (ORP) by BAE Systems on behalf of the Radford Army Ammunitions Plant (RFAAP).

There were reportedly no new-targeted constituents detected during the groundwater monitoring activities conducted during the second or fourth quarters of 2020 for HWMU-5. However, total cobalt, a potentially newly detected constituent, continues to be detected at concentrations greater than the groundwater protection standard (GPS) and alternate concentration limit (ACL) in several monitoring wells at HWMU-16. The Department requested a revised Alternate Source Demonstration (ASD) for cobalt in December 2020. The revised ASD should be submitted as soon as practicable.

Further, the presence of vinyl chloride was verified in 16WC1A at HWMU-16. The Department concurs with the recommendations to utilize a background value of 1 ug/L based on permit specified QL as the constituent has not previously been detected at the unit and a GPS of 2 ug/L based on the USEPA MCL for vinyl chloride.

EPA ID#: VA1210020730

May 3, 2021

Page 2 of 2

As previously noted, the Department acknowledges the presence of barium above the site-specific background concentration. The Department recognizes that the variability of the lithology in the area of HWMU-16 could potentially explain the variation of this element. No further investigation is required at this time; however, the Department may request further investigation if the barium levels in groundwater increase in the future.

The Department accepts the report as complete. However, the Department does want to acknowledge that several constituents were reported above the permit specified detection limits. The Department does not require any action at this time as this issue is being addressed by a Class 1 permit modification that is currently under review by DEQ.

If you have any questions regarding this correspondence, you may contact me at 703-583-3825 or by email at Kurt.Kochan@deq.virginia.gov.

Sincerely,



Kurt W. Kochan
Project Manager

cc: RFAAP Correspondence File
Tara Mason, Ashby Scott, DEQ-CO
Nikki Herschler, DEQ-BRRO
Melissa Lincoln, Jody Hawks, BAE
Mike Lawless, DAA



Commonwealth of Virginia

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Travis A. Voyles
Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director
(804) 698-4020

May 8, 2024

Mr. Matt Alberts
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

VIA ELECTRONIC MAIL

**Re: Annual Groundwater Monitoring Report for
Hazardous Waste Management Units 5 & 16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. Alberts:

This letter acknowledges the receipt and review of the 2023 Annual Groundwater Monitoring Report (Report) for Hazardous Waste Management Units (HWMU) 5 & 16 dated December 2023, submitted to the Virginia Department of Environmental Quality (Department or DEQ), Office of Remediation Programs (ORP) by BAE Systems on behalf of the Radford Army Ammunitions Plant (RFAAP).

The Department has no comment and accepts the Report as complete. Further, the Department concurs with the proposal to establish a background concentration and groundwater protection standard (GPS) for the newly detected compound silver. RFAAP may utilize historical data from monitoring well 16C1 to establish a background concentration and use the DEQ alternate concentration limit for the GPS as proposed.

EPA ID#: VA1210020730

May 8, 2024

Page 2 of 2

If you have any questions regarding this correspondence, you may contact me at 703-232-4200 or by email at Kurt.Kochan@deq.virginia.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Kurt W. Kochan", with a horizontal line extending to the right.

Kurt W. Kochan
Office of Remediation Programs

cc: RFAAP Correspondence File
Tara Mason, Ashby Scott, DEQ-CO
Laura Dickerson, RFAAP
Melissa Lincoln, BAE
Mike Lawless, TRC

Indicator Parameter Data for Monitoring Wells.

Radford Army Ammunition Plant (RFAAP) - Hazardous Waste Management Unit #16

Radford, Virginia

<i>Indicator Parameter</i>	<i>Unit</i>	<i>16C1</i>	<i>16MW8</i>	<i>16MW9</i>	<i>16WC1A</i>	<i>16WC1B</i>	<i>16WC2B</i>	<i>16-2</i>	<i>16-3</i>	<i>16-5</i>
<i>Second Quarter 2025</i>										
Dissolved Oxygen (DO)	mg/L	1.46	0.7	1.36	0.81	1.68	0.94	5.57	4.87	1.58
Oxidation Reduction Potential (ORP)	mV	78.7	124	20.4	-2.1	129.2	-4.5	76.2	45.6	48.6
pH	s.u.	6.48	5.19	6.62	6.82	6.44	7.97	7.02	8.06	7.39
Specific Conductivity	uS/cm	662	136.4	895	691	373.6	285.1	574.5	223.6	480.1
Temperature	deg's C	15.4	21.6	16.9	15.5	14.5	17	16.1	20.3	16.5
Turbidity	NTU	0.52	3.4	4.37	0.25	7.87	0.58	0.78	0.82	0.84
<i>Third Quarter 2025</i>										
Dissolved Oxygen (DO)	mg/L	0.73	0.37	0.39	0.4	1.81	0.86	5.37	5.52	1.55
Oxidation Reduction Potential (ORP)	mV	83.1	108.8	27.6	3.2	138.2	7	49.8	54.6	18.9
pH	s.u.	6.38	5.15	6.57	6.72	6.28	7.85	7.13	8.02	7.48
Specific Conductivity	uS/cm	655	118.4	871	707	356.1	276.9	572.3	216.6	473.2
Temperature	deg's C	15.3	18.8	16	15.6	16.6	15.7	15	16.3	14.3
Turbidity	NTU	1.38	2.82	4.47	0.95	2.49	1.44	1.88	1.64	1.98

APPENDIX C
LABORATORY ANALYTICAL RESULTS – YEAR 2025

Submitted as separate files due to size.

APPENDIX D

FIELD NOTES

6/24/25 - RFAAP (UNIT-5) / 667639 / ABPA LER F.S.#16

General Notes:

- Weather: Sunny 75-95°F
- PPE: Nitrile gloves, eye protection & safety boots.
- Calibrations: VSI Multimeter
 pH: 4.00 - 4.00, 7.00 - 7.00, 10.00 - 10.00
 Conductivity reads 1413 $\frac{\mu S}{cm}$ in 1413 $\frac{\mu S}{cm}$ std
 HACH 2100Q Turbidimeter: 0.02 - 1000 NTU
 DO: 70 = 100 %
- Dedicated well skirts used at each well location.
- All equipment deconned before & after event and between use at each sample location.
- All purge water collected & disposed of at a dedicated on-site location.
- All samples collected, transported & shipped on ice and in coolers.
- Sample collection order: 8260, 8270 & T.M.
- All wells purged and sampled at 0.25 L/min.
- All DTW's collected are in feet.
- VOA's collected from one pulse from bladder pump.

Bladder pump setting: 4 cycles/min. 5 sec discharge, 10 sec recharge

Sample Analysis Pres.		Sample Analysis Pres.	
8260A	HCL	T.M.	HNO ₃
8270E	None		

STATIC WATER LEVEL TABLE (meas. in feet)

WELL	DTW	P/PDTW	NOTES	WELL	DTW	P/PDTW	NOTES
SW8B	13.72	14.02	Pad OK	SWCA	12.65	—	Pad OK
SW12A	11.30	11.31	Pad OK	SW10A	13.10	—	Pad OK
SW7B	9.38	9.42	Pad OK	SWC11	14.55	—	Pad OK
SW5B	9.20	9.17	Pad OK	SSW5	8.16	—	Pad OK
SWC21	9.35	9.43	Pad OK	SSW6	7.15	—	
SWC22	9.22	9.26	Pad OK	SSW7	11.11	—	Pad OK
SWC23	8.62	8.67	Pad OK	SSW8	11.38	—	Pad OK
SWL's ONLY				SW11A	11.02	—	Pad OK
SW9A	1.44	—	Pad OK	SWC12	14.97	—	Shrub roots encroaching on pad

(46)

ABP-LEB F.B.#16

6/24/25. RFAAP/UNIT-5/667639/ABP-LEB F.B.#16

Confidence Solution Value Range

BATCH# - 24KIC

DATE OPENED: 6/24/25

+ safety boots

10.00 - 10.00
in 1413ms std
0.02 - 1000 NTU

	TEMP(°C)	ORP(mV)	COND ^{ms} /cm	pH
	Actual/Range	Actual/Range	Actual/Range	Actual/Range
PRE	15.9 / 16-20	7674 / 7630-7970	219 / 222-252	7.10 / 6.8-7.2
POST	17.1 / 16-20	7719 / 7630-7970	224 / 222-252	7.15 / 6.8-7.2

SWBB: DTW=13.72 CB: Begin Purge (0806)

P/Purge DTW=14.02

15

Initial Purge - Clear

TIME	TEMP(°C)	COND ^{ms} /cm	DOWS	pH	ORP(mV)	TURB	DTW	Desc.
(0807)	15.5	76.3	5.35	5.22	83.1	2.09	14.02	Clear
(0812)	14.8	66.1	4.81	5.07	142.1	1.79	14.02	Clear
(0817)	14.9	63.7	4.50	4.98	153.8	2.19	14.02	Clear
(0822)	14.7	60.3	4.70	4.95	156.2	2.99	14.02	Clear
(0827)	14.8	59.0	4.67	4.93	154.3	2.88	14.02	Clear
(0832)	14.8	58.0	4.67	4.97	153.8	2.70	14.02	
(0833)	Readings Stable							

Sample time (0835)

Samples collected: (3) 8260D, (1) TM

(0839)	14.6	53.8	5.01	5.06	149.7	3.85	14.02	Clear
--------	------	------	------	------	-------	------	-------	-------

bladder pump
min. 5 sec discharge
min. 10 sec recharge
Analysis Pres.
M. HNO₃

as. in feet)

W	P/P	DTW	NOTES
1.65	—	—	Pad OK
3.10	—	—	Pad OK
4.55	—	—	Pad OK
8.16	—	—	Pad OK
7.15	—	—	—
1.11	—	—	Pad OK
1.38	—	—	Pad OK
1.02	—	—	Pad OK
4.97	—	—	Shut rocks
NOED encroaching on pad			

(47)

6/24/25 RFAAP UNIT 15 / 667639/ABP LEB F.B.#1 6/25

SW12A DTW: 11.30 11.71 Begin Purge (0902)

P/Purge DTW: 11.31 Initial Purge - Clear

Time	Temp	Cond ^m	pH	DO ^{mg/L}	ORP ^{mV}	Turb ^{nm}	DTW	Desc
(0903)	15.5	433.9	6.70	3.01	130.9	1.74	11.35	Clear
(0908)	15.1	435.1	6.81	2.21	84.6	0.83	11.33	Clear
(0913)	15.4	438.5	6.83	1.60	66.7	0.73	11.31	Clear
(0918)	15.3	442.3	6.85	1.70	55.8	0.88	11.31	Clear
(0923)	15.5	441.3	6.85	1.65	50.2	0.81	11.31	Clear
(0928)	15.9	441.0	6.85	1.59	46.9	0.84	11.31	Clear
(0928)	Readings stable							

Sample Time (0930)

Samples Collected: (3) 8266D, (1) TM

(0935)	15.7	440.7	6.87	1.85	44.9	0.86	11.31	Clear
--------	------	-------	------	------	------	------	-------	-------

MS (MSD)

SW7B DTW: 9.38 CB: 10 Begin Purge (1008)

P/Purge DTW: 9.42 Initial Purge - Clear

Time	Temp	Cond ^m	pH	DO ^{mg/L}	ORP ^{mV}	Turb ^{nm}	DTW	Desc
(1009)	14.1	206.7	5.21	5.62	110.7	1.07	9.40	Clear
(1014)	16.1	185.4	5.24	4.82	121.4	1.73	9.38	Clear
(1019)	14.9	184.1	5.31	4.78	117.9	1.26	9.41	Clear
(1024)	15.2	186.0	5.32	4.52	114.6	1.01	9.42	Clear
(1029)	14.4	186.6	5.35	4.66	111.9	0.71	9.42	Clear
(1034)	14.3	184.9	5.35	4.70	110.2	0.85	9.42	Clear

(1034) Readings stable

Sample Time (1035)

Samples Collected: (9) 8260D, (3) TM, (6) 8270E (6) 8270E (GEL)

(1107)	14.7	232.9	5.86	3.75	66.7	2.64	9.41	Clear
--------	------	-------	------	------	------	------	------	-------

ABP-LEB F.B.#1

Purge (0902)

Purge - Clear

Pine Turbidity DTW Desc

9 1.74 11.35 Clear

6 0.83 11.33 Clear

7 0.73 11.31 Clear

3 0.88 11.31 Clear

2 0.81 11.31 Clear

9 0.84 11.31 Clear

0.86 11.31 Clear

Purge (1008)

Purge - Clear

Pine Turbidity DTW Desc

7 1.07 9.40 Clear

4 1.73 9.38 Clear

9 1.26 9.41 Clear

2 1.01 9.42 Clear

1 0.71 9.42 Clear

2 0.85 9.42 Clear

270E (6) 8270E (GEL)

2.64 9.41 Clear

6/24/25 RFAA UNIT 5/667637/ABP-LEB F.B.#16

5WSB

Draw: 9.20

CB: 11

Begin Purge (1124)

P/Purge Draw: 9.17

Initial Purge - Clear

Time	Temp	Cond. μ m	DO %	pH	ORP (mv)	Turb (ntu)	DTW	Desc.
(1125)	14.0	290.1	3.45	5.04	104.6	2.12	9.30	Clear
(1130)	14.4	289.0	2.27	5.58	95.3	1.75	9.31	Clear
(1135)	14.8	286.8	2.40	5.56	91.0	1.12	9.28	Clear
(1140)	15.2	288.3	2.25	5.55	90.2	1.22	9.29	Clear
(1145)	14.7	290.1	2.11	5.55	88.3	0.87	9.25	Clear
(1150)	15.1	288.3	2.17	5.54	87.3	0.99	9.16	Clear

(1150) Readings Stable

Sample time (1155)

Samples collected: (3) 8260D, (1) TM, (2) 8270E (2) 8270E (GEL)
(1205) 13.6 289.2 2.66 5.59 87.7 0.98 9.17 Clear

5WC22 DTW: 9.22

Begin Purge (1223)

P/Purge DTW: 9.26

Initial Purge - Clear

Time	Temp	Cond. μ m	DO %	pH	ORP (mv)	Turb (ntu)	DTW	Desc.
(1224)	17.5	734	1.73	6.83	75.4	1.13	9.26	Clear
(1229)	15.6	754	1.22	6.90	46.4	1.00	9.25	Clear
(1234)	15.4	764	1.06	6.90	37.5	1.92	9.26	Clear
(1239)	15.8	767	0.82	6.91	31.0	2.59	9.26	Clear
(1244)	15.6	772	0.75	6.92	28.6	2.44	9.26	Clear
(1249)	15.6	772	0.63	6.92	24.6	2.77	9.26	Clear

(1249) Readings Stable

Sample time (1250)

Samples collected: (3) 8260D, (1) TM, (2) 8270E (2) 8270E (GEL)
(1310) 15.4 798 0.33 6.92 22.8 2.81 9.26 Clear

6/24/25. RFAAP UNIT-5/667639/ABP-LEB F.B.#16

5WC23 DTW: 8.62 [CB:25] Begin Purge (1318)

Purge DTW: 8.67 Initial Purge - Clear

Time	Temp	Cond ^m	pH	DO ^m	ORP ^{mV}	Turb ^{NTU}	DTW	Desc
(1319)	16.4	811	7.29	32.4	50.7	1.73	8.67	Clear
(1324)	14.9	1006	7.02	5.66	30.6	1.69	8.68	Clear
(1329)	15.1	1009	6.99	2.66	25.5	1.77	8.68	Clear
(1334)	15.1	1005	7.04	2.81	24.1	0.96	8.68	Clear
(1339)	15.2	1008	7.03	3.46	22.6	0.62	8.67	Clear
(1344)	15.3	1006	7.03	4.15	19.8	1.46	8.67	Clear
(1349)	16.3	1002	7.02	3.78	19.8	0.68	8.68	Clear
(1354)	16.1	1006	7.02	3.71	19.5	0.80	8.67	Clear
(1354)	Readings stable							

Sample time (1355)

Samples Collected: (3)8260D, (1)TM, (2)8270E, (2)8270E(GEL)
(1411) 15.1 987 7.08 3.09 19.3 1.23 8.67

5WC21 DTW: 9.35 Begin Purge (1415)

Purge DTW: 9.43 Initial Purge - Clear

Time	Temp	Cond ^m	pH	DO ^m	ORP ^{mV}	Turb ^{NTU}	DTW	Desc
(1416)	14.8	534.9	6.20	3.25	42.7	1.40	9.35	Clear
(1421)	18.1	568.7	6.16	4.30	58.0	1.29	9.42	Clear
(1426)	15.8	540.5	6.09	4.08	60.7	1.47	9.42	Clear
(1431)	16.6	534.3	6.06	2.49	62.6	1.57	9.41	Clear
(1436)	16.0	533.9	6.05	1.85	62.6	1.03	9.41	Clear
(1441)	15.8	535.0	6.10	1.76	57.7	1.91	9.44	Clear
(1446)	15.7	532.7	6.11	1.82	56.4	1.39	9.44	Clear

(1446) Readings stable Sample time (1450)

Samples Collected: (3)8260D, (1)TM, (2)8270E, (2)8270E(GEL)
(1512) 13.9 508.7 6.04 3.81 53.9 0.93 9.43 Clear

5WDUP

Sample time (1450)

*collected from
5WC21

Sample time COC (1100)

Samples Collected: (3)8260D, (1)TM, (2)8270E, (2)8270E(GEL)

(50)

6/25/25 REZAP UNIT 16/667639/ABP-LEB F.B.#16

General Notes:

- Weather: 90's Sunny
- PPE: Nitrile gloves, eye protection & safety boots
- Calibrations: YSI Pro Plus
pH: 4.00 - 4.00, 7.00 - 7.00, 10.00 - 10.00
Conductivity reads 1413 $\mu S/cm$ in 1413 $\mu S/cm$ std.
D.O.% = 100%
- HACH 2100Q Turbidimeter: 0.02 - 1000 NTU
- Dedicated well skirts used at each well
- All equipment deconned before & after event and between use at each sample location.
- All purge water collected & disposed of at a dedicated on-site location.
- All samples collected, transported & stored on ice in coolers.
- Sample collection order: 8260, 8270 & TM.
- All wells purged & sampled at 0.25 L/min.
- All DTW's measured in feet.

SAMPLE ANALYSIS	Preservative	Sample Analysis	Preservative
8260D	HCL	TM	HNO ₃
8270E	NONE		

- Bladder pump settings: 4 cycles/min: 10 sec. discharge 5 sec. recharge
- VOA's collected from one pulse from bladder pump.

CONFIDENCE SOLUTION VALUE RANGE

BATCH # 24K1C		DATE OPENED: 6/24/25	
TEMP (°C)		COND $\mu S/cm$	
Actual/Range		ORP (mV)	
Actual/Range		pH	
PRE: 16.2 / 16-20	7741 / 7630-7920	223 / 222-252	7.10 / 6.8-7.2
POST: 19.4 / 16-20	7801 / 7630-7920	229 / 222-252	7.16 / 6.8-7.2

B.#16

6/25/25 RFAAP UNIT-16/667639/ABP.LEB F.B.#16

STATIC WATER LEVEL TABLE (Meas. in feet)

WELL	DTW	P/PURGE DTW	NOTES	WELL	DTW	P/PURGE DTW	NOTES
16-2	55.84	55.90	Purge	16MW9	65.05	66.0	Paddock
16-3	56.58	60.65	Purge	16C1	65.80	48.31	Paddock
16-5	4.50	8.21	Purge	SWLS ONLY			
16WC2B	53.75	58.40	Purge	16C3	65.80	—	
16WC1B	68.26	69.34	Purge	16C4H3	Dry at	—	68.50
16WC1A	67.97	68.49	Purge	16WC2A	Dry at	—	61.91
16MW8	73.47	74.55	Paddock	16-1	48.70	—	

16-5: DTW: 4.50 CB: 29 Begin Purge (0838)
P/PURGE DTW: 8.21 Initial Purge - Clear

Time	TEMP (°C)	COND (µmhos/cm)	DOE (mg/L)	pH	TURB (NTU)	ORP (mV)	DTW	Desc.
(0839)	14.9	498.0	2.68	7.35	1.50	99.1	5.15	Clear
(0844)	14.3	481.6	2.01	7.38	1.72	76.2	6.01	Clear
(0849)	16.3	477.8	1.63	7.38	1.93	66.5	6.39	Clear
(0854)	16.5	481.2	1.71	7.38	1.44	60.2	6.67	Clear
(0859)	17.4	478.1	1.66	7.37	0.87	61.8	6.72	Clear
(0904)	16.4	480.2	1.63	7.38	1.10	54.0	6.95	Clear
(0909)	16.6	476.9	1.57	7.39	1.29	48.9	7.05	Clear
(0914)	16.5	480.1	1.58	7.39	0.84	48.6	7.10	Clear
(0914)	Readings Stable							

Sample time (0915)

Samples taken: (3) 8260D, (2) 8270E, (1) TM
(0921) 16.4 484.5 2.08 7.44 2.18 40.2 8.21 Clear

16 Spring

Time	Temp (°C)	Cond (µmhos/cm)	DOE (mg/L)	pH	Turb (NTU)	ORP (mV)	Desc.
(0924)	15.1	545.8	5.81	7.42	7.81	52.9	Clear w/ S.S. particles.

Sample time (0925)

Samples Collected: (3) 8260D, (2) 8270E, (1) TM

(53)

6/25/25 RAAP (unit 16)/667639/ABP-LEB FB#16
 116WCAB DTW: 53.75 ⁵⁵ Begin Purge (0951)
 P/purge DTW: 58.40 initial Purge - clear

Time	Temp	conden	DO _{mg}	pH	ORP _{mv}	Turb _{NTU}	DTW	Desc
(0952)	17.1	289.7	7.73	7.72	71.6	1.03	54.70	clear
(0957)	17.1	291.7	3.54	7.77	58.1	0.77	54.90	clear
(1002)	16.1	286.8	1.15	8.07	19.6	0.68	55.81	clear
(1007)	17.5	282.7	0.97	8.03	7.0	3.26	56.20	clear
(1012)	17.4	284.9	0.95	7.99	3.0	1.16	56.59	clear
(1017)	17.0	285.1	0.94	7.97	-4.5	0.58	57.25	clear
(1017)	Readings stable							

Sample time (1020)

Samples collected: (3)8260D, (2)8270E, (1)TM
 (1028) 17.5 287.7 1.20 7.98 -4.5 0.82 58.40

16-2 - DTW: 55.84 CB: Begin Purge (1044)
 P/purge DTW: 55.90 initial Purge - clear

Time	Temp	conden	DO _{mg}	pH	ORP _{mv}	Turb _{NTU}	DTW	Desc
(1045)	16.7	537.0	7.90	7.19	81.0	0.51	55.87	clear
(1050)	15.8	566.1	5.72	7.04	70.7	1.41	55.89	clear
(1055)	15.3	570.4	5.58	7.04	69.8	0.96	55.89	clear
(1100)	15.8	574.2	5.39	7.03	74.1	1.01	55.89	clear
(1105)	15.9	574.6	5.40	7.03	74.9	0.68	55.90	clear
(1110)	16.1	574.5	5.57	7.02	76.2	0.78	55.90	clear
(1110)	Readings stable							

Sample time (1115)

Samples collected: (3)8260D, (2)8270E, (1)TM
 (1121) 15.0 574.5 6.14 7.04 73.3 0.68 55.90 clear

6/25/25 RAAP (unit 16) / 667639 / ABP - LEB FB# 16

16 MW3 DTW: 73.47 Begin Purge (1136)

(1137) P/Purge DTW: 74.55 Initial Purge - clear

Time	Temp	Cond. μ m	DO %	pH	ORP (mv)	Turb (ntu)	DTW	Desc
(1137)	20.8	152.4	4.59	5.69	92.2	1.98	73.63	Clear
(1142)	18.7	148.6	1.42	5.38	107.9	1.07	73.78	Clear
(1147)	20.6	148.4	0.76	5.31	119.3	2.41	73.89	Clear
(1152)	21.6	141.2	0.69	5.25	121.8	3.77	73.98	Clear w/ white particles
(1157)	21.7	138.6	0.71	5.20	123.2	4.09	74.02	Clear w/ white particles
(1202)	21.6	136.4	0.70	5.19	124.0	3.40	74.05	Clear w/ white particles

(1202) Readings stable

Sample time (1205)

Samples collected: (3) 8260D, (2) 8270E, (1) TM

(1214) 20.1 132.2 0.51 5.24 121.1 5.07 74.55 Clear w/ white particles

16-3 DTW: 56.58 (1231) Begin Purge (1231)

P/Purge DTW: 60.65 Initial Purge - clear

Time	Temp	Cond. μ m	DO %	pH	ORP (mv)	Turb (ntu)	DTW	Desc
(1232)	20.9	237.1	8.10	7.47	105.3	2.46	56.90	Clear
(1237)	16.4	223.7	5.69	7.90	70.3	0.79	57.80	Clear
(1242)	19.5	220.7	4.55	7.99	60.1	1.10	58.11	Clear
(1247)	20.3	223.8	4.96	8.00	54.7	0.88	58.28	Clear
(1252)	19.8	224.6	4.99	8.05	47.7	1.05	58.60	Clear
(1257)	20.3	223.6	4.87	8.06	45.6	0.82	59.00	Clear

(1257) Readings stable

Sample time (1300)

Samples collected: (3) 8260D, (2) 8270E, (1) TM

(1307) 16.6 227.2 5.62 8.13 45.0 1.02 60.65 Clear

6/26/25 RAAP (Unit 16) / 667639 / ADP-LEB FB#16

General NOTES:

- weather: Sunny, ~90°F
- PPE: nitrile gloves, eye protection, + safety boots
- Calibrations - VSI multimeter
- PH: $4.00 = \underline{4.00}$, $7.00 = \underline{7.00}$ $10.00 = \underline{10.00}$
- Conductivity reads $\underline{143 \frac{\mu S}{cm}}$ in $1413 \frac{\mu S}{cm}$
- DO % = $\underline{100\%}$
- Hach 21000 turbidity meter: 0.02 - 1000 NTU
- Dedicated well skirts and tubing used at each well.
- All equipment decontaminated before and after event and between each sample location.
- All purge water collected and disposed of at dedicated on-site location.
- All samples collected, transported, and stored on ice and in coolers.
- Sample collection order: 8260D, 8270E, TM ~~6/26/25~~
- All wells purged + sampled at 0.25 mL/min
- All DTW's measured in feet

Sample Analysis	Preservative	Sample Analysis	Preservative
8260 C/D	HCL	TM	HNO ₃
8270 D/E	—		

- VOA's collected from one pulse from bladder pump
- Bladder pump setting: 4 cycles/min ^{5 seconds discharge} _{10 seconds recharge}

Confidence		Solution Value Range	
Batch # 24K1C		Date opened 6/24/25	
Temp (°C)	Cond (µm)	ORP mv	PH
Actual / Range	Actual / Range	Actual / Range	Actual / Range
15.9 / 16-20	7698 / 7630-7720	231 / 222-252	6.99 / 6.8-7.2
17.8 / 16-20	7749 / 7630-7720	239 / 222-252	7.01 / 6.8-7.2

6/26/25 RAAP (Unit 16) / 667639 / ABP-LEB FB#16

16WC1B: # Well Bailed using 36" bailer

TD: 75.15

Begin Purge (0845)

DTW: 68.26

Initial Purge - Clear w/ Particles

$$6.89 \times 0.163 = 1.12 \times 3 = 3.37 \text{ gallons (WTB) (gal)}$$

Time	Temp	Conduct ^m	DO ^m	ORP ^m	pH	Turb	Bail #	Vol	Desc
(0846)	14.8	360.7	3.31	115.6	6.41	14.1	1	0.25	Clear Brack w/ Particles
(0850)	13.5	352.9	2.96	120.3	6.40	14.0	5	1.25	Clear Brack w/ Particles
(0854)	13.9	369.8	2.02	127.1	6.45	24.8	9	2.25	Clear Brack w/ Particles
(0859)	14.5	373.6	1.68	129.2	6.44	37.2	14	3.5	Clear Brack w/ Susp. Part

(0859) Well purged at ~ 3.5 gallons

Sample Time (1120) / Turbidity at Sample Time = 7.87

Samples Collected: (3) 8260D, (2) 8270E, (1) TM

← (ms/msd)

16WC1A: DTW: 67.97 [CB: 43] Begin Purge (0908)

Purge DTW: 68.49

Initial Purge - Clear

Time	Temp	Conduct ^m	DO ^m	pH	Turb	ORP ^m	DTW	Desc
(0908)	16.3	447.6	9.00	7.87	3.89	129.2	68.40	Clear
(0914)	15.3	677.0	1.85	6.95	0.65	104.3	68.57	Clear
(0919)	15.0	679.0	1.25	6.97	0.53	84.3	68.59	Clear
(0924)	15.7	678.0	1.13	6.99	0.38	78.1	68.45	Clear
(0929)	15.9	683.0	1.18	6.94	0.25	49.4	68.44	Clear
(0934)	15.6	684.0	0.90	6.87	0.35	12.8	68.44	Clear
(0939)	15.5	688.0	0.85	6.85	0.19	8.4	68.44	Clear
(0944)	15.5	691.0	0.81	6.82	0.25	-2.1	68.44	Clear

(0944) Readings Stable

Sample time (0945)

