Guerrero, Heather L

From: Rice, Kajuana D CIV (USA) <kajuana.d.rice.civ@army.mil>
Sent: Thursday, August 3, 2023 12:37 PM
To: Guerrero, Heather L
Cc: Mastin, Ashley T; Howard, J C (Clint) CIV USARMY USAG (USA); Robert Pope; Burton, Don; Pam G. Foti; Fluck, Paul V CIV USARMY CESAM (USA); Xanthos, George CIV USARMY IMCOM AEC (USA); Roeske, Ashley E CIV USARMY CEHNC (USA)
Subject: U.S. Army Garrison - Redstone Arsenal AHWMMA Permit Modification No. 2 Request
Attachments: Transmittal Letter to ADEM AHWMMA Permit Modification No. 2 Request.pdf; Transmittal Package for AHWMMA Permit Mod Request No. 2.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Heather,

Please find attached the U.S Army Garrison – Redstone Arsenal's submittal of the AHWMMA Permit Modification No. 2 request for the Department's review and approval.

If necessary, a hard copy of the subject request can be submitted to the Department as well.

I hope that you've had an amazing week thus far and if there are any additional questions and/or concerns regarding this matter, please feel free to contact me.

Respectfully Submitted,

Kajuana D. Rice
Environmental Engineer
Installation Restoration Branch
U.S. Army Garrison – Redstone Arsenal
O: 256-313-0368
Kajuana.d.rice.civ@army.mil

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO ATTENTION OF

August 3, 2023

Environmental Management Division

Mr. Stephen A. Cobb
Chief, Land Division
Alabama Department of Environmental Management
PO Box 301463
Montgomery, Alabama 36130-1463

Reference:

a. The Installation Restoration Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
b. Resource Conservation and Recovery Act Corrective Action Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
c. Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X (AHWMMA) Permit, Modification #1 dated August 12, 2022

Dear Mr. Cobb:

In accordance with Part VII of Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/ Solid Waste Management Unit Corrective Action/Subpart X Permit (Permit) Modification No. 1, dated August 12, 2022.

This purpose of this letter is to transmit Modification Request No. 2 to the AHWMMA Permit that was issued in a Final Determination Letter, August 12, 2022. Included with the Modification Request is a Summary of Changes table, along with supporting documentation and applicable updated Permit Application pages.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to 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 fine and imprisonment for knowing violations."

My point of contact for this matter is Ms. Kajuana Rice, Environmental Management Division, 256-313-0368 or email at Kajuana.d.rice.civ@army.mil.

Sincerely,

Jason Braxton, Chief
Environmental Management Division

Table 1. Sites for Inclusion in Permit Mod 2

Date: 5/19/23

Site Number	Current Permit Table	Requested Table in Mod 2	Status	Additions for Part VIII
Part A Application			Updated the Garrison Environmental Contact	See attached updated file
RSA-014, Unlined Inactive Burn Trenches, Unit #2, Operable Unit 14	VI.6 (Part VI, Page 29 of 36)	VIII.1 for soil at RSA-014 South (Part VIII, Page 34 of 36) VI.6 for groundwater by RSA-151 groundwater unit (Part VI, Page 29 of 36)	Revision 1 RSA-014S CMIP (March 29, 2022) for soil was approved by ADEM in letter dated July 26, 2022. Groundwater under RSA-014 is to be addressed by the RSA-151 groundwater unit.	See attached word file.
RSA-028, In-Ground Oil/Water Separator, 5693 Area, Operable Unit 10	VI.2 (Part VI, Page 20 of 36)	VI.6 for soil and groundwater to be addressed as part of RSA-028 (Part VI, Page 29 of 36)	Revision 5 RSA-028 RFI report (June 2022) was approved by ADEM in letter dated September 16, 2022. Soil and groundwater corrective measures at RSA-028 are to be implmented in conjunction with corrective measures required for RSA-E (groundwater only).	N/A
RSA-071-R-01, Former Test Site Resolute Way	VI.6 (Part VI, Page 10 or 37) as RSA-071	VI.6 (Part VI, Page 10 of 37 as RSA-071-R-01) and VI.6 (Part VI, Page 20 of 37 as RSA-071-R-01)	Areas R1101 and R1102, totally 244.72 acres were removed from the active range inventory (RSA-071) to provide additional access to Redstone's EUL area. Created a new SWMU to be indentified as RSA-071-R-01 Former Test Site Resolute Way	See attached word file.
RSA-122, Dismantled Lewisite Manufacturing Plant, Area U, Operable Unit 06	VI.6 (Part VI, Page 30 of 36)	VIII.1 for soil (Part VIII, Page 35 of 36) VI.6 for groundwater by RSA-147 groundwater unit (Part VI, Page 30 of 36)	Revision 0 RSA-122/183 CMIP (dated June 6, 2022, slip sheets November 4, 2022) for soil was approved by ADEM in letter dated January 10, 2023. Groundwater corrective measures will be implemented with the RSA-147 groundwater unit.	See attached word file.
RSA-183, Former Lewisite Manufacturing Plants 1 and 2, Operable Unit 05	VI.6 (Part VI, Page 32 of 36)	VIII.1 for soil (Part VIII, Page 35 of 36) VI.6 for groundwater by RSA-148 groundwater unit (Part VI, Page 32 of 36)	Revision 0 RSA-122/183 CMIP (dated May 2022, slip sheets November 2022) for soil was approved by ADEM in letter dated January 10, 2023. Groundwater corrective measures will be implemented with the RSA-148 groundwater unit.	See attached word file.
RSA-255, Former Manganese Ore Storage Area	VIII.1 (Part VIII, Page 23 of 36)	VI.3 for soil (Part VI, Page 24 or 36)	Revision 0 Corrective Measures Implementation Report Addendum, RSA-255, Former Manganese Ore Storgage Area (dated March 2022) approved by ADEM in a letter dated July 26, 2022.	N/A
RSA-269, Former UST, Bldg 7852	VII.1 and VIII.1 (Part VII, Page 8 and 11 of 43) and VIII.1 (Page 24 of 36)	VII.1 and VIII.1 (Part VII, Page 8 and 11 of 43) and VIII.1 (Page 24 of 36)	Revision 00 Annual Monitoring Report: 2021-2022 Environmental Remediation Services Site RSA-269, dated May 25, 2023 was approved to reduce the sampling frequency from quarterly to semiannually.	Here and all subsequent sections of the document, change the sampling frequency from quarterly to semiannually.
RSA-271, Former Boiler House, Building 7729, Operable Unit 10	VI.6 (Part VI, Page 35 of 36)	VIII.1 for soil and groundwater (Part VIII, Page 36 of 36)	Revision 1 RSA-271 CMIP (dated November 2021, slip sheets May 2022) for soil and groundwater was approved by ADEM in letter dated August 5, 2022.	N/A
RSA-291, Underground Storage Tank at Former Building T-3162 (Steam Plant), Operable Unit 24	VI.2 (Part VI, Page 20 of 36)	VI.6 for groundwater to be addressed as part of RSA-291 (Part VI, Page 20 of 36)	Revision 3 RSA-291 RFI report (June 2022) was approved by ADEM in letter dated Febraury 2, 2023. Soil is NFA. Groundwater requires corrective measures.	N/A

RSA-304, Oil/Water Separator, Washrack, and Sump, Adjacent to Building 5498, Operable Unit 05	VI.2 (Part VI, Page 20 of 36)	VI.6 for soil to be addressed as part of RSA-304 and for groundwater to be addressed as part of RSA-304/320 (Part VI, Page 35 of 36)	Revision 1 RSA-304/320 RFI report (dated March 2022, slip sheets October 2022) approved by ADEM in letter dated December 20, 2022. Soil and groundwater require corrective measures.	N/A
RSA-319, Former Oil/Water Separator, Building 4812 and Pad, Operable Unit 19	VI.2 (Part VI, Page 21 of 36)	VI.6 for groundwater to be addressed as part of RSA-150 (Part VI, Page 32 of 36)	Revision 1 RSA-319 RFI report (October 2022) was approved by ADEM in letter dated December 21, 2022. Groundwater requires corrective measures.	N/A
RSA-320, Parking/Equipment Staging Area, Operable Unit 05	VI.2 (Part VI, Page 21 of 36)	VI.6 for groundwater to be addressed as part of RSA-304/320 (Part VI, Page 36 of 36)	Revision 1 RSA-304/320 RFI report (dated March 2022, slip sheets October 2022) approved by ADEM in letter dated December 20, 2022. Groundwater requires corrective measures.	N/A
RSA-321, Cleared Area East and Northeast of Building 3639	VI.2 (Part VI, Page 21 of 36)	VI.6 for groundwater to be addressed as part of RSA-321/293 (Part VI, Page 36 of 36)	Revision 1 RSA-321 RFI report (dated May 2022, slip sheets December 2022) approved by ADEM in letter dated January 11, 2023. Soil is NFA. Groundwater requires corrective measures jointly with RSA-321 and RSA-293.	N/A
Replacement Well RS814 with RS3054	VII.1 (Part VII, Page 18 of 43) & (Part VII.E.1.j, Page 7 of 43)	VII.1 (Part VII, Page 18 of 43) & (Part VII.E.1.j, Page 7 of 43)	Replace RS814 (abonded well) with RS3054 as the latter well was obstructed and damaged and required replacing.	See attached word file.

OMB# 2050-0024; Expires 05/31/2020

United States Environmental Protection Agency
RCRA SUBTITLE C SITE IDENTIFICATION FORM

1. Reason for Submittal (Select only one.)

☐	Obtaining or updating an EPA ID number for an on-going regulated activity that will continue for a period of time. (Includes HSM activity)
☐	Submitting as a component of the Hazardous Waste Report for _____ (Reporting Year)
	☐ Site was a TSD facility and/or generator of > 1,000 kg of hazardous waste, > 1 kg of acute hazardous waste, or > 100 kg of acute hazardous waste spill cleanup in **one or more months of the reporting year** (or State equivalent LQG regulations)
☐	Notifying that regulated activity is no longer occurring at this Site
☐	Obtaining or updating an EPA ID number for conducting Electronic Manifest Broker activities
☑	Submitting a new or revised Part A Form

2. Site EPA ID Number

A	L	7	2	1	0	0	2	0	7	4	2

3. Site Name

US ARMY GARRISON - REDSTONE

4. Site Location Address

Street Address **4488 Martin Road**		
City, Town, or Village **Redstone Arsenal**		County **Madison**
State **Alabama**	Country **United States**	Zip Code **35898**

5. Site Mailing Address

☑ Same as Location Address

Street Address **4488 Martin Road**		
City, Town, or Village **Redstone Arsenal**		
State **Alabama**	Country **United States**	Zip Code **35898**

6. Site Land Type

☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

7. North American Industry Classification System (NAICS) Code(s) for the Site (at least 5-digit codes)

A. (Primary)	**928110**	C.	**336411**
B.	**541712**	D.	

8. Site Contact Information

☑ Same as Location Address

First Name **Jason**	MI **K**	Last Name **Braxton**
Title **Chief, Environmental Management Division**		
Street Address **4488 Martin Road, Room A-339**		
City, Town, or Village **Redstone Arsenal**		
State **Alabama**	Country **United States**	Zip Code **35898**
Email **Jason.k.braxton.civ@army.mil**		
Phone **256-876-8607**	Ext	Fax **256-955-6083**

9. Legal Owner and Operator of the Site

A. Name of Site's Legal Owner

☑ Same as Location Address

Full Name US Army Garrison - Redstone		Date Became Owner (mm/dd/yyyy) 1/1/1941
Owner Type ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other		
Street Address 4488 Martin Road		
City, Town, or Village Redstone Arsenal		
State Alabama	Country **United States**	Zip Code 35898
Email Jason.k.braxton.civ@army.mil		
Phone 256-876-8607	Ext	Fax 256-955-6083
Comments Garrison Environmental Contact		

B. Name of Site's Legal Operator

☑ Same as Location Address

Full Name US Army Garrison - Redstone		Date Became Operator (mm/dd/yyyy) 1/1/1941
Operator Type ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other		
Street Address **4488 Martin Road**		
City, Town, or Village **Redstone Arsenal**		
State **Alabama**	Country **United States**	Zip Code **35898**
Email Jason.k.braxton.civ@army.mil		
Phone **256-876-8607**	Ext	Fax **256-955-6083**
Comments **Garrison Environmental Contact**		

10. Type of Regulated Waste Activity (at your site)

Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities

☑ Y ☐ N	1. Generator of Hazardous Waste—If "Yes", mark only one of the following—a, b, c		
	☑	a. LQG	-Generates, in any calendar month (includes quantities imported by importer site) 1,000 kg/mo (2,200 lb/mo) or more of non-acute hazardous waste; or - Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lb/mo) of acute hazardous waste; or - Generates, in any calendar month or accumulates at any time, more than 100 kg/mo (220 lb/mo) of acute hazardous spill cleanup material.
	☐	b. SQG	100 to 1,000 kg/mo (220-2,200 lb/mo) of non-acute hazardous waste and no more than 1 kg (2.2 lb) of acute hazardous waste and no more than 100 kg (220 lb) of any acute hazardous spill cleanup material.
	☐	c. VSQG	Less than or equal to 100 kg/mo (220 lb/mo) of non-acute hazardous waste.
If "Yes" above, indicate other generator activities in 2 and 3, as applicable.			
☑ Y ☐ N	2. Short-Term Generator (generates from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section.		
☐ Y ☑ N	3. Mixed Waste (hazardous and radioactive) Generator		
☑ Y ☐ N	4. Treater, Storer or Disposer of Hazardous Waste—Note: A hazardous waste Part B permit is required for these activities.		
☐ Y ☑ N	5. Receives Hazardous Waste from Off-site		
☐ Y ☑ N	6. Recycler of Hazardous Waste		
	☐	a. Recycler who stores prior to recycling	
	☐	b. Recycler who does not store prior to recycling	
☐ Y ☑ N	7. Exempt Boiler and/or Industrial Furnace—If "Yes", mark all that apply.		
	☐	a. Small Quantity On-site Burner Exemption	
	☐	b. Smelting, Melting, and Refining Furnace Exemption	

B. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g. D001, D003, F007, U112). Use an additional page if more spaces are needed.

See	**Att.**	**1**				

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes. Please list the waste codes of the State hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

None						

Attachment 1

10.B – Waste Codes for Federally Regulated Hazardous Waste

D001	F001	P047	P120	U053	U121	U185	U243
D002	F002	P048	P121	U055	U122	U186	U244
D003	F003	P050	P122	U056	U123	U187	U246
D004	F004	P054	P123	U057	U124	U188	U247
D005	F005	P056	U001	U060	U125	U190	U359
D006	F006	P062	U002	U061	U126	U191	
D007	F007	P063	U003	U067	U127	U194	
D008	F008	P064	U004	U068	U128	U196	
D009	F009	P065	U006	U069	U129	U200	
D010	F027	P067	U007	U070	U130	U201	
D011	K045	P068	U008	U071	U131	U203	
D012	P001	P069	U009	U072	U132	U204	
D013	P003	P071	U010	U074	U133	U205	
D014	P005	P073	U011	U075	U134	U207	
D015	P006	P074	U012	U077	U135	U208	
D016	P009	P076	U014	U078	U136	U209	
D017	P010	P077	U015	U079	U138	U210	
D018	P011	P078	U017	U080	U139	U211	
D019	P012	P081	U019	U081	U140	U212	
D020	P013	P085	U020	U082	U141	U213	
D021	P014	P087	U021	U083	U142	U214	
D022	P015	P092	U022	U084	U144	U215	
D023	P016	P093	U023	U086	U145	U216	
D024	P020	P094	U025	U088	U146	U217	
D025	P021	P095	U028	U090	U147	U218	
D026	P022	P096	U029	U091	U148	U219	
D027	P023	P097	U031	U092	U150	U220	
D028	P024	P098	U032	U098	U151	U221	
D029	P028	P099	U033	U099	U153	U222	
D030	P029	P101	U034	U101	U154	U223	
D031	P030	P102	U036	U102	U158	U225	
D032	P031	P104	U037	U103	U159	U226	
D033	P033	P105	U039	U105	U160	U227	
D034	P034	P106	U042	U106	U161	U228	
D035	P036	P109	U043	U107	U162	U230	
D036	P038	P110	U044	U108	U165	U231	
D037	P039	P111	U045	U109	U167	U232	
D038	P040	P112	U046	U112	U169	U233	
D039	P041	P113	U047	U113	U170	U234	
D040	P042	P114	U048	U115	U171	U236	
D041	P043	P115	U050	U117	U182	U239	
D042	P044	P116	U051	U118	U183	U240	
D043	P045	P119	U052	U120	U184	U242	

11. Additional Regulated Waste Activities (NOTE: Refer to your State regulations to determine if a separate permit is required.)

