DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: **Avionics Specialties, Incorporated**
Facility Address: **3367 Earlysville Road, Earlysville, Virginia 22936**
Facility EPA ID #: **VAD089027759**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   ☒ If yes - check here and continue with #2 below.

   ☐ If no - re-evaluate existing data, or

   ☐ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

Background

The Former Avionics Specialties, Inc. facility occupies approximately 12 acres on a trapezoidal-shaped parcel positioned adjacent to the southwestern corner of the Charlottesville-Albemarle County Airport (site). A site location map is attached as Figure 1. The facility complex consists of four buildings, including a former production building, an adjacent administration building, a former processing building for parts finishing and testing, and a former chemical storage building. The site was constructed in 1954 and manufactured aircraft components and instruments until its closure in 2010. In 2016, the facility was sold to a private party, which is currently using the buildings and grounds for equipment storage. No personnel routinely occupy the site.

Investigative and remedial activities are being performed under the regulatory oversight of the U.S. Environmental Protection Agency (USEPA) and Virginia Department of Environmental Quality (VADEQ) in accordance with the requirements of Administrative Order on Consent (Docket No.: RCRA-03-2011-0103-TH), entered into agreement on March 26, 2012.

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action Program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While final remedies remain the long-term objective of the RCRA Corrective Action Program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

   ☒ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

   ☐ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

   ☐ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was previously completed for the site. Analytical data collected during the RFI defined volatile organic compounds (VOCs) as the main chemicals of concern (COCs).

Key contaminants exceeding USEPA Maximum Contamination Level (MCL) (or USEPA Tap Water Regional Screening Level [RSL]): tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), 1,1,1-trichloroethane and 1,1,2-trichloroethane (TCA), 1,1-dichloroethene (DCE), 1,1-dichloroethane and 1,2-dichloroethane (DCA), and 1,4-dioxane.

Supporting Documentation:

1. RFI Status Report of Phase 1 Activities and Phase 2 Work Plan, (Fishbeck, June 10, 2014)
2. RFI Phase 2 Work Plan Amendment 2 and related data/figures, (Fishbeck, April 30, 2015)
3. IM Completion Report, (Fishbeck, February 8, 2018)
4. RFI Report, (Fishbeck, December 14, 2017)
5. Draft Corrective Measures Study, (Fishbeck, December 27, 2018)
6. ERD Demonstration Test Summary Report, (Fishbeck, March 25, 2022)
7. June 2022 Site Monitoring Report, (Fishbeck, September 13, 2022)

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

   ☒ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

   ☐ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) – skip to #8 and enter "NO" status code, after providing an explanation.

   ☐ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Groundwater isoconcentration maps, as included in the RFI Report, are attached as Figures 2A, 3A, and 4A. These figures represent the *existing area of contaminated groundwater* in the three hydrostratigraphic units at the site – the unconsolidated unit, shallow bedrock aquifer, and deep bedrock aquifer – as of June 2015.

Following the RFI, interim measure (IM) activities were conducted at the site to advance the remediation of VOCs and reduce future risks. These activities included the excavation and proper disposal of 7,805 cubic yards of nonhazardous contaminated soil and 40 cubic yards of hazardous soil, piping, and piping materials, completion of a short-term soil vapor extraction (SVE) pilot test, and completion of enhanced reductive dechlorination (ERD) pilot and demonstration tests. As a result of IM implementation, the excavation has removed the majority of the VOC mass from soil and the ERD pilot and demonstration tests have reduced the VOC mass in the groundwater source area.

As discussed in the most recent groundwater monitoring report (June 2022 Site Monitoring Report), a site-wide groundwater monitoring program is currently being performed at key locations from within the three hydrostratigraphic units. Groundwater isoconcentration contour maps for each hydrostratigraphic unit were prepared based on the most recent groundwater sampling event and are presented in Figures 2, 3, and 4. Following completion of the IM activities and subsequent groundwater quality monitoring, a comparison of the plume isoconcentration maps for each hydrostratigraphic unit from June 2015 (Figures 2A/2, 3A/3, and 4A/4) to June 2022 (Figures 2, 3, and 4) indicates that migration of the groundwater impacts are not only taking place within the *existing area of contaminated groundwater,* as demonstrated in the RFI Report, but overall concentrations are decreasing as well. Examples of the reduction of PCE concentrations in groundwater include:

Source Area

- Unconsolidated aquifer monitoring well MW-06, PCE reduced from 3,760 micrograms per liter (µg/L) (6/27/2018) to 1,030 µg/L (6/14/2022)
- Shallow bedrock aquifer monitoring well MW-09, PCE reduced from 8,000 µg/L (8/9/2013) to 2,120 µg/L (6/14/2022)

Northern Plume Area

- Unconsolidated aquifer monitoring well MW-24, PCE reduced from 420 µg/L (9/30/2014) to 288 µg/L (6/15/2022)
- Shallow bedrock aquifer monitoring well MW-25, PCE reduced from 1,450 µg/L (6/26/2018) to 721 µg/L (6/15/2022)
- Deep bedrock aquifer monitoring well MW-18, PCE reduced from 1,000 µg/L (8/8/2013) to 212 µg/L (6/14/2022)

Southern Plume Area

- Unconsolidated aquifer monitoring well MW-28, PCE reduced from 1,600 µg/L (10/1/2014) to 566 µg/L (6/14/2022)
- Shallow bedrock aquifer monitoring well MW-29, PCE reduced from 3,800 µg/L (10/1/2014) to 1,700 µg/L (6/15/2022)
- Deep bedrock aquifer monitoring well MW-36, PCE reduced from 2,000 µg/L (6/23/2015) to 1,340 µg/L (6/15/2022)

Supporting Documentation:

1. RFI Report, (Fishbeck, December 14, 2017)
2. IM Completion Report, (Fishbeck, February 8, 2018)
3. Draft Corrective Measures Study, (Fishbeck, December 27, 2018)
4. ERD Demonstration Test Summary Report, (Fishbeck, March 25, 2022)
5. June 2022 Site Monitoring Report, (Fishbeck, September 13, 2022)

[2] *existing area of contaminated groundwater* is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

   ☒ If yes - continue after identifying potentially affected surface water bodies.

   ☐ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

   ☐ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The January 2015 *Amendment to the Phase 2 Work Plan* documents that pore water sampling results obtained from the northern and southwestern streams suggest that VOCs are venting to the surface water, with the highest VOC concentrations in the headwater portions of the streams (Figure 5). Low concentrations of PCE, TCE, and 1,1-DCA were detected at the southwest stream area at PWS-23, which is located 400 feet east-southeast of the MW-30/-31 monitoring well cluster. Additionally, trace concentrations of 1, 4-dioxane were identified in four of the five pore water sampling locations within and downstream of the large pond. 1,4-dioxane was not identified in pore water samples upstream of the large pond nor in the northern stream or its tributaries.

In surface water (Figure 6), low concentrations of chlorinated VOCs were detected with the northern stream samples and upstream of the large pond. Chlorinated VOCs were not detected at surface water locations within or downstream of the large pond. Finally, 1,4-dioxane was detected at surface water sampling locations within the northern stream and upstream of the large pond along the southwestern stream, while low to trace concentrations of the compound were detected in surface water within and downstream of the large pond.

Supporting Documentation:

1. RFI Status Report of Phase 1 Activities and Phase 2 Work Plan, (Fishbeck, June 10, 2014)
2. Amendment to the Phase 2 Work Plan, (Fishbeck, January 26, 2015)
3. RFI Phase 2 Work Plan Amendment 2 (and related data/figures), (Fishbeck, April 30, 2015)
4. RFI Report, (Fishbeck, December 14, 2017)

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

   ☐ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting:
   1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and
   2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

   ☒ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting:
   1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and
   2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

   ☐ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

As documented in the 2017 RFI Report, extensive pore water sampling has occurred along the north stream and its associated tributaries. While some pore water samples (13-PPS03, 14-PWS12, and 14-PWS11) exhibited elevated concentrations of VOCs (greater than 10 times their appropriate groundwater "level"), this area of the stream was determined to represent the headwaters and was characterized by pools of surface water with no measurable flow. Additional samples with elevated concentrations (14-PWS18 through 14-PWS20) were obtained from beneath active seeps positioned along an ephemeral stream channel. Water from the seeps then infiltrates back into the underlying unconsolidated aquifer before reaching the main stream channel and is not directly discharging to surface water. It should be noted that results from all remaining pore water samples collected at the north stream tributaries and downstream, beneath the single stream channel, demonstrated concentrations of chlorinated volatile organic compounds (CVOCs) were deemed *insignificant* and less than 10 times their appropriate groundwater standards.