Samples Collected: (9) 8260D, (6) 8270E, (3) TM

(1011) 15.9 710.0 1.25 6.80 0.41 18.1 68.49 Clear

16WDup Sample time (0945) / Sample time (0900)

Samples Collected: (3) 8260D, (2) 8270E, (1) TM

* Collected From well 16WC1A *

6/26/25 RAAP (unit 16) / 667639 / ABP-LEB FB #16
 16MW9: DTW: 65.05 (CB: 45) Begin Purge (0024)
 P/Purge DTW: 66.00 Initial Purge: Clear w/ tan susp particles

Time	Temp	Cond	DO ^m	pH	ORP(mv)	Turb ^m	DTW	Desc
(1025)	17.1	815	4.17	6.79	91.3	6.45	65.99	Clear w/ tan susp. part.
(1030)	19.5	870	1.14	6.61	67.0	18.40	65.69	Clear w/ tan susp. part.
(1035)	20.2	901	1.89	6.60	39.8	20.40	65.52	Clear w/ tan sus. particles
(1040)	18.7	908	1.62	6.61	32.1	14.6	65.66	Clear w/ tan sus. particles
(1045)	17.6	894	1.35	6.61	26.6	8.83	65.70	Clear w/ tan sus. particles
(1050)	16.8	902	1.37	6.61	22.6	7.81	65.65	Clear w/ tan sus. part.
(1055)	16.9	895	1.36	6.62	20.4	4.31	65.85	Clear
(1055)	Readings stable							

Sample time (1100)

Samples collected: (6) 8260D, (2) 8270E, (1) TM
 (1108) 17.1 895 0.58 6.62 16.9 3.70 66.00 Clear

16C1: DTW: 48.25 (CB: 42) Begin Purge (1147)
 P/Purge DTW: 48.31 Initial Purge -

Time	Temp	Cond	DO ^m	pH	ORP(mv)	Turb ^m	DTW	Desc
(1148)	17.4	495.8	7.23	7.65	114.7	1.01	48.26	Clear
(1153)	15.5	731.0	2.63	6.61	98.8	0.58	48.28	Clear
(1158)	15.4	709.0	1.64	6.58	81.8	0.24	48.28	Clear
(1203)	15.3	672.0	1.41	6.52	74.5	0.33	48.29	Clear
(1208)	15.3	667.0	1.42	6.48	78.9	0.73	48.29	Clear
(1213)	15.4	662.0	1.46	6.48	78.7	0.52	48.30	Clear
(1213)	Readings Stable							

Sample time (1215)

Samples collected: (6) 8260D, (2) 8270E, (1) TM
 (1223) 14.0 629.1 1.84 6.49 68.2 1.52 48.31 Clear

*additional items post event - LEB 7-8-25

- Trip Blank 1 6/26/25

- Trip Blank 2 6/25/25

* Pump in 16WC1B pulled and placed on plastic sheeting*

GENERAL NOTES:

- Weather: Mostly sunny & 80's
- PPE: Nitrile gloves, eye protection & safety boots
- Calibrations: NSI Multimeter
pH: 4.00-4.00 7.00-7.00 10.00-10.00
Conductivity reads 1413 $\mu S/cm$ in 1413 $\mu S/cm$ std.
HACH 2100Q Turbidimeter: 0.02-1000 NTU
D.O. % = 100.0 %
- Dedicated well skirts used at each well location.
- All equipment deconned before & after event and between use at each sample location.
- All purge water collected & disposed of at an onsite dedicated location.
- All samples collected, transported & shipped in ice & in coolers.
- Sample collection order: 8260, TM.
- All wells purged and sampled at 0.25 L/min.
- All DTW's collected are in feet.
- VOA's collected from one pulse from bladder pump.
Bladder pump setting: 9 cycles/min: 5 second charge, 10 second recharge
- Sample Analysis:
8260 D
T.M.
HCL
HNO₃

STATIC WATER LEVEL TABLE (Measured in feet)

WELL	DTW	P/P DTW	NOTES	WELL	DTW	P/P DTW	NOTES
SW8B	13.40	13.71	Pad ok	SW4A	11.75	-	Pad ok
SW12A	10.34	10.38	Pad ok	SW10A	12.41	-	Pad ok
SW7B	8.42	8.49	Pad ok	SW11	14.71	-	Pad ok
SW5B	8.07	8.38	Pad ok	SSW5	6.79	-	Pad ok
SWC21	8.42	8.64	Pad ok	SSW6	6.12	-	Pad ok
SWC22	8.27	8.32	Pad ok	SSW7	10.59	-	Pad ok
SWC23	7.67	7.71	Pad ok	SSW8	11.07	-	Pad ok
	5 W L's	ONLY		SW11A	9.41	-	Pad ok
SW9A	0.85	-	Pad ok	SW12	14.27	-	Pad ok

(61)

11
25 11/25

rd w/ ~25%
science in Sodium

OE, (1) ^{Hexa}chrom, (1) TM,
70 Solids, (1) TSP-DR

5-7
Time on CEC (1200)
8270E, (1) ^{Hexa}chrom,
18330D, (1) 70 Solids

7/28/25 - RFAAP (UNIT-5) / 667639 / KFC-LEB-AL

F.B.#16

CONFIDENCE SOLUTION VALUE RANGE

BATCH # - 24KIC

DATE OPENED: 6/24/25

	TEMP(°C)	ORP(mV)	COND ^{µS}	pH
	Actual/Range	Actual/Range	Actual/Range	Actual/Range
PRE-	17.1 / 16-20	7793 / 7630-7920	229 / 222-252	7.03 / 6.8-7.2
POST-	19.3 / 16-20	7837 / 7630-7920	239 / 222-252	7.06 / 6.8-7.2

SW8B: DTW: 13.40 CB: Begin Purge (1003)
 P/PURGE DTW: 13.71 18 Initial Purge - clear (1004) 2-1626

TIME	TEMP(°C)	COND ^{µS}	DO ^{mg/L}	pH	ORP (mV)	TURB (NTU)	DTW	Desc
(1004)	17.7	63.4	4.79	4.82	175.2	9.77	13.85	clear
(1009)	18.1	58.4	4.14	4.75	221.7	5.57	13.74	clear
(1014)	18.2	57.4	4.27	4.71	226.9	4.64	13.71	clear
(1019)	18.8	56.5	3.74	4.71	220.8	3.02	13.69	clear
(1024)	19.2	55.1	3.74	4.70	218.8	3.21	13.66	clear
(1029)	19.1	55.9	3.74	4.69	218.5	3.24	13.65	clear
(1029)	Readings Stable							

Sample time (1030)

Samples collected: (3) 8260D, (1) TM

(1034) 18.8 54.8 4.53 4.73 232.6 3.95 13.71 clear

E RANGE

ED: 6/24/25

Range	Actual	Range
222-252	7.03	6.8-7.2
222-252	7.06	6.8-7.2

Begin Purge (1003)

Final Purge - clear

TURB NTU DTW Desc

9.77 13.85 Clear

5.57 13.74 Clear

4.64 13.71 Clear

3.02 13.69 Clear

3.21 13.66 Clear

3.24 13.65 Clear

(1030)

TM

3.95 13.71 Clear

7/28/25 RFAAP (unit 5) / 667639 / KFC-1EB-AL FB#16

5w12A: DTW: 10.34 CB: 18 Begin Purge (1045)

P/Purge DTW: 10.38

Initial Purge - Clear

Time	Temp	Cond ^{us}	DO ^{mg}	pH	ORP ^{mV}	Turb ^{NTU}	DTW	Desc
(1046)	17.2	419.4	3.51	6.51	216.6	2.65	11.37	Clear
(1051)	18.7	419.0	2.06	6.59	193.0	1.36	10.33	Clear
(1056)	20.6	426.9	2.51	6.59	183.1	1.13	10.35	Clear
(1101)	22.7	435.6	2.38	6.61	177.1	0.99	10.34	Clear
(1106)	17.5	425.1	1.85	6.66	156.6	3.74	10.37	Clear
(1111)	17.3	425.3	1.68	6.66	148.0	2.68	10.35	Clear
(1116)	17.4	425.5	1.88	6.66	152.1	3.39	10.37	Clear
(1116)	Readings Stable							

Sample time (1120)

Samples collected: (3) 82600, (1) TM

(1122) 15.7 428.6 1.69 6.67 139.1 1.33 10.38 Clear

5w7B DTW: 8.42 CB: 10 Begin Purge (1129)

P/Purge DTW: 8.49

Initial Purge - Clear

Time	Temp	Cond ^{us}	DO ^{mg}	pH	ORP ^{mV}	Turb ^{NTU}	DTW	Desc
(1130)	20.3	230.9	4.47	5.00	194.5	4.01	8.51	Clear
(1135)	16.5	221.8	2.15	4.53	219.6	2.55	8.49	Clear
(1140)	18.8	261.4	2.08	4.48	217.7	1.58	8.45	Clear
(1145)	20.6	264.2	1.96	4.45	213.6	1.15	8.44	Clear
(1150)	21.1	266.8	1.85	4.39	216.0	0.51	8.42	Clear
(1155)	21.4	267.0	1.79	4.39	218.9	0.62	8.49	Clear
(1155)	Readings stable							

Sample time (1200)

Samples collected: (9) 82600, (3) TM

(1209) 21.2 267.1 1.87 4.45 241.4 2.87 8.49

*MS/msd well

(62)

7/28/25 RFAAP (Unit 5) / 667639 / KFC LEB AML FB#16

5W5B : DTW: 8.07 [CB: 10] Begin Purge (1220)

Purge DTW: 8.38

initial Purge - Clear

Time	Temp	Cond ^{mS}	DO ^{mg}	pH	ORP ^{mV}	Turbid ^{NTU}	DTW	Desc
(1221)	18.3	283.4	5.66	5.23	233.7	1.85	8.41	Clear
(1226)	16.0	274.9	2.03	5.26	216.0	3.08	8.41	Clear
(1231)	16.3	273.4	1.78	5.24	202.5	1.71	8.41	Clear
(1236)	16.6	274.3	1.79	5.23	195.4	1.57	8.41	Clear
(1241)	16.9	274.9	1.81	5.22	192.5	1.65	8.41	Clear
(1246)	17.0	276.1	1.79	5.22	188.2	2.34	8.41	Clear
(1246)	Readings Stable							

Sample time (1250)

Samples collected: (3) 8260D, (1) TM

(1252) 17.3 278.3 1.94 5.19 189.6 1.71 8.38 Clear

5W22 : DTW: 8.27 [CB: 19] Begin Purge (1302)

Purge DTW: 8.32

initial Purge - Clear

Time	Temp	Cond ^{mS}	DO ^{mg}	pH	ORP ^{mV}	Turbid ^{NTU}	DTW	Desc
(1303)	19.0	765	1.02	6.55	187.2	3.11	8.29	Clear
(1308)	16.0	779	0.45	6.72	146.7	4.92	8.35	Clear
(1313)	16.0	777	0.37	6.72	125.2	4.93	8.31	Clear
(1318)	15.8	785	0.31	6.71	112.8	6.99	8.32	Clear
(1323)	15.9	797	0.21	6.71	100.5	4.28	8.31	Clear
(1328)	15.8	803	0.18	6.72	94.1	5.82	8.33	Clear
(1333)	15.9	807	0.16	6.73	92.2	6.55	8.31	Clear
(1333)	Readings Stable							

Sample time (1335)

Samples collected: (3) 8260D, (1) TM

(1337) 16.1 815 0.47 6.74 91.3 5.31 8.32 Clear

(64)

1/KFC LEB AML FB#16

Begin Purge (1220)

ial Purge-Clear

Turbid	DTW	Desc
1.85	8.41	Clear
3.08	8.41	Clear
1.71	8.41	Clear
1.57	8.41	Clear
1.65	8.41	Clear
2.34	8.41	Clear

(1250)

1) TM

1.71	8.38	Clear
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in Purge (1302)

Purge - Clear

Turbid	DTW	Desc
2	3.11	8.29 Clear
7	4.92	8.35 Clear
2	4.93	8.31 Clear
8	6.99	8.32 Clear
5	4.28	8.31 Clear
1	5.82	8.33 Clear
2	6.55	8.31 Clear

(1335)

TM

3	5.31	8.32 Clear
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7/28/25 RFAAP (Unit 5) / 667639 / KFC LEB AML FB#16

5WC23: DTW: 7.67 CB#25 Begin Purge (1343)

Purge DTW: 7.71

Initial Purge - Clear

Time	Temp	Cond	DO	pH	Op	Turb	DTW	Desc
(1344)	19.6	822	2.64	7.02	136.7	0.38	7.77	Clear
(1349)	16.7	1015	0.38	6.85	115.7	1.56	7.71	Clear
(1354)	16.9	1002	0.17	6.84	96.8	0.88	7.71	Clear
(1359)	17.3	989	0.14	6.82	84.1	1.16	7.71	Clear
(1404)	16.8	977	0.26	6.83	79.4	1.12	7.72	Clear
(1409)	17.3	974	0.17	6.83	75.2	0.67	7.71	Clear

(1409) Readings Stable

Sample time (1410)

Samples collected: (3) 8260D, (1) TM

(1414)	17.8	973	0.39	6.84	68.1	0.89	7.71	Clear
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5WC21: DTW: 8.42 CB#18 Begin Purge (1417)

Purge DTW: 8.64

Initial Purge - Clear

Time	Temp	Cond	DO	pH	Op	Turb	DTW	Desc
(1418)	14.6	524.4	2.36	5.94	118.9	2.11	9.48	Clear
(1423)	18.4	548.1	1.65	5.91	137.7	1.74	8.46	Clear
(1428)	17.8	536.7	1.40	5.85	141.3	1.27	8.45	Clear
(1433)	17.1	527.1	1.20	5.80	142.1	2.12	8.41	Clear
(1438)	15.6	515.1	0.98	5.77	140.2	2.45	8.44	Clear
(1443)	15.2	513.2	1.18	5.76	139.3	1.66	8.49	Clear

(1443) Readings stable

Sample time (1445)

Samples collected: (3) 8260D, (1) TM

(1451)	15.1	508.5	0.98	5.78	138.4	2.70	8.64	Clear
--------	------	-------	------	------	-------	------	------	-------

5WDup

Sample time (1445)

*collected

Sample time COC (1040)

From 5WC21

Samples collected: (3) 8260D, (1) TM

(65)

General Notes -

- Weather: Partly cloudy & 80°s
- PPE: Nitr. le gloves, eye protection & safety boots
- Calibrations - YSI Pro Plus D.O. % = 100.0 %
pH: 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00
Conductivity reads 1413 $\mu S/cm$ in a 1413 $\mu S/cm$ std.
HACH 2100Q Turbidimeter: 0.02 - 1000 NTU
- Dedicated well skirts used at each well.
- All equipment deconned before & after event and between use at each sample location.
- All purge water collected & disposed of at a dedicated, on-site location.
- All samples collected, transported & stored on ice in coolers.
- Sample collection order: 8260, 8270, TM & CN
- All wells purged & sampled at 0.25 L/min.
- All DTW's measured in feet.

Sample Analysis	Preservative	Sample Analysis	Preservative
8260	HCL	TM	HNO ₃
8270	N/A	Cyanide	NaOH

- Bladder pump setting: 4 CYCLES/MIN 5 sec discharge 10 sec recharge
- VOA's collected from one pulse from bladder pump.

CONFIDENCE SOLUTION VALUE RANGE (*)

BATCH # = 24KIC

DATE OPENED: 6/24/25

TEMP(°C)	COND $\mu S/cm$	ORP (mV)	pH
ACTUAL/RANGE	ACTUAL/RANGE	ACTUAL/RANGE	ACTUAL/RANGE
PRE: 16.4 / 16-20	7749 / 7630-7920	231 / 222-252	6.99 / 6.8-7.2
POST: 19.8 / 16-20	7868 / 7630-7920	242 / 222-252	7.03 / 6.8-7.2

(*) OK

OK
1.24-26

(*) OK

OK
1.24-26

(*) OK

OK
1.24-26

(*) OK

OK
1.24-26

(66)

KFC ABP AL F.B.#16

* safety boots
0.70 = 100.0 %
0.00 = 10.00

413^{ms} std.
2-1000 NTU

ch well.

* after event

ple location.

period of at a

red & stored on

8270, TMA CN

0.25 L/min.

Analysis Preservative

TM HNO₃
anide NaOH

5 sec discharge
/MIN 10 sec recharge
in bladder pump.

UE RANGE *

OPENED: 6/24/25

P (mV)	PH
Range	Actual / Range
222-252	6.99 / 6.8-7.2
222-252	7.03 / 6.8-7.2

* OK
1.24-26
1.26-28

7/29/25: RFAAP (UNIT-16) / 667639 / KFC ABP AL F.B.#16

STATIC WATER LEVEL TABLE (Measured in feet)

WELL	DTW	P/PDTW	NOTES	WELL	DTW	P/PDTW	NOTES
16-2	55.85	55.92	Pad okay	16MW9	65.35	65.35	Pad okay
16-3	56.60	61.49	Pad okay	16C1	48.44	48.46	Pad okay
16-5	4.32	10.89	Pad okay	SWL'S ONLY			
16WCIB	68.28	68.95	Pad okay	16C3	65.95	-	Pad okay
16WCIA	67.98	68.55	Pad okay	16CDH3	68.55	-	Pad okay
16MW8	73.65	T.O.P	Pad okay	16WC2A	61.95	-	Pad okay
16C2B	53.75	60.79	Pad okay	16-1	48.01	-	Pad okay

16-5: DTW= 4.32 CB
P/P DTW= 10.89 29

TIME	TEMP	COND	DO	PH	Turb	ORP	DTW	DESC.
(0829)	15.0	513.8	2.94	7.49	26.8	0.49	5.14	clear
(0834)	14.2	488.9	1.77	7.48	31.4	1.29	6.57	clear
(0839)	14.1	482.7	1.62	7.46	32.6	1.06	7.69	clear
(0844)	14.0	476.7	1.56	7.50	24.7	2.17	9.13	clear
(0849)	14.9	481.6	1.68	7.46	21.9	0.71	9.44	clear
(0854)	14.3	473.2	1.55	7.48	18.9	1.98	10.06	clear
(0854)	Readings stable							

Sample Time (0855)

Samples collected: (3) 82600, (2) 8270 E, (1) TM

(0858)	14.7	476.3	1.69	7.48	15.7	2.92	10.89	clear
--------	------	-------	------	------	------	------	-------	-------

16 Spring

Time	Temp	Cond	DO	PH	Turb	ORP	DESC.
(0907)	14.3	519.7	6.43	7.40	5.69	68.6	clear

Sample Time (0910)

Samples collected: (3) 82600, (2) 8270 E, (1) TM

7/29/25

RFAAP (Unit 16) / 667639 / KFC. ABP. AML PB# 16

16WC2B

~~16WC2B~~ALJA
21626

DTW: 53.75 CB: 55.1

Begin Purge (0926)

P/Purge DTW: 60.79

Initial Purge - Clear

Time	Temp	Cond. μ m	DO μ m	pH	ORP (mv)	Turb μ m	DTW	Desc.
(0927)	18.0	293.7	8.47	7.99	93.6	0.91	54.21	Clear
(0932)	16.0	280.6	2.52	7.86	51.0	2.10	55.25	Clear
(0937)	15.4	279.2	1.33	7.94	25.3	1.95	56.39	Clear
(0942)	15.7	277.6	1.04	7.90	15.0	1.06	57.49	Clear
(0947)	15.4	277.8	0.88	7.87	10.3	1.15	58.62	Clear
(0952)	15.7	276.9	0.86	7.85	7.0	1.44	59.39	Clear
(0952)	Readings stable							

Sample Time (0955)

Samples Collected: (3) 8260D, (2) 8270E, (1) TM

(1000) 16.0 382.4 1.09 7.85 5.7 0.99 60.79 Clear

16-2

DTW: 55.85

CB: 54

Begin Purge (1000)

PostPurge DTW: 55.92

Initial Purge - Clear

Time	Temp	Cond. μ m	DO μ m	pH	ORP (mv)	Turb μ m	DTW	Desc.
(1010)	17.4	560.9	8.04	7.16	90.7	0.42	55.86	Clear
(1015)	14.8	569.8	5.96	7.06	70.3	1.85	55.86	Clear
(1020)	14.6	572.4	6.02	7.10	55.5	2.29	55.87	Clear
(1025)	15.2	575.1	5.80	7.09	51.5	2.07	55.88	Clear
(1030)	15.6	571.5	5.35	7.07	55.9	1.43	55.88	Clear
(1035)	15.0	572.3	5.37	7.13	49.8	1.88	55.89	Clear
(1035)	Readings stable							

Sample Time (1040)

Samples Collected: (3) 8260D, (2) 8270E, (1) TM

(1043) 15.2 578.7 6.19 7.05 57.6 1.31 55.92 Clear

(68)

PC, ABP, AML FB#16

Begin Purge (0926)

Initial Purge - Clear

Turb^(ft) DTW Desc.

0.91 54.21 Clear

2.10 55.25 Clear

1.95 56.39 Clear

1.06 57.49 Clear

1.15 58.62 Clear

1.44 59.39 Clear

(11) TM

1.99 60.79 Clear

Begin Purge (1009)

Initial Purge - Clear

Turb^(ft) DTW Desc.

2.42 55.86 Clear

1.85 55.86 Clear

1.29 55.87 Clear

2.07 55.88 Clear

1.43 55.88 Clear

1.88 55.89 Clear

(1) TM

31 55.92 Clear

7/29/25

RFAAP (Unit 16) / 667639 / KFC, ABP, AML

FB#16

16 MW8

DTW: 73.65

CB: 46

Begin Purge (1051)

Post Purge DTW: T.O.P

Initial Purge - Clear

Time	Temp	Cond. m	DO mg/L	pH	ORP mV	Turb ^(ft)	DTW	Desc.
(1052)	24.2	137.4	4.41	5.92	69.3	1.03	73.85	Clear
(1057)	19.0	129.5	2.20	5.28	101.2	1.41	74.20	Clear
(1102)	18.5	129.4	2.13	5.19	110.9	1.63	74.45	Clear
(1107)	18.6	124.7	0.97	5.18	110.8	3.10	74.62	Clear
(1112)	18.4	117.9	0.76	5.18	109.8	2.49	74.78	Clear
(1117)	18.8	118.4	0.37	5.15	108.8	2.82	74.89	Clear

(1117) Readings stable

Sample Time (1120)

Samples collected: (8) 8260D, (8) 8270E, (1) TM, (1) Cyanide

(1153) 28.6 122.5 1.60 5.09 115.7 1.63 T.O.P Clear

* well DTW ended below top of pump.

16-3

DTW: 56.56

CB: 45

Begin Purge (1204)

Post Purge DTW: T.O.P

ABP 7/29/25
T.O.P

61.49

Initial Purge - Clear

Time	Temp	Cond. m	DO mg/L	pH	ORP mV	Turb ^(ft)	DTW	Desc.
(1205)	20.0	222.5	8.35	7.34	108.9	1.45	57.64	Clear
(1210)	17.4	217.2	6.22	7.84	74.7	1.71	57.69	Clear
(1215)	17.4	217.3	5.84	7.94	65.3	1.57	58.42	Clear
(1220)	18.3	217.9	5.45	7.92	61.2	1.37	58.88	Clear
(1225)	16.9	217.4	5.47	8.01	53.9	1.38	59.58	Clear
(1230)	16.3	216.6	5.52	8.02	54.6	1.64	60.07	Clear

(1230) Readings stable

Sample Time (1235)

Samples collected: (3) 8260D, (2) 8270E, (1) TM

(1238) 16.5 224.1 5.73 7.96 54.0 1.04 61.49 Clear

(69)

General Notes:

- Weather - Sunny 75°F - 85°F
- PPE - Nitrile gloves eye protection & safety boots
- Calibrations - YSI Pro Plus / D.O. % = 99.9 %
pH: 4.00 = 4.00, 7.00 = 7.00, 10.00 = 10.00
- Conductivity reads 1413 $\mu\text{S}/\text{cm}$ in 1413 $\mu\text{S}/\text{cm}$ std.
- HACH 2100Q Turbidity meter: 0.02 - 1000 NTU
- Dedicated well skirts used at all wells.
- All equipment decontaminated before & after event and between use at each sample location.
- All purge water collected & disposed of at a dedicated, on-site location.
- All samples collected, transported & stored on ice & in coolers.
- Sample collection order: 8260, 8270, TM & CN
- All wells purged & sampled at 0.25 L/min.
- All DTW's measured in feet.

Sample Analysis	Preservative	Sample Analysis	Preservative
8260	HCL	TM	HCL
8270	N/A	Cyanide	NaOH

- Bladder pump setting: 4 cycles/min. ^{5 sec. discharge} _{10 sec. recharge}
- VOA's collected from one pulse from bladder pump.

CONFIDENCE SOLUTION VALUE RANGE

BATCH #: 24K1C

DATE OPENED: 6/24/25

TEMP (°C)	COND $\mu\text{S}/\text{cm}$	ORP (mV)	pH
Actual / Range	Actual / Range	Actual / Range	Actual / Range
PRE: 17.1 / 16-20	718 / 7630 7120	226 / 222 252	7.03 / 6.8-7.2
POST: 18.6 / 16-20	7820 / 7630 7920	239 / 222 252	7.04 / 6.8-7.2

and safety boots
D.O. % = 99.9 %
00 = 1000
in 1413ms std.
2-1000 NTU
all wells.
ref after event
ple location.
posed of at a
ed & started on

8270, TM & CN
0.25 L/min.
Analysis Preservative
TM HCL
wide NaOH
5 sec. discharge
MIN. 10 sec. recharge
in bladder pump.

E RANGE
POWER: 6/24/25
2 (mv) pH
1 / Range Actual / Range
6 / 222 7.03 / 6.8-7.2
7 / 252 7.04 / 6.8-7.2

16WCIB: DTW = 68.28 | CB | Begin Purge (0909)
P/Purge DTW = 68.95 | 51 | Initial Purge - Clear

TIME	TEMP (C)	COND μ S	DO %	pH	ORP mV	Turbidity	DTW	DESC.
(0910)	18.8	317.1	6.77	6.50	141.6	1.86	68.53	Clear
(0915)	16.4	353.4	3.22	6.27	156.0	1.34	68.58	Clear
(0920)	17.0	355.8	2.23	6.27	151.0	1.47	68.56	Clear
(0925)	16.7	357.5	2.00	6.27	146.3	2.00	68.57	Clear
(0930)	16.7	355.8	1.82	6.28	142.6	1.99	68.49	Clear
(0935)	16.5	356.7	1.79	6.27	141.0	2.05	68.56	Clear
(0940)	16.6	356.1	1.81	6.28	138.2	2.49	68.54	Clear
(0940)	Readings Stable							

Sample time (0945)
Samples Collected: (9) 8260D, (8) 8270E, (1) TM, (1) Cyanide
(1021) 16.4 387.1 1.69 6.30 132.7 2.55 68.95 Clear

16WCIA DTW: 67.98 | CB: 43 | Begin Purge (1024)
P/Purge DTW: 69.55 | Initial Purge - Clear

Time	Temp (C)	Cond μ S	DO %	pH	ORP mV	Turbidity	DTW	DESC.
(1025)	16.2	687.0	8.29	7.40	148.8	0.93	68.63	Clear
(1030)	15.6	686.0	1.88	6.86	130.2	1.96	69.05	Clear
(1035)	15.2	677.0	0.86	6.89	102.5	0.95	69.21	Clear
(1040)	15.3	682.0	0.66	6.85	87.7	0.41	69.19	Clear
(1045)	17.2	687.0	0.58	6.79	46.3	0.53	68.70	Clear
(1050)	15.2	705.0	0.56	6.74	26.9	0.77	69.11	Clear
(1055)	15.1	705.0	0.45	6.74	10.9	1.27	69.22	Clear
(1100)	15.6	707.0	0.40	6.72	3.2	0.95	69.19	Clear
(1100)	Readings Stable							

Sample time (1105)
Samples Collected: (27) 8260D, (24) 8270E, (3) TM, (3) Cyanide
(1235) 15.1 720 0.27 6.67 -27.2 5.60 69.55 Clear
16W Dup Sample time (1105) / Sample time COC (0925)
Samples Collected: (9) 8260D, (8) 8270E, (1) TM, (1) Cyanide
* Collected from Well 16WCIA *

16 MW9: DTW = 65.35 CB: 45 Begin Purge (1244)
 PIPURSE DTW = 66.12 Initial Purge - Clear w/ orange particles

TIME	TEMP(°C)	COND(µS)	DO(%)	pH	ORP(mV)	Turbidity	DTW	Desc.
(1245)	12.2	861.0	4.95	6.67	64.0	13.7	66.17	Clear w/ orange particles
(1250)	15.9	878.0	0.73	6.58	47.7	7.65	66.28	Clear
(1255)	16.0	877.0	0.49	6.58	37.6	7.01	66.18	Clear
(1300)	16.0	878.0	0.45	6.57	32.7	9.06	66.16	Clear
(1305)	16.2	874.0	0.42	6.57	29.6	8.96	66.16	Clear
(1310)	16.0	871.0	0.39	6.57	27.6	4.47	66.12	Clear
(1310)	Readings stable							

Sample time (1315)

SAMPLES Collected: (11) 8260D, (8) 8270E, (1) TM, (1) Cyanide

(1340)	15.7	859.0	0.38	6.56	19.9	6.25	66.12	Clear
--------	------	-------	------	------	------	------	-------	-------

16 C1: DTW = 48.44 CB: 48 Begin Purge (1352)
 PIPURSE DTW = 48.46 Initial Purge - CLEAR

TIME	TEMP(°C)	COND(µS)	DO(%)	pH	ORP(mV)	Turbidity	DTW	Desc.
(1353)	21.0	669	8.29	7.44	83.9	1.04	48.45	Clear
(1358)	16.0	721	2.52	6.52	83.6	1.01	48.46	Clear
(1403)	14.9	690	1.41	6.46	86.3	1.29	48.46	Clear
(1408)	15.2	671	1.26	6.39	85.9	1.26	48.46	Clear
(1413)	15.2	656	0.98	6.38	85.2	1.63	48.44	Clear
(1418)	15.3	655	0.73	6.38	83.1	1.38	48.46	Clear
(1418)	Readings stable							

Sample time (1420)

SAMPLES Collected: (11) 8260D, (8) 8270E, (1) TM, (1) Cyanide

(1441)	15.0	665	0.26	6.36	84.3	1.55	48.46	Clear
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APPENDIX E
CORRESPONDENCE

From: [Janet Frazier](#)
To: [Janet Frazier](#)
Subject: DEQ - approval for Cobalt GPS comparison to 6 ug/l
Date: Wednesday, February 13, 2019 10:40:58 AM

From: Kurt Kochan <kurt.kochan@deq.virginia.gov>
Sent: Friday, October 26, 2018 8:51 AM
To: McKenna, Jim <james.j.mckenna16.civ@mail.mil>
Cc: Hawks, Jody (US) <jody.hawks@baesystems.com>; Brett Fisher <brett.fisher@deq.virginia.gov>; Elizabeth Lohman <elizabeth.lohman@deq.virginia.gov>; Ashby Scott <ashby.scott@deq.virginia.gov>; Mike Lawless <mlawless@daa.com>
Subject: RE: 2018 Semiannual Groundwater Monitoring Report for HWMUs 5 & 16 - DEQ response

Good morning-

As stated in the permit and verified with the permit writer, the Permittee shall use the most up-to-date EPA MCL, the Department ACL, or EPA Region 3 RBC (RSL) as the GPS. Therefore, the GPS for Cobalt in HWMU-16 should be 6 ug/L not 5 ug/L as it is in the above-referenced report and my response letter to that report. Sorry for the confusion. Please let me know if you have any questions.