A. Other Waste Activities

☐ Y ☑ N	1. Transporter of Hazardous Waste—If "Yes", mark all that apply.
☐	a. Transporter
☐	b. Transfer Facility (at your site)
☐ Y ☑ N	2. Underground Injection Control
☐ Y ☑ N	3. United States Importer of Hazardous Waste
☐ Y ☑ N	4. Recognized Trader—If "Yes", mark all that apply.
☐	a. Importer
☐	b. Exporter
☐ Y ☑ N	5. Importer/Exporter of Spent Lead-Acid Batteries (SLABs) under 40 CFR 266 Subpart G—If "Yes", mark all that apply.
☐	a. Importer
☐	b. Exporter

B. Universal Waste Activities

☐ Y ☑ N	1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) - If "Yes" mark all that apply. Note: Refer to your State regulations to determine what is regulated.
☐	a. Batteries
☐	b. Pesticides
☐	c. Mercury containing equipment
☐	d. Lamps
☐	e. Other (specify) _____
☐	f. Other (specify) _____
☐	g. Other (specify) _____
☐ Y ☑ N	2. Destination Facility for Universal Waste Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities

☐ Y ☑ N	1. Used Oil Transporter—If "Yes", mark all that apply.
☐	a. Transporter
☐	b. Transfer Facility (at your site)
☐ Y ☑ N	2. Used Oil Processor and/or Re-refiner—If "Yes", mark all that apply.
☐	a. Processor
☐	b. Re-refiner
☐ Y ☑ N	3. Off-Specification Used Oil Burner
☐ Y ☑ N	4. Used Oil Fuel Marketer—If "Yes", mark all that apply.
☐	a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
☐	b. Marketer Who First Claims the Used Oil Meets the Specifications

12. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR 262 Subpart K.

☐ Y ☑ N	A. Opting into or currently operating under 40 CFR 262 Subpart K for the management of hazardous wastes in laboratories—If "Yes", mark all that apply. Note: See the item-by-item instructions for definitions of types of eligible academic entities.
☐	1. College or University
☐	2. Teaching Hospital that is owned by or has a formal written affiliation with a college or university
☐	3. Non-profit Institute that is owned by or has a formal written affiliation with a college or univer-
☐ Y ☑ N	B. Withdrawing from 40 CFR 262 Subpart K for the management of hazardous wastes in laboratories.

13. Episodic Generation

☐ Y ☑ N	Are you an SQG or VSQG generating hazardous waste from a planned or unplanned episodic event, lasting no more than 60 days, that moves you to a higher generator category. If "Yes", you must fill out the Addendum for Episodic Generator.

14. LQG Consolidation of VSQG Hazardous Waste

☐ Y ☑ N	Are you an LQG notifying of consolidating VSQG Hazardous Waste Under the Control of the Same Person pursuant to 40 CFR 262.17(f)? If "Yes", you must fill out the Addendum for LQG Consolidation of VSQGs hazardous waste.

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) OR Entire Facility (required)

☐ Y ☑ N	LQG Site Closure of a Central Accumulation Area (CAA) or Entire Facility.
	A. ☐ Central Accumulation Area (CAA) ☐ Entire Facility
	B. Expected closure date: _____ mm/dd/yyyy
	C. Requesting new closure date: _____ mm/dd/yyyy
	D. Date closed : _____ mm/dd/yyyy ☐ 1. In compliance with the closure performance standards 40 CFR 262.17(a)(8) ☐ 2. Not in compliance with the closure performance standards 40 CFR 262.17(a)(8)

16. Notification of Hazardous Secondary Material (HSM) Activity

☐ Y ☑ N	A. Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.
☐ Y ☑ N	B. Are you notifying under 40 CFR 260.43(a)(4)(iii) that the product of your recycling process has levels of hazardous constituents that are not comparable to or unable to be compared to a legitimate product or intermediate but that the recycling is still legitimate? If "Yes", you may provide explanation in Comments section. You must also document that your recycling is still legitimate and maintain that documentation on site.

17. Electronic Manifest Broker

☐ Y ☑ N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

18. Comments (include item number for each comment)

10.A.2 - Redstone is Research, Development, Test and Evaluation area - not a production facility.

19. Certification 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. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy) 01/09/2020
Printed Name (First, Middle Initial Last) **Laurence G. Gottschalk**	Title **Director (RCMD)**
Email **Laurence.G.Gottschalk.civ@mail.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

18. Comments (include item number for each comment)

10.A.2 - Redstone is Research, Development, Test and Evaluation area - not a production facility.

19. Certification 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. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
	01/10/2020
Printed Name (First, Middle Initial Last) **Juanita M. Christensen, Ph.D**	Title **Director (CCDC AvMC)**
Email **Juanita.M.Christensen3.civ@mail.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

18. Comments (include item number for each comment)

10.A.2 - Redstone is Research, Development, Test and Evaluation area - not a production facility.

19. Certification 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. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy) 01/27/2020
Printed Name (First, Middle Initial Last) **Kelsey A. Smith, Colonel, U.S. Army**	Title **Garrison Commander-Redstone Arsenal**
Email **Kelsey.A.Smith16.mil@mail.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

United States Environmental Protection Agency

HAZARDOUS WASTE PERMIT PART A FORM

1. Facility Permit Contact

First Name	**Alfred**	MI	**K**	Last Name	**Cook**
Title	**Chief, Environmental Management Division**				
Email	**Alfred.k.cook.civ@mail.mil**				
Phone	**256-876-8554**	Ext		Fax	**256-955-6083**

2. Facility Permit Contact Mailing Address

Street Address	**4488 Martin Road**				
City, Town, or Village	**Redstone Arsenal**				
State	**Alabama**	Country	United States	Zip Code	35898

3. Facility Existence Date (mm/dd/yyyy)

1/1/1941

4. Other Environmental Permits

A. Permit Type	B. Permit Number	C. Description
P	**7 0 9 - 0 0 0 7**	**CAA Title V Permit**
R	**4 5 - 0 3**	**Solid Waste Landfill**
U	**2 0 1 7 - 5 2 1**	**Drinking Water**
N	**A L 0 0 0 0 0 1 9**	**NPDES**
N	**A L R 0 4 0 0 3 3**	**NPDES**
N	**A L G 8 9 0 0 5 5**	**NPDES**
N	**A L G 8 9 0 5 9 4**	**NPDES**

5. Nature of Business

Redstone Arsenal's mission includes: research, development, engineering, testing, procurement, production, and logistics support of operational missile and rocket systems. Also included are training, production, verification, and stockpile reliability activities.

6. Process Codes and Design Capacities

Line Number		A. Process Code			B. Process Design Capacity (1) Amount	B. Process Design Capacity (2) Unit of Measure	C. Process Total Number of Units	D. Unit Name
0	1	S	0	1	435,600	G	033	Storage Igloos
0	2	X	0	1	5.175	N	06	(5) OB pans & (1) OD
0	3	T	0	4	0.0043544	S	02	Explosive Destruction Sys
					See	Attachment	2 , 3	& Section 11. Comments

7. Description of Hazardous Wastes (Enter codes for Items 7.A, 7.C and 7.D(1))

Line No.		A. EPA Hazardous Waste No.				B. Estimated Annual Qty of Waste	C. Unit of Measure	D. Processes (1) Process Codes								D. Processes (2) Process Description (if code is not entered in 7.D1))
0	1	D	0	0	1	75,000	P	S	0	1						
0	2	D	0	0	2	25,000	P	S	0	1						
0	3	D	0	0	3	100,000	P	S	0	1						
0	4	D	0	0	4	10,000	P	S	0	1						
0	5	D	0	0	5	200,000	P	S	0	1						
0	6	D	0	0	6	400,000	P	S	0	1						
0	7	D	0	0	7	400,000	P	S	0	1						
0	8	D	0	0	8	300,000	P	S	0	1						
0	9	D	0	0	9	3,000	P	S	0	1						
1	0	D	0	1	0	100	P	S	0	1						
																See cont. sheets

8. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

9. Facility Drawing

All existing facilities must include a scale drawing of the facility. See instructions for more detail.

10. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas. See instructions for more detail.

11. Comments

Reason for Update - Garrison Environmental Contact (Chief)
See additional comments on 11., continued

Attachment 2

Calculation Assumptions

Hazardous Waste Storage Units (total of 33 Units) for storing recovered munitions and other waste material for up to one year.

The estimated quantity of waste to be stored is based on design capacity of a storage unit (igloo) housing 55-gallon sized storage containers. The storage units are 26'5" wide by 81' long. However, because of the shape of the igloos and the need to provide adequate access for drum transport and inspection, each igloo can hold a maximum of 240 drums.

- 240 drums (55-gallon) in each igloo (storage unit) x 55-gallons per drum = 13,200 gallons per igloo
- 33 igloos x 240 drums (55-gallons per drum) per igloo = 7,920 drums (55-gallon) total or 435,600 gallon capacity

Note:

The maximum estimated quantity of hazardous waste that may be stored in the 33 storage units (igloos) is 435,600 gallons or 7,920 drums (55-gallon).

Attachment 3

Explosive Destruction System (EDS) Process Design Calculation

Treatment using the EDS is a batch process where one or more items may be processed at a time. The maximum number of items that can be treated is based on the amount of explosives (burster and fuse) items contained and the amount of donor charge needed to access the items. At no time will the total net explosive weight (NEW)[a] limit of an EDS be exceeded.

Each EDS Phase 2 unit is capable of safely withstanding up to 4.8 pounds of TNT equivalent explosives for each detonation and one detonation per day. Up to two EDS units will be operated at the EDS site.

The following calculation represents the maximum treatment design capacity scenario.

Estimated quantity of waste treated in the EDS:

A single EDS Phase 2 can process 4.8 lbs/day NEW[a]

- 4.8 pounds/day x 1 metric ton/2204.62 pounds = 0.0021772 metric tons per EDS unit/day
- 0.0021772 metric tons/day x 2 EDS Units = 0.0043544 metric tons/day maximum capacity

Note:

[a] New = The actual weight (in pounds) of explosive mixtures or compounds, including the trinitrotoluene (TNT) equivalent of energetic material that is used in determining explosive limits.

Section 7. Description of Hazardous Waste (Enter Codes for Items 7.A, 7.C and 7.D(1))

