

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action

Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: Aerojet Rocketdyne
Facility Address: Culpeper, Virginia 22701
Facility EPA ID #: VAD981112618

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, 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 #6 and enter "IN" (more information needed) status code.

BACKGROUND

The AR Facility is located at 7499 Pine Stake Road in Orange County, Virginia, approximately four miles north of the town of Rhoadesville. The approximately 2,100-acre Facility is generally rectangular in shape with access roads and buildings scattered throughout the property. The terrain is characterized by small hills and valleys, and much of the property is wooded or undeveloped. There are no established industrial operations immediately bordering the Facility. A few residential properties border the Facility, primarily to the north and south, with undeveloped wooded areas to the east and west.

Prior to the initial purchase of the property in 1986 by Atlantic Research Corporation (ARC), the area was primarily unimproved fields, woods, and farmland. ARC, a longstanding supplier of solid propulsion systems for the defense contract market, operated the Orange County, Virginia location from 1990 to 2003 as a solid rocket propellant production facility, as well as a rocket motor manufacturing and testing facility (SIC Code 3764). Since acquiring the Facility from ARC in 2003, AR (Aerojet General Corp. at the time of the purchase from ARC) continues to produce solid rocket propellants and motors and related components for rocket and missile systems. In addition to rocket motor production and testing, plant operations include administration, storage of explosive materials, laboratory testing, research and development, and historically included limited small-scale design and development of propulsion systems and propellants for air-bag inflators.

The Facility currently operates under a RCRA Hazardous Waste Management Permit for Container Storage and Treatment, No. VAD981112618 (effective January 2019). The Facility previously operated under a RCRA Research, Development and Demonstration (RD&D) permit (EPA ID Number VAD981112618). The RD&D permit governed the onsite destruction of energetic (propellant) waste by open burning at a thermal treatment facility (TTF). Thermal treatment events commenced in September of 1990 and continued through January of 2020. AR shifted its operational practices concerning energetic waste handling from onsite treatment of waste via open burning to onsite storage and offsite treatment/disposal, with subsequent closure of the TTF after the storage permit was issued and the storage facility was constructed. A RCRA Facility Assessment was recently completed in conjunction with the TTF closure.

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 “Current Human Exposures Under Control” EI

A positive “Current Human Exposures Under Control” EI determination (“YE” status code) indicates that there are no “unacceptable” human exposures to “contamination” (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all “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 “Current Human Exposures Under Control” EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program’s overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

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).

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “contaminated”¹ above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater		X		
Air (indoors) ²		X		
Surface Soil (e.g., <2 ft)	X			Perchlorate
Surface Water		X		
Sediment		X		
Subsurf. Soil (e.g., >2 ft)	X			Perchlorate
Air (outdoors)		X		

- ☐ If no (for all media) - skip to #6, and enter “YE,” status code after providing or citing appropriate “levels,” and referencing sufficient supporting documentation demonstrating that these “levels” are not exceeded.
- ☒ If yes (for any media) - continue after identifying key contaminants in each “contaminated” medium, citing appropriate “levels” (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.
- ☐ If unknown (for any media) - skip to #6 and enter “IN” status code.

Rationale:

Location ID	Sample Date	Sample Depth (inches)	Constituent of Concern (mg/kg)
			Perchlorate <i>SW6850</i>
EPA Region 3 Screening Level - Resident			5.5
SB01	7/25/2023	0 - 12	18
SB01	7/25/2023	12 - 24	35
SB02	7/25/2023	0 - 12	6.1
SB02	7/25/2023	12 - 24	1.6
SB03	7/25/2023	0 - 12	0.56
SB03 (DUP)	7/25/2023	0 - 12	0.39
SB03	7/25/2023	12 - 24	2.2
SB04	7/25/2023	0 - 12	0.26
SB04	7/25/2023	12 - 24	0.055
SB05	7/25/2023	0 - 12	0.088 F2
SB05	7/25/2023	12 - 24	0.027

Notes:

mg/kg = milligrams per kilogram

F2 = MS/MSD RPD exceeds control limits.

EPA Region 3 = EPA Regional Screening Level Summary Table, May 2023 (TR=1E-06; THQ=0.1).

Results in **bold** exceed EPA Region 3 Resident Soil screening level.