Kurt

From: Kurt Kochan <kurt.kochan@deq.virginia.gov>
Sent: Monday, October 22, 2018 11:29 AM
To: 'McKenna, Jim' <james.j.mckenna16.civ@mail.mil>
Cc: 'Hawks, Jody (US)' <jody.hawks@baesystems.com>; Brett Fisher <brett.fisher@deq.virginia.gov>; Elizabeth Lohman <elizabeth.lohman@deq.virginia.gov>; Ashby Scott <ashby.scott@deq.virginia.gov>; 'Mike Lawless (mlawless@daa.com)' <mlawless@daa.com>
Subject: 2018 Semiannual Groundwater Monitoring Report for HWMUs 5 & 16 - DEQ response

Good morning Jim-

Please find attached the DEQ response following review of the above-referenced report. Please let me know if you have any questions.

Best,

Kurt W. Kochan
Corrective Action Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
P.O. Box 1105
Richmond, VA 23218
(703) 583-3825



Commonwealth of Virginia

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Matthew J. Strickler
Secretary of Natural and Historic Resources

David K. Paylor
Director
(804) 698-4000

September 13, 2021

Mr. Jim McKenna
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

VIA ELECTRONIC MAIL

**Re: Alternate Source Demonstration for Cobalt in monitoring wells 16MW9, 16WC1A, and 16WC1B, HWMU #16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. McKenna:

The above-noted Alternate Source Demonstration (ASD) investigation, submitted on behalf of Radford Army Ammunition Plant, by Alliant Techsystems Inc., dated April 2021, has been reviewed for technical content and consistency with the requirements of 40 CFR 264.99.(i). The need to submit an ASD was triggered by an exceedance of the Cobalt Groundwater Protection standard reported to the Department for monitoring wells 16MW9, 16WC1A, and 16WC1B.

As defined under 40 CFR 264.99.(i), the Alternate Source Demonstration (ASD) report must show one of the following in order to obtain approval:

- 1) The contamination was caused by natural variation in groundwater.
- 2) The contamination was a result of an error in field sampling.
- 3) The contamination was the result of an error in lab analysis.
- 4) The SSI contamination was result of an error in statistical analysis.

The ASD report focused on proving the applicability of item #1 by presenting a statistical trend analysis that shows no trend or a decreasing trend of total cobalt concentrations in groundwater in 16MW9 and 16WC1B, respectively. Although an increasing trend in observed in

Approval Letter

HWMU #16, Radford Army Ammunition Plant, Radford, Virginia

Radford Army Ammunition Plant, Radford, VA

Page 2 of 2

16WC1A, based on the historical data from the well, current concentrations are less than historical values detected (including non-detects), therefore the observed values appear to be caused by a natural variation in local groundwater. Therefore, presenting data shows that cobalt is widely observed at significant concentrations in non-waste derived materials and ASD concentrations observed in groundwater monitoring wells 16MW9, 16WC1A, and 16WC1B are derived from ambient, naturally-occurring and naturally variable trace elements in the aquifer matrix, and not from a temporally- varying source such as a release from the closed hazardous waste management unit (HWMU-16).

Based on the above discussion and the body of evidence presented to the Department, the content of the ASD is determined to be sufficient to meet the Regulatory criteria for approval and as a result, the facility does not have to remediate the cobalt GPS exceedances observed in wells 16MW9, 16WC1A, and 16WC1B. Please note that future exceedances of the GPS for Cobalt noted in 16MW9, 16WC1A, and 16WC1B will not require the submittal of a separate ASD unless the monitoring results reveal a change in site conditions that may indicate a release from HWMU-16. Please make sure that this approval is reflected in future correspondence.

If you have any additional questions or would like to discuss further, you may contact me at 703-583-3825 or by email at Kurt.Kochan@deq.virginia.gov.

Sincerely,



Kurt W. Kochan
Office of Remediation Programs

cc: RFAAP Correspondence File
Tara Mason, Ashby Scott, VDEQ-CO
Nichole Herschler, VDEQ- BRO
Jody Hawks, BAE



Commonwealth of Virginia

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Travis A. Voyles
Acting Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director
(804) 698-4020

May 9, 2022

Mr. Len DiIorio Jr
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

VIA ELECTRONIC MAIL

**Re: 2021 Annual Groundwater Monitoring Report for
Hazardous Waste Management Units 5 & 16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. DiIorio:

This letter acknowledges the receipt and review of the 2021 Annual Groundwater Monitoring Report for Hazardous Waste Management Units (HWMU) 5 & 16 dated December 2021, submitted to the Virginia Department of Environmental Quality (Department or DEQ), Office of Remediation Programs (ORP) by BAE Systems on behalf of the Radford Army Ammunitions Plant (RFAAP).

There were reportedly no new-targeted constituents detected during the groundwater monitoring activities conducted during the second or fourth quarters of 2021 for HWMU-5 or -16. As previously noted, the Department acknowledges the presence of barium above the site-specific background concentration. The Department recognizes that the variability of the lithology in the area of HWMU-16 could potentially explain the variation of this element. No further investigation is required at this time; however, the Department may request further investigation if the barium levels in groundwater increase in the future.

The Department accepts the report as complete. However, the Department does want to acknowledge that several constituents were reported above the permit specified quantitation and/or detection limits. The Department does not require any action, however encourages RFAAP to engage laboratories that can routinely achieve these permit levels.

EPA ID#: VA1210020730

May 9, 2022

Page 2 of 2

If you have any questions regarding this correspondence, you may contact me at 703-232-4200 or by email at Kurt.Kochan@deq.virginia.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Kurt W. Kochan", with a long horizontal flourish extending to the right.

Kurt W. Kochan
Office of Remediation Programs

cc: RFAAP Correspondence File
Tara Mason, Ashby Scott, DEQ-CO
Melissa Lincoln, BAE
Mike Lawless, DAA



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Travis A. Voyles
Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director

December 2, 2024

Dear Interested Stakeholder:

This letter shares information about the updated Default 10-6 Alternate Concentration Limits (ACL) Table, effective January 2, 2025. The new, updated ACL Table issued as "Draft" (see attached) reflects the updates in the EPA Regional Screening Level (RSL) Table through November, 2024. Please note, this is a slight change compared to previous ACL Table updates typically based on the May RSL tables. This update includes EPA's November RSL update in part to capture important changes to EPA policy that occurred in October of 2024 (see below).

The RSL update established new values for 5 constituents: chloroprene, 1,1-Dichloroethylene; 1,1-dichloroethene/ vinylidene chloride, 3,3'-dimethylbenzidine, gamma-BHC/ Lindane, and lead. Lead values have been changed in the RSL based on the updated action levels presented in the [October 2024 EPA Lead and Copper Rule Memo](#), and could impact a number of solid waste facilities within the Commonwealth. Please review the table and contact the Department if you have any questions regarding your 2025 groundwater monitoring program.

Please keep in mind that for chemicals with a Maximum Contaminant Level (MCL), the MCL will continue to be the groundwater protection standard (GPS). For metals, the regulations allow site specific background to be used upon Department approval instead of the ACL. Please note that copper and lead do not have an MCL but have an 'action level.' For the purpose of setting the Groundwater Protection Standard, these action levels are treated as MCLs.

In some instances, use of site specific ACLs may be warranted. Any proposed use of 10-5 ACL values should meet all of the technical criteria described in "Submission Instruction #28 For Applying For Site-Specific Alternate Concentration Limits At Solid Waste Landfills In Areas With Public Water Supplies (version date = January, 2015)" and the related Frequently Asked Questions (FAQ) document. Contact the Department if you have questions regarding such application. If you have technical questions on ACL development, please contact Kyle Newman at [\(804\) 659-1322](tel:8046591322) or kyle.newman@deq.virginia.gov.

For further questions regarding the effect of the ACL use in groundwater monitoring or corrective action, please contact your regional office or the program Coordinator, Geoff Christe at [\(804\) 912-3674](tel:8049123674) or geoff.christe@deq.virginia.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Brent Williams", with a long horizontal flourish extending to the right.

Brent Williams

Director, Office of Financial Responsibility & Waste Programs

Virginia Department of Environmental Quality

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Encl:

1. Default ACL Table Draft Update, November, 2024 (lower of 10E-6 cancer risk and HQ = 1)
2. Change log

ACL for VSWMR Table 3.1 Constituents

Refer to the notes provided at the end of this table for additional information

N	=	No	I	=	IRIS
Y	=	YES	P	=	PPRTV
RSL	=	Regional Screening Level	O	=	OPP
VOC	=	Volatile Organic Compound	A	=	ATSDR
V	=	Volatile	T	=	ATSDR DRAFT
M	=	Mutagen	D	=	OW
ACL	=	Alternate Concentration Limit (µg/L)	C	=	Cal EPA
MCL	=	Maximum Contaminant Level (µg/L)	X	=	PPRTV Screening Level
CAS RN	=	Chemical Abstracts Service Registry Number	H	=	HEAST
SFO	=	Oral Slope Factor (mg/kg-day)	G	=	See RSL User's Guide
IUR	=	Inhalation Unit Risk (µg/m3)-1	W	=	TEF applied
RfDo	=	Chronic Oral Reference Dose (mg/kg-day)	E	=	RPF applied
RfCi	=	Chronic Inhalation Reference Concentration (mg/m3)	c	=	cancer
			n	=	noncancer

[illegible]

Virginia DEQ ACL 1E-6/1 Tapwater RSL as ACL

207-08-9	Benzo[k]fluoranthene		M	1.00E-02	E	6.00E-06	E					2.5	c	
100-51-6	Benzyl alcohol							1.00E-01	P			2000	n	
7440-41-7	Beryllium (Total)					2.40E-03	I	2.00E-03	I	2.00E-05	I	25	n	4
319-85-7	beta-BHC			1.80E+00	I	5.30E-04	I					0.025	c	
111-91-1	Bis(2-chloroethoxy)methane							3.00E-03	P			59	n	
111-44-4	Bis(2-chloroethyl) ether; Dichloroethyl ether	V		1.10E+00	I	3.30E-04	I					0.014	c	
108-60-1	Bis(2-chloro-1-methylethyl) ether; 2, 2'-Dichlorodiisopropyl ether; DCIP	V						4.00E-02	I			710	n	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)			1.40E-02	I	2.40E-06	C	2.00E-02	I			5.6	c	6
74-97-5	Bromochloromethane; Chlorobromomethane	V								4.00E-02	X	83	n	
75-27-4	Bromodichloromethane; Dibromochloromethane (THM)	V		6.20E-02	I	3.70E-05	C	8.00E-03	P			0.13	c	80
75-25-2	Bromoform; Tribromomethane (THM)	V		7.90E-03	I	1.10E-06	I	2.00E-02	I			3.3	c	80
101-55-3	4-Bromophenyl phenyl ether													
85-68-7	Butyl benzyl phthalate; Benzyl butyl phthalate			1.90E-03	P			2.00E-01	I			16	c	
7440-43-9	Cadmium (Total)					1.80E-03	I	1.00E-04	A	1.00E-05	A	1.8	n	5
75-15-0	Carbon disulfide	V						1.00E-01	I	7.00E-01	I	810	n	
56-23-5	Carbon tetrachloride	V		7.00E-02	I	6.00E-06	I	4.00E-03	I	1.00E-01	I	0.46	c	5
12789-03-6	Chlordane	V		3.50E-01	I	1.00E-04	I	5.00E-04	I	7.00E-04	I	0.02	c	2
108-90-7	Chlorobenzene	V						2.00E-02	I	5.00E-02	P	78	n	100
510-15-6	Chlorobenzilate			1.10E-01	C	3.10E-05	C	2.00E-02	I			0.31	c	
75-00-3	Chloroethane; Ethyl chloride	V								4.00E+00	P	8300	n	
67-66-3	Chloroform; Trichloromethane (THM)	V		3.10E-02	C	2.30E-05	I	1.00E-02	I	1.95E-03	T	0.22	c	80
91-58-7	2-Chloronaphthalene	V						8.00E-02	I			750	n	
95-57-8	2-Chlorophenol	V						5.00E-03	I			91	n	
7005-72-3	4-Chlorophenyl phenyl ether													
126-99-8	Chloroprene	V	M			3.00E-04	I	2.00E-02	H	2.00E-02	I	0.0068	c	
7440-47-3	Chromium (Total)													100
218-01-9	Chrysene		M	1.00E-03	E	6.00E-07	E					25	c	
156-59-2	cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	V						2.00E-03	I	4.00E-02	X	25	n	70
10061-01-5	cis-1,3-Dichloropropene	V												
7440-48-4	Cobalt (Total)					9.00E-03	P	3.00E-04	P	6.00E-06	P	6	n	
7440-50-8	Copper (Total)							4.00E-02	H			800	n	1300
57-12-5	Cyanide	V						6.00E-04	I	8.00E-04	G	1.5	n	200
94-75-7	2,4-D; 2,4-Dichlorophenoxyacetic acid							1.00E-02	I			170	n	70
72-54-8	4,4'-DDD			2.40E-01	I	6.90E-05	C	5.00E-04	A			0.032	c	
72-55-9	4,4'-DDE	V		3.40E-01	I	9.70E-05	C	5.00E-04	A			0.046	c	
50-29-3	4,4'-DDT			3.40E-01	I	9.70E-05	I	5.00E-04	I			0.23	c	
319-86-8	delta-BHC													
2303-16-4	Diallate			6.10E-02	H							0.54	c	
53-70-3	Dibenz[a,h]anthracene		M	1.00E+00	E	6.00E-04	E					0.025	c	
132-64-9	Dibenzofuran	V						1.00E-03	X			7.9	n	
106-93-4	1,2-Dibromoethane; Ethylene dibromide; EDB	V		2.00E+00	I	6.00E-04	I	9.00E-03	I	9.00E-03	I	0.0075	c	0.05
124-48-1	Dibromochloromethane; Chlorodibromomethane (THM)	V		8.40E-02	I			2.00E-02	I			0.87	c	80
96-12-8	1,2-Dibromo-3-chloropropane; DBCP	V	M	8.00E-01	P	6.00E-03	P	2.00E-04	P	2.00E-04	I	0.00033	c	0.2

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91-94-1	3,3'-Dichlorobenzidine			4.50E-01	I	3.40E-04	C					0.13	c	
75-71-8	Dichlorodifluoromethane; CFC 12;	V						2.00E-01	I	1.00E-01	X	200	n	
107-06-2	1,2-Dichloroethane; Ethylene dichloride	V		9.10E-02	I	2.60E-05	I	6.00E-03	X	7.00E-03	P	0.17	c	5
75-34-3	1,1-Dichloroethane; Ethylidene chloride	V		5.70E-03	C	1.60E-06	C	2.00E-01	P			2.8	c	
75-35-4	1,1-Dichloroethylene; 1,1-Dichloroethene; Vinylidene chloride	V						5.00E-02	I	3.96E-03	A	8.2	n	7
87-65-0	2,6-Dichlorophenol													
120-83-2	2,4-Dichlorophenol							3.00E-03	I			46	n	
594-20-7	2,2-Dichloropropane; isopropylidene chloride													
78-87-5	1,2-Dichloropropane; Propylene dichloride	V		3.70E-02	P	3.70E-06	P	4.00E-02	P	4.00E-03	I	0.85	c	5
142-28-9	1,3-Dichloropropane; Trimethylene dichloride	V						2.00E-02	P			370	n	
563-58-6	1,1-Dichloropropene													
60-57-1	Dieldrin			1.60E+01	I	4.60E-03	I	5.00E-05	I			0.0018	c	
84-66-2	Diethyl phthalate							8.00E-01	I			15000	n	
60-51-5	Dimethoate							2.20E-03	O			44	n	
131-11-3	Dimethyl phthalate													
57-97-6	7,12-Dimethylbenz[a]anthracene		M	2.50E+02	C	7.10E-02	C					0.0001	c	
119-93-7	3,3'-Dimethylbenzidine		M	1.10E+01	P							0.0021	c	
105-67-9	2,4-Dimethylphenol; m-Xylenol							2.00E-02	I			360	n	
84-74-2	Di-n-butyl phthalate							1.00E-01	I			900	n	
534-52-1	4,6-Dinitro-o-cresol; 4,6-Dinitro-2-methylphenol							8.00E-05	X			1.5	n	
51-28-5	2,4-Dinitrophenol							2.00E-03	I			39	n	
606-20-2	2,6-Dinitrotoluene			1.50E+00	P			3.00E-04	X			0.049	c	
121-14-2	2,4-Dinitrotoluene			3.10E-01	C	8.90E-05	C	2.00E-03	I			0.24	c	
117-84-0	Di-n-octyl phthalate							1.00E-02	P			200	n	
88-85-7	Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol							1.00E-03	I			15	n	7
122-39-4	Diphenylamine							1.00E-01	O			1300	n	
298-04-4	Disulfoton							4.00E-05	I			0.5	n	
959-98-8	Endosulfan I	V												
33213-65-9	Endosulfan II	V												
1031-07-8	Endosulfan sulfate							6.00E-03	P			110	n	
72-20-8	Endrin							3.00E-04	I			2.3	n	2
7421-93-4	Endrin aldehyde													
97-63-2	Ethyl methacrylate	V								3.00E-01	P	630	n	
100-41-4	Ethylbenzene	V		1.10E-02	C	2.50E-06	C	5.00E-02	P	1.00E+00	I	1.5	c	700
62-50-0	Ethylmethanesulfonate													
52-85-7	Famphur													
206-44-0	Fluoranthene							4.00E-02	I			800	n	
86-73-7	Fluorene	V						4.00E-02	I			290	n	
58-89-9	gamma-BHC; Lindane			1.10E+00	C	3.10E-04	C	8.00E-07	A			0.0097	n	0.2
76-44-8	Heptachlor	V		4.50E+00	I	1.30E-03	I	1.00E-04	A			0.0014	c	0.4
1024-57-3	Heptachlor epoxide	V		9.10E+00	I	2.60E-03	I	1.30E-05	I			0.0014	c	0.2
118-74-1	Hexachlorobenzene	V		1.60E+00	I	4.60E-04	I	1.00E-05	P			0.0098	c	1
87-68-3	Hexachlorobutadiene	V		7.80E-02	I	2.20E-05	I	1.00E-03	P			0.14	c	

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77-47-4	Hexachlorocyclopentadiene	V						6.00E-03	I	2.00E-04	I	0.41	n	50
67-72-1	Hexachloroethane	V		4.00E-02	I	1.10E-05	C	7.00E-04	I	3.00E-02	I	0.33	c	
1888-71-7	Hexachloropropene													
591-78-6	2-Hexanone; Methyl butyl ketone	V						5.00E-03	I	3.00E-02	I	38	n	
193-39-5	Indeno[1,2,3-cd]pyrene		M	1.00E-01	E	6.00E-05	E					0.25	c	
78-83-1	Isobutyl alcohol	V						3.00E-01	I	4.00E-01	X	730	n	
465-73-6	Isodrin													
78-59-1	Isophorone			9.50E-04	I			2.00E-01	I	2.00E+00	C	78	c	
120-58-1	Isosafrole													
143-50-0	Kepone			1.00E+01	I	4.60E-03	C	3.00E-04	I			0.0035	c	
7439-92-1	Lead (Total)											10	G	10
108-39-4	m-Cresol; 3-methyphenol							5.00E-02	I	6.00E-01	C	930	n	
541-73-1	m-Dichlorobenzene; 1,3-Dichlorobenzene	V												
99-65-0	m-Dinitrobenzene							1.00E-04	I			2	n	
7439-97-6	Mercury (Total)	V								3.00E-04	I	0.63	n	2
126-98-7	Methacrylonitrile	V						1.00E-04	I	3.00E-02	P	1.9	n	
91-80-5	Methapyrilene													
72-43-5	Methoxychlor							5.00E-03	I			37	n	40
74-83-9	Methyl bromide; Bromomethane	V						1.40E-03	I	5.00E-03	I	7.5	n	
74-87-3	Methyl chloride; Chloromethane	V								9.00E-02	I	190	n	
78-93-3	Methyl ethyl ketone; MEK; 2-Butanone	V						6.00E-01	I	5.00E+00	I	5600	n	
74-88-4	Methyl iodide; Iodomethane													
80-62-6	Methyl methacrylate	V						1.40E+00	I	7.00E-01	I	1400	n	
66-27-3	Methyl methanesulfonate			9.90E-02	C	2.80E-05	C					0.79	c	
298-00-0	Methyl parathion; Parathion methyl methyl							2.50E-04	I			4.5	n	
56-49-5	3-Methylcholanthrene		M	2.20E+01	C	6.30E-03	C					0.0011	c	
74-95-3	Methylene bromide; Dibromomethane	V								4.00E-03	X	8.3	n	
75-09-2	Methylene chloride; Dichloromethane	V	M	2.00E-03	I	1.00E-08	I	6.00E-03	I	6.00E-01	I	11	c	5
91-57-6	2-Methylnaphthalene	V						4.00E-03	I			36	n	
108-10-1	4-Methyl-2-pentanone; Methyl isobutyl ketone (MIBK)	V								3.00E+00	I	6300	n	
99-09-2	m-Nitroaniline; 3-Nitroaniline													
91-20-3	Naphthalene	V		1.20E-01	C	3.40E-05	C	2.00E-02	I	3.00E-03	I	0.12	c	
130-15-4	1,4-Naphthoquinone													
134-32-7	1-Naphthylamine													
91-59-8	2-Naphthylamine			1.80E+00	C	0.00E+00	C					0.039	c	
7440-02-0	Nickel (Total)					2.60E-04	C	2.00E-02	I	1.00E-05	T	390	n	
98-95-3	Nitrobenzene	V				4.00E-05	I	2.00E-03	I	9.00E-03	I	0.14	c	
99-55-8	5-Nitro-o-toluidine			9.00E-03	P			2.00E-02	X			8.2	c	
55-18-5	N-Nitrosodiethylamine		M	1.50E+02	I	4.30E-02	I					0.00017	c	
62-75-9	N-Nitrosodimethylamine	V	M	5.10E+01	I	1.40E-02	I	8.00E-06	P	4.00E-05	X	0.00011	c	
924-16-3	N-Nitrosodi-n-butylamine	V		5.40E+00	I	1.60E-03	I					0.0027	c	
86-30-6	N-Nitrosodiphenylamine			4.90E-03	I	2.60E-06	C					12	c	
621-64-7	N-Nitrosodipropylamine; N-Nitroso-N-dipropylamine; Di-n-propylnitrosami			7.00E+00	I	2.00E-03	C					0.011	c	

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10595-95-6	N-Nitrosomethylethalamine	V		2.20E+01	I	6.30E-03	C					0.00071	c	
100-75-4	N-Nitrosopiperidine			9.40E+00	C	2.70E-03	C					0.0082	c	
930-55-2	N-Nitrosopyrrolidine			2.10E+00	I	6.10E-04	I					0.037	c	
95-48-7	o-Cresol; 2-methyphenol							5.00E-02	I	6.00E-01	C	930	n	
95-50-1	o-Dichlorobenzene; 1,2-Dichlorobenzene	V						9.00E-02	I	2.00E-01	H	300	n	600
88-74-4	o-Nitroaniline; 2-Nitroaniline							1.00E-02	X	5.00E-05	X	190	n	
88-75-5	o-Nitrophenol; 2-Nitrophenol													
297-97-2	O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin													
126-68-1	O,O,O-Triethyl phosphorothioate													
95-53-4	o-Toluidine			1.60E-02	P	5.10E-05	C					4.7	c	
56-38-2	Parathion							6.00E-03	H			86	n	
106-47-8	p-Chloroaniline			2.00E-01	P			5.00E-04	P			0.37	c	
59-50-7	p-Chloro-m-cresol; 4-Chloro-3-methylphenol							1.00E-01	A			1400	n	
106-44-5	p-Cresol; 4-methyphenol							2.00E-02	P	6.00E-01	C	370	n	
106-46-7	p-Dichlorobenzene; 1,4-Dichlorobenzene	V		5.40E-03	C	1.10E-05	C	7.00E-02	A	8.00E-01	I	0.48	c	75
60-11-7	p-(Dimethylamino)azobenzene			4.60E+00	C	1.30E-03	C					0.005	c	
608-93-5	Pentachlorobenzene	V						8.00E-04	I			3.2	n	
82-68-8	Pentachloronitrobenzene	V		2.60E-01	H			3.00E-03	I			0.12	c	
87-86-5	Pentachlorophenol			4.00E-01	I	5.10E-06	C	5.00E-03	I			0.041	c	1
62-44-2	Phenacetin			2.20E-03	C	6.30E-07	C					34	c	
85-01-8	Phenanthrene	V												
108-95-2	Phenol							3.00E-01	I	2.00E-01	C	5800	n	
298-02-2	Phorate							2.00E-04	H			3	n	
100-01-6	p-Nitroaniline; 4-Nitroaniline			2.00E-02	P			4.00E-03	P	6.00E-03	P	3.8	c	
100-02-7	p-Nitrophenol; 4-Nitrophenol													
1336-36-3	Polychlorinated biphenyls; PCBS; Aroclors	V		2.00E+00	I	5.71E-04	I							0.5
106-50-3	p-Phenylenediamine							1.00E-03	X			20	n	
23950-58-5	Pronamide							7.50E-02	I			1200	n	
107-12-0	Propionitrile; Ethyl cyanide													
129-00-0	Pyrene	V						3.00E-02	I			120	n	
94-59-7	Safrole		M	2.20E-01	C	6.30E-05	C					0.096	c	
7782-49-2	Selenium (Total)							5.00E-03	I	2.00E-02	C	100	n	50
7440-22-4	Silver (Total)							5.00E-03	I			94	n	
93-72-1	Silvex; 2,4,5-TP							8.00E-03	I			110	n	50
100-42-5	Styrene	V						2.00E-01	I	1.00E+00	I	1200	n	100
18496-25-8	Sulfide													
99-35-4	sym-Trinitrobenzene							3.00E-02	I			590	n	
93-76-5	2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid							1.00E-02	I			160	n	
95-94-3	1,2,4,5-Tetrachlorobenzene	V						3.00E-05	P			0.17	n	
79-34-5	1,1,2,2-Tetrachloroethane	V		2.00E-01	I	5.80E-05	C	2.00E-02	I			0.076	c	
630-20-6	1,1,1,2-Tetrachloroethane	V		2.60E-02	I	7.40E-06	I	3.00E-02	I			0.57	c	
127-18-4	Tetrachloroethylene; Tetrachloroethene; Perchloroethylene	V		2.10E-03	I	2.60E-07	I	6.00E-03	I	4.00E-02	I	11	c	5
58-90-2	2,3,4,6-Tetrachlorophenol							3.00E-02	I			240	n	

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7440-28-0	Thallium (Total)							1.00E-05	X			0.2	n	2
7440-31-5	Tin (Total)							6.00E-01	H			12000	n	
108-88-3	Toluene	V						8.00E-02	I	5.00E+00	I	1100	n	1000
8001-35-2	Toxaphene			1.10E+00	I	3.20E-04	I	9.00E-05	P			0.071	c	3
110-57-6	trans-1,4-Dichloro-2-butene	V				4.20E-03	P					0.0013	c	
156-60-5	trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene	V						2.00E-02	I	4.00E-02	X	68	n	100
10061-02-6	trans-1,3-Dichloropropene	V												
120-82-1	1,2,4-Trichlorobenzene	V		2.90E-02	P			1.00E-02	I	2.00E-03	P	1.2	c	70
79-00-5	1,1,2-Trichloroethane	V		5.70E-02	I	1.60E-05	I	4.00E-03	I	2.00E-04	X	0.28	c	5
71-55-6	1,1,1-Trichloroethane; Methychloroform	V						2.00E+00	I	5.00E+00	I	8000	n	200
79-01-6	Trichloroethylene; Trichloroethene ethane	V	M	4.60E-02	I	4.10E-06	I	5.00E-04	I	2.00E-03	I	0.49	c	5
75-69-4	Trichlorofluoromethane; CFC-11	V						3.00E-01	I			5200	n	
95-95-4	2,4,5-Trichlorophenol							1.00E-01	I			1200	n	
88-06-2	2,4,6-Trichlorophenol			1.10E-02	I	3.10E-06	I	1.00E-03	P			4.1	c	
96-18-4	1,2,3-Trichloropropane	V	M	3.00E+01	I			4.00E-03	I	3.00E-04	I	0.00075	c	
7440-62-2	Vanadium (Total)							5.04E-03	G	1.00E-04	A	86	n	
108-05-4	Vinyl acetate	V						1.00E+00	H	2.00E-01	I	410	n	
75-01-4	Vinyl chloride; Chloroethene	V	M	7.20E-01	I	4.40E-06	I	3.00E-03	I	5.11E-02	A	0.019	c	2
1330-20-7	Xylene (Total)	V						2.00E-01	I	1.00E-01	I	190	n	10000
7440-66-6	Zinc (Total)							3.00E-01	I			6000	n	

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Refer to ACL release memo and/or Virginia DEQ for additional information.