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
11	D011	2,500	P	S01	
12	D012	5	P	S01	
13	D013	5	P	S01	
14	D014	5	P	S01	
15	D015	5	P	S01	
16	D016	2,000	P	S01	
17	D017	2,000	P	S01	
18	D018	125,000	P	S01	
19	D019	5,000	P	S01	
20	D020	30,000	P	S01	
21	D021	1,000	P	S01	
22	D022	10,000	P	S01	
23	D023	10	P	S01	
24	D024	10	P	S01	
25	D025	10	P	S01	
26	D026	301	P	S01	
27	D027	7,500	P	S01	
28	D028	30,000	P	S01	
29	D029	50,000	P	S01	
30	D030	5	P	S01	
31	D031	5	P	S01	
32	D032	5	P	S01	
33	D033	10,000	P	S01	
34	D034	100	P	S01	
35	D035	15,000	P	S01	
36	D036	20	P	S01	
37	D037	1,000	P	S01	
38	D038	100	P	S01	
39	D039	125,000	P	S01	
40	D040	200,000	P	S01	
41	D041	24,000	P	S01	
42	D042	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
43	D043	25,000	P	S01	
44	F001	200,000	P	S01	
45	F002	150,000	P	S01	
46	F003	40,000	P	S01	
47	F004	1,500	P	S01	
48	F005	80,000	P	S01	
49	F006	10	P	S01	
50	F007	10	P	S01	
51	F008	5	P	S01	
52	F009	5	P	S01	
53	F027	5	P	S01	
54	K045	3,000	P	S01	
55	P001	5	P	S01	
56	P003	5	P	S01	
57	P005	5	P	S01	
58	P006	5	P	S01	
59	P009	5	P	S01	
60	P010	5	P	S01	
61	P011	5	P	S01	
62	P012	10	P	S01	
63	P013	5	P	S01	
64	P014	5	P	S01	
65	P015	15	P	S01	
66	P016	5	P	S01	
67	P020	5	P	S01	
68	P021	5	P	S01	
69	P022	10	P	S01	
70	P023	5	P	S01	
71	P024	5	P	S01	
72	P028	10	P	S01	
73	P029	5	P	S01	
74	P030	10,000	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
75	P031	5	P	S01	
76	P033	5	P	S01	
77	P034	5	P	S01	
78	P036	5	P	S01	
79	P038	5	P	S01	
80	P039	5	P	S01	
81	P040	5	P	S01	
82	P041	5	P	S01	
83	P042	10	P	S01	
84	P043	5	P	S01	
85	P044	5	P	S01	
86	P045	5	P	S01	
87	P047	5	P	S01	
88	P048	10	P	S01	
89	P050	5	P	S01	
90	P054	5	P	S01	
91	P056	5	P	S01	
92	P062	5	P	S01	
93	P063	5	P	S01	
94	P064	5	P	S01	
95	P065	5	P	S01	
96	P067	5	P	S01	
97	P068	5	P	S01	
98	P069	5	P	S01	
99	P071	5	P	S01	
100	P073	5	P	S01	
101	P074	5	P	S01	
102	P076	5	P	S01	
103	P077	5	P	S01	
104	P078	5	P	S01	
105	P081	5	P	S01	
106	P085	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
107	P087	5	P	S01	
108	P092	5	P	S01	
109	P093	5	P	S01	
110	P094	5	P	S01	
111	P095	5	P	S01	
112	P096	5	P	S01	
113	P097	5	P	S01	
114	P098	2,000	P	S01	
115	P099	5	P	S01	
116	P101	10	P	S01	
117	P102	10	P	S01	
118	P104	10	P	S01	
119	P105	5	P	S01	
120	P106	5	P	S01	
121	P109	5	P	S01	
122	P110	5	P	S01	
123	P111	5	P	S01	
124	P112	5	P	S01	
125	P113	5	P	S01	
126	P114	5	P	S01	
127	P115	5	P	S01	
128	P116	5	P	S01	
129	P119	20	P	S01	
130	P120	5	P	S01	
131	P121	5	P	S01	
132	P122	5	P	S01	
133	P123	5	P	S01	
134	U001	5	P	S01	
135	U002	50	P	S01	
136	U003	7	P	S01	
137	U004	5	P	S01	
138	U006	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
139	U007	5	P	S01	
140	U008	10	P	S01	
141	U009	21	P	S01	
142	U010	5	P	S01	
143	U011	5	P	S01	
144	U012	5	P	S01	
145	U014	5	P	S01	
146	U015	100	P	S01	
147	U017	5	P	S01	
148	U019	100	P	S01	
149	U020	5	P	S01	
150	U021	5	P	S01	
151	U022	5	P	S01	
152	U023	5	P	S01	
153	U025	5	P	S01	
154	U028	10	P	S01	
155	U029	5	P	S01	
156	U031	25	P	S01	
157	U032	50	P	S01	
158	U033	5	P	S01	
159	U034	5	P	S01	
160	U036	5	P	S01	
161	U037	200	P	S01	
162	U039	5	P	S01	
163	U042	5	P	S01	
164	U043	5	P	S01	
165	U044	50	P	S01	
166	U045	5	P	S01	
167	U046	5	P	S01	
168	U047	5	P	S01	
169	U048	5	P	S01	
170	U050	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
171	U051	5	P	S01	
172	U052	10	P	S01	
173	U053	5	P	S01	
174	U055	5.5	P	S01	
175	U056	5	P	S01	
176	U057	20	P	S01	
177	U060	5	P	S01	
178	U061	5	P	S01	
179	U067	5	P	S01	
180	U068	5	P	S01	
181	U069	10	P	S01	
182	U070	5	P	S01	
183	U071	5	P	S01	
184	U072	5	P	S01	
185	U074	5	P	S01	
186	U075	5	P	S01	
187	U077	2,300	P	S01	
188	U078	5	P	S01	
189	U079	5	P	S01	
190	U080	3,400	P	S01	
191	U081	5	P	S01	
192	U082	5	P	S01	
193	U083	5	P	S01	
194	U084	5	P	S01	
195	U086	5	P	S01	
196	U088	5	P	S01	
197	U090	5	P	S01	
198	U091	5	P	S01	
199	U092	5	P	S01	
200	U098	360	P	S01	
201	U099	5	P	S01	
202	U101	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
203	U102	5	P	S01	
204	U103	5	P	S01	
205	U105	5	P	S01	
206	U106	5	P	S01	
207	U107	5	P	S01	
208	U108	50	P	S01	
209	U109	5	P	S01	
210	U112	200	P	S01	
211	U113	5	P	S01	
212	U115	5	P	S01	
213	U117	5	P	S01	
214	U118	5	P	S01	
215	U120	5	P	S01	
216	U121	5	P	S01	
217	U122	20	P	S01	
218	U123	5	P	S01	
219	U124	5	P	S01	
220	U125	5	P	S01	
221	U126	5	P	S01	
222	U127	5	P	S01	
223	U128	5	P	S01	
224	U129	5	P	S01	
225	U130	5	P	S01	
226	U131	5	P	S01	
227	U132	5	P	S01	
228	U133	12,000	P	S01	
229	U134	5	P	S01	
230	U135	5	P	S01	
231	U136	5	P	S01	
232	U138	5	P	S01	
233	U139	5	P	S01	
234	U140	10.5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
235	U141	5	P	S01	
236	U142	5	P	S01	
237	U144	5	P	S01	
238	U145	5	P	S01	
239	U146	5	P	S01	
240	U147	75	P	S01	
241	U148	5	P	S01	
242	U150	50	P	S01	
243	U151	10	P	S01	
244	U153	5	P	S01	
245	U154	1,000	P	S01	
246	U158	400	P	S01	
247	U159	500	P	S01	
248	U160	5	P	S01	
249	U161	5	P	S01	
250	U162	5	P	S01	
251	U165	5	P	S01	
252	U167	5	P	S01	
253	U169	20	P	S01	
254	U170	5	P	S01	
255	U171	5	P	S01	
256	U182	5	P	S01	
257	U183	5	P	S01	
258	U184	5	P	S01	
259	U185	5	P	S01	
260	U186	5	P	S01	
261	U187	5	P	S01	
262	U188	100	P	S01	
263	U190	20	P	S01	
264	U191	5	P	S01	
265	U194	5	P	S01	
266	U196	10	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
267	U200	5	P	S01	
268	U201	5	P	S01	
269	U203	5	P	S01	
270	U204	5	P	S01	
271	U205	5	P	S01	
272	U207	5	P	S01	
273	U208	5	P	S01	
274	U209	5	P	S01	
275	U210	500	P	S01	
276	U211	500	P	S01	
277	U212	400	P	S01	
278	U213	5	P	S01	
279	U214	5	P	S01	
280	U215	5	P	S01	
281	U216	5	P	S01	
282	U217	5	P	S01	
283	U218	5	P	S01	
284	U219	10	P	S01	
285	U220	400	P	S01	
286	U221	5	P	S01	
287	U222	10	P	S01	
288	U223	10	P	S01	
289	U225	5	P	S01	
290	U226	500	P	S01	
291	U227	100	P	S01	
292	U228	1,000	P	S01	
293	U230	5	P	S01	
294	U231	5	P	S01	
295	U232	5	P	S01	
296	U233	5	P	S01	
297	U234	5	P	S01	
298	U236	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
299	U239	250	P	S01	
300	U240	5	P	S01	
301	U242	5	P	S01	
302	U243	5	P	S01	
303	U244	5	P	S01	
304	U246	5	P	S01	
305	U247	5	P	S01	
306	U359	5	P	S01	
307	D001	68.75	T	X01	
308	D002			X01	Included with above
309	D003			X01	Included with above
310	D004			X01	Included with above
311	D005			X01	Included with above
312	D006			X01	Included with above
313	D007			X01	Included with above
314	D008			X01	Included with above
315	D009			X01	Included with above
316	D010			X01	Included with above
317	D011			X01	Included with above
318	D018			X01	Included with above
319	D019			X01	Included with above
320	D021			X01	Included with above
321	D022			X01	Included with above
322	D023			X01	Included with above
323	D024			X01	Included with above
324	D025			X01	Included with above
325	D026			X01	Included with above
326	D027			X01	Included with above
327	D028			X01	Included with above
328	D029			X01	Included with above
329	D030			X01	Included with above
330	D032			X01	Included with above

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
331	D035			X01	Included with above
332	D036			X01	Included with above
333	D038			X01	Included with above
334	D039			X01	Included with above
335	D040			X01	Included with above
336	F001			X01	Included with above
337	F002			X01	Included with above
338	F003			X01	Included with above
339	F004			X01	Included with above
340	F005			X01	Included with above
341	U133			X01	Included with above
342	D001	1,500	P	T04	
343	D002			T04	Included with above
344	D003			T04	Included with above
345	D004			T04	Included with above
346	D005			T04	Included with above
347	D006			T04	Included with above
348	D007			T04	Included with above
349	D008			T04	Included with above
350	D009			T04	Included with above
351	D010			T04	Included with above
352	D011			T04	Included with above
353	D018			T04	Included with above
354	D019			T04	Included with above
355	D022			T04	Included with above
356	D028			T04	Included with above
357	D029			T04	Included with above
358	D030			T04	Included with above
359	D034			T04	Included with above
360	D039			T04	Included with above
361	D040			T04	Included with above
362	D043			T04	Included with above

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
363	P036			T04	Included with above
364	P095			T04	Included with above

Section 11. Comments, continued

The weights for line 2 (process code X01) are expressed as net explosive weight.

Section 6: Process Codes and Design Capacities
The treatment capacity of an Explosive Destruction System (EDS) Phase 2 unit is 4.8 lbs. net explosive weight per day. See Attachment 3 for process design calculations. Explosives shaped charges are used to detonate a munition burster (if present) and breach the munition wall exposing the chemical fill. A predetermined amount of reagent is added to treat the chemical fill and explosive residue. Agitation with heat (if required) follows. Liquid and solid wastes generated from the treatment process are then removed from the Containment Vessel, containerized (in 55-gallon drums) and placed in a hazardous waste storage area for offsite disposition.

Section 8: Map
See Topographical Map(s) referenced in Section B of this Permit Renewal Application.

Sections 9 and 10: Facility Drawing and Photographs
See Section B of this Permit Renewal Application.

VIII.C AREA SPECIFIC CONDITIONS

(approximately 4) RSA-014, Unlined Inactive Burn Trenches, Operable Unit 2: As described in the Revision 1 CMI Work Plan for RSA-014S, the Permittee shall perform surface clearance for potential munitions and explosives of concern (MEC) at planned excavation areas; excavate TCE contaminated soil and replace it with clean soil; remove and dispose of MEC if encountered during the surface clearance or soil excavation; excavated, contaminated soil will be stockpiled on impervious material and covered with waterproof material to prevent contaminant migration before transport to a Subtitle D landfill; composite samples will be collected from the completed excavation sidewalls and from the excavation floor for laboratory TCE analyses; one floor sample for every 2,500 square feet and one sidewall sample for every 50 linear feet of sidewall will be collected; excavated soil with concentrations exceeding the cleanup goal will be shipped to a permitted Subtitle D landfill for disposal as a non-hazardous special waste; and prior to transport and disposal of excavated waste, appropriate approval from ADEM and the selected waste disposal facility is required.

The Permittee shall implement restrictions on land use due to potential hazards with MEC which includes signage, fencing, and on-site unexploded ordinance (UXO) construction support for intrusive activities. The Permittee shall inspect and maintain LUCs required as follows:

a. RSA-014 shall be restricted to industrial/commercial uses. Residential use and/or residential development of the LUC area of the site, including use or development for residential housing, elementary and secondary schools, child care facilities, and playgrounds, are prohibited.

b. A NEUR, in accordance with ADEM Admin. Code r. 335-5-1-.02(3), shall be completed, incorporated into the facility Master Plan and recorded in the land records for the property.

c. Inspection of the signs and 6-foot high chain-link fencing at the boundaries of the LUC areas shall be performed annually to ensure that they are present and legible and in good repair. Sign and fence repair or replacement will be made on an as-needed basis. The Army will notify ADEM within 10-days if the inspections identify any site uses inconsistent with the restrictions imposed on the site.

d. Intrusive activities within the site LUC boundaries will be conducted with appropriate approvals and safety controls (e.g., anomaly avoidance, on-site UXO construction support).

e. An annual monitoring report on the presence and effectiveness of land use restrictions and controls shall be submitted to ADEM for the site. This report shall document the annual inspection and identify the status of the NEUR and how any deficiencies or inconsistent uses have been addressed. The annual evaluation shall address whether the use restrictions and controls referenced previously are communicated in the deed(s), whether the owners and state and local agencies are notified of the use

restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls.

f. Notice shall be provided to ADEM in the annual monitoring report regarding any observed changes in use, any identified proposed changes in use, applications for building permits, or proposals for any site work inconsistent with the NEUR.

g. The LUCs shall be maintained until the concentrations of hazardous substances at RSA-014 are at levels suitable for unrestricted use and exposure, and a permit modification, in accordance with Permit Condition I.J., to remove the LUCs is approved by the Department.

Table VIII.1
List of SWMUs and AOCs requiring Corrective Measures:

ADD:

Applicable SWMU/AOC	*CMS/CMI/ROD/LUC RD	Approval Date
RSA-014, Unlined Inactive Burn Trenches, Unit #2, OU-14	Revision 1 CMI Work Plan, RSA-014S, dated March 29, 2022	TBD

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO
ATTENTION OF

July 31, 2023

Mr. Steve Cobb
Chief, Land Division
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

RE: Removal of 244.72 Acres from Active Range (RSA-071) at Redstone Arsenal to be identified as RSA-071-R-01 – Former Test Site Resolute Way

Dear Mr. Cobb:

The U.S Army Garrison – Redstone Arsenal (Redstone Arsenal – RSA) Commander in coordination with the Director of Public Works and the Chiefs of Base Operations, Environmental Management and Master Planning approved the removal of the referenced 244.72 acres from the active range inventory. The purpose of the closure of the actives ranges is to provide additional access from Interstate 565 to Redstone Arsenal's Enhanced Use Lease (EUL) property and Gate 9.

The 4.6 million square foot EUL is approximately 25% complete and the nearby Gate 9 processes over 43% of the installation's daily traffic. The referenced sites are accessed from a single nearby interstate exit, resulting in significant hazards and delays as the combined traffic frequently backs up beyond and onto the interstate. By utilizing the adjacent ranges, R1101 and R1102, to modify another interstate exit will integrate dedicated access to the EUL with municipal infrastructure and remove an anticipated 1700 vehicles from the Gate 9 access road. Improvements to the installation's access will enhance readiness, resilience, and quality of life for the Soldiers and Civilians of Redstone Arsenal, as well as the surrounding communities.

RSA-071, the High Explosive Drop/Test Site, Area A located in the northwest part of Redstone Arsenal, was a 600-acre area used for explosives training and munitions testing during World War II. Portions of the site are located within an operational range area and are in an active use status. Two existing structures on R1101 were being used by a single tenant organization as equipment storage; however, an alternate location was identified for use upon approval of the closure request.

The 244.72 acres that have been identified and removed from the active range will be identified and listed in Table VI.1 (Master List of known SWMUs/AOCs at the facility) and Table VI.2 (List of SWMU's and AOC's requiring a RCRA Facility Investigation (RFI)) of the Redstone Arsenal AHWMMA Permit as RSA-071-R-01.

If there are any questions and/or concerns regarding this matter, please contact Jason Watson at 256-842-1448 or via email at Jason.n.watson3.civ@army.mil.

Sincerely,

Clint Howard

Clint Howard
Chief, Environmental Restoration Branch

Cc/via email: Ashley T. Mastin, ADEM
Robert Pope, US EPA Region IV

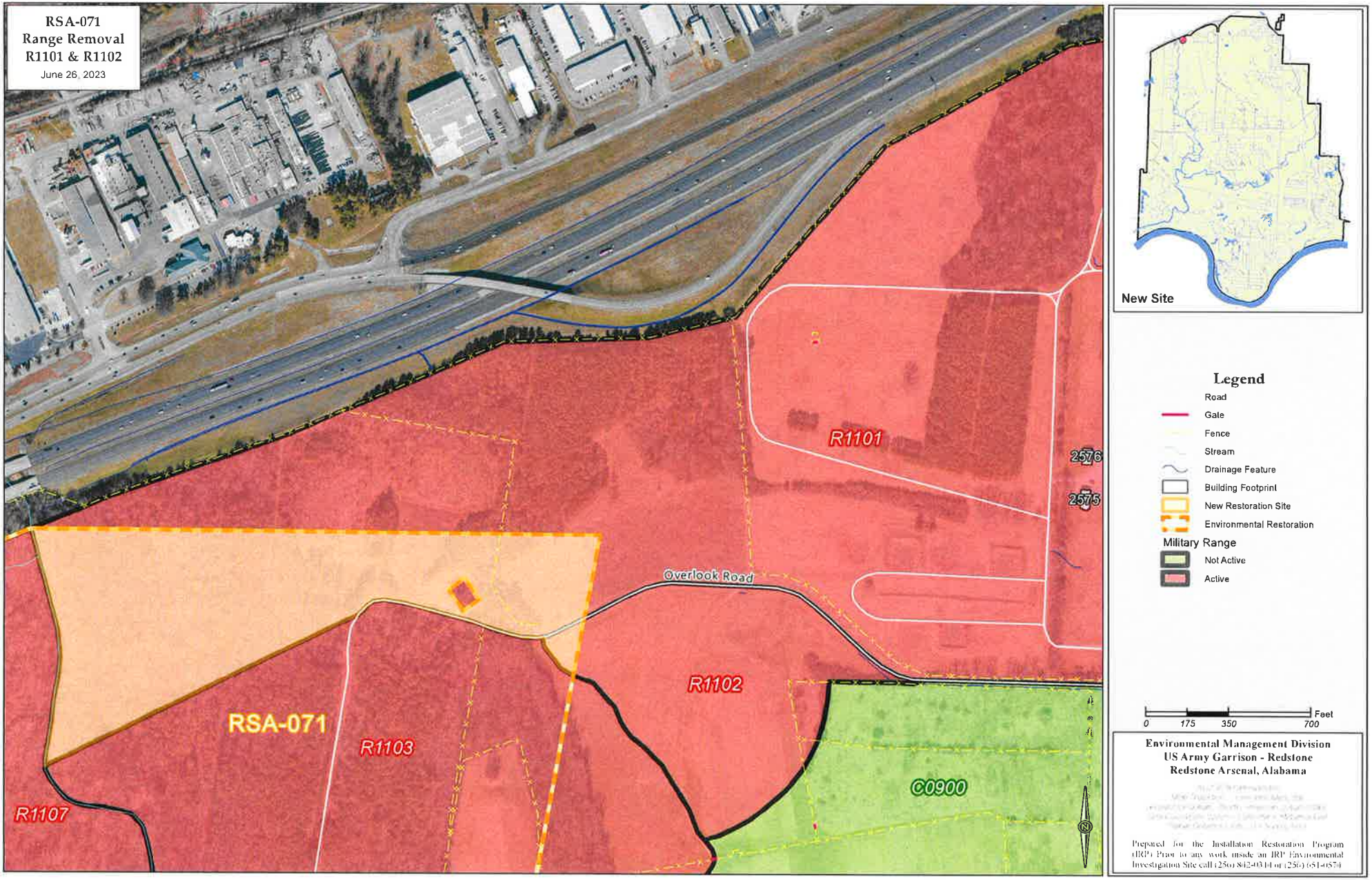
RSA-071
Range Removal
R1101 & R1102
June 26, 2023
R1101
2576
2575
Overlook Road
R1102
RSA-071
R1103
R1107
C0900
New Site
Legend
Road
Gate
Fence
Stream
Drainage Feature
Building Footprint
New Restoration Site
Environmental Restoration
Military Range
Not Active
Active
0
175
350
700
Feet
Environmental Management Division
US Army Garrison - Redstone
Redstone Arsenal, Alabama
Prepared for the Installation Restoration Program (IRP). Prior to any work inside an IRP Environmental Investigation Site call (256) 842-0314 or (256) 651-0574