Extensive pore water samples were also obtained from beneath the southwest stream as documented in the 2017 RFI Report. Concentrations of CVOCs were significantly less than what were observed beneath the north stream headwaters. The most elevated concentrations were identified beneath the headwaters of the southwest stream at the sample location nearest to the subject property (14-PWS13). The concentrations of CVOCs decrease in the downstream direction. No CVOCs were detected in samples obtained downstream of the confluence near the MW-30/-31 well cluster.

Additionally, it should be noted that groundwater concentrations observed in the unconsolidated aquifer in monitoring wells adjacent to both the north and southwest streams have been reduced significantly since the pore water sampling was performed.

During the January 2015 sampling event, samples were also analyzed for 1,4-dioxane. Trace concentrations of 1,4-dioxane were identified in four of the five sampling locations within and downstream of the large pond. 1,4-dioxane was not identified upstream of the large pond or in the northern stream tributary.

Supporting Documentation:

1. RFI Status Report of Phase 1 Activities and Phase 2 Work Plan, (Fishbeck, June 10, 2014)
2. Amendment to the Phase 2 Work Plan, (Fishbeck, January 26, 2015)
3. RFI Phase 2 Work Plan Amendment 2 (and related data/figures), (Fishbeck, April 30, 2015)
4. RFI Report, Fishbeck, (December 14, 2017)
5. Draft Corrective Measures Study, (Fishbeck, December 27, 2018)

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

   ☒ If yes - continue after either:

   1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater;

   OR

   2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

   ☐ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

   ☐ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

As part of the 2017 RFI Report, a Screening Level Ecological Risk Assessment (SLERA) was performed of the aquatic habitats within the north and southwest stream systems. As documented in the SLERA, the potential risks associated with the site are limited in extent (i.e., the headwater sections of both streams), there is a functioning and relatively diverse aquatic community in the streams, and the IM soil excavation has greatly reduced the VOC mass in the source area. The IM action has significantly decreased the likelihood of future releases of VOCs to groundwater and potential ecological exposure. The complete SLERA report is included as Appendix 10 of the RFI Report.

Additionally, as documented in the December 2018 Draft Corrective Measures Study, the site conceptual model states that "Most of the remaining VOC mass is present in the unconsolidated and shallow bedrock aquifers. It is migrating toward the gaining streams located to the north and south of the former Avionics property and attenuating with distance. Remaining VOCs vent to these surface water features. The VOCs then completely attenuate in surface water in a downstream direction."

Supporting Documentation:

1. RFI Report, Fishbeck, December 14, 2017
2. Draft Corrective Measures Study, Fishbeck, December 27, 2018

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-system

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

   ☒ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations, which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be grating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

   ☐ If no - enter "NO" status code in #8.

   ☐ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

The specific well/measurement locations to be tested in the future to verify that groundwater contamination will not be migrating horizontally or vertically beyond the "existing area of groundwater contamination" are detailed in the Draft Corrective Measures Study.

Supporting Documentation:

1. Draft Corrective Measures Study, (Fishbeck, December 27, 2018
2. June 2022 Site Monitoring Report, Fishbeck, September 13, 2022

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8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

☒ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Former Avionics Specialties, Incorporated facility, EPA ID # VAD089027759, located in Earlysville, VA. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater". This determination will be reevaluated when the Agency becomes aware of significant changes at the facility.

☐ NO - Unacceptable migration of contaminated groundwater is observed or expected.

☐ IN - More information is needed to make a determination.

Completed by _____ Date 07/14/2023
Kurt W. Kochan
Corrective Action Project Manager

Supervisor _____
Date 07/14/2023
Tara Mason
RCRA Corrective Action Program Manager
Virginia Department of Environmental Quality

Locations where References may be found:

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