MCL, when available, supersedes ACL.

ACL Constituents are listed by common names found in 9VAC20-81-250 Table 3.1 and are widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals. CAS numbers are provided as unique chemical identifiers.

Constituents without ACL value do not have a toxicity value or other inputs to develop an ACL at this time.

For constituents where (Total) is noted, all species in the groundwater that contains this element are included.

Bis(2-chloro-1-methylethyl) ether; 2, 2'-dichlorodiisopropyl ether; DCIP (CAS RN 108-60-1) is often called bis(2-chloroisopropyl) ether, the name Chemical Abstracts Service applies to its noncommercial isomer, propane, 2,2'-oxybis(2-chloro) (CAS RN 39638-32-9).

Chlordane includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12739-03-6).

The term chlordane in association with CAS RN 57-74-9 refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components. For issues related to chlordane contact Virginia DEQ Solid Waste.

Copper (CAS RN 7440-50-8) and lead (CAS RN 7439-92-1) do not have an MCL but have an "action level" based on treatment technology. For setting the ground water protection standard (GPS), these action levels are treated as MCLs.

Polychlorinated biphenyls (PCBs) (CAS RN 1336-36-3) contains congener chemicals, including constituents of aroclor 1016 (CAS RN 12674-11-2), aroclor 1221 (CAS RN 11104-28-2), aroclor 1232 (CAS RN 11141-16-5), aroclor 1242 (CAS RN 53469-21-9), aroclor 1248 (CAS RN 12672-29-6), aroclor 1254 (CAS RN 11097-69-1), and aroclor 1260 (CAS RN 11096-82-5).

Individual constituents of THMs (dibromochloromethane, CAS RN: 124-48-1; chloroform, CAS RN: 67-66-3; bromoform, CAS RN: 75-25-2; bromodichloromethane, CAS RN: 75-27-4) have a listed MCL of 80 µg/L. However, this MCL is for TOTAL THMs.

The MCL provided for individual THMs may ONLY be used as the MCL for total THMs provided the sum of detected THM concentrations plus the detection limits for nondetects is below the total THM MCL value of 80µg/L.

Toxaphene includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), i.e., chlorinated camphene.

Xylene (Total) includes o-xylene (CAS RN 96-47-6), m-xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7).

Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³ -y)	k e y	RfD _c (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)
2.20E-06	I	3.00E-04	O			9.00E-03	I	V		1	0.1	1.07E+05	Acephate	30560-19-1	1.9E+01	n	2.5E+02	n			6.0E+00	n				1.3E-03	n	
		2.00E-02	I							1	0.1		Acetaldehyde	75-07-0	1.1E+01	c**	4.9E+01	c**	1.3E+00	c**	5.6E+00	c**	2.6E+00	c**		5.2E-04	c**	
		9.00E-01	I							1		1.14E+05	Acetone	67-64-1	7.0E+04	n	1.1E+06	nms			1.8E+04	n		3.7E+00	n			
						2.00E-03	X	V		1	0.1	1.28E+05	Acetone Cyanohydrin	75-86-5	2.8E+06	nm	1.2E+07	nm	2.1E+00	n	8.8E+00	n				2.6E-02	n	
3.80E+00	C	1.30E-03	C	1.00E-01	I			V		1		2.52E+03	Acetonitrile	75-05-8	8.1E+02	n	3.4E+03	n	6.3E+01	n	2.6E+02	n	1.3E+02	n		2.6E-02	n	
										1	0.1	2.27E+04	Acetophenone	98-86-2	7.8E+03	ns	1.2E+05	nms					1.9E+03	n		5.8E-01	n	
		5.00E-04	I	2.00E-05	I	V			1			Acetylaminofluorene, 2-Acrolein	53-96-3	1.4E-01	c	6.0E-01	c	2.2E-03	c	9.4E-03	c	1.6E-02	c		7.5E-05	c		
										1			Acrolein	107-02-8	1.4E-01	n	6.0E-01	n	2.1E-02	n	8.8E-02	n	4.2E-02	n		8.4E-06	n	
5.00E-01	I	1.00E-04	I	2.00E-03	I	6.00E-03	I	V		1	0.1		Acrylamide	79-06-1	2.4E-01	c	4.6E+00	c	1.0E-02	c	1.2E-01	c	5.0E-02	c		1.1E-05	c	
		5.00E-01	I	2.00E-04	P	V			1		1.09E+05	Acrylic Acid	79-10-7	2.0E+01	n	8.3E+01	n	2.1E-01	n	8.8E-01	n	4.2E-01	n		8.5E-05	n		
5.40E-01	I	6.80E-05	I	9.00E-05	T	2.00E-03	I	V		1		1.13E+04	Acrylonitrile	107-13-1	2.5E-01	c*	1.1E+00	c*	4.1E-02	c*	1.8E-01	c*	5.2E-02	c*		1.1E-05	c*	
5.60E-02	C			1.00E-02	I					1	0.1		Adiponitrile	111-69-3	8.5E+06	nm	3.6E+07	nm	6.3E+00	n	2.6E+01	n						
				1.00E-03	I					1	0.1		Alachlor	15972-60-8	9.7E+00	c*	4.1E+01	c			1.1E+00	c	2.0E+00	n	2.0E+00	8.7E-04	c	1.6E-03
				1.00E-03	I					1	0.1		Aldicarb	116-06-3	6.3E+01	n	8.2E+02	n			2.0E+01	n			3.0E+00	4.9E-03	n	7.5E-04
										1	0.1		Aldicarb Sulfone	1646-88-4	6.3E+01	n	8.2E+02	n			2.0E+01	n			2.0E+00	4.4E-03	n	4.4E-04
1.70E+01	I	4.90E-03	I	3.00E-05	I			V		1			Aldicarb sulfoxide	1646-87-3	3.9E-02	c*	1.8E-01	c	5.7E-04	c	2.5E-03	c	9.2E-04	c		1.5E-04	c	
2.10E-02	C	6.00E-06	C	4.00E-03	P	1.00E-04	X	V		1		1.11E+05	Aldrin	309-00-2	3.9E-02	c*	1.8E-01	c	5.7E-04	c	2.5E-03	c	9.2E-04	c		1.5E-04	c	
										1		1.42E+03	Allyl Alcohol	107-18-6	3.5E+00	n	1.5E+01	n	1.0E-01	n	4.4E-01	n	2.1E-01	n		4.2E-05	n	
										1			Allyl Chloride	107-05-1	7.2E-01	c**	3.2E+00	c**	4.7E-01	c**	2.0E+00	c**	7.3E-01	c**		2.3E-04	c**	
										1			Aluminum	7429-90-5	7.7E-04	n	1.1E+06	nm	5.2E+00	n	2.2E+01	n	2.0E+04	n		3.0E+04	n	
2.10E+01	C	6.00E-03	C	4.00E-04	I					1			Aluminum Phosphide	20859-73-8	3.1E+01	n	4.7E+02	n			8.0E+00	n						
				9.00E-03	I					1	0.1		Ametryn	834-12-8	5.7E+02	n	7.4E+03	n			1.5E+02	n			1.6E-01	n		
				8.00E-02	P					1	0.1		Aminobiphenyl, 4-	92-67-1	2.6E-02	c	1.1E-01	c	4.7E-04	c	2.0E-03	c	3.0E-03	c		1.5E-05	c	
				4.00E-03	X					1	0.1		Aminophenol, m-	591-27-5	5.1E+03	n	6.6E+04	n			1.6E+03	n			6.1E-01	n		
				4.00E-03	X					1	0.1		Aminophenol, o-	95-55-6	2.5E+02	n	3.3E+03	n			7.9E+01	n			3.0E-02	n		
				2.00E-02	P					1	0.1		Aminophenol, p-	123-30-8	1.3E+03	n	1.6E+04	n			4.0E+02	n			1.5E-01	n		
				2.50E-03	I					1	0.1		Amirtraz	33089-61-1	1.6E+02	n	2.1E+03	n			8.2E+00	n			4.2E+00	n		
						5.00E-01	I	V		1		Ammonia	7664-41-7	1.6E+02	n	2.1E+03	n	5.2E+02	n	2.2E+03	n							
				2.00E-03	X					1	0.1		Ammonium Picrate	131-74-8	1.3E+02	n	1.6E+03	n			4.0E+01	n			1.9E-01	n		
				2.00E-01	I					1			Ammonium Sulfamate	7773-06-0	1.6E+04	n	2.3E+05	nm			4.0E+03	n						
5.70E-03	I	1.60E-06	C	7.00E-03	P	1.00E-03	I			1	0.1	1.37E+04	Amly Alcohol, tert-	75-85-4	8.2E-01	n	3.4E+02	n	3.1E+00	n	1.3E+01	n	6.3E+00	n		1.3E-03	n	
										1	0.1		Aniline	62-53-3	9.5E-01	c**	4.0E+02	c*	1.0E+00	n	4.4E+00	n	1.3E+01	c*		4.6E-03	c*	
4.00E-02	P			2.00E-03	X					1	0.1		Anthraquinone, 9,10-	84-65-1	1.4E+01	c**	5.7E+01	c*			1.4E+00	c*			1.4E-02	c*		
				4.00E-04	I	3.00E-04	A			0.15			Antimony (metallic)	7440-36-0	3.1E+01	n	4.7E+02	n	3.1E-01	n	1.3E+00	n	7.8E+00	n	6.0E+00	3.5E-01	n	2.7E-01
1.50E+00	I	4.30E-03	I	5.00E-04	H					1			Antimony Pentoxide	1314-60-9	3.9E+01	n	5.8E+02	n			9.7E+00	n						
										0.15			Antimony Tetroxide	1332-81-6	3.1E+01	n	4.7E+02	n			7.8E+00	n						
				2.00E-04	I					0.15			Antimony Trioxide	1309-64-4	2.8E+05	nm	1.2E+06	nm	2.1E-01	n	8.8E-01	n						
				1.50E-05	C					0.03			Arsenic, Inorganic	7440-38-2	6.8E-01	c**	3.0E+00	cG	6.5E-04	c*	2.9E-03	c*	5.2E-02	c	1.0E+01	1.5E-03	c	2.9E-01
				3.50E-06	C	5.00E-05	I			1			Arsine	7784-42-1	2.7E-01	n	4.1E+00	n	5.2E-02	n	2.2E-01	n	7.0E-02	n				
										1			Asbestos (units in fibers)	1332-21-4	2.7E-01	n	4.1E+00	n	5.2E-02	n	2.2E-01	n	7.0E-02	n				
2.30E-01	C			3.60E-01	O					1	0.1		Asulam	3337-71-1	2.3E+04	n	3.0E+05	nm			7.2E+03	n			7.0E+06(G)	1.8E+00	n	
				3.00E-03	A					1	0.1		Atrazine	1912-24-9	2.4E+00	c*	1.0E+01	c			3.0E-01	c	3.0E+00	c	2.0E-04	c	1.9E-03	
8.80E-01	C	2.50E-04	C							1	0.1		Auramine	492-80-8	6.2E-01	c	2.6E+00	c	1.1E-02	c	4.9E-02	c	7.8E-02	c		7.1E-04	c	
				4.00E-04	I					1	0.1		Avermectin B1	65195-55-3	2.5E+01	n	3.3E+02	n			8.0E+00	n			1.4E+01	n		
1.10E-01	I	3.10E-05	I	3.00E-03	A	1.00E-02	A			1	0.1		Azinphos-methyl	86-50-0	1.9E+02	n	2.5E+03	n	1.0E+01	n	4.4E+01	n	5.6E+01	n		1.7E-02	n	
				1.00E+00	P	7.00E-06	P			1	0.1		Azobenzene	103-33-3	5.6E+00	c	2.6E+01	c	9.1E-02	c	4.0E-01	c	1.2E-01	c		9.3E-04	c	
										1			Azodicarbonamide	123-77-3	8.6E+03	n	4.0E+04	n	7.3E-03	n	3.1E-02	n	2.0E+04	n		6.8E+00	n	
				2.00E-01	I	5.00E-04	H			0.07			Barium	7440-39-3	1.5E+04	n	2.2E+05	nm	5.									

Toxicity and Chemical-specific Information													Contaminant		Screening Levels												Protection of Groundwater SSLs		
SFO (mg/kg-day) ¹	k _e y	IUR (ug/m ³) ⁻¹	k _e y	RfD _a (mg/kg-day)	k _e y	RfC _i (mg/m ³)	k _e y	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)		
				8.00E-03	I	6.00E-02	I	V			6.79E+02	Bromobenzene	108-86-1	2.9E+02	n	1.8E+03	ns	6.3E+01	n	2.6E+02	n	6.2E+01	n		4.2E-02	n			
6.20E-02	I	3.70E-05	C	8.00E-03	P	4.00E-02	X	V			4.04E+03	Bromochloromethane	74-97-5	1.5E+02	n	6.3E+02	n	4.2E+01	n	1.8E+02	n	8.3E+01	n		2.1E-02	n			
7.90E-03	I	1.10E-06	I	2.00E-02	I			V			9.15E+02	Bromodichloromethane	75-27-4	2.9E-01	c	1.3E+00	c	7.6E-02	c	3.3E-01	c	1.3E-01	c	8.0E+01(G)	3.6E-05	c	2.2E-02		
								V				Bromoforn	75-25-2	1.9E+01	c*	8.6E+01	c	2.6E+00	c	1.1E+01	c	3.3E+00	c	8.0E+01(G)	8.7E-04	c	2.1E-02		
				1.40E-03	I	5.00E-03	I	V			3.59E+03	Bromomethane	74-83-9	6.8E+00	n	3.0E+01	n	5.2E+00	n	2.2E+01	n	7.5E+00	n		1.9E-03	n			
				5.00E-03	H			V				Bromophos	2104-96-3	3.9E+02	n	5.8E+03	n					3.5E+01	n		1.5E-01	n			
		3.70E-06	C			1.00E-01	A	V			9.66E+02	Bromopropane, 1-	106-94-5	1.6E+00	c	7.1E+00	c	7.6E-01	c	3.3E+00	c	1.5E+00	c		4.6E-04	c			
1.03E-01	O			1.50E-02	O					0.1		Bromoxynil	1689-84-5	6.3E+00	c	2.2E+01	c					6.1E-01	c		5.2E-04	c			
1.03E-01	O			1.50E-02	O			V				Bromoxynil Octanoate	1689-99-2	6.7E+00	c	3.2E+01	c					2.4E-01	c		2.1E-03	c			
6.00E-01	C	3.00E-05	I			2.00E-03	I	V			6.67E+02	Butadiene, 1,3-	106-99-0	7.6E-02	c*	3.3E-01	c*	9.4E-02	c*	4.1E-01	c*	7.1E-02	c*		3.9E-05	c*			
				1.00E-01	I			V			7.64E+03	Butanol, N-	71-36-3	7.8E+03	ns	1.2E+05	nms					2.0E+03	n		4.1E-01	n			
5.00E-04	I			4.00E-01	I	5.00E+00	I	V				Butyl Alcohol, t-	75-65-0	1.4E+03	c*	6.5E+03	c*	5.2E+03	n	2.2E+04	n	1.5E+02	c*		3.2E-02	c*			
				2.00E+00	P	3.00E+01	P	V			2.13E+04	Butyl alcohol, sec-	78-92-2	1.3E+05	nms	1.5E+06	nms	3.1E+04	n	1.3E+05	n	2.4E+04	n		5.0E+00	n			
				5.00E-02	I			V				Butylate	2008-41-5	3.9E+03	n	5.8E+04	n					4.6E+02	n		4.5E-01	n			
2.00E-04	C	5.70E-08	C							0.1		Butylated hydroxyanisole	25013-16-5	2.7E+03	c	1.1E+04	c	4.9E+01	c	2.2E+02	c	1.5E+02	c		2.9E-01	c			
3.60E-03	P			3.00E-01	P					0.1		Butylated hydroxytoluene	128-37-0	1.5E+02	c	6.4E+02	c					3.4E+00	c		1.0E-01	c			
				5.00E-02	P			V			1.08E+02	Butylbenzene, n-	104-51-8	3.9E+03	ns	5.8E+04	ns					1.0E+03	n		3.2E+00	n			
				1.00E-01	X			V			1.45E+02	Butylbenzene, sec-	135-98-8	7.8E+03	ns	1.2E+05	nms					2.0E+03	n		5.9E+00	n			
				1.00E-01	X			V			1.83E+02	Butylbenzene, tert-	98-06-6	7.8E+03	ns	1.2E+05	nms					6.9E+02	n		1.6E+00	n			
				2.00E-02	A					0.1		Cacodylic Acid	75-60-5	1.3E+03	n	1.6E+04	n					4.0E+02	n		1.1E-01	n			
		1.80E-03	I	1.00E-04	A	1.00E-05	A		0.025	0.001		Cadmium (Diet)	7440-43-9	7.1E+00	n	1.0E+02	n	1.6E-03	c**	6.8E-03	c**								
		1.80E-03	I	1.00E-04	A	1.00E-05	A		0.05	0.001		Cadmium (Water)	7440-43-9					1.6E-03	c**	6.8E-03	c**	1.8E+00	n	5.0E+00	1.4E-01	n	3.8E-01		
				5.00E-01	I	2.20E-03	C			0.1		Caprolactam	105-60-2	3.1E+04	n	4.0E+05	nm	2.3E+00	n	9.6E+00	n	9.9E+03	n		2.5E+00	n			
1.50E-01	C	4.30E-05	C	2.00E-03	I					0.1		Captafol	2425-06-1	3.6E+00	c*	1.5E+01	c	6.5E-02	c	2.9E-01	c	4.0E-01	c*		7.1E-04	c*			
2.30E-03	C	6.60E-07	C	1.30E-01	I					0.1		Captan	133-06-2	2.4E+02	c*	1.0E+03	c	4.3E+00	c	1.9E+01	c	3.1E+01	c*		2.2E-02	c*			
				1.00E-01	I					0.1		Carbaryl	63-25-2	6.3E+03	n	8.2E+04	n					1.8E+03	n		1.7E+00	n			
				5.00E-03	I					0.1		Carbofuran	1563-66-2	3.2E+02	n	4.1E+03	n					9.4E+01	n		3.7E-02	n	1.6E-02		
				1.00E-01	I	7.00E-01	I	V			7.38E+02	Carbon Disulfide	75-15-0	2.7E+02	ns	3.5E+03	ns	7.3E+02	n	3.1E+03	n	8.1E+02	n		2.4E-01	n			
7.00E-02	I	6.00E-06	I	4.00E-03	I	1.00E-01	I	V			4.58E+02	Carbon Tetrachloride	56-23-5	6.5E-01	c	2.9E+00	c	4.7E-01	c	2.0E+00	c	4.6E-01	c	5.0E+00	1.8E-04	c	1.9E-03		
				1.00E-01	P	V					5.89E+03	Carbonyl Sulfide	463-58-1	6.7E+01	c	2.8E+02	n	1.0E+02	n	4.4E+02	n	2.1E+02	n		5.1E-01	n			
				1.00E-02	I					0.1		Carbosulfan	55285-14-8	6.3E+02	n	8.2E+03	n					5.1E+01	n		1.2E+00	n			
				1.00E-01	I					0.1		Carboxin	5234-68-4	6.3E+03	n	8.2E+04	n					1.9E+03	n		1.0E+00	n			
						9.00E-04	I					Ceric oxide	1306-38-3	1.3E+06	nm	5.4E+06	nm	9.4E-01	n	3.9E+00	n								
				1.00E-01	I			V				Chloral Hydrate	302-17-0	7.8E+03	n	1.2E+05	nm					2.0E+03	n		4.0E-01	n			
				1.50E-02	I							Chloramben	133-90-4	9.5E+02	n	1.2E+04	n					2.9E+02	n		7.0E-02	n			
4.03E-01	H									0.1		Chloramines, Organic	E701235											4.0E+03(G)					
										0.1		Chloranil	118-75-2	1.3E+00	c	5.7E+00	c					1.8E-01	c		1.5E-04	c			
				5.00E-04	G			V		0.04		Chlordane (alpha)	5103-71-9	3.6E+01	n	5.0E+02	n					3.6E+00	n		4.9E-01	n			
3.50E-01	I	1.00E-04	I	5.00E-04	G			V		0.04		Chlordane (gamma)	5103-74-2	3.6E+01	n	5.0E+02	n					1.0E+01	n		1.4E+00	n			
				5.00E-04	I	7.00E-04	I	V		0.04		Chlordane (technical mixture)	12789-03-6	1.7E+00	c*	7.7E+00	c*	2.8E-02	c*	1.2E-01	c*	2.0E-02	c*	2.0E+00	2.7E-03	c*	2.7E-01		
1.00E+01	I	4.60E-03	C	3.00E-04	I					0.1		Chlordecone (Kepone)	143-50-0	5.4E-02	c	2.3E-01	c	6.1E-04	c	2.7E-03	c	3.5E-03	c		1.2E-04	c			
				7.00E-04	A					0.1		Chlorfeniphos	470-90-6	4.4E+01	n	5.7E+02	n					1.1E+01	n		3.1E-02	n			
				9.00E-02	O					0.1		Chlorimuron, Ethyl-	90982-32-4	5.7E+03	n	7.4E+04	n					1.8E+03	n		6.0E-01	n			
				1.00E-01	I	1.45E-04	A	V			2.78E+03	Chlorine	7782-50-5	1.8E-01	n	7.8E-01	n	1.5E-01	n	6.4E-01	n	3.0E-01	n	4.0E+03(G)	1.5E-04	n	2.0E+00		
				3.00E-02	I	2.00E-04	I	V				Chlorine Dioxide	10049-04-4	2.3E+03	n	3.4E+04	n	2.1E-01	n	8.8E-01	n	4.2E-01	n	8.0E+02(G)					
				3.00E-02	I							Chlorite (Sodium Salt)	7758-19-2	2.3E+03	n	3.5E+04	n					6.0E+02	n	1.0E+03					
4.60E-01	H	3.00E-04	I	2.00E-02	H	5.00E+01	I	V			1.15E+03	Chloro-1,1-difluoroethane, 1-	75-68-3	5.4E+04	ns	2.3E+05	nms	5.2E+04	n	2.2E+05	n	1.0E+05	n						

Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³ -y) ¹	k e y	RfD _c (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l u t a g e n	GIABS	ABS _d	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)	
1.60E-01	I	1.10E-02	I	1.50E+00	I	3.00E-05	I	M	0.013			Chromium(III), Insoluble Salts	16065-83-1	1.2E+05	nm	1.8E+06	nm					2.2E+04	n		4.0E+07	n		
				9.00E-04	I				0.025			Chromium(VI)	18540-29-9	9.5E-01	c*	2.0E+01	c*	9.2E-05	c	1.1E-03	c	1.1E-01	c		2.1E-03	c		
				1.30E-02	I				0.013	0.1		Chromium, Total	7440-47-3															
		9.00E-03	P	3.00E-04	P	6.00E-06	P					Clofentazine	74115-24-5	8.2E+02	n	1.1E+04	n					2.3E+02	n		1.4E+01	n	1.8E+05	
		6.20E-04	I					V M				Cobalt	7440-48-4	2.3E+01	n	3.5E+02	n	3.1E-04	c*	1.4E-03	c*	6.0E+00	n		2.7E-01	n		
				4.00E-02	H							Coke Oven Emissions	E649830					1.6E-03	c	2.0E-02	c							
				5.00E-02	I	6.00E-01	C			0.1		Copper	7440-50-8	3.1E+03	n	4.7E+04	n					8.0E+02	n	1.3E+03	2.8E+01	n	4.6E+01	
				5.00E-02	I	6.00E-01	C					Cresol, m-	108-39-4	3.2E+03	n	4.1E+04	n	6.3E+02	n	2.6E+03	n	9.3E+02	n		7.4E-01	n		
				5.00E-02	I	6.00E-01	C			0.1		Cresol, o-	95-48-7	3.2E+03	n	4.1E+04	n	6.3E+02	n	2.6E+03	n	9.3E+02	n		7.5E-01	n		
				2.00E-02	P	6.00E-01	C			0.1		Cresol, p-	106-44-5	1.3E+03	n	1.6E+04	n	6.3E+02	n	2.6E+03	n	3.7E+02	n		3.0E-01	n		
				1.00E-01	A					0.1		Cresol, p-chloro-m-	59-50-7	6.3E+03	n	8.2E+04	n					1.4E+03	n		1.7E+00	n		
1.90E+00	H			1.00E-01	A	6.00E-01	C			0.1		Cresols	1319-77-3	6.3E+03	n	8.2E+04	n	6.3E+02	n	2.6E+03	n	1.5E+03	n		1.3E+00	n		
				1.00E-03	P			V			1.66E+04	Crotonaldehyde, trans-	123-73-9	3.7E-01	c	1.7E+00	c					4.0E-02	c		8.2E-06	c		
				1.00E-01	I	4.00E-01	I	V			2.68E+02	Cumene	98-82-8	1.9E+03	ns	9.9E+03	ns	4.2E+02	n	1.8E+03	n	4.5E+02	n		7.4E-01	n		
2.20E-01	C	6.30E-05	C							0.1		Cupferron	135-20-6	2.5E+00	c	1.0E+01	c	4.5E-02	c	1.9E-01	c	3.5E-01	c		6.1E-04	c		
8.40E-01	H			2.00E-03	H					0.1		Cyanazine	21725-46-2	6.5E-01	c	2.7E+00	c					8.8E-02	c		4.1E-05	c		
				1.00E-03	I	9.00E-03	C					~Calcium Cyanide	592-01-8	7.8E+01	n	1.2E+03	n	9.4E+00	n	3.9E+01	n	2.0E+01	n					
				5.00E-03	I						9.54E+05	~Copper Cyanide	544-92-3	3.9E+02	n	5.8E+03	n					1.0E+02	n					
				6.00E-04	I	8.00E-04	G V					~Cyanide (CN-)	57-12-5	2.4E+01	n	1.6E+02	n	8.3E-01	n	3.5E+00	n	1.5E+00	n	2.0E+02	1.5E-02	n	2.0E+00	
				1.00E-03	I			V				~Cyanogen	460-19-5	7.8E+01	n	1.2E+03	n					2.0E+01	n					
				9.00E-02	I			V				~Cyanogen Bromide	506-68-3	7.0E+03	n	1.1E+05	nm					1.8E+03	n					
				5.00E-02	I			V				~Cyanogen Chloride	506-77-4	3.9E+03	n	5.8E+04	n					1.0E+03	n					
				6.00E-04	I	8.00E-04	I V				1.00E+07	~Hydrogen Cyanide	74-90-8	2.3E+01	n	1.5E+02	n	8.3E-01	n	3.5E+00	n	1.5E+00	n		1.5E-02	n		
				2.00E-03	I	9.00E-03	C					~Potassium Cyanide	151-50-8	1.6E+02	n	2.3E+03	n	9.4E+00	n	3.9E+01	n	4.0E+01	n					
				5.00E-03	I					0.04		~Potassium Silver Cyanide	506-61-6	3.9E+02	n	5.8E+03	n					8.2E+01	n					
				1.00E-01	I					0.04		~Silver Cyanide	506-64-9	7.8E+03	n	1.2E+05	nm					1.8E+03	n					
				1.00E-03	I	9.00E-03	C					~Sodium Cyanide	143-33-9	7.8E+01	n	1.2E+03	n	9.4E+00	n	3.9E+01	n	2.0E+01	n	2.0E+02				
				5.00E-02	I							~Zinc Cyanide	557-21-1	3.9E+03	n	5.8E+04	n					1.0E+03	n					
2.00E-02	X			2.00E-02	X	6.00E+00	I V			0.1	1.17E+02	Cyclohexane	110-82-7	6.5E+03	ns	2.7E+04	ns	6.3E+03	n	2.6E+04	n	1.3E+04	n		1.3E+01	n		
				5.00E+00	I	7.00E-01	P V				5.11E+03	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	2.7E+01	c*	1.1E+02	c					2.8E+00	c		1.6E-02	c		
												Cyclohexanone	108-94-1	2.8E+04	ns	1.3E+05	nms	7.3E+02	n	3.1E+03	n	1.4E+03	n		1.4E-01	n		
				5.00E-03	P	1.00E+00	X V				2.83E+02	Cyclohexene	110-83-8	3.1E+02	ns	3.1E+03	ns	1.0E+03	n	4.4E+03	n	7.0E+01	n		4.6E-02	n		
				2.00E-01	I			V			2.93E+05	Cyclohexylamine	108-91-8	1.6E+04	n	2.3E+05	nm					3.8E+03	n		1.0E+00	n		
				2.50E-02	I					0.1		Cyfluthrin	68359-37-5	1.6E+03	n	2.1E+04	n					1.2E+02	n		3.1E+01	n		
				5.00E-01	O					0.1		Cyromazine	66215-27-8	3.2E+04	n	4.1E+05	nm					9.9E+03	n	2.0E+02	2.5E+00	n		
1.80E-02	C	5.10E-06	C	3.00E-02	I					0.1		Dalapon	75-99-0	1.9E+03	n	2.5E+04	n					6.0E+02	n		1.2E-01	n	4.1E-02	
				1.50E-01	I					0.1		Daminozide	1596-84-5	3.0E+01	c	1.3E+02	c	5.5E-01	c	2.4E+00	c	4.3E+00	c		9.5E-04	c		
7.00E-04	I			7.00E-03	I					0.1		Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	4.4E+02	n	3.3E+03	c**					1.1E+02	c**		6.2E+01	c**		
				4.00E-05	I					0.1		Demeton	8065-48-3	2.5E+00	n	3.3E+01	n					4.2E-01	n					
1.20E-03	I			6.00E-01	I					0.1		Di(2-ethylhexyl)adipate	103-23-1	4.5E+02	c*	1.9E+03	c					6.5E+01	c	4.0E+02	4.7E+00	c	2.9E+01	
6.10E-02	H									0.1		Diallate	2303-16-4	8.9E+00	c	3.8E+01	c					5.4E-01	c		8.0E-04	c		
				7.00E-04	A					0.1		Diazinon	333-41-5	4.4E+01	n	5.7E+02	n					1.0E+01	n		6.5E-02	n		
8.00E-01	P	6.00E-03	P	2.00E-04	I V	M					9.79E+02	Dibromo-3-chloropropane, 1,2-	96-12-8	5.3E-03	c	6.4E-02	c	1.7E-04	c	2.0E-03	c	3.3E-04	c	2.0E-01	1.4E-07	c	8.6E-05	
2.50E-01	C			3.00E-04	C					0.1		Dibromoacetic acid	631-64-1	2.2E+00	c**	9.2E+00	c*					3.1E-01	c*	6.0E+01(G)	6.3E-05	c*	1.2E-02	
				4.00E-04	X			V			1.59E+02	Dibromobenzene, 1,3-	108-36-1	3.1E+01	n	4.7E+02	ns					5.3E+00	n		5.1E-03	n		
				1.00E-02	I			V				Dibromobenzene, 1,4-	106-37-6	7.8E+02	n	1.2E+04	n					1.3E+02	n		1.2E-01	n		
8.40E-02	I			2.00E-02	I			V			8.02E+02	Dibromochloromethane	124-48-1	8.3E+00	c	3.9E+01	c					8.7E-01	c	8.0E+01(G)	2.3E-04	c	2.1E-02	
2.00E+00	I	6.00E-04	I	9.00E-03	I	9.00E-03	I V				1.34E+03	Dibromoethane, 1,2-	106-93-4	3.6E-02	c	1.6E-01	c	4.7E-03	c	2.0E-02	c	7.5E-03	c	5.0E-02	2.1E-06	c	1.4E-05	
				4.0																								