Table J-3
Redstone Operational Range Description and SWMUs with Deferred RFIs
Redstone Arsenal, Madison County, Alabama

Range Complex	Range ID	Acres	Use Description	SWMU Located within Range
R0100	R0100	37.8	FTX, Light Maneuver Area, RDT&E, Flat	
R0200	R0200	590.7	FTX, Light Maneuver Area, RDT&E, Gently Rolling	
R0300	R0300	162.8	Corkern Range Training, RDT&E, Flat	
R0400	R0400	2283.4	RDT&E, TA-10, Gently Rolling	RSA-129
R0500	R0501	302.1	Hazardous Devices Range Training North, Flat	
	R0502	274.0	RDT&E South Plant, Gently Rolling	
	R0503	209.8	RDT&E E3, Laser Area	
	R0504	249.5	HOR- Hazardous Devices Range Training South, Gently Rolling	
	R0505	1977.5	RDT&E, TA-5, ATF, FTX, Training, Heavily Rolling	RSA-046
	R0506	346.3	RDT&E, Tower-Laser Testing, Flat	RSA-046
R0600	R0600	815.9	RDT&E, ASP, Explosive Storage, Mountainous	
R0700	R0701	2033.2	RDT&E, Explosive Storage, FTX, Light Maneuver Area, 80% Flat, 20% Mountainous	
	R0702	47.3	OBOD, Flat	
R0800	R0800	609.2	Training, McKinley Range Training, RDT&E, Flat	
R0900	R0900	83.0	RDT&E, RDEC Test Facility 7804, Flat	
R1000	R1000	9816.0	RDT&E, FTX, TA-1,2,4,6 Open Air Range, 85% Flat 15% Mountainous	RSA-074, RSA-254, RSA-260
R1100	R1103	181.1	RDT&E, FTX, Unmanned Ground Vehicles, Heavily Rolling	RSA-071
	R1104	370.6	RDT&E, Garrison/RDEC Light Maneuver Area, Heavily Rolling	RSA-071, RSA-072
	R1105	311.7	FTX, Light Maneuver Area, RDT&E, Gently Rolling	RSA-071, RSA-072
	R1106	419.5	FTX, RDT&E, Light Maneuver Area, Heavily Rolling	RSA-072
	R1107	2338.5	RDT&E, UAV Training, TA-3 Open Air Range Heavily Rolling	RSA-073, RSA-074
R1200	R1200	1608.3	RDT&E, FTX, SA Range, Light Maneuver Area Mountainous	
R1300	R1300	18.7	RDT&E, FTX, EOD Training, OMEMS - Public Safety Bomb Tech PSBD, Gently Rolling	

ASP – Ammunition Supply Point.
ATF – Bureau of Alcohol, Tobacco, Firearms and Explosives.
EOD – Explosive ordnance disposal.
FTX – Field training exercise. OBOD – Open Burn/Open Detonation.
OMEMS – Ordnance Munitions and Electronic Maintenance School.
RDEC – Research, Development and Engineering Center.
RDT&E – Research, development, test and evaluation.
TA – Test Area.
UAV – Unmanned aircraft vehicle.

VIII.C AREA SPECIFIC CONDITIONS

(approximately 17) RSA-122, Dismantled Lewisite Manufacturing Plant, Area Unit 06: This corrective action has been designed to 1) remove and dispose of contaminated soils to achieve conditions suitable for industrial/commercial site use; 2) remove relict structures (e.g., abandoned underground chemical piping, sumps, pits, trenches); 3) employ LUCs throughout the site for soils that exceed residential cleanup goals (CGs); and 4) LUCs will be employed at RSA-122 to address soils deeper than six feet below ground surface to prevent or minimize exposure by a commercial worker/groundskeeper receptor.

a) As described in the CMI Work Plan for RSA-122/183, the Permittee shall excavate contaminated soil, dispose of it off-site, and replace it with clean soil. One sidewall sample for every 250 square feet of sidewall and one floor sample for every 2,500 square feet shall be collected. At locations where detected concentrations exceed CGs, over-excavation may be performed.

b) The excavated, contaminated soil will either be loaded directly for transport to a Subtitle C or D landfill with preapproval or will be stockpiled onto impervious material within RSA-122 and covered with waterproof material to prevent contaminant migration. Composite samples of the stockpile will be collected at a frequency of one sample per 200 cubic yards of material for TCLP metals. Soil meeting regulatory levels will be shipped to an off-site, permitted, Subtitle D landfill for disposal as a non-hazardous special waste. The excavated soil that is stockpiled may undergo stabilization to render the material nonhazardous for waste disposal purposes, if needed. The Permittee shall ship excavated soil to an off-site, permitted Subtitle C landfill for disposal as hazardous waste should stabilization not meet requirements to render the material as nonhazardous. Prior to transport and disposal of excavated waste, appropriate approval from ADEM and the selected waste disposal facility is required.

c) The Permittee shall remove relict structures from the historical mustard manufacturing facility (e.g., abandoned underground chemical piping, sumps, pits, trenches) as described in the CMI Work Plan for RSA-122/183.

d) The Permittee shall implement restrictions on land use due to potential hazards with CWM and for arsenic and benzo(a)pyrene concentrations remaining in soil above residential cleanup goals which includes signage and on-call UXO support for intrusive activities. The Permittee shall inspect and maintain LUCs required as follows:

    i. RSA-122 shall be restricted to industrial/commercial uses. Residential use and/or residential development of the LUC area of the site, including use or development for residential housing, elementary and secondary schools, child care facilities, and playgrounds, are prohibited.
    ii. Groundskeepers or other commercial receptors shall be restricted from contact to soils deeper than 6 feet below ground surface.
    iii. A NEUR, in accordance with ADEM Admin. Code r. 335-5-1-.02(3), shall be completed, incorporated into the facility Master Plan and recorded in the land records for the property.

iv. Inspection of the signs at the boundaries of the LUC areas shall be performed annually to ensure that they are present and legible. Sign repair or replacement will be made on an as-needed basis. The Army will notify ADEM within 10-days if the inspections identify any site uses inconsistent with the restrictions imposed on the site.

v. Intrusive activities within areas retaining elevated CWM probabilities within the site-wide LUC boundaries will be conducted with appropriate approvals and safety controls (e.g., chemical agent monitoring, onsite or on-call UXO support). The requirement to implement these supplemental controls will be determined by the Permittee and presented to ADEM in the Corrective Measures Report for this site.

vi. An annual monitoring report on the presence and effectiveness of land use restrictions and controls shall be submitted to ADEM for the site. This report shall document the annual inspection and identify the status of the NEUR and how any deficiencies or inconsistent uses have been addressed. The annual evaluation shall address whether the use restrictions and controls referenced previously are communicated in the deed(s), whether the owners and state and local agencies are notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls.

vii. Notice shall be provided to ADEM in the annual monitoring report regarding any observed changes in use, any identified proposed changes in use, applications for building permits, or proposals for any site work inconsistent with the NEUR.

viii. The LUCs shall be maintained until the concentrations of hazardous substances at RSA-122 are at levels suitable for unrestricted use and exposure, and a permit modification, in accordance with Permit Condition I.J., to remove the LUCs is approved by the Department.

Table VIII.1

List of SWMUs and AOCs requiring Corrective Measures:

ADD:

Applicable SWMU/AOC	*CMS/CMI/ROD/LUC RD	Approval Date
RSA-122, Dismantled Lewisite Manufacturing Plant, Area U, OU-06	Revision 0 CMI Work Plan, RSA-122/183, dated June 6, 2022, Revised November 4, 2022	TBD

VIII.C AREA SPECIFIC CONDITIONS

(approximately 19) RSA-183, Former Lewisite Manufacturing Plants 1 and 2 Sites, Operable Unit 05: This corrective action has been designed to 1) remove and dispose of contaminated soils to achieve conditions suitable for industrial/commercial site use; 2) remove relict structures (e.g., abandoned underground chemical piping, sumps, pits, trenches); 3) employ LUCs throughout the site for soils that exceed residential cleanup goals (CGs); and 4) LUCs will be employed at RSA-183 to address soils deeper than six feet below ground surface to prevent or minimize exposure by a commercial worker/groundskeeper receptor.

a) As described in the CMI Work Plan for RSA-122/183, the Permittee shall excavate contaminated soil, dispose of it off-site, and replace it with clean soil. One sidewall sample for every 250 square feet of sidewall and one floor sample for every 2,500 square feet shall be collected. At locations where detected concentrations exceed CGs, over-excavation may be performed.

b) The excavated, contaminated soil will either be loaded directly for transport to a Subtitle C or D landfill with preapproval or will be stockpiled onto impervious material within RSA-183 and covered with waterproof material to prevent contaminant migration. Composite samples of the stockpile will be taken at a frequency of one sample per 200 cubic yards of material for TCLP metals. Soil meeting regulatory levels will be shipped to an off-site, permitted Subtitle D landfill for disposal as a non-hazardous special waste. The excavated soil that is stockpiled may undergo stabilization to render the material nonhazardous for waste disposal purposes, if needed. The Permittee shall ship excavated soil to an off-site, permitted Subtitle C landfill for disposal as hazardous waste should stabilization not meet requirements to render the material as nonhazardous. Prior to transport and disposal of excavated waste, appropriate approval from ADEM and the selected waste disposal facility is required.

c) The Permittee shall remove relict structures from the historical mustard manufacturing facility (e.g., abandoned underground chemical piping, sumps, pits, trenches) as described in the CMI Work Plan for RSA-122/183.

d) The Permittee shall implement restrictions on land use due to potential hazards with CWM and for arsenic concentrations remaining in soil above residential cleanup goals which includes signage and on-call UXO support for intrusive activities. The Permittee shall inspect and maintain LUCs required as follows:

    i. RSA-183 shall be restricted to industrial/commercial uses. Residential use and/or residential development of the LUC area of the site, including use or development for residential housing, elementary and secondary schools, child care facilities, and playgrounds, are prohibited.
    ii. Groundskeepers or other commercial receptors shall be restricted from contact with soils deeper than 6 feet below ground surface.
    iii. A NEUR, in accordance with ADEM Admin. Code r. 335-5-1-.02(3), shall be completed, incorporated into the facility Master Plan and recorded in the land records for the property.

June 8, 2023

AHWMMA Permit Modification Application Information and Revised Tables
RSA-306, Steam Heating Plant, Building 7291

RSA-306, Steam Heating Plant, Building 7291, is listed in the current AHWMMA Permit in Table VI.6 as needing a Corrective Measures Implementation Plan (CMIP). The RSA-306 CMIP has recently been approved by ADEM, and a permit modification is requested. The following site-specific information is provided to aid in the completion of the AHWMMA Permit Modification Application. The data is organized by Permit Section.

Section V11.E Corrective Action Monitoring Program

1.) Monitoring Systems

In addition to the point of compliance and background well monitoring systems identified in Permit Conditions VII.B.1.b. and VII.B.1.c., the Permittee shall:

Maintain groundwater monitoring wells RS2340, RS2341, RS2342, RS2343, RS2344, RS2346, RS2805, RS2806, and RS2807 as effectiveness wells for RSA-306, as specified in Table VII.6 of this Permit.

3.) Monitoring Requirements

At RSA-306, the Permittee shall sample the groundwater wells listed in Table VII.1 for the constituents listed in Table VII.3. The Permittee shall sample the monitoring wells on a quarterly basis through the duration of the remedial action period. Passive recovery of light non-aqueous phase liquid (LNAPL) shall be performed at monitoring well RS2340 using absorbent socks. LNAPL recovery shall be performed on a quarterly basis during years 1-10. The Permittee may request a permit modification, in accordance with Permit Condition I.J., to the sampling or LNAPL recovery frequency or the analyte list based on the sample results presented in the Annual Effectiveness Report.

Table VII.1 Monitoring Well Designations

Test Location	Type	Latitude	Longitude	Units Monitored	Depth	Ground Elevation (ft amsl)	Top of Riser Elevation (ft amsl)	Screened Interval (ft bgs)	Zone
RS2340	EFF	34° 35' 55.715" N	86° 37' 15.519" W	RSA-306	17.2	584.56	584.10	6.8 - 16.8	OVB
RS2341	EFF	34° 35' 56.299" N	86° 37' 16.335" W	RSA-306	17.0	583.99	583.76	6.5 - 16.5	OVB
RS2342	EFF	34° 35' 56.011" N	86° 37' 16.553" W	RSA-306	16.4	583.90	583.56	6.0 - 16.0	OVB
RS2343	EFF	34° 35' 56.021" N	86° 37' 15.795" W	RSA-306	12.4	585.02	584.68	7.0 - 12.0	OVB
RS2344	EFF	34° 35' 56.018" N	86° 37' 15.491" W	RSA-306	9.8	584.72	584.38	4.4 - 9.4	OVB

Test Location	Type	Latitude	Longitude	Units Monitored	Depth	Ground Elevation (ft amsl)	Top of Riser Elevation (ft amsl)	Screened Interval (ft bgs)	Zone
RS2346	EFF	34° 35' 55.385" N	86° 37' 15.059" W	RSA-306	12.0	584.10	583.85	6.6 - 11.6	OVB
RS2805	EFF	34° 35' 54.810" N	86° 37' 16.176" W	RSA-306	17.3	582.95	585.44	6.9 - 16.9	OVB
RS2806	EFF	34° 35' 55.343" N	86° 37' 14.461" W	RSA-306	12.9	583.71	585.93	7.5 - 12.5	OVB
RS2807	EFF	34° 35' 56.788" N	86° 37' 14.672" W	RSA-306	15.5	584.44	586.70	5.1 - 15.1	OVB

Notes:
EFF – effectiveness monitoring well
Ft amsl – feet above mean sea level
Ft bgs – feet below ground surface

Table VII.2 Groundwater Quality Monitoring Constituents

Unit	Hazardous Constituent
RSA-306	1-Methylnaphthalene
	Benzene
	Iron

Table VII.3 Groundwater Protection Standards

Unit	Hazardous Constituent	Maximum Concentration Limit (µg/L)
RSA-306	1-Methylnaphthalene	11
	Benzene	5
	Iron	Background

Section VIII.C Area Specific Conditions

RSA-306, Steam Heating Plant, Building 7291: The Permittee shall conduct monitored natural attenuation (MNA) groundwater monitoring in accordance with Section VII of this permit. The Permittee shall maintain the administrative controls currently in place for groundwater including the installation-wide groundwater IROD as implemented using the RSA site access control (SAC) program. While this IROD is interim in nature, it will apply to the groundwater at RSA-083 until groundwater at the site meets cleanup goals. The decision to implement permanent LUCs for groundwater will occur in conjunction with the RSA-146 groundwater unit.