Reference:

1. Aerojet / Environmental Alliance. 2013. *RCRA Closure Plan Thermal Treatment Units*. February 2013.
2. Environmental Alliance. 2017. *RCRA Hazardous Waste Facility Storage Permit Application*. September 2017.
3. Environmental Alliance. 2021. *Thermal Treatment Facility Closure Report*. March 2021, revised September 2021.
4. Environmental Alliance. 2023. *Area of Concern Sampling Plan - Propulsion Test, Bay #2*. July 2023.
5. Environmental Alliance. 2023. *Area of Concern Sampling Report - Propulsion Test, Bay #2*. October 2023

Footnotes:

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 appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

² Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

<u>“Contaminated” Media</u>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	-	-	-	-	-	-	-
Air (indoors)	-	-	-	-	-	-	-
Soil (surface, e.g., <2 ft)	NO	NO	NO	NO	NO	NO	NO
Surface Water	-	-	-	-	-	-	-
Sediment	-	-	-	-	-	-	-
Soil (subsurface e.g., >2 ft)	NO	NO	NO	NO	NO	NO	NO
Air (outdoors)	-	-	-	-	-	-	-

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not “contaminated” as identified in #2 above.
2. enter “yes” or “no” for potential “completeness” under each “Contaminated” Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces (“___”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

- ☒ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).
- ☐ If yes (pathways are complete for any “Contaminated” Media - Human Receptor combination) - continue after providing supporting explanation.
- ☐ If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code.

Soil:

Soil was investigated as part of the TTF closure activities. Limited soil excavation and off-site disposal occurred during closure of the TTF. The TTF was clean-closed and remaining soil was found to be acceptable for unrestricted residential use. Soil was also investigated at the Propulsion Test, Bay #2 AOC. The laboratory analytical results exceeded residential screening values in several soil samples for perchlorate, however, the risk assessment evaluation indicated that the AOC at Building 106, Test Bay #2 contains soil that is acceptable for unrestricted residential use.

Groundwater:

Groundwater was investigated as part of the TTF closure activities. The TTF was clean closed based on the groundwater results gathered over several years. Further, groundwater was not expected to be impacted based on the results of soil sampling for perchlorate at the Propulsion Test, Bay #2 AOC.

Surface Water, Sediment, Air:

No direct surface water impacts via spills, or documented discharges of impacted groundwater to surface water, have been identified. Therefore, surface water is not identified as an affected medium at the Facility. Release or impacts to sediment within on-site water bodies or waterways are not known to have occurred. Therefore, sediment is not identified as an affected medium at the Facility. Release or impacts to the subsurface of volatile organic compounds (VOCs) are not known to have occurred; therefore, indoor air is not identified as an affected medium at the Facility.

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Reference:

1. Aerojet / Environmental Alliance. 2013. *RCRA Closure Plan Thermal Treatment Units*. February 2013.
2. Environmental Alliance. 2017. *RCRA Hazardous Waste Facility Storage Permit Application*. September 2017.
3. Environmental Alliance. 2021. *Thermal Treatment Facility Closure Report*. March 2021, revised September 2021.
4. Environmental Alliance. 2023. *Area of Concern Sampling Plan - Propulsion Test, Bay #2*. July 2023.
5. Environmental Alliance. 2023. *Area of Concern Sampling Report - Propulsion Test, Bay #2*. October 2023

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be “**significant**”⁴ (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?
- ☐ If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”
- ☐ If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”
- ☐ If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

⁴ If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.

**Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)**

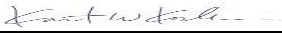
5. Can the “significant” **exposures** (identified in #4) be shown to be within **acceptable** limits?
- ☐ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).
- ☐ If no - (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.
- ☐ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code.

Rationale and Reference(s):

**Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)**

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI (event code CA725), 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, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Aerojet Rocketdyne Facility, EPA ID #VAD981112618, located at 7499 Pine Stake Road, Culpeper, Virginia 22701 under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.
- ☐ NO - "Current Human Exposures" are NOT "Under Control."
- ☐ IN - More information is needed to make a determination.

Completed by (signature)  Date: 12-28-2023
 (print) Kurt Kochan
 (title) Project Manager

Supervisor (signature)  Date 12-28-2023
 (print) Tara Mason.
 (title) RCRA CA Program Manager
 (EPA Region or State) VA

Locations where References may be found:

Virginia Department of Environmental Quality
Office of Remediation Programs
1111 East Main Street, Suite 1400
Richmond, VA 23219

Contact telephone numbers and e-mail

(name) Kurt W. Kochan (VDEQ)
(phone #) 703-232-4200
(e-mail) kurt.kochan@deq.virginia.gov