Toxicity and Chemical-specific Information													Contaminant		Screening Levels											Protection of Groundwater SSLs		
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³) ⁻¹	k e y	RfD _a (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)
3.00E-04	C	1.00E-01	C	2.00E-03	P	5.00E-03	I				1	0.1	Diesel Engine Exhaust	E17136615	1.3E+02	n	1.6E+03	n	9.4E-03	c	4.1E-02	c				8.1E-03	n	
				3.00E-02	P	2.00E-04	P		1	0.1	Diethanolamine	111-42-2	1.9E+03	n	2.4E+04	n	2.1E-01	n	8.8E-01	n	4.0E+01	n		1.3E-01	n			
				6.00E-02	P	1.00E-04	P		1	0.1	Diethylene Glycol Monobutyl Ether	112-34-5	3.8E+03	n	4.8E+04	n	1.0E-01	n	4.4E-01	n	6.0E+02	n		2.4E-01	n			
				1.00E-03	P	3.00E-04	P		1	0.1	Diethylene Glycol Monoethyl Ether	111-90-0	7.8E+01	n	1.2E+03	n	3.1E-01	n	1.3E+00	n	1.2E+03	n		4.1E-03	n			
3.50E+02	C	1.00E-01	C	8.30E-02	O					1	0.1	Diethylstilbestrol	56-53-1	1.6E-03	c	6.6E-03	c	2.8E-05	c	1.2E-04	c	5.1E-05	c		2.8E-05	c		
				2.00E-02	I				1	0.1	Difenzoquat	43222-48-6	5.2E+03	n	6.8E+04	n			1.7E+03	n		2.6E+02	n					
						4.00E+01	I	V			1	0.1	Diflubenuron	35367-38-5	1.3E+03	n	1.6E+04	n			2.9E+02	n		3.3E-01	n			
						3.00E+01	X	V			1		Difluoropropane, 1,1-	75-37-5	4.8E+04	ns	2.0E+05	nms	4.2E+04	n	1.8E+05	n	8.3E+04	n		2.8E+01	n	
4.40E-02	C	1.30E-05	C							1		Dihydrosofrole	420-45-1	2.4E+04	ns	1.0E+05	ns	3.1E+04	n	1.3E+05	n	6.3E+04	n		1.4E+02	n		
									1		Diisopropyl Ether	94-58-6	9.9E+00	c	4.5E+01	c	2.2E-01	c	9.4E-01	c	3.0E-01	c		1.9E-04	c			
									1		Diisopropyl Methylphosphonate	108-20-3	2.2E+03	n	9.4E+03	ns	7.3E+02	n	3.1E+03	n	1.5E+03	n		3.7E-01	n			
									1		Dimethipin	1445-75-6	6.3E+03	ns	9.3E+04	ns			1.6E+03	n		4.5E-01	n					
1.60E+00	P			2.18E-02	O					1	0.1	Dimethoate	55290-64-7	1.4E+03	n	1.8E+04	n			4.4E+02	n				9.6E-02	n		
				2.20E-03	O				1	0.1	Dimethoate	60-51-5	1.4E+02	n	1.8E+03	n			4.4E+01	n		9.9E-03	n					
						2.00E-02	X	2.00E-04	X	V	M		1		Dimethoxybenzidine, 3,3'-	119-90-4	7.6E-02	c	1.4E+00	c			1.5E-02	c		1.9E-05	c	
						6.00E-02	P				1	0.1	Dimethyl Sulfide	75-18-3	6.2E-01	n	2.6E+00	n	2.1E-01	n	8.8E-01	n	4.2E-01	n		1.0E-04	n	
1.70E-03	P									1	0.1	Dimethyl methylphosphonate	756-79-6	3.2E+02	c*	1.4E+03	c*			4.6E+01	c*				9.6E-03	c*		
									1	0.1	Dimethylamino azobenzene [p-]	60-11-7	1.2E-01	c	5.0E-01	c	2.2E-03	c	9.4E-03	c	5.0E-03	c		2.1E-05	c			
									1	0.1	Dimethylaniline HCl, 2,4-	21436-96-4	9.4E-01	c	4.0E+00	c			1.3E-01	c		1.2E-04	c					
									1	0.1	Dimethylaniline, 2,4-	95-68-1	2.7E+00	c*	1.1E+01	c			3.7E-01	c		2.1E-04	c					
2.70E-02	P	1.10E+01	P	2.00E-03	I			V		1		Dimethylaniline, N,N-	121-69-7	2.6E+01	c**	1.2E+02	c*			2.5E+00	c*				9.0E-04	c*		
									1	0.1	Dimethylbenzidine, 3,3'-	119-93-7	1.1E-02	c	2.1E-01	c			2.1E-03	c		1.4E-05	c					
									1		Dimethylformamide	68-12-2	2.6E+03	n	1.5E+04	n	3.1E+01	n	1.3E+02	n	6.1E+01	n		1.2E-02	n			
									1		Dimethylhydrazine, 1,1-	57-14-7	5.7E-02	n	2.4E-01	n	2.1E-03	n	8.8E-03	n	4.2E-03	n		9.3E-07	n			
5.50E+02	C	1.60E-01	C	1.00E-04	X	2.00E-06	X	V		1		Dimethylhydrazine, 1,2-	540-73-8	8.8E-04	c	4.1E-03	c	1.8E-05	c	7.7E-05	c	2.8E-05	c		6.5E-09	c		
									1	0.1	Dimethylphenol, 2,4-	105-67-9	1.3E+03	n	1.6E+04	n			3.6E+02	n		4.2E-01	n					
									1	0.1	Dimethylphenol, 2,6-	576-26-1	3.8E+01	n	4.9E+02	n			1.1E+01	n		1.3E-02	n					
									1	0.1	Dimethylphenol, 3,4-	95-65-8	6.3E+01	n	8.2E+02	n			1.8E+01	n		2.1E-02	n					
4.50E-02	C	1.30E-05	C					V		1		Dimethylvinylchloride	513-37-1	1.1E+00	c	4.8E+00	c	2.2E-01	c	9.4E-01	c	3.3E-01	c		1.1E-04	c		
									1	0.1	Dinitro-o-cresol, 4,6-	534-52-1	5.1E+00	n	6.6E+01	n			1.5E+00	n		2.6E-03	n					
									1	0.1	Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	1.3E+02	n	1.6E+03	n			2.3E+01	n		7.7E-01	n					
									1	0.1	Dinitroaniline, 3,5-	618-87-1	2.5E+01	n	3.3E+02	n	2.1E+00	n	8.8E+00	n	7.7E+00	n		4.1E-03	n			
6.80E-01	I	3.10E-01	C	8.90E-05	C	2.00E-03	I				1		Dinitrobenzene, 1,2-	528-29-0	6.3E+00	n	8.2E+01	n			1.9E+00	n				1.8E-03	n	
											1	0.1	Dinitrobenzene, 1,3-	99-65-0	6.3E+00	n	8.2E+01	n			2.0E+00	n		1.8E-03	n			
											1	0.1	Dinitrobenzene, 1,4-	100-25-4	6.3E+00	n	8.2E+01	n			2.0E+00	n		1.8E-03	n			
											1	0.1	Dinitrophenol, 2,4-	51-28-5	1.3E+02	n	1.6E+03	n			3.9E+01	n		4.4E-02	n			
1.50E+00	P			2.00E-03	I					1	0.102	Dinitrotoluene Mixture, 2,4/2,6-	E1615210	8.0E-01	c	3.4E+00	c			1.1E-01	c				1.5E-04	c		
									1		Dinitrotoluene, 2,4-	121-14-2	1.7E+00	c*	7.4E+00	c	3.2E-02	c	1.4E-01	c	2.4E-01	c		3.2E-04	c			
									1	0.099	Dinitrotoluene, 2,6-	606-20-2	3.6E-01	c*	1.5E+00	c			4.9E-02	c		6.7E-05	c					
									1	0.006	Dinitrotoluene, 2-Amino-4,6-	35572-78-2	7.7E+00	n	1.1E+02	n			1.9E+00	n		1.5E-03	n					
4.50E-01	X			1.00E-04	X					1	0.009	Dinitrotoluene, 4-Amino-2,6-	19406-51-0	7.7E+00	n	1.1E+02	n			1.9E+00	n				1.5E-03	n		
									1	0.1	Dinitrotoluene, Technical grade	25321-14-6	1.2E+00	c*	5.1E+00	c			1.0E-01	c		1.4E-04	c					
									1	0.1	Dinoseb	88-85-7	6.3E+01	n	8.2E+02	n			1.5E+01	n		1.3E-01	n	6.2E-02				
									1		Dioxane, 1,4-	123-91-1	5.3E+00	c	2.4E+01	c	5.6E-01	c*	2.5E+00	c*	4.6E-01	c		9.4E-05	c			
6.20E+03	I	1.30E+00	I	7.00E-10	I	4.00E-08	C	V		1	0.03	Dioxins	34465-46-8	1.0E-04	c	4.7E-04	c	2.2E-06	c	9.4E-06	c	1.3E-05	c		1.7E-05	c		
									1	0.03	~Hexachlorodibenzo-p-dioxin, Mixture ~TCDD, 2,3,7,8-	1746-01-6	4.8E-06	c*	2.2E-05	c*	7.4E-08	c	3.2E-07	c	1.2E-07	c	3.0E-05	5.9E-08	c	1.5E-05		
									1	0.1	Diphenamid	957-51-7	1.9E+03	n	2.5E+04	n			5.3E+02	n		5.2E+00	n					
									1		Diphenyl Ether	101-84-8	3.4E+01	n	1.4E+02	n	4.2E-01	n	1.8E+00	n	8.3E-01	n		3.4E-03	n			
8.00E-01	I	2.20E-04	I	8.00E-04	X					1	0.1	Diphenyl Sulfone	127-63-9	5.1E+01	n	6.6E+02	n			1.5E+01	n				3.6E-02	n		
									1	0.1	Diphenylamine	122-39-4	6.3E+03	n	8.2E+04	n			1.3E+03	n		2.3E+00	n					
									1	0.1	Diphenylhydrazine, 1,2-	122-66-7	6.8E-01	c	2.9E+00	c	1.3E-02	c	5.6E-02	c	7.8E-02	c		2.5E-04	c			
									1	0.1	Diquat	2764-72-9	1.4E+02	n	1.8E+03	n			4.0E+01	n		3.3E-01	n	1.7E-01				
7.40E+00	C	2.10E-03	C	2.20E-03	I					1	0.1	Direct Black 38	1937-37-7	7.3E-02	c													

Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³ -y) ¹	k e y	RfD _d (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	V o l u t a g e n	GIABS	ABS _d	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	key	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)
1.10E-02	C	2.50E-06	C	5.00E-02	P	1.00E+00	I	V	1	0.1	4.80E+02	Ethylbenzene	100-41-4	5.8E+00	c	2.5E+01	c	1.1E+00	c	4.9E+00	c	1.5E+00	c	7.0E+02		1.7E-03	c	7.8E-01
				7.00E-02	P				1			Ethylene Cyanohydrin	109-78-4	4.4E+03	n	5.7E+04	n					1.4E+03	n			2.8E-01	n	
				9.00E-02	P			V	1		1.89E+05	Ethylene Diamine	107-15-3	7.0E+03	n	1.1E+05	nm					1.8E+03	n			4.1E-01	n	
				8.00E-01	A	4.00E-01	C		1	0.1		Ethylene Glycol	107-21-1	5.1E+04	n	6.6E+05	nm	4.2E+02	n	1.8E+03	n	1.6E+04	n			3.2E+00	n	
3.10E-01	C	3.00E-03	I	1.00E-01	I	1.60E+00	I		1	0.1		Ethylene Glycol Monobutyl Ether	111-76-2	6.3E+03	n	8.2E+04	n	1.7E+03	n	7.0E+03	n	2.0E+03	n			4.1E-01	n	
4.50E-02	C	1.30E-05	C	8.00E-05	I	3.00E-02	C	V	M	1	0.1	Ethylene Oxide	75-21-8	2.0E+03	c	2.5E-02	c	3.4E-04	c	4.1E-03	c	6.7E-04	c			1.4E-07	c	
6.50E+01	C	1.90E-02	C					V	1			Ethylene Thiourea	98-45-7	5.1E+00	n	5.1E+01	c**	2.2E-01	c	9.4E-01	c	1.6E+00	n			3.6E-04	n	
				3.00E+00	I				1	0.1	1.54E+05	Ethyleneimine	151-56-4	2.7E-03	c	1.2E-02	c	1.5E-04	c	6.5E-04	c	2.4E-04	c			5.2E-08	c	
				2.50E-04	I				1	0.1		Fenamiphos	84-72-0	1.9E+05	nm	2.5E+06	nm					5.8E+04	n			1.3E+02	n	
				2.50E-02	I				1	0.1		Fenpropathrin	39515-41-8	1.6E+03	n	2.1E+04	n					6.4E+01	n			2.9E+00	n	
				2.50E-02	I				1	0.1		Fenvalerate	51630-58-1	1.6E+03	n	2.1E+04	n					5.0E+02	n			3.2E+02	n	
				1.30E-02	I				1	0.1		Fluometuron	2164-17-2	8.2E+02	n	1.1E+04	n					2.4E+02	n			1.9E-01	n	
				4.00E-02	C	1.30E-02	C		1			Fluoride	16984-48-8	3.1E+03	n	4.7E+04	n	1.4E+01	n	5.7E+01	n	8.0E+02	n	4.0E+03		1.2E+02	n	6.0E+02
				6.00E-02	I	1.30E-02	C		1			Fluorine (Soluble Fluoride)	7782-41-4	4.7E+03	n	7.0E+04	n	1.4E+01	n	5.7E+01	n	1.2E+03	n	4.0E+03		1.8E+02	n	6.0E+02
				8.00E-02	I				1	0.1		Fluridone	59756-60-4	5.1E+03	n	6.6E+04	n					1.4E+03	n			1.6E+02	n	
				4.00E-02	O				1	0.1		Flurprimidol	56425-91-3	2.5E+03	n	3.3E+04	n					6.9E+02	n			3.1E+00	n	
				2.00E-03	O				1	0.1		Flusilazole	85509-19-9	1.3E+02	n	1.6E+03	n					3.1E+01	n			5.1E+00	n	
				5.00E-01	O				1	0.1		Flutolanil	66332-96-5	3.2E+04	n	4.1E+05	nm					7.9E+03	n			4.2E+01	n	
				1.00E-02	I				1	0.1		Fluvalinate	69409-94-5	6.3E+02	n	8.2E+03	n					2.0E+02	n			2.9E+02	n	
				9.00E-02	O				1	0.1		Folpet	133-07-3	5.7E+03	n	7.4E+04	n					1.6E+03	n			3.9E-01	n	
				1.00E-02	O				1	0.1		Fomesafen	72178-02-0	6.3E+02	n	8.2E+03	n					1.9E+02	n			6.3E-01	n	
2.10E-02	C	7.40E-06	I	2.00E-03	I	7.00E-03	I	V	M	1	0.1	Fonofos	944-22-9	1.3E+02	n	1.6E+03	n					2.4E+01	n			4.7E-02	n	
				2.00E-01	I	7.00E-03	I	V		1		Formaldehyde	50-00-0	4.3E+00	c	7.0E+01	c*	1.4E-01	c*	1.7E+00	c*	2.2E-01	c*			4.5E-05	c*	
				9.00E-01	P	3.00E-04	X	V	1	0.1	1.06E+05	Formic Acid	64-18-6	2.9E+01	n	1.2E+02	n	3.1E-01	n	1.3E+00	n	6.3E-01	n			1.3E-04	n	
				2.50E+00	O				1	0.1		Fosetyl-AL	39148-24-8	1.6E+05	nm	2.1E+06	nm					5.0E+04	n			6.6E+02	n	
				1.00E-03	X			V	1			Furans	132-64-9	7.8E+01	n	1.2E+03	n					7.9E+00	n			1.5E-01	n	
				1.00E-03	I			V	1		6.22E+03	-Furan	110-00-9	7.8E+01	n	1.2E+03	n					1.9E+01	n			7.3E-03	n	
				9.00E-01	I	2.00E+00	I	V	1	0.1	1.65E+05	-Tetrahydrofuran	109-99-9	1.8E+04	n	9.5E+04	n	2.1E+03	n	8.8E+03	n	3.4E+03	n			7.5E-01	n	
3.80E+00	H								1	0.1		Furazolidone	67-45-8	1.4E-01	c	6.0E-01	c					2.0E-02	c			3.9E-05	c	
				3.00E-03	I	5.00E-02	H	V	1	0.1	1.01E+04	Furfural	98-01-1	2.1E+02	n	2.6E+03	n	5.2E+01	n	2.2E+02	n	3.8E+01	n			8.1E-03	n	
1.50E+00	C	4.30E-04	C						1	0.1		Furium	531-82-8	3.6E-01	c	1.5E+00	c	6.5E-03	c	2.9E-02	c	5.1E-02	c			6.8E-05	c	
3.00E-02	I	8.60E-06	C						1	0.1		Furmecyclox	60568-05-0	1.8E+01	c	7.7E+01	c	3.3E-01	c	1.4E+00	c	1.1E+00	c			1.2E-03	c	
				6.00E-03	O				1	0.1		Glufosinate, Ammonium	77182-82-2	3.8E+02	n	4.9E+03	n					1.2E+02	n			2.6E-02	n	
				1.00E-01	A	8.00E-05	C		1	0.1		Glutaraldehyde	111-30-8	6.0E+03	n	7.0E+04	n	8.3E-02	n	3.5E-01	n	2.0E+03	n			4.0E-01	n	
				4.00E-04	I	1.00E-03	X	V	1	0.1	1.06E+05	Glycidaldehyde	765-34-4	2.3E+01	n	2.1E+02	n	1.0E+00	n	4.4E+00	n	1.7E+00	n			3.3E-04	n	
				1.00E-01	I			V	1	0.1		Glyphosate	1071-83-6	6.3E+03	n	8.2E+04	n					2.0E+03	n	7.0E+02		8.8E+00	n	3.1E+00
				1.00E-02	X			V	1			Guanidine	113-00-8	7.8E+02	n	1.2E+04	n					2.0E+02	n			4.5E-02	n	
				2.00E-02	P				1	0.1		Guanidine Chloride	50-01-1	1.3E+03	n	1.6E+04	n					4.0E+02	n					
				3.00E-02	X				1	0.1		Guanidine Nitrate	506-93-4	1.9E+03	n	2.5E+04	n					6.0E+02	n			1.5E-01	n	
				5.00E-05	I				1	0.1		Haloxypol, Methyl	69806-40-2	3.2E+00	n	4.1E+01	n					7.6E-01	n			8.4E-03	n	
				1.00E-04	A			V	1			Heptachlor	76-44-8	1.3E-01	c*	6.3E-01	c	2.2E-03	c	9.4E-03	c	1.4E-03	c	4.0E-01		1.2E-04	c	3.3E-02
9.10E+00	I	2.60E-03	I	1.30E-05	I			V	1		2.09E+02	Heptachlor Epoxide	1024-57-3	7.0E-02	c*	3.3E-01	c*	1.1E-03	c	4.7E-03	c	1.4E-03	c*	2.0E-01		2.8E-05	c*	4.1E-03
						3.00E-03	X	V	1		5.79E+01	Heptanal, n-	111-71-7	2.4E+01	n	1.0E+02	n	3.1E+00	n	1.3E+01	n	6.3E+00	n			1.4E-03	n	
				3.00E-04	X	4.00E-01	P	V	1			Heptane, N-	142-82-5	2.2E+01	n	2.9E+02	ns	4.2E+02	n	1.8E+03	n	6.0E+00	n			4.8E-02	n	
				2.00E-03	I			V	1			Hexabromobenzene	87-82-1	1.6E+02	n	2.3E+03	n					4.0E+01	n			2.3E-01	n	
				2.00E-04	I				1	0.1		Hexabromodiphenyl ether, 2,2',4,4',5,5'-(BDE-153)	68631-49-2	1.3E+01	n	1.6E+02	n					4.0E+00	n					
1.60E+00	I	4.60E-04	I	1.00E-05	P			V	1																			