Table VIII.1 List of SWMUs and AOCs Requiring Corrective Measures

Applicable SWMU/AOC	CMS/CMI/ROD/LUC RD	Approval Date
RSA-306	Revision 1, CMI Work Plan, RSA-306, dated April 27, 2023	May 25, 2023

K83-RS814 Reason for Well Removal and Replacement

During groundwater monitoring activities on 27 September 2022, an obstruction was encountered in monitoring well K83-RS814 at approximately 5.51 feet below the top of the well casing. Sand, and polyvinyl chloride (PVC) shards were observed in the well riser, indicating a cave-in has likely occurred, and the well screen is destroyed. The Alabama Department of Environmental Management (ADEM) was notified in writing of the damage on 28 September 2022. The well was damaged beyond repair; therefore, abandonment and re-installation was required.

The well abandonment plan for K83-RS814 was submitted to ADEM on 10/27/2022 and was approved on 11/23/2022. Well abandonment activities commenced on 6/23/2023. The concrete pad was removed, then the damaged riser and screen were removed from the borehole along with the protective casing. The existing borehole was over-drilled via hollow-stem auger (HAS) method to 12 feet below ground surface (bgs), and a new riser and screen were installed. The well identification number assigned to the new well location by the Installation Restoration Branch is 083-RS3054. Construction details for monitoring well 083-RS3054 are as follows:

Test Location	Type	Latitude	Longitude	Unit(s) Monitored	Depth (ft bgs)	Ground Elevation (ft AMSL)	Top of Riser Elevation (ft AMSL)	Screened Interval (ft bgs)	Monitored Zone
RS3054	EFF	34°37' 14.471"N	86°37' 13.592"W	RSA-083	12.0	568.58	570.88	2.0-12.0	OVB