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; T = ATSDR DRAFT; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; R = ORD; N = Wt; W = TEF applied; E = RPF applied; G = see user's guide; c = cancer; n = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded; V = volatile; M = mutagen.																															
Toxicity and Chemical-specific Information												Contaminant		Screening Levels										Protection of Groundwater SSLs							
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³) ¹	k e y	RfD _a (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)			
9.50E-04	I			1.00E-02	A						1		Iodine	7553-56-2	7.8E+02	n	1.2E+04	n					2.0E+02	n		1.2E+01	n				
				4.00E-02	I						1	0.1	Iprodione	36734-19-7	2.5E+03	n	3.3E+04	n					7.4E+02	n		2.2E-01	n				
				7.00E-01	P									Iron	7439-89-6	5.5E+04	n	8.2E+05	nm					1.4E+04	n		3.5E+02	n			
				3.00E-01	I	4.00E-01	X	V					1.00E+04	Isobutyl Alcohol	78-83-1	7.8E+03	n	4.3E+04	ns	4.2E+02	n	1.8E+03	n	7.3E+02	n		1.5E-01	n			
				2.00E-01	I	2.00E+00	C					1	0.1	Isophorone	78-59-1	5.7E+02	c*	2.4E+03	c*	2.1E+03	n	8.8E+03	n	7.8E+01	c*		2.6E-02	c*			
				1.50E-02	I				V			1		Isopropanol	33820-53-0	1.2E+03	n	1.8E+04	n					4.0E+01	n		9.2E-01	n			
				2.00E+00	P	2.00E-01	P	V				1		Isopropanol	67-63-0	5.6E+03	n	2.4E+04	n	2.1E+02	n	8.8E+02	n	4.1E+02	n		8.4E-02	n			
				1.00E-01	I							1	0.1	Isopropyl Methyl Phosphonic Acid	1832-54-8	6.3E+03	n	8.2E+04	n					2.0E+03	n		4.3E-01	n			
				4.00E-03	X	4.00E-02	X	V				1		1.62E+02	Isopropyltoluene, p-	99-87-6	1.7E+02	ns	1.1E+03	ns	4.2E+01	n	1.8E+02	n	2.1E+01	n		5.2E-02	n		
				5.00E-02	I							1	0.1	Isosaxen	82558-50-7	3.2E+03	n	4.1E+04	n					7.3E+02	n		2.0E+00	n			
						3.00E-01	A	V			1		Jet propulsion fuel 7 (JP-7)	E1737665	4.3E+08	nm	1.8E+09	nm	3.1E+02	n	1.3E+03	n	6.3E+02	n							
				8.00E-03	O						1	0.1	Lactofen	77501-63-4	5.1E+02	n	6.6E+03	n					1.0E+02	n		4.6E+00	n				
				2.00E-04	X						1	0.1	Lactonitrile	78-97-7	1.3E+01	n	1.6E+02	n					4.0E+00	n		8.1E-04	n				
				5.00E-05	P						1		Lanthanum	7439-91-0	3.9E+00	n	5.8E+01	n					1.0E+00	n							
				2.08E-05	P						1	0.1	Lanthanum Acetate Hydrate	100587-90-4	1.3E+00	n	1.7E+01	n					4.2E-01	n							
				1.87E-05	P						1		Lanthanum Chloride Heptahydrate	10025-84-0	1.5E+00	n	2.2E+01	n					3.7E-01	n							
				2.83E-05	P						1		Lanthanum Chloride, Anhydrous	10099-58-8	2.2E+00	n	3.3E+01	n					5.7E-01	n							
				1.60E-05	P						1		Lanthanum Nitrate Hexahydrate	10277-43-7	1.3E+00	n	1.9E+01	n					3.2E-01	n							
		8.50E-03	C	1.20E-05	C							1		Lead Compounds																	
		2.10E-01	C	8.00E-05	C							1	0.1	~Lead Phosphate	7446-27-7	8.2E+01	c	3.8E+02	c	2.3E-01	c	1.0E+00	c	9.1E+00	c						
3.80E-02	C	1.10E-05	C										~Lead acetate	301-04-2	2.6E+00	c	1.1E+01	c	3.5E-02	c	1.5E-01	c	3.7E-01	c		7.5E-05	c		9.0E+00		
				1.00E-07	I			V		1		2.43E+00	~Tetraethyl Lead	78-00-2	7.8E-03	n	1.2E-01	n					1.3E-03	n				4.5E-04	c		
				5.00E-06	P			V		1		3.83E+02	Lewisite	541-25-3	3.9E-01	n	5.8E+00	n					9.0E-02	n				4.7E-06	n		
				7.70E-03	O					1	0.1		Linuron	330-55-2	4.9E+02	n	6.3E+03	n					1.3E+02	n				1.1E-01	n		
				2.00E-03	P					1			Lithium	7439-93-2	1.6E+02	n	2.3E+03	n					4.0E+01	n				1.2E+01	n		
				5.00E-04	I					1	0.1		MCPA	94-74-6	3.2E+01	n	4.1E+02	n					7.5E+00	n				2.0E-03	n		
				4.40E-02	O					1	0.1		MCPB	94-81-5	2.8E+03	n	3.6E+04	n					6.5E+02	n				2.6E-01	n		
				1.00E-03	I					1	0.1		MCPP	93-65-2	6.3E+01	n	8.2E+02	n					1.6E+01	n				4.7E-03	n		
				2.00E-02	I					1	0.1		Malathion	121-75-5	1.3E+03	n	1.6E+04	n					3.9E+02	n				1.0E-01	n		
				1.00E-01	I	7.00E-04	C				1	0.1		Maleic Anhydride	108-31-6	6.3E+03	n	8.0E+04	n	7.3E-01	n	3.1E+00	n	1.9E+03	n				3.8E-01	n	
				5.00E-01	I						1	0.1		Maleic Hydrazide	123-33-1	3.2E+04	n	4.1E+05	nm					1.0E+04	n				2.1E+00	n	
				1.00E-04	P					1	0.1		Malononitrile	109-77-3	6.3E+00	n	8.2E+01	n					2.0E+00	n				4.1E-04	n		
				3.00E-02	H					1	0.1		Mancozeb	8018-01-7	1.9E+03	n	2.5E+04	n					5.4E+02	n				7.6E-01	n		
				5.00E-03	I					1	0.1		Maneb	12427-38-2	3.2E+02	n	4.1E+03	n					9.8E+01	n				1.4E-01	n		
				1.40E-01	I	5.00E-05	I						Manganese (Diet)	7439-96-5					5.2E-02	n	2.2E-01	n									
				2.40E-02	G	5.00E-05	I			0.04			Manganese (Non-diet)	7439-96-5	1.8E+03	n	2.6E+04	n	5.2E-02	n	2.2E-01	n	4.3E+02	n				2.8E+01	n		
				9.00E-05	H						1	0.1		Mephosfolan	950-10-7	5.7E+00	n	7.4E+01	n					1.8E+00	n				2.6E-03	n	
				3.00E-02	I						1	0.1		Mepiquat Chloride	24307-26-4	1.9E+03	n	2.5E+04	n					6.0E+02	n				2.0E-01	n	
				4.00E-03	P						1	0.1		Mercaptobenzothiazole, 2-	149-30-4	4.9E+01	c**	2.1E+02	c*					6.3E+00	c*				1.8E-02	c*	
														Mercury Compounds																	
														~Mercuric Chloride (and other Mercury salts)	7487-94-7	2.3E+01	n	3.5E+02	n	3.1E-01	n	1.3E+00	n	5.7E+00	n	2.0E+00			3.3E-02	n	1.0E-01
				1.00E-04	I					1		3.13E+00	~Mercury (elemental)	7439-97-6	7.1E+00	ns	3.0E+01	ns	3.1E-01	n	1.3E+00	n	6.3E-01	n				1.4E+01	n		
				8.00E-05	I					1	0.1		~Methyl Mercury	22967-92-6	7.8E+00	n	1.2E+02	n					2.0E+00	n				5.0E-04	n		
				3.00E-05	I			V		1			~Phenylmercuric Acetate	62-38-4	5.1E+00	n	6.6E+01	n					1.6E+00	n							
				6.00E-02	I					1	0.1		Merphos	150-50-5	2.3E+00	n	3.5E+01	n					6.0E-01	n				5.9E-02	n		
				1.00E-04	I	3.00E-02	P	V		1		4.58E+03	Metalaxyl	57837-19-1	3.8E+03	n	4.9E+04	n					1.2E+03	n				3.3E-01	n		
				2.00E+00	I	2.00E+01	I	V		1		1.06E+05	Methacrylonitrile	126-98-7	7.5E+00	n	1.0E+02	n	3.1E+01	n	1.3E+02	n	1.9E+00	n				4.3E-04	n		
				5.00E-05	I					1	0.1		Methamidophos	10265-92-6	3.2E+00	n	4.1E+01	n					1.0E+00	n				2.1E-04	n		
				2.00E+00	I	2.00E+01	I	V		1			Methanol	67-56-1	1.2E+05	nms	1.2E+06	nms	2.1E+04	n	8.8E+04	n	2.0E+04	n				4.1E+00	n		
				1.50E-03	O					1	0.1		Methidathion	950-37-8	9.5E+01	n	1.2E+03	n					2.9E+01	n				7.1E-03	n		
				2.50E-02	I					1	0.1		Methomyl	16752-77-5	1.6E+03	n	2.1E+04	n					5.0E+02	n				1.1E-01	n		
4.90E-02	C			5.00E-03	I					1	0.1		Methoxy-5-nitroaniline, 2-	99-59-2	1.1E+01	c	4.7E+01	c					1.5E+00	c				5.3E-04	c		
				8.00E-03	P	1.00E-03	P	V		1		1.15E+05	Methoxychlor	72-43-5	3.2E+02	n	4.1E+03	n					4.7E+01	n				2.0E+00	n	2.2E+00	
				5.00E-03	P	7.00E-03	P	V		1		1.06E+05	Methoxyethanol Acetate, 2-	110-49-6	1.1E+02	n	5.1E+02	n	1.0E+00	n	4.4E+00	n	2.1E+00	n				4.2E-04	n		
				1.00E+00	X			V		1		2.90E+04	Methyl Acetate	109-86-4	2.6E+02	n	2.0E+03	n	7.3E+00	n	3.1E+01	n	1.3E+01	n				2.6E-03	n		
										1			Methyl Acetate	79-20-9	7.8E+04	ns	1.2E+06	nms					2.0E+04	n				4.1E+00	n		
						2.00E-02	P	V																							

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; T = ATSDR DRAFT; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; R = ORD; N = Wt; W = TEF applied; E = RPF applied; G = see user's guide; c = cancer; n = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded; V = volatile; M = mutagen.																													
Toxicity and Chemical-specific Information													Contaminant		Screening Levels												Protection of Groundwater SSLs		
SFO (mg/kg-day) ⁻¹	k e y	IUR (ug/m ³) ⁻¹	k e y	RfD _c (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)	
2.00E-03	I	1.00E-08	I	6.00E-03	I	6.00E-01	I	V	M	1		3.32E+03	Methylene Chloride	75-09-2	5.7E+01	c**	1.0E+03	c**	1.0E+02	c**	1.2E+03	c**	1.1E+01	c**	5.0E+00	2.9E-03	c**	1.3E-03	
1.00E-01	P	4.30E-04	C	2.00E-03	P				M	1	0.1		Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.2E+00	c	2.3E+01	c*	2.4E-03	c	2.9E-02	c	1.6E-01	c		1.8E-03	c		
4.60E-02	I	1.30E-05	C								0.1		Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	1.2E+01	c	5.0E+01	c	2.2E-01	c	9.4E-01	c	7.0E-01	c		3.9E-03	c		
1.60E+00	C	4.60E-04	C			2.00E-02	C			1	0.1		Methylenbisbenzenamine, 4,4'-	101-77-9	3.4E-01	c	1.4E+00	c	6.1E-03	c	2.7E-02	c	4.7E-02	c		2.1E-04	c		
						6.00E-04	I			1	0.1		Methylenediphenyl Diisocyanate	101-68-8	8.5E+05	nm	3.6E+06	nm	6.3E-01	n	2.6E+00	n							
				7.00E-02	H			V		1		5.00E+02	Methylstyrene, Alpha-	98-83-9	5.5E+03	ns	8.2E+04	ns					7.8E+02	n		1.2E+00	n		
				1.50E-01	I					1	0.1		Metolachlor	51218-45-2	9.5E+03	n	1.2E+05	nm					2.7E+03	n		3.2E+00	n		
				2.50E-02	I					1	0.1		Metribuzin	21087-64-9	1.6E+03	n	2.1E+04	n					4.9E+02	n		1.5E-01	n		
				2.50E-01	I					1	0.1		Metsulfuron-methyl	74223-64-6	1.6E+04	n	2.1E+05	nm					4.9E+03	n		1.9E+00	n		
4.50E-06	X	1.00E-02	X	1.00E-01	P	V				1		6.86E+00	Midrange Aliphatic Hydrocarbon Streams	E1790669	6.5E-01	c	2.8E+00	c	6.2E-01	c	2.7E+00	c	1.2E+00	c*		1.8E-02	c*		
1.80E+01	C	5.10E-03	C	3.00E+00	P			V		1		3.42E-01	Mineral oils	8012-95-1	2.3E+05	nms	3.5E+06	nms					6.0E+04	n		2.4E+03	n		
				2.00E-03	I					1	0.1		Mirex	2385-85-5	3.6E-02	c	1.7E-01	c	5.5E-04	c	2.4E-03	c	8.8E-04	c		6.3E-04	c		
				2.00E-03	I					1			Molinate	2212-67-1	1.3E+02	n	1.6E+03	n					3.0E+01	n		1.7E-02	n		
				5.00E-03	I	2.00E-03	A			1			Molybdenum	7439-98-7	3.9E+02	n	5.8E+03	n	2.1E+00	n	8.8E+00	n	1.0E+02	n		2.0E+00	n		
				1.00E-01	I					1			Monochloramine	10599-90-3	7.8E+03	n	1.2E+05	nm					2.0E+03	n	4.0E+03(G)				
				2.00E-03	P					1	0.1		Monomethylaniline	100-61-8	1.3E+02	n	1.6E+03	n					3.8E+01	n		1.4E-02	n		
				2.50E-02	I					1	0.1		Myclobutanil	88671-89-0	1.6E+03	n	2.1E+04	n					4.5E+02	n		5.6E+00	n		
				3.00E-04	X					1	0.1		N,N'-Diphenyl-1,4-benzenediamine	74-31-7	1.9E+01	n	2.5E+02	n					3.6E+00	n		3.7E-01	n		
				2.00E-03	I			V		1			Naled	300-76-5	1.6E+02	n	2.3E+03	n					4.0E+01	n		1.8E-02	n		
1.80E+00	C	0.00E+00	C	3.00E-02	X	1.00E-01	P	V		1	0.1		Naphtha, High Flash Aromatic (HFAN)	64742-95-6	2.3E+03	n	3.5E+04	n	1.0E+02	n	4.4E+02	n	1.5E+02	n					
										1	0.1		Naphthylamine, 2-	91-59-8	3.0E-01	c	1.3E+00	c					3.9E-02	c		2.0E-04	c		
				1.20E-01	O					1	0.1		Napropamide	15299-99-7	7.6E+03	n	9.8E+04	n					2.0E+03	n		1.3E+01	n		
		2.60E-04	C	1.10E-02	C	1.40E-05	C			1	0.1		Nickel Acetate	373-02-4	6.7E+02	n	8.1E+03	n	1.1E-02	c**	4.7E-02	c**	2.2E+02	n		4.5E-02	n		
		2.60E-04	C	1.10E-02	C	1.40E-05	C			1	0.1		Nickel Carbonate	3333-67-3	6.7E+02	n	8.1E+03	n	1.1E-02	c**	4.7E-02	c**	2.2E+02	n					
		2.60E-04	C	1.10E-02	C	1.40E-05	C	V		1			Nickel Carbonyl	13463-39-3	8.2E+02	n	1.1E+04	n	1.1E-02	c**	4.7E-02	c**	2.2E-02	c**					
		2.60E-04	C	1.10E-02	C	1.40E-05	C			0.04			Nickel Hydroxide	12054-48-7	8.2E+02	n	1.1E+04	n	1.1E-02	c**	4.7E-02	c**	2.0E+02	n					
		2.60E-04	C	1.10E-02	C	2.00E-05	C			0.04			Nickel Oxide	1313-99-1	8.4E+02	n	1.2E+04	n	1.1E-02	c**	4.7E-02	c**	2.0E+02	n					
		2.40E-04	I	1.10E-02	C	1.40E-05	C			0.04			Nickel Refinery Dust	E715532	8.2E+02	n	1.1E+04	n	1.2E-02	c**	5.1E-02	c**	2.2E+02	n		3.2E+01	n		
		2.60E-04	C	2.00E-02	I	1.00E-05	T			0.04			Nickel Soluble Salts	7440-02-0	1.4E+03	n	1.7E+04	n	1.0E-02	n	4.4E-02	n	3.9E+02	n		2.6E+01	n		
1.70E+00	C	4.80E-04	I	1.10E-02	C	1.40E-05	C			0.04			Nickel Sulfide	12035-72-2	4.1E-01	c	1.9E+00	c	5.8E-03	c**	2.6E-02	c**	4.5E-02	c					
9.10E-01	C	2.60E-04	C	1.10E-02	C	1.40E-05	C			1	0.1		Nickelocene	1271-28-9	6.0E-01	c	2.5E+00	c	1.1E-02	c**	4.7E-02	c**	8.6E-02	c					
				1.60E+00	I					1			Nitrate (measured as nitrogen)	14797-55-8	1.3E+05	nm	1.9E+06	nm					3.2E+04	n	1.0E+04				
										1			Nitrate + Nitrite (measured as nitrogen)	E701177											1.0E+04				
				1.00E-01	I					1			Nitrite (measured as nitrogen)	14797-65-0	7.8E+03	n	1.2E+05	nm					2.0E+03	n	1.0E+03				
2.00E-02	P			1.00E-02	X	5.00E-05	X			1	0.1		Nitroaniline, 2-	88-74-4	6.3E+02	n	8.0E+03	n	5.2E-02	n	2.2E-01	n	1.9E+02	n		8.0E-02	n		
				4.00E-03	P	6.00E-03	P			1	0.1		Nitroaniline, 4-	100-01-6	2.7E+01	c**	1.1E+02	c*	6.3E+00	n	2.6E+01	n	3.8E+00	c*		1.6E-03	c*		
		4.00E-05	I	2.00E-03	I	9.00E-03	I	V		1		3.05E+03	Nitrobenzene	98-95-3	5.1E+00	c*	2.2E+01	c*	7.0E-02	c	3.1E-01	c	1.4E-01	c*		9.2E-05	c*		
				3.00E+03	P					1	0.1		Nitrocellulose	9004-70-0	1.9E+08	nm	2.5E+09	nm					6.0E+07	n		1.3E+04	n		
				7.00E-02	H					1	0.1		Nitrofurantoin	67-20-9	4.4E+03	n	5.7E+04	n					1.4E+03	n		6.1E-01	n		
1.30E+00	C	3.70E-04	C							1			Nitrofurazone	59-87-0	4.2E-01	c	1.8E+00	c	7.6E-03	c	3.3E-02	c	6.0E-02	c		5.4E-05	c		
1.70E-02	P			1.00E-04	P					1	0.1		Nitrogluciferin	55-63-0	6.3E+00	n	8.2E+01	n					2.0E+00	n		8.5E-04	n		
				1.00E-01	I					1	0.1		Nitroguanidine	556-88-7	6.3E+03	n	8.2E+04	n					2.0E+03	n		4.8E-01	n		
		8.80E-06	P			5.00E-03	P	V		1		1.80E+04	Nitromethane	75-52-5	5.4E+00	c*	2.4E+01	c*	3.2E-01	c*	1.4E+00	c*	6.4E-01	c*		1.4E-04	c*		
		5.80E-04	X			2.00E-02	I	V		1		4.86E+03	Nitropropane, 2-	79-46-9	6.4E-02	c	2.8E-01	c	4.8E-03	c	2.1E-02	c	9.7E-03	c		2.5E-06	c		
2.70E+01	C	7.70E-03	C						M	1	0.1		Nitroso-N-ethylurea, N-	759-73-9	4.5E-03	c	8.5E-02	c	1.3E-04	c	1.6E-03	c							

Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³) ¹	k e y	RfD _c (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l	mutagen	GIABS	ABS _g	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)
1.00E-04	X			1.00E+00	P	V				1	0.1	3.88E+02	Pentamethylphosphoramide (PMPA)	10159-46-3	6.3E+00	n	8.2E+01	n					2.0E+00	n		4.1E-04	n	
				3.00E-06	D					1	0.1		Pentane, n-Per- and Polyfluoroalkyl Substances (PFAS)	109-66-0	8.1E+02	ns	3.4E+03	ns	1.0E+03	n	4.4E+03	n	2.1E+03	n		1.0E+01	n	
				1.00E-03	I			V		1		2.68E+02	~Ammonium perfluoro-2-methyl-3-oxahexanoate	62037-80-3	1.9E-01	n	2.5E+00	n					2.1E-02	n		2.2E-05	n	
				2.07E-09	I					1	0.1		~Ammonium perfluorobutanoate	10495-86-0	7.8E+01	n	1.2E+03	ns					1.9E+01	n		6.8E-03	n	
				5.00E-04	I					1	0.1		~Ammonium perfluorodecanoate	3108-42-7	1.3E-04	n	1.7E-03	n					4.2E-05	n		4.1E-08	n	
2.93E+04	D			3.00E-08	D					1	0.1		~Ammonium perfluorohexanoate	21615-47-4	3.2E+01	n	4.1E+02	n					7.2E+00	n		1.7E-03	n	
				3.00E-04	R			V		1			~Ammonium perfluorooctanoate	3825-26-1	1.9E-05	c	7.8E-05	c					2.7E-06	c		4.0E-08	c	
				3.00E-06	D			V		1		1.92E+06	~Bis(trifluoromethylsulfonyl)amine (TFSl)	82113-65-3	2.3E+01	n	3.5E+02	n					5.9E+00	n		1.9E-03	n	
				3.00E-06	D			V		1			~Hexafluoropropylene oxide dimer acid (HFPO-DA)	13252-13-6	2.3E-01	n	3.5E+00	n					1.5E-02	n	1.0E-02(G)	1.5E-05	n	1.0E-05
				3.00E-04	R			V		1		1.92E+06	~Lithium bis(trifluoromethylsulfonyl)azanide	90076-65-6	2.3E+01	n	3.5E+02	n					6.0E+00	n		1.9E-03	n	
				3.00E-06	D			V		1			~Perfluoro(2-propoxypropanoate)	122499-17-6	2.3E-01	n	3.5E+00	n					6.0E-02	n	1.0E-02(G)	6.1E-05	n	1.0E-05
				3.00E-04	P					1	0.1		~Perfluorobutanesulfonate	45187-15-3	1.9E+01	n	2.5E+02	n					6.0E+00	n	(G)	3.0E-03	n	
				3.00E-04	P					1	0.1		~Perfluorobutanesulfonic acid (PFBS)	375-73-5	1.9E+01	n	2.5E+02	n					6.0E+00	n	(G)	3.0E-03	n	
				1.00E-03	I			V		1		2.56E+03	~Perfluorobutanoate	45048-62-2	7.8E+01	n	1.2E+03	n					1.8E+01	n		6.3E-03	n	
				1.00E-03	I			V		1		2.57E+03	~Perfluorobutanoic acid (PFBA)	375-22-4	7.8E+01	n	1.2E+03	n					1.8E+01	n		6.5E-03	n	
				2.00E-09	I					1	0.1		~Perfluorodecanoate	73829-36-4	1.3E-04	n	1.6E-03	n					4.0E-05	n		4.0E-08	n	
				2.00E-09	I					1	0.1		~Perfluorodecanoic acid (PFDA)	335-76-2	1.3E-04	n	1.6E-03	n					4.0E-05	n		8.1E-08	n	
				5.00E-05	N					1	0.1		~Perfluorododecanoic acid (PFDoDA)	307-55-1	3.2E+00	n	4.1E+01	n					1.0E+00	n		1.7E-01	n	
				2.00E-05	A					1	0.1		~Perfluorohexanesulfonate	108427-53-8	1.3E+00	n	1.6E+01	n					3.9E-01	n	1.0E-02(G)	1.7E-04	n	4.2E-06
				2.00E-05	A					1	0.1		~Perfluorohexanesulfonic acid (PFHxS)	355-46-4	1.3E+00	n	1.6E+01	n					3.9E-01	n	1.0E-02(G)	1.7E-04	n	4.2E-06
				5.00E-04	I					1	0.1		~Perfluorohexanoate	92612-52-7	3.2E+01	n	4.1E+02	n					6.1E+00	n		1.5E-03	n	
				5.00E-04	I					1	0.1		~Perfluorohexanoic acid (PFHxA)	307-24-4	3.2E+01	n	4.1E+02	n					9.9E+00	n		2.4E-03	n	
				3.00E-06	A					1	0.1		~Perfluorononanoate	72007-68-2	1.9E-01	n	2.5E+00	n					5.9E-02	n	1.0E-02(G)	2.5E-04	n	4.2E-05
				3.00E-06	A					1	0.1		~Perfluorononanoic acid (PFNA)	375-95-1	1.9E-01	n	2.5E+00	n					5.9E-02	n	1.0E-02(G)	2.5E-04	n	4.2E-05
				4.00E-02	N					1	0.1		~Perfluorooctadecanoic acid (PFODA)	16517-11-6	2.5E+03	n	3.3E+04	n					8.0E+02	n		2.2E+02	n	
3.95E+01	D			1.00E-07	D					1	0.1		~Perfluorooctanesulfonate	45289-90-6	6.3E-03	n	5.8E-02	c**					2.0E-03	c**		4.0E-03	c**	3.0E-05
3.95E+01	D			1.00E-07	D					1	0.1		~Perfluorooctanesulfonic acid (PFOS)	1763-23-1	6.3E-03	n	5.8E-02	c**					2.0E-03	c**		4.0E-03	c**	3.0E-05
2.93E+04	D			3.00E-08	D					1	0.1		~Perfluorooctanoate	45285-51-6	1.9E-05	c	7.8E-05	c					2.7E-06	c		4.0E-03	c	6.1E-05
2.93E+04	D			3.00E-08	D					1	0.1		~Perfluorooctanoic acid (PFOA)	335-67-1	1.9E-05	c	7.8E-05	c					2.7E-06	c		4.0E-03	c	6.1E-05
				5.00E-04	R			V		1		1.36E+04	~Perfluoropropanoic acid (PFPrA)	422-64-0	3.9E+01	n	5.8E+02	n					9.8E+00	n		2.1E-03	n	
				1.00E-03	N					1	0.1		~Perfluorotetradecanoic acid (PFTeDA)	376-06-7	6.3E+01	n	8.2E+02	n					2.0E+01	n		9.4E+00	n	
				3.00E-04	N					1	0.1		~Perfluoroundecanoic acid (PFUDA)	2058-94-8	1.9E+01	n	2.5E+02	n					6.0E+00	n		4.5E-02	n	
				3.00E-04	P					1	0.1		~Potassium perfluorobutanesulfonate	29420-49-3	1.9E+01	n	2.5E+02	n					6.0E+00	n		3.0E-03	n	
				2.00E-03	I			V		1		9.61E+04	~Potassium perfluorobutanoate	2966-54-3	1.6E+02	n	2.3E+03	n					3.8E+01	n		1.3E-02	n	
				2.15E-09	I					1	0.1		~Potassium perfluorodecanoate	51604-85-4	1.4E-04	n	1.8E-03	n					4.3E-05	n		4.3E-08	n	
3.95E+01	D			1.00E-07	D					1	0.1		~Potassium perfluorooctanesulfonate	2795-39-3	6.3E-03	n	5.8E-02	c**					2.0E-03	c**		1.5E-05	c**	
				1.00E-03	I			V		1		8.99E+04	~Sodium perfluorobutanoate	2218-54-4	7.8E+01	n	1.2E+03	n					1.8E+01	n		6.4E-03	n	
				2.00E-09	I					1	0.1		~Sodium perfluorodecanoate	3830-45-3	1.3E-04	n	1.7E-03	n					4.2E-05	n		4.2E-08	n	
				5.00E-04	I					1	0.1		~Sodium perfluorohexanoate	2923-26-4	3.2E+01	n	4.1E+02	n					1.0E+01	n		2.4E-03	n	
				7.00E-04	I					1			Perchlorates															
				7.00E-04	I					1			~Ammonium Perchlorate	7790-98-9	5.5E+01	n	8.2E+02	n					1.4E+01	n				
				7.00E-04	I					1			~Lithium Perchlorate	7791-03-9	5.5E+01	n	8.2E+02	n					1.4E+01	n				
				7.00E-04	I					1			~Perchlorate and Perchlorate Salts	14797-73-0	5.5E+01	n	8.2E+02	n					1.4E+01	n	1.5E+01(G)			
				7.00E-04	I					1			~Potassium Perchlorate	7778-74-7	5.5E+01	n	8.2E+02	n					1.4E+01	n				
				7.00E-04	I					1			~Sodium Perchlorate	7601-89-0	5.5E+01	n	8.2E+02	n					1.4E+01	n				
2.20E-03	C	6.30E-07	C	5.00E-02	I					1	0.1		Permethrin	52645-53-1	3.2E+03	n	4.1E+04	n					1.0E+03	n		2.4E+02	n	
				2.40E-01	O					1	0.1		Phenacetin	62-44-2	2.5E+02	c	1.0E+03	c	4.5E+00	c	1.9E+01	c	3.4E+01	c		9.7E-03	c	
				2.40E-01	O					1	0.1		Phenmedipham	13684-63-4	1.5E+04	n	2.0E+05	nm					3.8E+03	n		2.1.		

Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) November 2024

Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³ -y) ¹	k e y	RfD ₀ (mg/kg-day)	k e y	RfC ₁ (mg/m ³)	k e y	o v o l u t a g e n	GIABS	ABS ₀	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)	
				1.00E+00	P				1			~Sodium trimetaphosphate	7785-84-4	7.8E+04	n	1.2E+06	nm					2.0E+04	n					
				1.00E+00	P				1			~Sodium tripolyphosphate	7758-29-4	7.8E+04	n	1.2E+06	nm					2.0E+04	n					
				1.00E+00	P				1			~Tetrapotassium phosphate	7320-34-5	7.8E+04	n	1.2E+06	nm					2.0E+04	n					
				1.00E+00	P				1			~Tetrasodium pyrophosphate	7722-88-5	7.8E+04	n	1.2E+06	nm					2.0E+04	n					
				3.25E+00	X				1			~Trialluminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5	2.5E+05	nm	3.8E+06	nm					6.5E+04	n					
				3.13E+00	X				1	0.1		~Triphosphoric acid, aluminum salt (1:1) [aluminum triphosphate]	13939-25-8	2.0E+05	nm	2.6E+06	nm					6.2E+04	n					
				1.00E+00	P				1			~Tripotassium phosphate	7778-53-2	7.8E+04	n	1.2E+06	nm					2.0E+04	n					
				1.00E+00	P				1			~Trisodium phosphate	7601-54-9	7.8E+04	n	1.2E+06	nm					2.0E+04	n					
				3.00E-04	I	3.00E-04	I	V	1			Phosphine	7803-51-2	2.3E+01	n	3.5E+02	n	3.1E-01	n	1.3E+00	n	5.7E-01	n					
				2.00E-05	I			V	1			Phosphorus	7723-14-0	1.6E+00	n	2.3E+01	n					4.0E-01	n		1.5E-03	n		
				2.00E-05	G			V	1			Phosphorus, white	12185-10-3	1.6E+00	n	2.3E+01	n					4.0E-01	n		1.5E-03	n		
1.40E-02	I	2.40E-06	C	2.00E-02	I				1	0.1		~Bis(2-ethylhexyl)phthalate	117-81-7	3.9E+01	c*	1.6E+02	c	1.2E+00	c	5.1E+00	c	5.6E+00	c*	6.0E+00	1.3E+00	c*	1.4E+00	
1.90E-03	P			2.00E-01	I				1	0.1		~Butyl Benzyl Phthalate	85-68-7	2.9E+02	c*	1.2E+03	c					1.6E+01	c		2.4E-01	c		
				1.00E+00	I				1	0.1		~Butylphthalyl Butylglycolate	85-70-1	6.3E+04	n	8.2E+05	nm					1.3E+04	n		3.1E+02	n		
				1.00E-01	I				1	0.1		~Dibutyl Phthalate	84-74-2	6.3E+03	n	8.2E+04	n					9.0E+02	n		2.3E+00	n		
				8.00E-01	I				1	0.1		~Diethyl Phthalate	84-66-2	5.1E+04	n	6.6E+05	nm					1.5E+04	n		6.1E+00	n		
				1.00E-01	I			V	1			~Dimethylterephthalate	120-61-6	7.8E+03	n	1.2E+05	nm					1.9E+03	n		4.9E-01	n		
				1.00E-02	P				1	0.1		~Octyl Phthalate, di-N-	117-84-0	6.3E+02	n	8.2E+03	n					2.0E+02	n		5.7E+01	n		
				5.00E-01	X				1	0.1		~Phthalic Acid, p-	100-21-0	3.2E+04	n	4.1E+05	nm					9.4E+03	n		3.4E+00	n		
				2.00E+00	I	2.00E-02	C		1	0.1		~Phthalic Anhydride	85-44-9	1.3E+05	nm	1.6E+06	nm	2.1E+01	n	8.8E+01	n	3.9E+04	n		8.5E+00	n		
				7.00E-02	I				1	0.1		Picloram	1918-02-1	4.4E+03	n	5.7E+04	n					1.4E+03	n		3.8E-01	n	1.4E-01	
				1.00E-04	X				1	0.1		Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	6.3E+00	n	8.2E+01	n					2.0E+00	n		1.3E-03	n		
				2.00E-03	X				1	0.1		Picric Acid (2,4,6-Trinitrophenol)	88-89-1	1.3E+02	n	1.6E+03	n					4.0E+01	n		1.9E-01	n		
				7.30E-04	O				1	0.1		Pirimiphos, Methyl	29232-93-7	4.6E+01	n	6.0E+02	n					8.9E+00	n		8.4E-03	n		
3.00E+01	C	8.60E-03	C	7.00E-06	H				1	0.1		Polybrominated Biphenyls	36355-01-8	1.8E-02	c*	7.7E-02	c*	3.3E-04	c	1.4E-03	c	2.6E-03	c*					
												Polychlorinated Biphenyls (PCBs)																
7.00E-02	G	2.00E-05	G	7.00E-05	I			V	1	0.14		~Aroclor 1016	12674-11-2	4.1E+00	n	2.7E+01	c**	1.4E-01	c	6.1E-01	c	2.2E-01	c**		2.1E-02	c**		
2.00E+00	G	5.71E-04	G					V	1	0.14		~Aroclor 1221	11104-28-2	2.0E-01	c	8.3E-01	c	4.9E-03	c	2.1E-02	c	4.7E-03	c		8.0E-05	c		
2.00E+00	G	5.71E-04	G					V	1	0.14		~Aroclor 1232	11141-16-5	1.7E-01	c	7.2E-01	c	4.9E-03	c	2.1E-02	c	4.7E-03	c		8.0E-05	c		
2.00E+00	G	5.71E-04	G					V	1	0.14		~Aroclor 1242	53469-21-9	2.3E-01	c	9.5E-01	c	4.9E-03	c	2.1E-02	c	7.8E-03	c		1.2E-03	c		
2.00E+00	G	5.71E-04	G					V	1	0.14		~Aroclor 1248	12672-29-6	2.3E-01	c	9.4E-01	c	4.9E-03	c	2.1E-02	c	7.8E-03	c		1.2E-03	c		
2.00E+00	G	5.71E-04	G	2.00E-05	I			V	1	0.14		~Aroclor 1254	11097-69-1	2.4E-01	c**	9.7E-01	c*	4.9E-03	c	2.1E-02	c	7.8E-03	c*		2.0E-03	c*		
2.00E+00	G	5.71E-04	G					V	1	0.14		~Aroclor 1260	11096-82-5	2.4E-01	c	9.9E-01	c	4.9E-03	c	2.1E-02	c	7.8E-03	c		5.5E-03	c		
				6.00E-04	X			V	1	0.14		~Aroclor 5460	11126-42-4	3.5E-01	n	4.4E+02	n					1.2E+01	n		2.0E+00	n		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Heptachlorobiphenyl, 2,3,3',4,4',5,5'-(PCB 189)	39635-31-9	1.3E-01	c*	5.2E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		2.8E-03	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Hexachlorobiphenyl, 2,3',4,4',5,5'-(PCB 167)	52663-72-6	1.2E-01	c*	5.1E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.7E-03	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Hexachlorobiphenyl, 2,3,3',4,4',5'-(PCB 157)	69782-90-7	1.2E-01	c*	5.0E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.7E-03	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Hexachlorobiphenyl, 2,3,3',4,4',5-(PCB 156)	38380-08-4	1.2E-01	c*	5.0E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.7E-03	c		
3.90E+03	W	1.14E+00	W	2.33E-08	W	1.33E-06	W	V	1	0.14		~Hexachlorobiphenyl, 3,3',4,4',5,5'-(PCB 169)	32774-16-6	1.2E-04	c*	5.1E-04	c*	2.5E-06	c	1.1E-05	c	4.0E-06	c		1.7E-06	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Pentachlorobiphenyl, 2,3,4,4',5-(PCB 123)	65510-44-3	1.2E-01	c*	4.9E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.0E-03	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Pentachlorobiphenyl, 2,3',4,4',5-(PCB 118)	31508-00-6	1.2E-01	c*	4.9E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.0E-03	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Pentachlorobiphenyl, 2,3,3',4,4'-(PCB 105)	32598-14-4	1.2E-01	c*	4.9E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.0E-03	c		
3.90E+00	W	1.14E-03	W	2.33E-05	W	1.33E-03	W	V	1	0.14		~Pentachlorobiphenyl, 2,3,4,4',5-(PCB 114)	74472-37-0	1.2E-01	c*	5.0E-01	c*	2.5E-03	c	1.1E-02	c	4.0E-03	c		1.0E-03	c		
1.30E+04	W	3.80E+00	W	7.00E-09	W	4.00E-07	W	V	1	0.14		~Pentachlorobiphenyl, 3,3',4,4',5-(PCB 126)	57465-28-8	3.6E-05	c*	1.5E-04	c*	7.4E-07	c	3.2E-06	c	1.2E-06	c		3.0E-07	c		
2.00E+00	I	5.71E-04	I					V	1	0.14		~Polychlorinated Biphenyls (high risk)	1336-36-3	2.3E-01	c	9.4E-01	c	4.9E-03	c	2.1E-02	c			5.0E-01	5.0E-01	6.8E-03	c	7.8E-02
4.00E-01</																												

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; T = ATSDR DRAFT; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; R = ORD; N = Wt; W = TEF applied; E = RPF applied; G = see user's guide; c = cancer; n = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded; V = volatile; M = mutagen.																													
Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Groundwater SSLs				
SFO (mg/kg-day) ⁻¹	k _e y	IUR (ug/m ³ -y) ⁻¹	k _e y	RfD _a (mg/kg-day)	k _e y	RfC _i (mg/m ³)	k _e y	V _o I	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)	
1.92E-01	O			1.30E-02	I						1	0.1	Propachlor	1918-16-7	8.2E+02	n	1.1E+04	n					2.5E+02	n			1.5E-01	n	
				5.00E-03	I						1	0.1	Propanil	709-98-8	3.2E+02	n	4.1E+03	n					8.2E+01	n		4.5E-02	n		
				4.00E-02	O						1	0.1	Proparlot	2312-35-8	2.8E+00	c	1.2E+01	c					1.6E-01	c		1.1E-02	c		
				2.00E-03	I			V				1.11E+05	Propargyl Alcohol	107-19-7	1.6E+02	n	2.3E+03	n					4.0E+01	n		8.1E-03	n		
				2.00E-02	I						1	0.1	Propazine	139-40-2	1.3E+03	n	1.6E+04	n					3.4E+02	n		3.0E-01	n		
				2.00E-02	I						1	0.1	Propham	122-42-9	1.3E+03	n	1.6E+04	n					3.5E+02	n		2.2E-01	n		
2.40E-01	I	3.70E-06	I	1.00E-01	O						1	0.1	Propiconazole	60207-90-1	6.3E+03	n	8.2E+04	n					1.6E+03	n		5.3E+00	n		
						8.00E-03	I	V			1		Propionaldehyde	123-38-6	7.5E+01	n	3.1E+02	n	8.3E+00	n	3.5E+01	n	1.7E+01	n		3.4E-03	n		
						1.00E-01	X		V		1		Propyl benzene	103-65-1	3.8E+03	ns	2.4E+04	ns	1.0E+03	n	4.4E+03	n	6.6E+02	n		1.2E+00	n		
						3.00E+00	C	V			1		Propylene	115-07-1	2.2E+03	ns	9.3E+03	ns	3.1E+03	n	1.3E+04	n	6.3E+03	n		6.0E+00	n		
						2.00E+01	P				1	0.1	Propylene Glycol	57-55-6	1.3E+06	nm	1.6E+07	nm					4.0E+05	n		8.1E+01	n		
						2.72E-04	A				1	0.1	Propylene Glycol Dinitrate	6423-43-4	3.9E+05	nm	1.6E+06	nm	2.8E-01	n	1.2E+00	n							
2.40E-01	I	3.70E-06	I	7.00E-01	H	2.00E+00	I	V			1		Propylene Glycol Monomethyl Ether	107-98-2	4.1E+04	n	3.7E+05	nms	2.1E+03	n	8.8E+03	n	3.2E+03	n		6.5E-01	n		
						3.00E-02	I	V			1		Propylene Oxide	75-56-9	2.1E+00	c	9.7E+00	c	7.6E-01	c*	3.3E+00	c*	2.7E-01	c		5.6E-05	c		
						1.00E-03	I		V		1		Pyridine	110-86-1	7.8E+01	n	1.2E+03	n					2.0E+01	n		6.8E-03	n		
						5.00E-04	I				1	0.1	Quinalphos	13593-03-8	3.2E+01	n	4.1E+02	n					5.1E+00	n		4.3E-02	n		
						9.00E-03	I				1	0.1	Quinoline	91-22-5	1.8E-01	c	7.7E-01	c					2.4E-02	c		7.8E-05	c		
											1	0.1	Quizalofop-ethyl	76578-14-8	5.7E+02	n	7.4E+03	n					1.2E+02	n		1.9E+00	n		
3.00E+00	I					3.00E+04	A				1		Refractory Ceramic Fibers (units in fibers)	E715557					3.1E+04	G	1.3E+05	G							
						3.00E-02	I				1	0.1	Resmethrin	10453-86-8	1.9E+03	n	2.5E+04	n					6.7E+01	n		4.2E+01	n		
						5.00E-02	H		V		1		Ronnel	299-84-3	3.9E+03	n	5.8E+04	n					4.1E+02	n		3.7E+00	n		
						4.00E-03	I				1	0.1	Rotenone	83-79-4	2.5E+02	n	3.3E+03	n					6.1E+01	n		3.2E+01	n		
											1	0.1	Safrole	94-59-7	5.5E-01	c	1.0E+01	c	1.6E-02	c	1.9E-01	c	9.6E-02	c		5.9E-05	c		
						5.00E-03	I				1		Selenious Acid	7783-00-8	3.9E+02	n	5.8E+03	n					1.0E+02	n		5.2E-01	n	2.6E-01	
2.20E-01	C	6.30E-05	C	5.00E-03	I	2.00E-02	C				1		Selenium Sulfide	7782-49-2	3.9E+02	n	5.8E+03	n	2.1E+01	n	8.8E+01	n	1.0E+02	n		5.0E+01	n		
						5.00E-03	C	2.00E-02	C		1		Sethoxydim	7446-34-6	3.9E+02	n	5.8E+03	n	2.1E+01	n	8.8E+01	n	1.0E+02	n					
						1.40E-01	O				1	0.1	Silica (crystalline, respirable)	74051-80-2	8.8E+03	n	1.1E+05	nm					1.6E+03	n		1.4E+01	n		
								3.00E-03	C		1		Silver	7631-86-9	4.3E+06	nm	1.8E+07	nm	3.1E+00	n	1.3E+01	n							
						5.00E-03	I			0.04			Simazine	7440-22-4	3.9E+02	n	5.8E+03	n					6.1E-01	c		8.0E-01	n		
						1.30E-02	I				1	0.1	Sodium Acifluorfen	122-34-9	4.5E+00	c*	1.9E+01	c					6.1E-01	c		3.0E-04	c	2.0E-03	
2.70E-01	H			4.00E-03	I						1		Sodium Azide	62476-59-9	8.2E+02	n	1.1E+04	n					2.6E+02	n		2.1E+00	n		
						3.00E-02	I				1	0.1	Sodium Diethyldithiocarbamate	26628-22-8	3.1E+02	n	4.7E+03	n					8.0E+01	n					
											1		Sodium Fluoride	148-18-5	2.0E+00	c	8.5E+00	c					2.9E-01	c		1.8E-04	c		
						5.00E-02	A	1.40E-02	C		1		Sodium Fluoroacetate	7681-49-4	3.9E+03	n	5.8E+04	n	1.5E+01	n	6.1E+01	n	1.0E+03	n		4.0E+03	n	6.0E+02	
						2.00E-05	I				1	0.1	Sodium Metavanadate	62-74-8	1.3E+00	n	1.6E+01	n					4.0E-01	n		8.1E-05	n		
						1.00E-03	H				1		Sodium Tungstate	13718-26-8	7.8E+01	n	1.2E+03	n					2.0E+01	n					
2.40E-02	H			8.00E-04	P						1		Sodium Tungstate Dihydrate	13472-45-2	6.3E+01	n	9.3E+02	n					1.6E+01	n					
						8.00E-04	P				1		Strofos (Tetrachlorovinphos)	10213-10-2	6.3E+01	n	9.3E+02	n					1.6E+01	n					
						3.00E-02	I				1	0.1	Styrene	961-11-5	2.3E+01	c*	9.6E+01	c					2.8E+00	c		8.2E-03	c		
						6.00E-01	I				1		Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	7440-24-6	4.7E+04	n	7.0E+05	nm					1.2E+04	n		4.2E+02	n		
						3.00E-04	I				1	0.1	Sulfone	57-24-9	1.9E+01	n	2.5E+02	n					5.9E+00	n		6.5E-02	n		
						2.00E-01	I	1.00E+00	I	V	1		Styrene	100-42-5	6.0E+03	ns	3.5E+04	ns	1.0E+03	n	4.4E+03	n	1.2E+03	n		1.0E+02	n	1.1E-01	
5.00E-03	C	1.30E-06	C	3.00E-03	P						1	0.1	Styrene-Acrylonitrile (SAN) Trimer (THNA isomer)	57964-39-3	1.9E+02	n	2.5E+03	n					4.8E+01	n					
						3.00E-03	P				1	0.1	Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6	1.9E+02	n	2.5E+03	n					4.8E+01	n					
						1.00E-03	P	2.00E-03	X		1	0.1	Sulfolane	126-33-0	6.3E+01	n	8.2E+02	n	2.1E+00	n	8.8E+00	n	2.0E+01	n		4.4E-03	n		
						8.00E-04	P				1	0.1	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	5.1E+01	n	6.6E+02	n					1.1E+01	n		6.5E-02	n		
								1.00E-03	C	V		1		Sulfur Trioxide	7446-11-9	1.4E+06	nm	6.0E+06	nm	1.0E+00	n	4.4E+00	n	2.1E+00	n		1.5E-02	c	
						1.00E-03	C				1		Sulfuric Acid	7664-93-9	1.4E+06	nm	6.0E+06	nm	1.0E+00	n	4.4E+00	n	2.1E+00	n		3.9E-01	n		
2.50E-02	I	7.10E-06	I	5.00E-02	H						1	0.1	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	2.2E+01	c	9.2E+01	c	4.0E-01	c	1.7E+00	c	1.3E+00	c		1.5E-02	c		
						7.00E-02	I				1	0.1	Tebuthiuron	34014-18-1	4.4E+03	n	5.7E+04	n					1.4E+03	n		7.6E+01	n		
						2.00E-02	H				1	0.1	Temephos	3383-96-8	1.3E+03	n	1.6E+04	n					4.0E+02	n					
						1.30E-02	I				1	0.1	Terbacil	5902-51-2	6.2E+02	n	1.1E+04	n					2.5E+02	n		7.5E-02	n		
						2.50E-05	H		V		1		Terbutos	13071-79-9	2.0E+00	n	2.9E+01	n					2.4E-01	n		5.2E-04	n		
						1.00E-03	I				1	0.1	Terbutryn	886-50-0	6.3E+01	n	8.2E+02	n					1.3E+01	n		1.9E-02	n		
5.00E-03	C	1.30E-06	C					V			1		Tert-Butyl Acetate	540-88-5	8.1E+00	c	3.6E+01	c	2.2E+00	c	9.4E+00	c	3.3E+00	c		7.6E-04	c		
						3.00E-05	P				1	0.1	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1	6.3E+00	n	8.2E+01	n					2.0E+00	n		5.3E-02	n		
											1		Tetrachlorobenzene, 1,2,4,5-	95-94-3	2.3E+00	n	3.5E+01	n					1.7E-01	n		7.9E-04	n		
						2.60E-02	I	7.40E-06	C		1		Tetrachloroethane, 1,1,1,2-	630-20-6	2.0E+00	c	8.8E+00	c	3.8E-01	c	1.7E+00	c	5.7E-01	c		2.2E-04	c		
						2.00E-01	I	5.80E-05	O		1		Tetrachloroethane, 1,1,2,2-	79-34-5	6.0E-01	c	2.7E+00	c	4.8E-02	c	2.1.								

Toxicity and Chemical-specific Information														Contaminant		Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ¹	k e y	IUR (ug/m ³ -y)	k e y	RfD _c (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l	mutagen	GIABS	ABS _s	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)	
1.16E-02	O			3.00E-04	H					1	0.1		Thiofanox	39196-18-4	1.9E+01	n	2.5E+02	n					5.3E+00	n		1.8E-03	n		
				1.60E-01	O					1	0.1		Thiophanate, Methyl	23564-05-8	4.7E+01	c	2.0E+02	c					6.7E+00	c		5.7E-03	c		
				1.50E-02	O					1	0.1		Thiram	137-26-8	9.5E+02	n	1.2E+04	n					2.9E+02	n		4.2E-01	n		
				6.00E-01	H					1			Tin	7440-31-5	4.7E+04	n	7.0E+05	nm					1.2E+04	n		3.0E+03	n		
3.90E-02	C	1.10E-05	C	8.00E-02	I	1.00E-04	A	V	1			8.18E+02	Titanium Tetrachloride	7550-45-0	1.4E+05	nm	6.0E+05	nm	1.0E-01	n	4.4E-01	n	2.1E-01	n		1.0E+03	7.6E-01	n	6.9E-01
				5.00E+00	I	5.00E+00	I	V	1																2.1E+03	n			
3.90E-02	C	1.10E-05	C	8.00E-06	C	V				1			Toluene	108-88-3	4.9E+03	ns	4.7E+04	ns	5.2E+03	n	2.2E+04	n	1.1E+03	n			2.5E-04	n	
1.80E-01	X			1.00E-04	X					1	0.1		Toluene-2,4-diisocyanate	584-84-9	6.4E+00	n	2.7E+01	n	8.3E-03	n	3.5E-02	n	1.7E-02	n			2.6E-04	n	
				2.00E-04	X					1	0.1		Toluene-2,6-diisocyanate	91-08-7	5.3E+00	n	2.2E+01	n	8.3E-03	n	3.5E-02	n	1.7E-02	n			6.2E-04	n	
				2.00E-04	X					1	0.1		Toluenediamine, 2,3-	2687-25-4	6.3E+00	n	8.2E+01	n					2.0E+00	n			1.3E-04	c**	
1.60E-02	P	5.10E-05	C	1.00E-04	X					1	0.1		Toluenediamine, 2,5-	95-70-5	3.0E+00	c**	1.3E+01	c*					4.3E-01	c**			6.2E-04	n	
				5.00E-03	P						1	0.1		Toluenediamine, 3,4-	496-72-0	6.3E+00	n	8.2E+01	n					2.0E+00	n			2.3E-02	n
3.00E-02	P			4.00E-03	X					1	0.1		Toluic Acid, p-	99-94-5	3.2E+02	n	4.1E+03	n					9.0E+01	n			2.0E-03	c	
				3.00E+00	P					1			Toluidine, o- (Methylaniline, 2-)	95-53-4	3.4E+01	c	1.4E+02	c	5.5E-02	c	2.4E-01	c	4.7E+00	c			1.1E-03	c*	
				5.00E-03	P	4.00E-01	P	V		1			Toluidine, p-	106-49-0	1.8E+01	c*	7.7E+01	c*					2.5E+00	c*			2.4E+03	n	
				5.00E-03	P	4.00E-01	P	V		1			Total Petroleum Hydrocarbons (Aliphatic High)	E1790670	2.3E+05	nms	3.5E+06	nms					6.0E+04	n			2.0E-02	n	
1.10E+00	I	3.20E-04	I	1.00E-02	X	1.00E-01	P	V		1		6.86E+00	Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668	9.6E+01	ns	4.4E+02	ns	1.0E+02	n	4.4E+02	n	1.0E+02	n			1.5E+00	n	
				3.00E-04	P	2.00E-06	P		1	0.13	6.86E+00	Total Petroleum Hydrocarbons (Aromatic High)	E1790676	1.8E+01	n	2.2E+02	n	2.1E-03	n	8.8E-03	n	6.0E+00	n			7.1E+00	n		
				1.00E-02	P	6.00E-02	P	V		1	2.31E+02	Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674	3.0E+02	ns	1.7E+03	ns	6.3E+01	n	2.6E+02	n	5.7E+01	n			8.3E-02	n		
				3.00E-05	X					1	0.1		Toxaphene	8001-35-2	4.9E-01	c*	2.1E+00	c*	8.8E-03	c	3.8E-02	c	7.1E-02	c*	3.0E+00	1.1E-02	c*	4.6E-01	
7.17E-02	O			7.50E-03	I					1	0.1		Toxaphene, Weathered	E1841606	1.9E+00	n	2.5E+01	n					6.0E-01	n			9.3E-02	n	
				3.00E-04	A		V		1			Tralometrin	66841-25-6	4.7E+02	n	6.2E+03	n					1.5E+02	n			5.8E+01	n		
				8.00E+01	X				1	0.1		Tri-n-butyltin	688-73-3	2.3E+01	n	3.5E+02	n					3.7E+00	n			8.2E-02	n		
				3.40E-02	O				1	0.1		Triacetin	102-76-1	5.1E+06	nm	6.6E+07	nm					1.6E+06	n			4.5E+02	n		
9.00E-03	P			1.00E-02	P					1	0.1		Triadimefon	43121-43-3	2.1E+03	n	2.8E+04	n					6.3E+02	n			5.0E-01	n	
				1.00E-02	I				1	0.1		Triallate	2303-17-5	9.7E+00	c	4.6E+01	c					4.7E-01	c			1.0E-03	c		
				8.00E-03	I				1	0.1		Triasulfuron	82097-50-5	6.3E+02	n	8.2E+03	n					2.0E+02	n			2.1E-01	n		
				5.00E-03	I			V	1			Tribenuron-methyl	101200-48-0	5.1E+02	n	6.6E+03	n					1.6E+02	n			6.1E-02	n		
7.70E-03	I			9.00E-03	X					1	0.1		Tribromobenzene, 1,2,4-	615-54-3	3.9E+02	n	5.8E+03	n					4.5E+01	n			6.4E-02	n	
				2.00E-04	O				1	0.1		Tribromophenol, 2,4,6-	118-79-6	5.7E+02	n	7.4E+03	n					1.2E+02	n			2.2E-01	n		
				2.00E-04	O				1	0.1		Tribufos	78-48-8	1.3E+01	n	1.6E+02	n					5.7E-01	n			2.8E-03	n		
				1.00E-02	P				1	0.1		Tributyl Phosphate	126-73-8	6.0E+01	c*	2.6E+02	c*					5.2E+00	c*			2.5E-02	c*		
7.00E-02	I			3.00E-04	P					1	0.1		Tributyltin Compounds	E1790679	1.9E+01	n	2.5E+02	n					6.0E+00	n			2.9E+02	n	
				3.00E-04	I				1	0.1		Tributyltin Oxide	56-35-9	1.9E+01	n	2.5E+02	n					5.7E+00	n			2.9E+02	n		
				3.00E+01	I	5.00E+00	P	V		1	0.1	9.10E+02	Trichloramine	10025-85-1	6.7E+03	ns	2.8E+04	ns	5.2E+03	n	2.2E+04	n	1.0E+04	n	4.0E+03(G)	2.6E+01	n		
				2.00E-02	I				1				Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	7.8E+00	c	3.3E+01	c					1.1E+00	c	6.0E+01(G)	2.2E-04	c	1.2E-02	
2.90E-02	H			3.00E-05	X					1	0.1		Trichloroacetic Acid	76-03-9	1.9E+01	c	7.9E+01	c					2.7E+00	c			7.4E-03	c	
				8.00E-04	X				1	0.1		Trichloroaniline HCl, 2,4,6-	33663-50-2	1.9E+00	n	2.5E+01	n					4.0E-01	n			3.6E-03	n		
				8.00E-04	X				1			Trichloroaniline, 2,4,6-	634-93-5	6.3E+01	n	9.3E+02	n					7.0E+00	n			2.1E-02	n		
				1.00E-02	P	2.00E+00	I	2.00E-03	P	V	1		4.04E+02	Trichlorobenzene, 1,2,4-	120-82-1	2.4E+01	c**	1.1E+02	c**	2.1E+00	n	8.8E+00	n	1.2E+00	c**	7.0E+01	3.4E-03	c**	2.0E-01
5.70E-02	I	1.60E-05	I	4.00E-03	I	5.00E+00	I	V	1		6.40E+02	Trichloroethane, 1,1,1-	71-55-6	8.1E+03	ns	3.6E+04	ns	5.2E+03	n	2.2E+04	n	8.0E+03	n	2.0E+02	2.8E+00	n	7.0E-02		
				5.00E-04	I	2.00E-04	X	V	1		2.16E+03	Trichloroethane, 1,1,2-	79-00-5	1.1E+00	c**	5.0E+00	c**	1.8E-01	c**	7.7E-01	c**	2.8E-01	c**	5.0E+00	8.9E-05	c**	1.6E-03		
				5.00E-04	I	2.00E-03	I	V	M		6.92E+02	Trichloroethylene	79-01-6	9.4E+01	c**	6.0E+00	c**	4.8E-01	c**	3.0E+00	c**	4.9E-01	c**	5.0E+00	1.8E-04	c**	1.8E-03		
				3.00E-01	I			V	1		1.23E+03	Trichlorofluoromethane	75-69-4	2.3E+04	ns	3.5E+05	nms					5.2E+03	n			3.3E+00	n		
1.10E-02	I	3.10E-06	I	1.00E-03	P					1	0.1		Trichlorophenol, 2,4,5-	95-95-4	6.3E+03	n	8.2E+04	n					1.2E+03	n			4.0E+00	n	
				1.00E-02	I					1	0.1		Trichlorophenol, 2,4,6-	88-06-2	4.9E+01	c**	2.1E+02	c**	9.1E-01	c	4.0E+00	c	4.1E+00	c**			4.0E-03	c**	
				8.00E-03	I					1	0.1		Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	6.3E+02	n	8.2E+03	n					1.6E+02	n			6.8E-02</		

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; T = ATSDR DRAFT; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; R = ORD; N = WI; W = TEF applied; E = RPF applied; G = see user's guide; c = cancer; n = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded; V = volatile; M = mutagen.																													
Toxicity and Chemical-specific Information												Contaminant				Screening Levels										Protection of Groundwater SSLs			
SFO (mg/kg-day) ⁻¹	k e y	IUR (ug/m ³ -y) ⁻¹	k e y	RfD _o (mg/kg-day)	k e y	RfC _i (mg/m ³)	k e y	v o l u t a g e n	GIABS	ABS _d	C _{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m ³)	key	Industrial Air (ug/m ³)	key	Tap Water (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	key	MCL-based SSL (mg/kg)		
7.20E-01	I	4.40E-06	I	3.00E-03	I	5.11E-02	A	V	M	1	3.92E+03	Vinyl Chloride	75-01-4	5.9E-02	c	1.7E+00	c	1.7E-01	c	2.8E+00	c*	1.9E-02	c	2.0E+00	6.5E-06	c	6.9E-04		
				3.00E-04	I					1	0.1	Warfarin	81-81-2	1.9E+01	n	2.5E+02	n					5.6E+00	n		5.9E-03	n			
				2.00E-01	G	1.00E-01	G	V		1	3.88E+02	Xylene, m-	108-38-3	5.5E+02	ns	2.4E+03	ns	1.0E+02	n	4.4E+02	n	1.9E+02	n		1.9E-01	n			
				2.00E-01	G	1.00E-01	G	V		1	4.34E+02	Xylene, o-	95-47-6	6.4E+02	ns	2.8E+03	ns	1.0E+02	n	4.4E+02	n	1.9E+02	n		1.9E-01	n			
				2.00E-01	G	1.00E-01	G	V		1	3.90E+02	Xylene, p-	106-42-3	5.6E+02	ns	2.4E+03	ns	1.0E+02	n	4.4E+02	n	1.9E+02	n		1.9E-01	n			
				2.00E-01	I	1.00E-01	I	V		1	2.60E+02	Xylenes	1330-20-7	5.8E+02	ns	2.5E+03	ns	1.0E+02	n	4.4E+02	n	1.9E+02	n	1.0E+04	1.9E-01	n	9.9E+00		
				3.00E-04	I					1		Zinc Phosphide	1314-84-7	2.3E+01	n	3.5E+02	n					6.0E+00	n						
				3.00E-01	I					1		Zinc and Compounds	7440-66-6	2.3E+04	n	3.5E+05	nm					6.0E+03	n		3.7E+02	n			
				5.00E-02	I					1	0.1	Zineb	12122-67-7	3.2E+03	n	4.1E+04	n					9.9E+02	n		2.9E+00	n			
				8.00E-05	X					1		Zirconium	7440-67-7	6.3E+00	n	9.3E+01	n					1.6E+00	n		4.8E+00	n			



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stefanie K. Taillon
Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director

April 29, 2025

Mr. Matt Alberts
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

VIA ELECTRONIC MAIL

**Re: Annual Groundwater Monitoring Report
Hazardous Waste Management Units 5 and 16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. Alberts:

The Virginia Department of Environmental Quality (DEQ) has completed review of the Radford Army Ammunitions Plant (RFAAP) electronic submission of the 2024 Annual Groundwater Monitoring Report for Hazardous Waste Management Units (HWMU) 5 and 16, dated December 2024, and received February 26, 2025. The 2024 Annual Groundwater Monitoring Report was submitted in accordance with the requirements specified in the Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16.

The Department has no comments on the submittal and concurs with the recommendation to continue monitoring in accordance with the Corrective Action Groundwater Monitoring Program. If you have any questions regarding this correspondence, you may contact me at the email address or phone number listed below.