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-001	Fox Army Community Hospital Incinerator	This unit was an incinerator for infectious waste at the Fox Army Community Hospital and was operated from 1988 through 1993. The incinerator had a capacity of 150 pounds/batch. Each batch would run for approximately 14 hours. The exterior of the incinerator was made of steel, and the combustion chamber was refractory-lined. The unit sat on a concrete base outside of the building and was covered by a roof. The incinerator ash was disposed in the Sanitary Landfill at RSA-010. No releases were known to occur, and no stains or evidence of release were observed.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-002	In-Ground Oil/Water Separator, Building 3338	This unit was an in-ground oil/water separator located at a maintenance and repair facility for heavy military equipment. The unit measured 8-feet wide by 4-feet long by 5-feet deep and received liquids from a washrack and an oil-changing service pit. The unit was used from 1981 to 1997 and then replaced by a new washrack and separator at Building 3338. The original unit was removed in August 2000. There were no known releases and structural integrity testing of the unit demonstrated it was sound. However, total petroleum hydrocarbon sampling during the removal of the unit demonstrated a release(s) had occurred and contaminated soils were removed in 2002.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-003	In-Ground Oil/Water Separator, Building 3617	RSA-003 is a former in-ground oil/water separator located just south of Building 3617. The unit was a concrete structure (8' x 8' x 8') and was designed to hold approximately 4 feet of liquid (approximately 2,000-gallons). The unit received waste lubricant oils, grease, solvents, and detergents from vehicle maintenance activities from the 1960s to 1997 when it was taken out of service and replaced by a new unit. The former oil/water separator was removed in 2000. The Building 3617 floor drains and the former oil/water separator discharged directly to the ground surface by a former outfall pipeline that extended to the east prior to installation of and connection to a sanitary sewer. Investigation results demonstrated that releases occurred at this site during its operational period. Contaminants in soil were addressed as an interim measure removal action in 2002. Approximately 175 cubic yards of petroleum-contaminated soils were removed. COCs remain in groundwater.	Soil: No COCs Groundwater: Benzo(a)anthracene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene 1,1-Dichloroethane 1,1-Dichloroethene 1,2-Dichloroethane cis-1,2-Dichloroethene trans-1,2-Dichloroethene Methylene chloride Trichloroethene Vinyl chloride 2-Nitrotoluene	VI.6 and VIII.1
RSA-004	In-Ground Oil/Water Separator & Washrack	This in-ground concrete oil/water separator located outside Building 3636 received wash water from maintenance shop activities. The structure was 8' x 8' x 8' and was designed to hold about 4-feet of liquid (approximately 2,000 gallons). The wash rack basin was approximately 36-feet long by 24-feet wide and 10-feet in depth. The wash rack basin was designed to hold approximately 30,000 gallons of water. The unit began operation in 1983. By 2008, this unit was no longer receiving wastewater from the maintenance shop but receiving wash water from a concrete pad where large vehicles were washed down. The oil was periodically removed for recycling and the wash water was sent to the wastewater treatment plant.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-005	Inactive Waste Accumulation Area	This unit consisted of two buildings (Building 3630 and an unnumbered building (demolished in 2012) and an outdoor waste accumulation area (25' x 25'). The unit was operational from the late 1970s to 1989. Lead contamination was present in the site drainage features and around the building and waste accumulation area from releases of paints, fuel, and other motor pool wastes. Approximately 136 cubic yards of lead-contaminated soil were removed in 2016 to meet the cleanup goal.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-006	Paint Shop & Sump at Motor Pool, Building 3634	This unit consisted of two aboveground steel sumps (8' x 3' x 23') with a water-curtain paint booth inside Building 3634 (paint shop) and one aboveground steel sump (6' x 2' x 2') outside of Building 3634. Beginning in 1980, wastewater was collected in the sumps from water-curtain type systems in the paint booths that were used to paint vehicles, furniture, and other equipment. The sumps were no longer needed in 1992 when the paint booths were converted to a dry filter process. The sumps were sampled (non-hazardous waste), cleaned, residue disposed, and filled with concrete to take the units out of service. No releases were known to have occurred and the sumps appeared to be structurally sound.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-007	Hazardous Waste Storage Area, Building 3775	A hazardous waste drum storage area (8' x 5' concrete pad with a 6 inch curb) was located east of Building 3775 beginning in 1988. Drummed waste from the welding shop was reportedly stored at this location. However, a visual site inspection/employee interview in 2008 found that only plastic from the plastic shop was being stored in drums at this location. The welding shop waste was classified as scrap and sent off as scrap metal. Reportedly, no hazardous waste was ever stored at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-008	Inactive Sewage Treatment Plant #4	The Sewage Treatment Plant #4 was constructed in 1959 and removed from active service in 1992. The plant was used for treatment of sewage and wastewater generated in the northern portion of Redstone Arsenal. The plant also received floor wash water from research labs and motor pools and water separated by oil/water separators located in the area. Most of the original site features remain (digester, sludge drying beds, primary clarifier, secondary clarifiers, trickling filter, sewage lift station, effluent pump station, and six small concrete aboveground storage tank saddles). Two diesel underground storage tanks used to operate generators as a backup power source were removed in 1995. A shop was present in former Building 3775. Treated sludge from the sludge drying beds was disposed of in a sanitary landfill on Redstone Arsenal. The plant originally discharged treated effluent via an unlined drainage ditch which flowed east just outside of the southern site boundary towards McDonald Creek. Later, the effluent was discharged through a manifold force main system to a Parshall flume near Shields and Buxton Roads and released to the Tennessee River under a National Pollutant Discharge Elimination System permit. The plant is still used periodically for storage on a temporary basis if an emergency event occurs at the current wastewater treatment plant. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 4,4'-DDD Alpha-BHC Arsenic Dieldrin Trichloroethene	VI.2
RSA-009	Inactive Sewage Treatment Plant #3	The Sewage Treatment Plant #3 was constructed in 1942. The plant treated sewage generated in the central portion of Redstone Arsenal as well as discharges from the George C. Marshall Space Flight Center. The types of wastes treated included floor wash water, water from oil/water separators, and domestic sewage. Specific types of wastes treated included organic and metal-contaminated liquids and sludges. The treatment plant originally discharged to Indian Creek. All discharge to Indian Creek was regulated under the National Pollutant Discharge Elimination System permit. Releases to Indian Creek stopped in the 1980s, when the discharge from the plant was routed to a force main system that was routed to the Tennessee River. Treatment of sewage at the plant ceased in 1992. The plant is currently utilized on an as needed basis for only storage of raw sewage in the primary clarifier, trickling filter, and secondary clarifier during times when operational concerns with other plants or pipeline repairs require temporary diversion of the flow. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Arsenic Mercury Aroclor 1248 Aroclor 1254 Aroclor 1260 Groundwater: Benzo(a)anthracene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-010	Closed Sanitary Landfill	This unit is a sanitary landfill which was constructed in 1972, received waste until 1991, and was closed in 1992. Materials disposed of in the sanitary landfill included household, administrative, and industrial waste. Waste lube oil, fuel oil sludge, and sewage treatment grease trap solids were disposed in the northern portion of the landfill in waste oil pits. Household waste, paper products, hospital infectious waste, construction debris, asbestos, and ash from incinerated paper were disposed in trenches in the remainder of the landfill. The disposal trenches in this area were approximately 25' x 400' x 20'. The trenches were later covered with a thin layer of soil. Currently, a 43.55-acre active C&D landfill (ADEM Permit No. 45-03) is operational and permitted for disposal within the RSA-010 site. Closed portions of the landfill include west-east trending disposal trenches and a rubble fill area located in the southern and southeastern portions of RSA-010. During construction of a surface-water diversion ditch in June 2015, a partially buried drum containing a small amount of munition-related material was uncovered. The drum contained two 76mm projectiles, illumination; one 105mm projectile (empty); one cylinder of propellant; six rocket motors; one M42 submunition (empty); and multiple small miscellaneous scrap items (empty). It is not known when or how these items came to be disposed at the site. Digital geophysical mapping found extensive subsurface metallic debris within the southeastern portion of RSA-010; single point intrusive investigation to evaluate the potential for individual munitions items to be present in the subsurface was not conducted. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Chromium, Lead, Mercury 1,3-Dinitrobenzene, 2-Nitrotoluene Aroclor 1242, Aroclor 1254 Aroclor 1260, 4,4'-DDT, alpha-Chlordane, Dieldrin, gamma-Chlordane Heptachlor, Heptachlor epoxide Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Naphthalene Pentachlorophenol Groundwater: Chromium, Iron Manganese, Mercury Nickel, Zinc 1,1,2,2-TeCA, 1,1-DCA Benzene, cis-1,2-DCE Methylene chloride PCE, TCE, Vinyl chloride Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Naphthalene, 1,3-DNT, 2,4-DNT, 2,6-DNT, 2-NT, 3-NT, Nitrobenzene Nitroglycerin RDX, Aldrin alpha- and beta-BHC dieldrin, 4,4'-DDD Heptachlor expoxide	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-011	Former Sewage Treatment Plant No. 1	Sewage Treatment Plant No. 1 was used for the treatment of domestic/sanitary sewage generated in the eastern portion of Redstone Arsenal and wastewater from the propellant manufacturing operations performed in the adjacent Redstone Arsenal Rocket Engine North Plant area. The treatment plant consisted of two separate treatment units that operated in parallel. The first unit was constructed in 1942; the second was added in 1946. Both units were removed from service in 1992. The two treatment units involved similar treatment processes, although the physical structures differed in size and shape. Raw sewage entered the plant through underground sanitary sewer lines along the southern boundary. Raw sewage flowed through a mechanical bar screen into separate sumps for each treatment unit. The sewage was pumped from the sumps to a primary clarifier and then was gravity-fed via underground lines to a high-rate trickling filter, a secondary sedimentation tank/clarifier, and finally an open-topped digester. Wastewater was continuously fed back to the primary clarifier, while the sludge was discharged from the digesters to the two sludge drying beds. The sludge drying beds were shallow, unlined structures equipped with a supernatant collection system to divert filtrate to an aeration unit. The wastewater effluent from both treatment units was combined and chlorinated prior to being discharged to Huntsville Spring Branch to the north via a gravity drain line. Sludge from the drying beds was periodically removed and disposed in the sanitary landfill (RSA-010). All of these features were aboveground concrete structures that are still in place today.	Soil: No COCs Groundwater: Arsenic Cadmium Chromium Vanadium Perchlorate bis(2-Ethylhexyl)phthalate Tetrachloroethene Trichloroethene	VI.6
RSA-012	Active Open Burn Pans, Unit 2 (OB)	The active open burn pans are used to thermally treat hazardous energetic and energetic-contaminated waste generated on-site or from the George C. Marshall Space Flight Center. The unit consists of five open burn pans and has been in operation since 1986. The pans are constructed of 2-inch-thick boiler plate, with dimensions of 19.5 feet by 8 feet, and are 4 feet deep. Each pan sits on a 25-foot by 10-foot concrete pad that is 4 feet high. During nonoperational periods, lids are placed on the pans using a forklift. The operations at this facility are governed by a Subpart X permit. The Subpart X permit requires the development and implementation of a baseline monitoring program for groundwater.	To be determined.	VI.4 and Table VIII.1
RSA-013	Unlined Inactive Open Burn Pad	RSA-013 consists of two formerly used unlined (earthen) burn pads that were used from the 1950s until 1986 for the thermal treatment (burning) of explosives and explosives contaminated material and reactive waste, primarily propellant. Following treatment, the ash material was disposed in trenches at RSA-066 and RSA-014. The pads, each approximately 200 feet square, were bare ground surrounded by grass fields and earthen berms on the west side of each pad. A groundwater treatment system was operated at RSA-013 from 1995 to early 2000 to treat VOCs in groundwater. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Perchlorate RDX Groundwater: Perchlorate 2,6-Dinitrotoluene 2-Nitrotoluene RDX Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene 1,1-Dichloroethene 1,2-Dichloroethane Chloroform Methylene chloride Trichloroethene Dibenz(a,h)anthracene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-014	Unlined Inactive Burn Trenches Unit #2	RSA-014 comprises two separate and distinct parcels, referred to as RSA-014 North and RSA-014 South. The RSA-014 North parcel may have been used for historical disposal of beryllium and small quantities of miscellaneous laboratory samples and production chemicals but all weights-of-evidence point to no former disposal activities. Two former unlined trenches within RSA-014 South (approximately 150 to 200 feet long, 35 feet wide, and 6 to 12 feet deep) were used for disposal and burning of packaging and pallets used to ship munitions, contaminated metals, propellants containing waste solvent, and nonhazardous propellant-contaminated materials. The trenches were reportedly used from the mid-1950s until 1991. Some of the ash, residue, and metal debris remaining from burning activities conducted at burn pads (RSA-013) located west of the current OB/OD area were disposed at the RSA-014 South trenches, and the remainder went to RSA-066 located north of the embayment. In 1984, the Army was made aware that propellant-contaminated solvents and explosives from Thiokol Corporation's manufacturing and production areas were disposed and burned in the trenches. Solvent disposal/burning at this site ceased in 1984 since procedures dictated that only nonhazardous propellant-contaminated materials (containing less than 4 percent propellant) could be disposed in the two trenches at RSA-014S. From 1984 until 1991, materials such as non-hazardous propellant-contaminated materials were disposed in the trenches at least once every 90 days. Diesel fuel and kerosene were reportedly used as starter materials. All burning and disposal activities ceased after 1991, and the trenches were filled and covered with clean fill. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: RSA-014 North - No COCs RSA-014 South - Trichloroethene Groundwater: Manganese Perchlorate 2,4,6-Trinitrotoluene 2,4-Dinitrotoluene 2,6-Dinitrotoluene 2-Nitrotoluene RDX 1-Methylnaphthalene Benzo(a)anthracene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene 1,1,1-Trichloroethane 1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichlorothene 1,2-Dichloroethane Benzene Chlorobenzene Chloroform cis-1,2-Dichloroethene Methylene chloride Tetrachloroethene Toluene Trichloroethene Vinyl chloride	VI.6 and VIII.1
RSA-015	Hazardous Waste Storage Igloo, No. 1 (8621)	Hazardous waste storage unit (HWSU) igloo (Building 8621) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-016	Hazardous Waste Storage Igloo, No. 2 (8622)	Hazardous waste storage unit (HWSU) igloo (Building 8622) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-017	Hazardous Waste Storage Igloo, No. 3 (8623)	Hazardous waste storage unit (HWSU) igloo (Building 8623) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-018	Hazardous Waste Storage Igloo, No. 4 (8624)	Hazardous waste storage unit (HWSU) igloo (Building 8624) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-019	Hazardous Waste Storage Igloo, No. 5 (8625)	Hazardous waste storage unit (HWSU) igloo (Building 8625) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-020	Hazardous Waste Storage Igloo, No. 6 (8630)	Hazardous waste storage unit (HWSU) igloo (Building 8630) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-021	Hazardous Waste Storage Igloo, No. 7 (863I)	Hazardous waste storage unit (HWSU) igloo (Building 8631) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-022	Hazardous Waste Storage Igloo, No. 8 (8632)	Hazardous waste storage unit (HWSU) igloo (Building 8632) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-023	Hazardous Waste Storage Igloo, No. 9 (8633)	Hazardous waste storage unit (HWSU) igloo (Building 8633) containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Active since 1984.	To be determined.	VI.4