Sincerely,

A handwritten signature in blue ink, appearing to read "Kurt Kochan".

Kurt Kochan, Remediation Project Manager
Virginia Department of Environmental Quality
Central Office
1111 E. Main Street, Suite 1400
Richmond, VA 23219
kurt.kochan@deq.virginia.gov
703-232-4200

cc: RFAAP Correspondence File
Melissa Lincoln, BAE
Tara Mason, Sarah Dyer, DEQ-CO
Nikki Herschler, DEQ-BRRO
Mike Lawless, TRC Engineers, Inc.

ORDNANCE SYSTEMS INC.
Radford Army Ammunition Plant
4050 Pepper's Ferry Road
Radford Virginia 24141

August 4, 2025

Mr. Kurt Kochan
Office of Remediation Programs
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, Virginia 23219

Subject: Semiannual and Annual Corrective Action Groundwater Monitoring Event Notification – HWMU-5
Semiannual Detection Notification – HWMU-16
Post Closure Care Permit HWMUs 5 & 16
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730

Dear Mr. Kochan:

The following information pertains to routine detection notification for the recent semiannual groundwater monitoring event for Hazardous Waste Management Units (HWMUs) 5 and 16. Final results were received from the laboratory on July 30, 2025.

Groundwater Monitoring Event Notification - HWMU-5 and HWMU-16

During Second Quarter 2025, BAE Systems, Ordnance Systems Inc. (BAE) completed semiannual groundwater monitoring for HWMUs 5 and 16 located at the Radford Army Ammunition Plant (RFAAP) in Radford, Virginia. The Second Quarter 2025 event served as the semiannual and annual Corrective Action (CA) groundwater monitoring events for HWMU-5 conducted in accordance with the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* (reissued August 16, 2014) with subsequent Class 1 Permit modifications. The Second Quarter 2025 groundwater monitoring event also served as the semiannual Compliance groundwater monitoring event for HWMU-16. The Second Quarter 2025 groundwater monitoring event was conducted using revised detection limits (DLs) and quantitation limits (QLs), where applicable, as specified in the Class 1 Permit Modification approved by the Virginia Department of Environmental Quality (VDEQ) in electronic correspondence dated May 5, 2021. Total silver was added to the HWMU-16 Compliance Monitoring List as directed by VDEQ in correspondence dated May 8, 2024. Additionally, HWMU-16 total cobalt data were evaluated using the revised alternate source demonstration (ASD) for total cobalt in groundwater at HWMU-16 approved by the VDEQ in electronic correspondence dated September 13, 2021. The following information summarizes the findings of the Second Quarter 2025 semiannual monitoring activities at each Unit.

HWMU-5

For this event, all wells in the CA groundwater monitoring network were sampled for the constituents listed in Appendix J to Permit Attachment 2 (Groundwater Corrective Action Targeted Constituents - GPS and Semiannual Monitoring List for HWMU-5). The CA groundwater monitoring network for HWMU-5 consists of upgradient well 5W8B, point of compliance (POC) wells 5W5B, 5W7B, 5WC21, 5WC22, and 5WC23, and plume monitoring well 5W12A. During Second Quarter 2025, groundwater samples collected from all of the wells in the CA groundwater monitoring network were analyzed for the CA Targeted Constituents: trichloroethene (TCE) and its daughter products 1,1-dichloroethene (1,1-DCE), *cis*-1,2-dichloroethene (*c*DCE), *trans*-1,2-dichloroethene (*t*DCE), and vinyl chloride (VC). Additionally, samples collected from all of the wells in the CA groundwater monitoring network were analyzed for total cobalt, which was added to the list of CA Targeted Constituents as directed by the VDEQ on May 4, 2011.

TCE was detected in POC wells 5WC21, 5WC22 and 5WC23 at concentrations of 1.3 ug/l, 1.4 ug/l and 2.6 ug/l, respectively, which are less than the groundwater protection standard (GPS) of 5 ug/l.

Total cobalt was detected in POC well 5WC21 at a concentration of 16 ug/l, which is greater than the GPS of 7 ug/l. Total cobalt was detected in POC well 5WC22 at a concentration of 6.5 ug/l, which is less than the GPS of 7 ug/l. Total cobalt was also detected in POC well 5W7B at a concentration less than the QL of 5 ug/l.

TCE and total cobalt were not detected in any of the other wells in the CA groundwater monitoring network. Additionally, TCE daughter products were not detected in any of the wells comprising the CA groundwater monitoring network.

This event also served as the annual monitoring event in which the POC wells at HWMU-5 were sampled for the constituents listed in Appendix K to Permit Attachment 2 (Groundwater Corrective Action Annual Monitoring List). Annual monitoring for the constituents listed in Appendix K is required in order to evaluate whether additional hazardous constituents that are not the targets for the current CA (e.g., TCE and its daughter products and total cobalt) are present at concentrations greater than their respective GPS. No other additional hazardous constituents that are not targets for the current CA for the Unit were detected at concentrations greater than their respective GPS during Second Quarter 2025.

A footnote presented in Appendix K to Permit Attachment 2 indicates that verification is required for constituents detected at concentrations less than the QL if their associated GPS are 1) based on background values equal to the QL, and 2) are greater than the applicable risk-based concentrations (i.e., VDEQ Alternate Concentration Limit (ACL) or USEPA Regional Screening Level (RSL)). In these instances, verification must be conducted using an alternate low-level analytical method in order to confirm or refute the observed initial detections if the QL achievable by that method is less than, or equal to, the ACL or RSL for the subject constituent. If a concentration greater than the low-level analytical method QL is observed above the ACL or RSL, then a revised background concentration will be established using the low-level analytical method, if appropriate, and the GPS for that constituent will be updated, if warranted. This applies to p-nitroaniline (a.k.a., 4-nitroaniline) and nitrobenzene listed on Appendix K to Permit Attachment 2; however, only p-nitroaniline has an alternate low level analytical method that can achieve a QL less than, or equal to, the ACL or RSL which could be used for additional verification. For this event, p-nitroaniline was not detected at or above the laboratory method detection limit and no further action is needed.

HWMU-16

In accordance with the Permit, the groundwater data from the POC wells at HWMU-16 were compared to the established GPS for the Unit listed in Appendix G of Permit Attachment 3 (modified to add 1,1-dichloroethene in Class 1 Permit Modification approved September 12, 2014; modified to add tetrahydrofuran in Class 1 Permit Modification approved December 1, 2016; modified to add vinyl chloride in Class 1 Permit Modification approved May 5, 2021; and modified to add total silver as directed by VDEQ in correspondence dated May 8, 2024). The following constituents were detected in the POC wells for HWMU 16 at concentrations greater than their respective GPS:

- Total cobalt was detected in POC well 16WC1A and 16MW9 at concentrations of 12 ug/l and 5.4 ug/l, respectively, which are greater than the Permit-specified GPS of 5 ug/l. As directed by the VDEQ in electronic correspondence dated October 26, 2018, RFAAP also compared the total cobalt concentrations in POC wells 16WC1A and 16MW9 to the latest (effective January 2, 2025) ACL for cobalt of 6 ug/l. Additionally, the total cobalt data were evaluated using the revised ASD for total cobalt in groundwater at HWMU-16 for POC wells 16MW9, 16WC1A, and 16WC1B approved by the VDEQ in electronic correspondence dated September 13, 2021. Based on the conclusions of the VDEQ-approved ASD, the Second Quarter 2025 total cobalt concentrations detected in POC wells 16WC1A and 16MW9 appear to be consistent with natural variation in local groundwater and are not indicative of a release from the Unit. Therefore, a verification event will not be conducted for the Second Quarter 2025 total cobalt concentration detected greater than the Permit-specified GPS in POC wells 16WC1A and 16MW9. Based on VDEQ correspondence dated September 13, 2021, a separate ASD will not be required. Total cobalt was not detected at concentrations greater than the Permit-specified GPS or the latest VDEQ ACL in the other POC wells during Second Quarter 2025.

No other constituents were detected in the upgradient well or in the POC wells at concentrations greater than their respective GPS during Second Quarter 2025.

The following constituents were detected at concentrations greater than their respective background concentrations in plume monitoring wells:

- Total barium was detected in plume monitoring wells 16-2, 16-3, 16-5, and 16Spring at concentrations of 250 ug/l, 770 ug/l, 180 ug/l, and 230 ug/l, respectively, which are greater than the site-specific background concentration of 175.4 ug/l. However, these concentrations are less than the USEPA maximum contaminant level (MCL) drinking water standard for barium of 2,000 ug/l. Higher total barium concentrations in downgradient plume monitoring wells relative to background at HWMU-16 may be the result of natural variations in trace element distribution in groundwater. As illustrated in the boring logs for the compliance network monitoring wells (Appendix H of Permit Attachment 3), upgradient well 16C1 is screened in limestone while downgradient plume monitoring wells (16-2, 16-3, and 16-5) and former plume well (now piezometer) 16-1 are screened in shale and fault breccia. Such differing lithologic formations would be expected to contain very different trace element distributions. Therefore, no further action regarding the Second Quarter 2025 total barium concentrations detected in plume monitoring wells 16-2, 16-3, 16-5 and 16Spring is recommended at this time.

Total barium was detected in plume monitoring well 16WC2B at a concentration of 120 ug/l, which is less than the site-specific background concentration of 175.4 ug/l. No other constituents were detected in the plume monitoring wells at concentrations greater than their respective Permit-specified QLs.

A footnote presented in Appendix G of Permit Attachment 3 indicates that verification is required for constituents detected at concentrations less than the QL if their associated GPS are equal to the QL and are greater than the applicable risk-based concentrations (i.e., ACL or RSL). In these instances, verification must be conducted using an alternate low-level analytical method in order to confirm or refute the observed initial detections if the QL achievable by that method is less than, or equal to, the ACL or RSL for the subject constituent. If a concentration greater than the low-level analytical method QL is observed, then the GPS for that constituent will be updated, if warranted. During Second Quarter 2025, no constituents with GPS equal to their respective QLs and greater than the applicable risk-based concentrations were detected at concentrations less than their respective QLs based on review of associated instrument data; therefore, no further action was warranted. This applied to 2,4-dinitrotoluene and 2,6-dinitrotoluene.

Complete details regarding the Second Quarter 2025 monitoring event (field data, laboratory data, and data validation reports) will be forwarded to the VDEQ in the forthcoming *Semiannual Groundwater Monitoring Report for Hazardous Waste Management Units 5 and 16, Second Quarter 2025*, which is due by August 15, 2025.

If you have any questions or concerns, please contact me at 540/639-7087 (Melissa.Lincoln@baesystems.us).

Sincerely,

Melissa
Lincoln

Melissa Lincoln
Sr. Environmental Engineer
BAE Systems, Ordnance Systems Inc.

Digitally signed by
Melissa Lincoln
Date: 2025.08.04
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Coordination: ALBERTS.MATTHE
W.JOHN.16195746
36
M. Alberts

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cc: Nikki Herschler, VDEQ-BRRO
Tara Mason, Ashby Scott, VDEQ-CO
Nelson Hernandez, BAE Staff
Mike Lawless, TRC, Engineers, Inc. (formerly Draper Aden Associates)
Janet Frazier, TRC, Engineers, Inc. (formerly Draper Aden Associates)
William Mason-Deese, TRC, Engineers, Inc. (formerly Draper Aden Associates)
Env. File

Lincoln
25-0900-143

Concerning the following:

*CY 2025 Second Quarter Semiannual Monitoring Event
Hazardous Waste Management Units 5 – Corrective Action Groundwater Monitoring
Hazardous Waste Management Unit 16 – Compliance Groundwater Monitoring
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730*

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SIGNATURE: HOUGH.MARIE.JU
DITH.1012284086 Digitally signed by
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Date: 2025.08.11 14:17:17 -04'00'

PRINTED NAME: Marie J. Hough
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Commanding

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Date: 2025.08.06
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PRINTED NAME: Aron Theroux
TITLE: General Manager
BAE Systems

August 13, 2025

Mr. Kurt Kochan
Office of Remediation Programs
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, Virginia 23219

**Subject: Semiannual Groundwater Monitoring Report –
HWMU-5 and HWMU-16
Post Closure Care Permit HWMUs 5 & 16
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730**

Dear Mr. Kochan:

The Hazardous Waste Management Units (HWMUs) 5 & 16 Semiannual Groundwater Monitoring Report for Second Quarter 2025 can be accessed at:

File 1 of 3 - RPT - 25 0815 - HWMUs 5-16 SA GW Mon Rpt - 2Q 2025

Please click the following link to download your files:

http://url7650.trccompanies.com/ls/click?upn=u001.r3Ub5tJapbroc-2BoR3pDpMutijDYs4A-2B589KdAsKsI13F19M3cpuOtQjWGfMc7MM7R8mY3F9oAjMYpwt0fiMECsDGB64FF7NrXBwLRffLppnHvJnCuNwEMztPfKiiABYvaBNIsMLy6y7q4ylGbyQRNcZagbyVLAvdyfsyrJDRP91J7hCrFV1Od3B5z0YFqGHsWkZziyU0syALdwQSDnsZ8H50t8K7SzUYa-2BrQYVsC162otXV86-2BOVdd8RAAVGbgQmHCwUSr0q1imp-2BMvjzJO73w-3D-3Di9Hi_U1DwBosgdOupfGWMY-2FbHALwvH1tZhh065sjitOLm6RSfyS72MRGaXzPkbjH-2BKq5wSvd-2BVOl8uMjfyJHoaK2y6cjXPnOvD90-2FUUKBUS8-2FASMXS0N5zkkw2FG59yYENUVDVscwYjRag8w2lkuRcJZuSa-2BCx3Y2TWPPZ9JeqvN60ADDnCs8IPWXb2d7n-2FuALkr4FUElpu1errC0t6RnhfkuA-3D-3D

File 2 of 3 - HWMU 5 2Q 2025 Data Validation and Laboratory Data

Please click the following link to download your files:

http://url7650.trccompanies.com/ls/click?upn=u001.r3Ub5tJapbroc-2BoR3pDpMutijDYs4A-2B589KdAsKsI13F19M3cpuOtQjWGfMc7MM7R8mY3F9oAjMYpwt0fiMECsDGB64FF7NrXBwLRffLppkjarUHJGf1Phs5w7-2FpqmcMKy-2BaU1JSx6dQW9g6UOoCbuQLjcbDbEe8YyzYvlzvZYX31zCqfJr-2FdobYKW4DTXX89bA89cp4bY6n8fempt02-2FG65wilPUvUxHk16QXuC-2BOC749p5cr3LbVJWXPv8iUEgtInLi9fZT0r-2Bcyzr1sNjg-3D-3DDNLR_U1DwBosgdOupfGWMY-2FbHALwvH1tZhh065sjitOLm6RTjLNCGBvI9X14CZxZWuRqUFebxz59EOh77aCtBfZ6y-2FPp5fTfCzx7WXta9U2ISRx-2BYKWystuxxhwJRVLO8-2BA7CSHFMCdmg1MbTKGgsbxWFpJ5I13NMYvZBb-2BOvy4nWCIHkPoTjRkQ88fZBSjVafDrtJMz3lj6sAbvmR2zMDlTyw-3D-3D

File 3 of 3 -HWMU 16 2Q 2025 Data Validation and Laboratory Data

Please click the following link to download your files:

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The above links are valid for 20 days. This report meets the requirements of the Semiannual Groundwater Monitoring Report for Second Quarter 2025 for the Post-Closure Care Permit for HWMU 5 and 16 at RFAAP.

If you have any questions or concerns, please contact me at 540/639-7087 (Melissa.lincoln@baesystems.us).

Sincerely,

Melissa Lincoln
Sr. Environmental Engineer
BAE Systems, Ordnance Systems Inc.

Coordination: _____
M. Alberts

cc: Nikki Herschler, VDEQ- BRRO
Tara Mason, Ashby Scott, VDEQ-CO
M. Alberts, Army Staff
Nelson Hernandez, BAE Staff
Mike Lawless, TRC Engineers, Inc (formerly Draper Aden Associates)
Janet C. Frazier, TRC Engineers, Inc (formerly Draper Aden Associates)
William Mason-Deese, TRC Engineers, Inc (formerly Draper Aden Associates)
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Concerning the following:

*CY 2025 Second Quarter Semiannual Groundwater Monitoring Event
Hazardous Waste Management Units 5 – Correction Action Groundwater Monitoring
Hazardous Waste Management Unit 16 – Compliance Groundwater Monitoring
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730*

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SIGNATURE:

PRINTED NAME:

Marie Hough

TITLE:

Lieutenant Colonel, US Army
Commanding

SIGNATURE:

PRINTED NAME:

Aron Theroux

TITLE:

General Manager
BAE Systems

ORDNANCE SYSTEMS INC.
Radford Army Ammunition Plant
4050 Pepper's Ferry Road
Radford Virginia 24141

September 22, 2025

Mr. Kurt Kochan
Office of Remediation Programs
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, Virginia 23219

Subject: Semiannual Corrective Action Groundwater Monitoring Event Notification – HWMU-5
Semiannual and Annual Compliance Groundwater Monitoring Event Notification – HWMU-16
Post Closure Care Permit HWMUs 5 & 16
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730

Dear Mr. Kochan:

The following information pertains to routine detection notification for the recent groundwater monitoring event for Hazardous Waste Management Units (HWMUs) 5 and 16 located at the Radford Army Ammunition Plant (RFAAP) in Radford, Virginia.

Groundwater Monitoring Event Notification - HWMU-5 and HWMU-16

During Third Quarter 2025, BAE Systems, Ordnance Systems Inc. (BAE) completed groundwater monitoring for HWMUs 5 and 16 in accordance with the *Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16* (reissued August 16, 2014). The Third Quarter 2025 event served as the semiannual Corrective Action (CA) groundwater monitoring event for HWMU-5 and the semiannual compliance groundwater monitoring event for HWMU-16. The Third Quarter 2025 event also served as the annual compliance groundwater monitoring event under 40 CFR 264 Appendix IX for HWMU-16. The final laboratory analytical data packages for this event were received on September 19, 2025. The Third Quarter 2025 groundwater monitoring event was conducted using revised detection limits (DLs) and quantitation limits (QLs), where applicable, as specified in the Class 1 Permit Modification approved by the Virginia Department of Environmental Quality (VDEQ) in electronic correspondence dated May 5, 2021. Total silver was added to the HWMU-16 Compliance Monitoring List as directed by VDEQ in correspondence dated May 8, 2024. Additionally, HWMU-16 total cobalt data were evaluated using the revised alternate source demonstration (ASD) for total cobalt in groundwater at HWMU-16, approved by the VDEQ in electronic correspondence dated September 13, 2021. The following information summarizes the findings of the Third Quarter 2025 semiannual activities at each Unit.

HWMU-5

For this event, all wells in the CA groundwater monitoring network were sampled for the constituents listed in Appendix J to Permit Attachment 2 (Groundwater Corrective Action Targeted Constituents – GPS and Semiannual Monitoring List for HWMU-5). The CA groundwater monitoring network for HWMU-5 consists of upgradient well 5W8B, point of compliance (POC) wells 5W5B, 5W7B, 5WC21, 5WC22, and 5WC23, and plume monitoring well 5W12A. During Third Quarter 2025, groundwater samples collected from all of the wells in the CA groundwater monitoring network were analyzed for the CA Targeted Constituents: trichloroethene (TCE) and its daughter products 1,1-dichloroethene (1,1-DCE), *cis*-1,2-dichloroethene (*c*DCE), *trans*-1,2-dichloroethene (*t*DCE), and vinyl chloride (VC). Additionally, samples collected from all of the wells in the CA groundwater monitoring network were analyzed for total cobalt, which was added to the list of CA Targeted Constituents as directed by the VDEQ on May 4, 2011.

TCE was detected in POC wells 5WC21, 5WC22, and 5WC23 at concentrations of 1.3 micrograms per liter (ug/l), 1.5 ug/l, and 2.6 ug/l, respectively, which are less than the groundwater protection standard (GPS) of 5 ug/l.

Total cobalt was detected in POC wells 5W7B and 5WC21 at concentrations of 7.7 ug/l and 14 ug/l, respectively, which are greater than the GPS of 7 ug/l. Total cobalt was detected in POC well 5WC22 at a concentration less than the QL of 5 ug/l.

TCE and total cobalt were not detected in any of the other wells in the CA groundwater monitoring network. Additionally, the TCE daughter products were not detected in any of the wells comprising the CA groundwater monitoring network.

As stated in the Annual Groundwater Monitoring Reports for the Unit for calendar years 2015 through 2024, TCE remedial endpoints have been achieved. During Second and Third Quarters 2025, TCE was not detected at concentrations greater than its GPS in any of the wells comprising the CA groundwater monitoring network for HWMU-5. Additionally, no daughter products of TCE were detected in any of the wells comprising the CA groundwater monitoring network for HWMU-5; therefore, TCE remedial objectives continue to be met. However, total cobalt continued to be detected at concentrations greater than its GPS during Second and Third Quarters 2025.

No changes to the continuation of the groundwater CA program are anticipated at this time. An evaluation of the effectiveness of the Corrective Action will be presented in the forthcoming Annual Groundwater Monitoring Report for Units 5 and 16, which is due to the VDEQ on March 1, 2026.

HWMU-16

In accordance with the Permit, the groundwater data from the POC wells at HWMU-16 were compared to the established GPS for the Unit listed in Appendix G of Permit Attachment 3 (modified to add 1,1-dichloroethene, tetrahydrofuran, and vinyl chloride in Class 1 Permit Modifications approved September 12, 2014, December 1, 2016, and May 5, 2021, respectively, and modified to add total silver as directed by VDEQ as noted above). The following constituents were detected in the POC wells for HWMU-16 at concentrations greater than their respective GPS:

- Total cobalt was detected in POC well 16WC1A at a concentration of 11 ug/l which is greater than the GPS of 5 ug/l. As directed by the VDEQ in electronic correspondence dated October 26, 2018, RFAAP also compared the total cobalt concentration detected in POC well 16WC1A to the latest (effective January 2, 2025) VDEQ Alternate Concentration Limit (ACL) for cobalt of 6 ug/l. Additionally, the total cobalt data were evaluated using the revised ASD for total cobalt in groundwater at HWMU-16 for POC wells 16MW9, 16WC1A, and 16WC1B approved by the VDEQ in electronic correspondence dated September 13, 2021. Based on the conclusions of the VDEQ-approved ASD, the Third Quarter 2025 total cobalt concentration detected in POC well 16WC1A appears to be consistent with natural variation in local groundwater and is not indicative of a release from the Unit. Therefore, a verification event will not be conducted for the Third Quarter 2025 total cobalt concentration detected in POC well 16WC1A. Based on VDEQ correspondence dated September 13, 2021, a separate ASD will not be required.

No other constituents were detected in the upgradient well or in the POC wells at concentrations greater than their respective GPS during Third Quarter 2025.

Additionally, a footnote presented in Appendix G of Permit Attachment 3 (Groundwater Protection Standards: Unit 16) indicates that verification is required for constituents detected at concentrations less than the QL if their associated GPS are equal to the QL and are greater than the applicable risk-based concentrations (i.e., ACL or RSL). In these instances, verification must be conducted using an alternate low-level analytical method in order to confirm or refute the observed initial detections if the QL achievable by that method is less than, or equal to, the ACL or RSL for the subject constituent. If a concentration greater than the low-level analytical method QL is observed, then the GPS for that constituent will be updated, if warranted. During Third Quarter 2025, no constituents with GPS equal to their respective QLs and greater than the applicable risk-based concentrations were detected at concentrations less than their respective QLs; therefore, no further action was warranted. This applied to 2,4-dinitrotoluene and 2,6-dinitrotoluene.

The following constituents were detected at concentrations at or above their respective background concentrations in plume monitoring wells:

- Total barium was detected in plume monitoring wells 16-2, 16-3, and 16Spring at concentrations of 240 ug/l, 730 ug/l, and 220 ug/l, respectively, which are greater than the site-specific background concentration of 175.4 ug/l. However, these concentrations are less than the USEPA maximum contaminant level (MCL) drinking water standard for barium of 2,000 ug/l. Higher total barium concentrations in downgradient plume monitoring wells relative to background at HWMU-16 may be the result of natural variations in trace element distribution in groundwater. As illustrated in the boring logs for the compliance network monitoring wells (Appendix H of Permit Attachment 3), upgradient well 16C1 is screened in limestone while downgradient plume monitoring wells (16-2, 16-3, and 16-5) are screened in shale and fault breccia. Such differing lithologic formations would be expected to contain very different trace element distributions. Therefore, no further action regarding the Third Quarter 2025 total barium concentrations detected in plume monitoring wells 16-2, 16-3, and 16Spring is recommended at this time.

Total barium was detected in plume monitoring wells 16-5 and 16WC2B at a concentration of 170 ug/l and 110 ug/l, respectively, which are less than the site-specific background concentration of 175.4 ug/l. No other constituents were detected in the plume monitoring wells at concentrations greater than their respective Permit-specified QLs.

This event also served as the annual monitoring event in which the upgradient and POC wells at HWMU-16 were sampled for the 40 CFR Part 264 Appendix IX constituents listed in Appendix I of Permit Attachment 1. During the Third Quarter 2025 event, no Appendix IX constituents were detected at or above the respective Permit-specified MDLs. As such, no verification event is required.

Complete details regarding the Third Quarter 2025 monitoring event (field data, laboratory data, and data validation reports) will be forwarded to the VDEQ in the forthcoming *Semiannual Groundwater Monitoring Report for Hazardous Waste Management Units 5 and 16, Third Quarter 2025*, which will be combined with the 2025 Annual Groundwater Monitoring Report for the Units as directed by VDEQ on May 4, 2011. The 2025 Annual Groundwater Monitoring Report is due to VDEQ by March 1, 2026.

If you have any questions or concerns, please contact me at 540/639-7087 (Melissa.Lincoln@baesystems.us).

Sincerely,

**Melissa
Lincoln**

Digitally signed by
Melissa Lincoln
Date: 2025.09.22
14:55:25 -04'00'

Melissa Lincoln
Sr. Environmental Engineer
BAE Systems, Ordnance Systems Inc.

Coordination:

ALBERTS.MATTHEW
W.JOHN.16195746
36
M. Alberts

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Date: 2025.09.22 15:25:31 -04'00'

cc:

Nikki Herschler, VDEQ-BRRO
Tara Mason, Ashby Scott, Sarah Dyer, VDEQ-CO
M. Alberts, Army Staff
Nelson Hernandez, BAE Staff
Mike Lawless, TRC Engineers, Inc. (formerly Draper Aden Associates)
Janet C. Frazier, TRC Engineers, Inc. (formerly Draper Aden Associates)
Will Mason-Deese, TRC Engineers, Inc. (formerly Draper Aden Associates)
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Concerning the following:

*CY 2025 Third Quarter Semiannual and Annual Monitoring Event – Event Notification
Hazardous Waste Management Units 5 – Corrective Action Groundwater Monitoring
Hazardous Waste Management Unit 16 – Compliance Groundwater Monitoring
Radford Army Ammunition Plant, Radford, Virginia
EPA ID#: VA1210020730*

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SIGNATURE:

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DITH.1012284086

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HOUGH.MARIE.JUDITH.101228
4086
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PRINTED NAME:

Marie J. Hough

TITLE:

Lieutenant Colonel, US Army
Commanding

SIGNATURE:

Aron Theroux

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Theroux
Date: 2025.09.23
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Aron Theroux

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General Manager
BAE Systems



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

www.deq.virginia.gov

Stefanie K. Taillon
Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director

October 22, 2025

Mr. Matt Alberts
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

VIA ELECTRONIC MAIL

**Re: Semiannual Groundwater Monitoring Report
Hazardous Waste Management Units 5 and 16
Radford Army Ammunitions Plant
Route 114, Radford, Virginia 24141
EPA ID#: VA1210020730**

Dear Mr. Alberts:

The Virginia Department of Environmental Quality (DEQ) has completed review of the Radford Army Ammunitions Plant (RFAAP) electronic submission of the 2024 Annual Groundwater Monitoring Report for Hazardous Waste Management Units (HWMU) 5 and 16, dated August 2025. The Semiannual Groundwater Monitoring Report was submitted in accordance with the requirements specified in the Final Hazardous Waste Post-Closure Care Permit for HWMUs 5 and 16.

The Department has the following comments:

- Please check on why there are references to HWMU-7 and “annual” on the top of the page when the document is opened. Please see attachment to the email.
- Note, for the Annual Groundwater Monitoring Report, as per section VI.J.4 (f), of the Post-Closure Care Permit for these units, please include long-term concentration plots for constituents of concern.

EPA ID#: VA1210020730

October 22, 2025

Page 2 of 2

The Department concurs with the recommendation to continue monitoring in accordance with the Corrective Action Groundwater Monitoring Program. If you have any questions regarding this correspondence, you may contact me at the email address or phone number listed below.

Sincerely,



Kurt Kochan, P.G.

Remediation Project Manager

Virginia Department of Environmental Quality, Central Office

1111 E. Main Street, Suite 1400

Richmond, VA 23219

kurt.kochan@deq.virginia.gov

703-232-4200

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Melissa Lincoln, BAE
Tara Mason, Sarah Dyer, DEQ-CO
Nikki Herschler, DEQ-BRRO
Mike Lawless, TRC Engineers, Inc.