RSA-024	Hazardous Waste Storage Igloo No. 10	Site is former hazardous waste storage unit (HWSU) igloo No. 10 containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Hazardous waste is not currently stored in this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-025	Hazardous Waste Vacant Storage Igloo No. 11	Site is former hazardous waste storage unit (HWSU) igloo No. 11 containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Hazardous waste is not currently stored in this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-026	Hazardous Waste Vacant Storage Igloo No. 12	Site is former hazardous waste storage unit (HWSU) igloo No. 12 containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Hazardous waste is not currently stored in this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-027	Hazardous Waste Vacant Storage Igloo No. 13	Site is former hazardous waste storage unit (HWSU) igloo No. 13 containing 2,146 sq. ft. of floor space (81 feet deep x 26.5 feet wide). The maximum storage capacity is 240 55-gallon containers (13,200 gallons). Hazardous waste is not currently stored in this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-028	In-Ground Oil Water Separator, 5693 Area	The site originally included only four oil/water separators (three still remaining and one removed). However, the investigation area was expanded to include the entire bulk fuel tank yard. This area includes the locations of nine former aboveground storage tanks and one active aboveground storage tank, their associated aboveground fuel delivery piping systems, underground drainage piping associated with each aboveground storage tank's containment basin, a former pump house, a former fuel transfer station, three fuel transfer areas/dispenser islands, two other small buildings, and the four oil/water separators. The oil/water separators were installed in the 1970s and replaced in the 1990s. Two significant releases occurred during the history of operations: One in 1985 from AST No. 5693 where approximately 30,000 gallons of No. 2 fuel oil seeped into the soil and 366,000 gallons of oil/water mixture was recovered in a recovery trench; and a 2003 lightning incident at Tank No. 5631 which released approximately 11,500 gallons of diesel fuel but recovery efforts as well as the resulting fire resulted in minimizing the overall fuel release. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: 1-Methylnaphthalene Groundwater: Iron Manganese Mercury 1-Methylnaphthalene Dibenz(a,h)anthracene Benzene Trichloroethene 2-Methylnaphthalene Benzo(a)anthracene Dibenzofuran Naphthalene Methyl-tert-butyl ether	VI.6
RSA-029	Redstone Arsenal Sanitary Sewer System	Underground sewer system consisting of approximately 200 miles of sewer line constructed in the 1940s and has had periodic replacements/upgrades. The unit carries domestic sewage, surface water, and wash water to the sewage treatment plants. The components of the sewer system are constructed concrete, polyvinyl chloride, vitreous clay, steel, and asbestos/cement. Potential impacts to groundwater and soil are evaluated in the groundwater unit investigations.	No COCs were identified (ADEM, 2008)	VI.3
RSA-030	Former Central Oil/Water Separator	This unit consisted of Building 5427, a 2,000-gallon concrete initial oil holding sump/settling basin, an oil/water separator, a 1,200-gallon steel holding tank (waste oil pit) located inside of a concrete sump, and Building 5427-A. Waste oil and wastewater/oil mixtures collected from other oil/water separator units located throughout Redstone Arsenal were transported to RSA-030 and emptied into the holding sump for further processing. After the solids settled out, the liquid contents of the holding sump were transferred to the oil/water separator. Recovered oil was pumped to the central oil/water separator storage tanks at RSA-031. Treated water effluent from the oil/water separator was discharged to the sanitary sewer system at a National Pollutant Discharge Elimination System-permitted discharge point. All of the structures, including buried piping, at RSA-030 were removed during a demolition project completed in 2005. Additionally, in 2005 a removal action removed 195 cubic yards of total petroleum hydrocarbon-contaminated soil from the site resulting from historical releases.	Soil: No COCs Groundwater: Trichloroethene	VI.6
RSA-031	Former Central Oil/Water Separator Storage Tanks	This unit consisted of three aboveground storage tanks that stored oil recovered from the gravity separation and filtration treatment process at former Building 5427. Two of the aboveground storage tanks (5,000- and 2,000-gallon capacities) were located within a bermed secondary containment area with a synthetic liner. The third aboveground storage tank (5,000-gallon capacity), which was constructed after the first two, was a double-walled tank with a built-in secondary containment system. All of the structures, including buried piping, at RSA-031 were removed during a demolition project completed in 2005. Additionally, in 2005 a removal action removed 66 cubic yards of total petroleum hydrocarbon-contaminated soil from below the aboveground storage tanks resulting from historical releases.	Soil: No COCs Groundwater: Trichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-032	Inactive Scrap Metal Storage Area	This unit was used for a variety of purposes including testing of materials from the toxic gas storage yards, warehouse equipment storage, scrap metal storage, temporary hazardous waste storage, strategic materials (zinc) staging, and drum/open storage for chemical agents (mustard and lewisite). Operations were conducted from the 1940s through 2001. Investigation results demonstrated that releases to groundwater occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene 1,1,2,2-Tetrachloroethane Tetrachloroethene 1,1,2-Trichloroethane 2-Nitrotoluene	VI.6
RSA-033	Plating Room Floor Drains, Building 5432	This unit consists of concrete floor drains located in Building 5432. Building 5432 has been used for electroplating operations since 1974. The floor drains collected leaks and spills from plating operations (which generate F006 wastes). An emergency cleanout/sewer bypass outlet was located on the east side of the building. The floor drains discharge to the sanitary sewer by gravity flow, so they do not retain any spills resulting from the electroplating operations. Satellite accumulation areas within the building were noted to be properly used throughout the building during a 2008 visual site inspection (ADEM, 2008).	Soil: No COCs Groundwater: No COCs	VI.3
RSA-034	Waste Aviation Fuel Temporary Storage Area	This unit is a storage area (approximately 30' x 30') consisting of an unbermed asphalt pad used to temporarily store drummed waste aviation fuel and lube oil. The unit began operations in 1979. As of a visual site inspection in 2008, aviation fuel was no longer being stored in the unit and only miscellaneous equipment was visible within the fenced storage unit.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-035	In-Ground Oil/Water Separator, Building 4812	This unit was a two-stage, in-ground oil/water separator located at the Redstone Arsenal airfield. The oil/water separator received runoff from a fuel truck parking area. The original unit was installed in the 1940s, upgraded in the 1970s and again in 1985, and was last modified in 1997. It consisted of two stages (initial and secondary) separated by approximately 150 feet. The initial stage is located in close proximity to Building 4812 and just east of the airfield underground storage tank. The initial stage consisted of a 2-foot by 3-foot by 2-foot deep concrete pit. The secondary stage consisted of a 2-foot by 3-foot by 4-foot deep concrete pit. The secondary stage oil/water separator collected waste oil, which was then pumped through an underground pipeline to a waste-oil underground storage tank at RSA-042. Water discharged from the oil/water separator was routed to a shallow ditch on the north side of the site. When the new unit was installed in 1997, the secondary stage was taken out of service. The secondary stage oil/water separator and the associated piping connecting the two stages of the unit were removed in January 2000. A removal action to remove total petroleum hydrocarbon-contaminated soil and riprap (48 cubic yards) from a discharge ditch was conducted in 2002. On June 16, 2005, the initial stage of the oil/water separator was removed from service and was demolished using a concrete breaker. Approximately 19 cubic yards of polynuclear aromatic hydrocarbon-contaminated soil was removed from the site in 2016.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-036	In-ground Oil/Water Separator, Building 4832	This unit was an in-ground oil/water separator located southwest of Building 4832. The oil/water separator had a 5,000-gallon capacity (25' x 25' x 10') and was active beginning in 1988. The separator consisted of a grated holding basin and an oil holding basin. The unit primarily received wash water from aircraft maintenance activities conducted in Building 4832. Water from the separator was discharged to the sanitary sewer.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-037	Underground Used Oil Storage Tank at Building 7857	This unit is an underground storage tank and oil/water separator located near Building 7857. The underground storage tank held waste oil and had a 1,500-gallon capacity. The tank was installed in 1966 and received oil from the oil/water separator. The dimensions of the separator were about 3 feet by 16 inches. No known releases were reported from either the tank or the separator. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal. The waste oil tank is located partially under a corner of Building 7857. The tank could not be removed without compromising the integrity of the building foundation so the tank was closed in place 2000.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-038	Underground Used Oil Storage Tank, Building 3240	This unit was an underground storage tank located at Building 3240. The tank was used to store waste oil from the former service station for Redstone Arsenal employees and had a 500-gallon capacity. The tank was installed in 1969 and removed in 1995. No known releases were reported. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-039	Underground Used Oil Storage Tank, Building 3338	This unit is an underground storage tank located at Building 3338. The tank was used to store waste oil from the vehicle maintenance shop and has a 1,000-gallon capacity. The tank was installed in 1972 and was removed by 1995. No known releases were reported. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-040	Underground Used Oil Storage Tank, Building 3617	This unit is an underground storage tank located at Building 3617. The tank was used to store waste oil from maintenance shop activities and had a 1,000-gallon capacity. This tank began use in the 1970s and was removed in 1996. No known releases were reported. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal. A visual site investigation in 2008 noted that the underground storage tank has been replaced by an aboveground used oil tank.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-041	Underground Used Oil Storage Tank, Building 3636	This unit was an underground waste oil storage tank located at Building 3636. The tank was used to store waste oil from the motor pool maintenance complex and had a 3,000-gallon capacity. No known releases were reported. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal. The tank was installed in the 1970s and was removed in 1992. The underground storage tank was replaced by an aboveground used oil tank.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-042	Underground Used Oil Storage Tank, Building 4812E	This unit was an underground storage tank located near Building 4812E. The tank was used to store waste oil and had a 1,000-gallon capacity. The tank was used as a flow-through process tank for the waste oil collected at RSA-035. No known releases were reported. The waste oil accumulated in the tank was removed on a regular basis and taken to RSA-030 for recycling. The tank began use in 1970 and was removed in 1993.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-043	Underground Used Oil Storage Tank, Building 5435A	This unit was an underground storage tank located at Building 5435A. The tank was used to store waste oil and had a 1,000-gallon capacity. No known releases were reported. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal. The tank was installed in 1974 and was removed in 1993.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-044	Underground Used Oil Storage Tank, Building 5435B	This unit was an underground storage tank located at Building 5435B. The tank was used to store waste oil and had a 500-gallon capacity. At one time, the underground storage tank received waste hydraulic oil from calibration equipment used in Building 5435B. The waste oil was periodically sent to a holding tank at the central oil/water separator at RSA-030 or shipped offsite for disposal. The tank began operation in the mid-1980s and was removed in 1984. No known releases were reported.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-045	Smoke Munitions Plant 3	RSA-045 encompassed Buildings 3775 through 3791 within the former Smoke Munitions Plant 3. The majority of the buildings at RSA-045 were constructed in the 1940s and 1950s to support initial munitions production and subsequent fuse modification activities. Former operations consisted of tear gas munitions production from December 1943 to May 1944. The plant was used for filling grenades with chloroacetophenone (CN) (tear gas) and adamsite (DM) (vomit gas) mixed with CN. These agents were not manufactured at RSA; they were brought in by rail and filled in grenades, mortars (4.2-inch and 81-millimeter [mm]) and shells (155-mm) at the plant. M-7 CN grenades and M-6 CN-DM grenades were filled at this plant. Additionally, the M-1 fuse was manufactured at Smoke Munitions Filling Plant 3. In the 1950s, following the use of the facility for munitions production, several buildings at RSA-045 may have been used for fuse modifications for 4.2-inch and 81-mm mortars and 155-mm shells. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Alpha-chlordane Gamma-chlordane Heptachlor epoxide Benzo(a)pyrene Benzo[b]fluoranthene Dibenz[a,h]anthracene Groundwater: 1,1-Dichloroethene Carbon tetrachloride cis-1,2-Dichloroethene Trichloroethene 2-nitrotoluene Benzo(b)fluoranthene Dibenz(a,h)anthracene	VI.6
RSA-046	Inactive Chemical Munition Test Site, Area CC	This unit was used for demilitarization of chemical weapons. Operations were conducted during the 1940s and 1950s.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2 and VI.5
RSA-047	Chemical Training Facility, Area EE	This former live chemical agent training area was used from 1972 to 1985. Residues of mustard and nerve agents were used for the training. Small quantities of the live agents were mixed at Building 3539. East of this building was a decontamination area including a shower with a captive holding sump. The trainees undergoing decontamination were tested with a spectrometer. Decontaminated clothing was bagged and stored in fenced area 3537. The training area consisted of two concrete pads, each approximately 3 ft by 4 ft by 1 ft. One pad was lined with plastic. Trainees would escort agent and chemical munitions to the pads with the purpose of containing and cleaning up the live agent. The training area was surrounded by a 450 meter radius safety circle for containment and cleanup, if necessary. In 1986, the Army decontaminated the training facility. The area then continued to be used as a chemical training area but live agents were no longer used after 1985.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-048	Inactive Sanitary Landfill, Area G	This landfill was active from 1947 through the early 1950s. The landfill received construction debris and sanitary waste. Wastes were disposed in trenches and then covered with a thin layer of soil. The trenches were approximately 12 feet deep. Items observed in the test pits included concrete rubble, bricks, scrap metal, tin cans, scrap lumber, and shingles. Some material appeared to have been incinerated. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: VOCs Metals Groundwater: Cadmium Chromium Barium Arsenic	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-049	Capped Arsenic Waste Lagoons – West, Area F	This unit includes three former surface waste ponds (unlined) that were constructed in the 1940s as waste collection and treatment units for former Lewisite Plants 1 and 2. Liquid arsenic waste was piped from RSA-183 to the RSA-049 ponds. The waste went through large disposal reactors (now removed), where lime was used to treat the arsenic waste stream. After lime (e.g., calcium hydroxide and sodium hydroxide) treatment, the liquid arsenic waste was released to the unlined ponds. After World War II, the ponds at RSA-049 were used for the disposal of waste, ash, and rubble from the demolition and demilitarization of sumps, piping, and buildings at the old Lewisite plants. In the 1960s, the ponds were used for disposal of rubble and industrial waste from the George C. Marshall Space Flight Center and from the Army. The ponds were backfilled in 1977 with soil from an area west of RSA-049 and then re-vegetated. In 1997, this soil cover was replaced with a multilayer RCRA-type cap installed over the waste ponds and associated contaminated areas in response to a notice of violation from ADEM This site has been fenced with warning signs. Maintenance and inspections of the cap and long-term groundwater monitoring (Table VII.3 in the Permit) are ongoing in compliance with the Permit (Section VIII.C).	Soil: Arsenic Mercury Trichloroethene Carbon tetrachloride (under cap) Groundwater: Arsenic Mercury Trichloroethene Carbon tetrachloride	VI.6 and VIII.1
RSA-050	Inactive Munitions Demil/Disposal Area H	A small grassy knoll in this area was reportedly used for the demilitarization and burning of high explosives, white phosphorus, and mustard or phosgene gas containers during the late 1940s and 1950s. Portions of the site near Centerline Road have also been used for range instruments and missile target locations. Active Test Areas TA-1 and TA-6 fully encompass RSA-050 and are actively used for testing aerial projectiles (including missiles). Aerial projectiles or fragments from these ranges frequently land within the boundary of RSA-050. No munitions and explosives of concern have been identified on RSA-050.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-051	Inactive Munitions Demil/Disposal Area I	This unit within an active missile test range was used in the 1950s for the demilitarization of munitions and explosives by open burning, burning and burial in trenches, detonation in earthen pits, and other similar methods. The site is characterized by irregularly spaced, circular burn pad-type features and a series of disposal trenches.	To be determined	VI.2 and VI.5
RSA-052	Inactive Munitions Demil/Disposal Area N	This unit within an active missile test range was used from the 1940s to 1950s as a disposal (open burn/open detonation) site for chemical munitions, including mustard components and lewisite agents. Operations were conducted on the ground surface and in trenches identified at the site. Ordnance and metal fragments are visible on the surface throughout the site. From 2000-2001, the unit was fenced and the trenches marked with monuments and surveyed as part of a Time-Critical Removal Action.	To be determined	VI.2 and VI.5

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-053	Inactive Sanitary & Industrial Landfill, Area Q3	RSA-053 is a closed sanitary and industrial waste landfill. It consists of the Northern Disposal Area, the Waste Disposal Trench Area, and a relatively large undisturbed area (Area C). The Northern Disposal Area was used to dispose of DDT manufacturing wastes accumulated from the production of DDT at a nearby manufacturing plant. It is reported that 2 feet of surface material from an area within the Northern Disposal Area was excavated from the site and placed in disposal cells at RSA-107 as part of the DDT Abatement Program conducted from 1977 to 1982. Three waste oil pits approximately 25 by 50 feet were also identified and are located within a portion of the Northern Disposal Area. The Waste Disposal Trench Area was active for approximately 10 years, closing in 1973. It consists of four trenches approximately 12 feet deep and ranging from 400 to 1,400 feet in length used to dispose of industrial and sanitary wastes; some of the material was incinerated. By the time the landfill closed, the trenches were covered with 3 to 5 feet of soil and revegetated with grasses and trees. Area C makes up the area surrounding the Northern Disposal Area and Waste Disposal Trench Area and is considered relatively free of waste material since it has been undisturbed. In 2001, the landfill was fenced with 5-strand barbed wire as part of a Time-Critical Removal Action. From 2012 to 2015 remedial action was conducted at this unit due to releases from the landfill. The waste from the southern portion of the site (where groundwater may have been impacted by contact with waste material) was relocated to the northern portion of the site, and the soil/waste was covered with a low permeability cover. In situ thermal treatment was implemented for treatment of the chlorobenzene dense nonaqueous-phase liquid in the saturated zone under the site. Groundwater monitoring and land-use controls have been implemented.	Soil: 4,4'-DDT 4,4'-DDE Benzo(a)pyrene (under landfill cover) Groundwater: Chlorobenzene Benzene 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin Alpha-BHC Alpha-Chlordane Beta-BHC Delta-BHC Dieldrin Endosulfan Endosulfan II Endosulfan Sulfate Endrin Endrin Aldehyde Endrin Ketone Gamma-BHC (Lindane) Gamma-Chlordane Heptachlor Heptachlor Epoxide Methoxychlor Toxaphene	VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-054	Inactive Sanitary & Industrial Landfill, Area T	This unit was designated as two landfills separated by Fowler Road (RSA-054 and RSA-055). The landfill was active from the 1950s through the early 1970s for disposal of household, administrative, and industrial waste. Trenches were used to dispose of waste and then covered with a thin layer of soil. The trenches were approximately 10 feet deep. DDT waste was also disposed at various locations at RSA-054 between 1968 and 1973. A time-critical removal action was conducted in 2000-2001 to fence this site. Corrective measure activities were initiated in 2012 at RSA-054/RSA-055 and included 1) excavation and consolidation to reduce the waste footprint to within RSA-054, 2) construction of a low-permeability soil cover over consolidated waste within RSA-054, 3) implementation of land-use controls for surface media, and 4) implementation of long-term groundwater monitoring (Table VII.3 in the Permit).	Soil: 4,4'-DDT Benzo(a)pyrene Chlorobenzene Naphthalene Groundwater: VOCs, SVOCs, Pesticides, TAL Metals Trichlorotrifluoroethane Methyl Acetate Cyclohexane 1,3-Dichloroproene 2-Hexanone 1,2-Dibromo-3-Chloropropane Benzaldehyde Acetophenone 2-Nitrophenol Bis(2-Chloroethoxy)methane Hexachlorobutadiene Caprolactam 1,1-Biphenyl Fluorine 4,6-Dinitro-2-Methylphenol 4-Nitroaniline Atrazine Dibenz(a,h)anthracene Aldrin Alpha-Chlordane Delta-BHC Endosulfan I Endosulfan II Endosulfan Sulfate Endrin Aldehyde Endrin Ketone Gamma-Chlordane	VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-055	Inactive Sanitary & Industrial Landfill, Area S	This unit was designated as two landfills separated by Fowler Road (RSA-054 and RSA-055). The landfill was active from the 1950s through the early 1970s for disposal of household, administrative, and industrial waste. Trenches were used to dispose of waste and then covered with a thin layer of soil. The trenches were approximately 10 feet deep. A time-critical removal action was conducted in 2000-2001 to fence this site. Corrective measure activities were initiated in 2011 at RSA-054/RSA-055. The wastes within RSA-055 were excavated and consolidated within RSA-054. Implementation of long-term groundwater monitoring is ongoing for RSA-054/055.	Soil: No COCs Groundwater: VOCs, SVOCs, Pesticides, TAL Metals Trichlorotrifluoroethane Methyl Acetate Cyclohexane 1,3-Dichloroproene 2-Hexanone 1,2-Dibromo-3-Chloropropane Benzaldehyde Acetophenone 2-Nitrophenol Bis(2-Chloroethoxy)methane Hexachlorobutadiene Caprolactam 1,1-Biphenyl Fluorine 4,6-Dinitro-2-Methylphenol 4-Nitroaniline Atrazine Dibenz(a,h)anthracene Aldrin Alpha-Chlordane Delta-BHC Endosulfan I Endosulfan II Endosulfan Sulfate Endrin Aldehyde Endrin Ketone Gamma-Chlordane	VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-056	Closed Arsenic Waste Ponds (South) Area U	This unit consisted of two open, unlined, earthen-diked waste ponds (total capacity of 3,500,000 gallons) that were constructed by 1943 to contain the waste streams generated during lewisite production at Plants 3 and 4 and the AT plant. The larger waste pond received acetylene generator sludge from the acetylene gas scrubber unit. Drummed waste or lewisite product may also have been stored within the acetylene sludge pond. The smaller waste pond received arsenic sludge associated with the disposal reactors. Slaked lime was to be used to treat the arsenic waste stream in the disposal reactor and then dropped to the sludge pond, causing arsenic to precipitate out as calcium meta-arsenite. It is assumed, based on lack of historical documentation that removal of calcium meta-arsenite from the waste pond never occurred. RSA-056 is located within the RSA-122 site boundary. An unnamed creek that flows along the east sides of RSA-056 and RSA-139 discharges to the Huntsville Spring Branch approximately 1 mile downstream. Following a fish kill in the adjacent unnamed creek due to elevated levels of arsenic and receipt of a notice of violation from ADEM, the former waste ponds were covered with soil covers and vegetated with grass that is periodically mowed. The soil cover was extended at the site in 2001 following additional investigation and fencing installed as part of a time-critical removal action. The southeast corner of the RSA-056 cap/creek interface is lined with heavy-gauge geotextile fabric and riprap. RSA-056 is now fenced with single-wire, high-visibility fencing and has warning signs around the perimeter.	Soil: Arsenic Surface Water: No COCs Sediment: No COCs Groundwater: Arsenic	VI.6 and VIII.1
RSA-057	Inactive Arsenic Waste Lagoons – East	This site encompasses two former sludge ponds or lagoons built to treat and contain liquid wastes from the lewisite production process. The lagoons were reportedly constructed with earthen berms on all four sides. Presently, the only remaining visible evidence of the waste ponds is the northern berm and half of the western berm of the Acetylene Generator Sludge Pond, which measure approximately 6 feet high. There is no remaining evidence of the Arsenic Sludge Pond. Investigation results demonstrated that releases occurred at this site during its operational period. In 2008, 22,291 tons of arsenic and mercury-contaminated soil was removed from the site as part of a remedial action. Concentrations of arsenic and mercury are protective of industrial receptors but do not meet cleanup goals for a hypothetical resident receptor for unrestricted use. Land-use controls have been established for soil. COCs remain in groundwater and long-term monitoring is ongoing.	Soil: Arsenic Mercury Groundwater: Arsenic Mercury	VI.6
RSA-058	Inactive Rubble Fill/Waste Pile, Area W	RSA-058 is an old rubble fill area. There is no official documentation of landfilling activities at the site, but the waste presently located at RSA-058 has been thoroughly characterized through numerous investigations. The site was believed to be used for disposal of ash from ordnance demolition in the 1940s and 1950s and of rubble and other fill during the 1960s and 1970s. Investigation results demonstrated that releases occurred at this site during its operational period. Between 2014 and 2016, 32,067 tons of soil was excavated to address soil contaminated with arsenic, 4-4'-DDT and its metabolites, endrin, and the polynuclear aromatic hydrocarbons benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, and chlorobenzene as part of corrective measures conducted at the site.	Soil: Arsenic 4,4'-DDD 4,4'-DDE 4,4'-DDT Endrin Benzo(a)pyrene equivalents Chlorobenzene Nitroglycerin Beta-BHC Groundwater: See RSA-145	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-059	Inactive Construction Rubble Fill, Area R	RSA-059 is a closed construction rubble landfill that received construction-related debris in the 1970s. In the 1940s, RSA-059 was reportedly originally used as a borrow area and discharge area for wastewater from the liquid caustic processing plant at RSA-117, located to the west of RSA-059. Aerial photographs indicate that the landfill activity took place throughout the 1970s, with operations moving from east to west as the eastern areas became overgrown with vegetation with time. Specifically, RSA-059 was active from 1972 through 1976 for disposal of construction debris and industrial waste. Trenches were used to dispose of waste and then covered with a layer of soil (up to approximately 18 inches thick). Based on review of historical information (test pits, boring logs, etc.), the trenches were approximately 12 feet deep. Rubble, metal debris, railroad ties, and concrete slabs were observed around the landfill boundaries, particularly along the south and east boundaries. This site may have been a borrow area before being used as a rubble fill. There is a low-lying wet area on the northeastern edge of the rubble fill. The shallow subsurface consists essentially of concrete rubble. Examination of 1950s aerial photographs indicates that the area may have been a discharge basin or drainage for the adjacent liquid caustic plant. Investigation results demonstrated that releases occurred at this site during its operational period. During 2000-2001, the unit was partially fenced and the trenches marked with monuments and surveyed as part of a Time-Critical Removal Action.	Soil: Aluminum Arsenic Cadmium Mercury Silver bis(2-ethylhexyl)phthalate Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Indeno(1,2,3-cd)pyrene Groundwater: Arsenic Cadmium Chromium Lead	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-060	Inactive Sanitary & Industrial Landfill, Area Q4	RSA-060 is an inactive, unlined landfill that was in operation from 1963 to 1968 for disposal of sanitary wastes and may also have been used to dispose of DDT wastes from the former Olin Manufacturing Plant; these wastes were later removed during the Army's DDT abatement program in the late 1970s. The site is largely wooded and characterized by a series of elongated mounds and depressions. As part of the DDT abatement program, Calgon Corporation constructed a small water treatment plant within the boundary of RSA-060 (RSA-124). All equipment was removed after DDT abatement activities ceased in the 1980s and the building has been demolished. Investigation results demonstrated that releases occurred at this site during its operational period. Between 2016 and 2017, approximately 105,791 cubic yards of soil and waste were consolidated within a new landfill footprint at the site. Upon completion of waste consolidation and compaction activities, construction of an engineered landfill cover system (including foundation layer, geosynthetic clay liner layer, and protective soil layer), took place between April and July 2017.Chemicals of concern remain in groundwater.	Soil: 4,4'-DDD 4,4'-DDE 4,4'-DDT Benzo(a)pyrene (under a landfill cover) Groundwater: Arsenic Cadmium Iron Manganese 1,4,6-Trinitrotoluene 2-Nitrotoluene 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin Alpha-BHC Beta-BHC Dieldrin 4-Chloroaniline 1,1,2,2-Tetrachloroethane 1,1-Dichloroethene cis 1,2-Dichloroethene Benzene Chlorobenzene Tetrachloroethene Trichloroethene Vinyl Chloride	VIII.1
RSA-061	Inactive Munitions Demil/Disposal, Area P	This unit was used for the demilitarization and disposal site of white phosphorus and chemical munitions in the 1940s and 1950s. The materials were incinerated in disposal trenches, covered, and the residues remain in place. Ordnance and metal fragments are evident on the surface throughout the site. During 2000-2001, the site was fenced and the trenches marked and surveyed as part of a Time-Critical Removal Action. RSA-061 and 062 are one disposal area, and both will be addressed as RSA-061.	To be determined	VI.2 and VI.5
RSA-062	Inactive Munitions Demil	RSA-061 and 062 are one disposal area, and both are addressed as RSA-061.	See RSA-061	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-063	Inactive Chemical Munitions Disposal, Area M	This unit consists of two historical inactive disposal trenches for a number of types of chemically filled munitions, incendiary munitions, and bulk chemicals. These trenches were identified based on geophysical surveys, historical archives, and aerial photographs. Munitions and explosives of concern, including the potential for chemical warfare materiel, exist at RSA-063. The site has been fenced and the trenches marked and surveyed.	To be determined	VI.2 and VI.5
RSA-064	Inactive Munitions Demil/Disposal Area BB	RSA-064 is a historical and inactive, one-time demilitarization and disposal area which is not visible on the surface today. RSA-064 was used only one time in 1955 or 1956 to burn 322 leaking 4.2-inch mortars mustard agent shells. Disposal occurred at ground surface without any release controls and the burned shells were left in place. It is believed that these mortars were subsequently removed and disposed of in the Gulf of Mexico. No munitions and explosives of concern or chemical agent have been detected at the site.	To be determined	VI.2 and VI.5
RSA-065	Former Chemical Drum Storage Area, Area X	This unit was formerly used in the 1940s and 1950s as a Toxic Gas Yard (Yard #1) for drummed chemical agents. Mustard and lewisite were stored in drums (1-ton steel containers and 55-gallon steel drums) within 234 earthen cells in the eastern two-thirds of the site. Each storage cell was approximately 100 feet by 100 feet in size and bordered by earthen berms. Drums were offloaded from flatcars and rolled and moved into each storage cell using a hand-operated crane. The berms surrounding each storage cell were topped with rail beds that were used to move and transfer the drums. The berms provided boundaries in the cells and helped to minimize the movement of drums during storage and during flooding that was frequent in this area. Investigation results demonstrated that releases occurred at this site during its operational period. Based on the detection of thiodiglycol (an initial breakdown product of the chemical agent mustard), in sediment, wetland soil, and surface water, residual mustard is potentially present in the cells. The site was re-fenced in 2000-2001 during a time critical removal action.	Soil/Sediment: Potential for mustard Groundwater: Trichloroethene 1,1,2,2-Tetrachloroethane Tetrachloroethene 1,1,2-Trichloroethane Benzene Carbon tetrachloride 2-Nitrotoluene	VI.6
RSA-066	Inactive Ash Disposal Site, Area X-1	This unit was an unlined waste disposal and demolition area located within an operational range. The landfill portion of the site was active from the 1950s to the late 1970s, and was used as a disposal area for incineration ash, residue, and unsalvageable metal debris (e.g., rocket motor parts, crushed drums) from the open burning operations at RSA-014. The site was additionally used for demilitarization of chemically filled ordnance. Based on the presence of detonation lines and small bunkers, the area may have also been used for detonation activities. A 5-strand barbed wire fence was installed around the site in 2001 as part of a Time-Critical Removal Action. Eleven drums of barium hydroxide abandoned at the site were removed from the site during a time-critical removal action conducted in 2000; however, the site has not been closed.	To be determined	VI.2 and VI.5
RSA-067	Former Chemical Drum Storage Area, Area AA	This unit was a Toxic Gas Yard which was used for aboveground storage of drummed mustard and lewisite the 1940s and 1950s. The chemical agents mustard and lewisite were stored in drums (1-ton containers and 55-gallon drums) across the site. Drums of chemical agent were transported into and out of the Toxic Gas Yards by rail. A track ran along the western side of RSA-067. Drums were offloaded from flatcars and rolled and moved into the site for storage. In addition to storage of drummed chemical agent at RSA-067, it is likely that carbon tetrachloride and trichloroethene were stored at the site for purposes of personnel and equipment decontamination following exposure to agent. Igloo Pond is located in the southeast corner of RSA-067. An unnamed pond also exists in the northern portion of RSA-067. Investigation results demonstrated that releases occurred at this site during its operational period. Based on the detection of thiodiglycol (an initial breakdown product of the chemical agent mustard), in sediment, wetland soil, and surface water, residual mustard is potentially present at the site. The site was re-fenced in 2000-2001 during a time critical removal action.	Soil/Sediment: Potential for mustard Groundwater: No COCs	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-068	Inactive Chemical Disposal Area, Area Z	The site was used as a demilitarization and disposal area for explosives in the 1940s. From the 1950s to 1980, the site was used as a neutralization and/or disposal area for fuming nitric acid, cyanide, chromium, metallic salts, beryllium, and numerous laboratory chemicals. In 1980, approximately 100 gallons of chlorine trifluoride were disposed at the site via neutralization in pits using sodium bicarbonate. Fuming nitric acid was neutralized in pits lined with crushed limestone. The majority of the chemicals were disposed of in two trenches and buried along the eastern and southern boundaries. Metal waste and buried ordnance were encountered in a text pit excavated at the site. A chain link fence was installed at the site in 2001 as part of a Time-Critical Removal Action.	To be determined	VI.2 and VI.5
RSA-069	Former Chemical Drum Storage Area, Area Y	This unit was a Toxic Gas Storage Yard #2, which was used for storage of drummed mustard and lewisite in the 1940s and 1950s. The chemical agents mustard and lewisite were stored in drums (1-ton containers and 55-gallon drums) within approximately 170 earthen cells across most of the site. Each cell is approximately 100 feet by 100 feet in size and bordered by earthen berms. These earthen (unlined) storage cells are several feet deep. Drums of chemical agent were transported into and out of the Toxic Gas Yards by rail. A track ran along the western side of RSA-069. Drums were offloaded from flatcars and rolled and moved into each storage cell through use of a hand-operated crane. The berms surrounding each storage cell were topped with railroad tracks that were used to transfer the drums. The berms provided boundaries in the cells and helped to minimize the movement of drums during storage and during flooding that was frequent in this area. In addition to storage of drummed mustard and lewisite at RSA-069, it is likely that drums of carbon tetrachloride, trichloroethene, and other chlorinated solvents were stored at the site for purposes of personnel and equipment decontamination following exposure to agent. Investigation results demonstrated that releases occurred at this site during its operational period. Based on the detection of thiodiglycol (an initial breakdown product of the chemical agent mustard), in sediment, wetland soil, and surface water, residual mustard is potentially present at the site. The site was re-fenced in 2000-2001 during a time critical removal action.	Soil/Sediment: Potential for mustard Groundwater: Trichloroethene 1,1,2,2-Tetrachloroethane Tetrachloroethene 1,1,2-Trichloroethane cis-1,2-Dichloroethene trans-1,2-Dichloroethene	VI.6
RSA-070	Inactive Toxic Chemical Storage Area, Area Y1	The northeast corner of RSA-069 does not contain storage cells and was formerly designated as site RSA-070. The Army administratively combined RSA-069 and RSA-070 about 10 years ago because a separation of the two sites based on distinctively different site uses was not justified. The site was fenced in 2000-2001 during a time critical removal action.	See RSA-069	VI.6
RSA-071	High Explosive Drop Test Site, Area A	RSA-071 was an area used for explosives training and munitions testing during WW II. Historical records note the extensive testing of 4.2-inch mortars and other incendiary munitions was conducted at the site. A metal detector-aided surface clearance was performed at the site in the 1950s. Portions of the site are still used as range areas. The site being managed under the Military Munitions Response Program.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.6
RSA-071-R-01	Former Test Site Resolute Way	RSA-071-R-01 was 244.72 acres that were identified and removed from the active range, RSA-071, the High Explosive Drop/Test Site, Area A. This area consists of range areas, R1101 (OMEMS ASP - Ammunition Supply Training, FTX, Gently Rolling) and R1102 (FTX Light Manuever Area Gently Rolling); two existing structures on R1101 were being used by a single tenant organization as equipment storage.	To be determined	VI.2
RSA-072	Mortar Shell Test Site, Area B	RSA-072 was a field used for mortar testing and explosives training during WW II. Historical records note the extensive testing of 4.2-inch mortars and other incendiary munitions at the site. A metal detector-aided surface clearance was performed at the site in the 1950s. The site is being managed under the Military Munitions Response Program.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-073	High Explosive Impact Test Site, Area C	RSA-073 was used for explosive training/munitions testing during the 1940s and 1950s. A metal detector-aided surface clearance was performed at the site in the 1950s. The site being managed under the Military Munitions Response Program.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2
RSA-074	High Explosive Impact Test Site, Area D	RSA-074 was used for explosives training/munitions testing during WW II. A metal detector-aided surface clearance was performed at the site in the 1950s. The site is currently being used for various testing operations not involving the use of explosives or ordnance. The site being managed under the Military Munitions Response Program.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2
RSA-075	Inactive Solid Waste Incinerator	This unit consisted of three incinerators used for the thermal destruction of municipal solid wastes and office trash located in Building 5410. Each incinerator was connected to a boiler to provide steam to power facility operations. The ash was disposed in the Sanitary Landfill (RSA-010). The incinerators were active from approximately 1980 to 1984. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-076	RDX/HMX Filtration Unit 1, Thiokol North	This unit was used to filter RDX and HMX propellants from floor wash water in Building 7380A. The unit was housed in a metal building that was 25' long x 25' wide x 30' high. There was a 3,000-gallon storage tank, a 300-gallon filter tank, and three 100 gallon carbon columns. The tanks were supported in a metal platform that provided secondary containment. This unit removes nitrex from RDX and HMX suspensions. The suspensions were contained in an internal holding tank. The suspensions were metered into the activated charcoal columns by a continuous belt filter within the filter tank. The treated filtered water was discharged to the Sanitary Sewer System (RSA-029) from the RDX/HMX Filtration Sump (RSA-078). Spent charcoal and filters were placed in the Charcoal Column Dolly (RSA-081). The unit began operation in 1987, while the time at which the unit ceased to operate is unknown. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-077	RDX/HMX Filtration Unit 2, Thiokol South	This unit was identical to the unit at RSA-077. It was initially located in South Plant and then moved to North Plant. However, it was reportedly never used.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-078	RDX/HMX Filtration Unit 1 Sump, Thiokol North	This unit was a concrete sump, covered by a metal grate. It had an approximately 3,000-gallon capacity, and was located at Building 7380A. It received the treated wastewater from Filtration Unit #I (RSA-076), and discharged those wastes (following testing) to the Sanitary Sewer System (RSA-029). The unit began operation in 1987, while the time at which the unit ceased operations is unknown. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-079	RDX/HMX Filtration Unit 2 Sump, Thiokol South	This unit was a concrete sump, covered by a metal grate. It had an approximately 3,000-gallon capacity, and was located initially in South Plant but then moved to North Plant. It was to receive the treated wastewater from Filtration Unit #2 (RSA-077), and then discharge those wastes (following testing) to the Sanitary Sewer System (RSA-029). However, the Filtration Unit #2 (RSA-077) and this sump were never put into service.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-080	RDX/HMX Suspension Transfer Pad/Sump	This unit was a RDX/HMX filtration unloading pad and adjacent sump (40' x 15') located outdoors at Building 3380A. The sump was made of reinforced concrete and has a capacity of approximately 6,000 to 7,000 gallons. The unit began operations in 1987, but the date it ceased operations is unknown. It received drippage from the RDX/HMX Filter unit (RSA-076). The drippage was pumped back into the Filter unit for treatment. The pad was approximately 40 feet long and 15 feet wide, and surrounded by a four inch high concrete curb. The sump was covered and not open to rainwater. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-081	RDX/HMX Filtration Units, Charcoal Column Dolly	This unit consisted of portable containers (4' long x 3' wide x 2' deep) made of metal and was used as a collection bin for spent filter column charcoal and filter paper which contain waste RDX/HMX. The unit was located in Building 7380A and elevated above the concrete floor by four six-inch-diameter wheels. The filters were generated by the wastewater filtration unit that was located in Building 7380A (RSA-076). The unit was active beginning in 1987 and is no longer in use. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-082	Former Sparging Unit, Building 7595	This unit was a propellant sparge unit at Building 7595 and was active from 1985-1990 when the process was then relocated to Building 7354. The stainless steel sparge unit consisted of a 300-gallon propellant sparge tank with a 500-gallon mist eliminator, two condensers, a 500-gallon condensate tank, and approximately 100 feet of piping. A lead-lined captive sump (RSA-135J) was used for waste accumulation. The facility utilized methylene chloride as a mixing agent when preparing various propellant mixtures. The sparge unit would drive off the methylene chloride from the propellant as a vapor and recover it as condensate. The propellant/solvent mixture was placed into the sparge unit. The sparge unit would drive off the methylene chloride vapors to the mist eliminator located in another room. The vapors were heated, driving the gases through two condensers. Methylene chloride condensate was collected by the condensate receiving tank. Vapors were discharged to the atmosphere by a negative pressure induction blower. The batch operation lasted two days. However, 90 percent of the sparging occurred in the first four to six hours. Each batch generated approximately 250 pounds of methylene chloride. The solvent was drummed and disposed at RSA-012. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-083	Paint Spray Booth Sump, Building 7344	This unit was constructed in 1960 for large rocket motor preparation and assembly and for painting missile casings. The eastern portion of the building contained two rocket motor assembly bays. The casings were painted in a paint spray booth which controlled excess paint mist emissions. A falling water curtain was used to trap excess latex paint during spraying applications. The water was recirculated through the sump. The collected paint and solvents were stored in drums in temporary storage areas (RSA-084/RSA-136A) until they were removed for off-site disposal. The water was subsequently discharged directly to a septic tank that drained to a drain field located just southwest of Building 7344. In the early to mid-1990s, the septic system was decommissioned and a force main lift station was installed to tie the building into the sanitary sewer. The water curtain and sump were removed from the building in the mid- to late 1990s. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Chlorobenzene 1,1-DCE cis-1,2-DCE Trichloroethene Vinyl Chloride 2,4-Dinitrotoluene	VI.6 and VIII.1
RSA-084	Inactive Temporary Waste Storage Pad, Building 7344	This unit was a temporary waste storage area for Building 7344 (RSA-083) where latex paint and solvent wastes (including methyl ethyl ketone, trichloroethene, and toluene) from missile spray painting operations were collected in drums and temporarily stored prior to off-site disposal. The storage pad was approximately 25-square foot concrete pad and was located in the northeast corner of the parking lot. The pad did not contain berms on three sides, and the fourth side was bounded by cracked asphalt. The temporary storage area was used from about 1981 until 1990 when it was replaced by a newer temporary storage area (RSA-136A). No releases were known to have occurred. This unit lies within RSA-083.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-085	Inactive Temporary Waste Storage Pad 1, Building 7359	RSA-085 is an inactive 15-foot x 5-foot concrete pad located at Building 7359. The pad was used from 1967 to store Class 1.3 propellant waste, waste solvents, and other wastes generated during cleanup activities associated with Building 7359. This site was investigated as part of RSA-198. Investigation results demonstrated that releases occurred at this site during its operational period. Contaminants in soil were addressed when corrective measures were conducted at RSA-198/085 in 2018; perchlorate was removed to the cleanup goal. COCs remain in groundwater.	Soil: No COCs Groundwater: Perchlorate 2,4-Dinitrotoluene 2,6-Dinitrotoluene RDX 1,1,2-Trichloroethane 1,2-Dichloropropane Tetrachloroethene Trichloroethene	VI.6
RSA-086	Inactive Temporary Waste Storage Pad 2, Building 7359	This unit was a temporary storage area north of Building 7359. The unit was a concrete pad approximately 225 square feet and was used to store waste solvent and solvent-contaminated with propellant. The unit did not contain runoff controls. This unit was used from approximately 1981 to 1990. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-087	Inactive Temporary Waste Storage Pad 1 & 2, Building 7368	This unit was a temporary storage area that consisted of two concrete pads, each measuring approximately 200 square feet, located approximately 150 feet west of the northwest corner of former Building 7368 at RSA-095. The temporary storage area provided interim outdoor storage for drums of wastes generated in the 7300 – Group 2 buildings located in the northern portion of the Redstone Arsenal Rocket Engine North Plant area. This unit was active from approximately 1981 to early 1990 for short-term storage of Class 1.1 and Class 1.3 propellants and associated waste process chemicals and materials, including inert waste solvent (methylene chloride), waste polyisoprene insulation, empty paint cans, and methyl ethyl ketone. In early 1990, the two storage pads were removed from service and metal sheds were erected behind each of the original concrete pads to provide enclosed storage of wastes. The metal storage sheds were identified as RSA-138F (northern building) and RSA-138G (southern building). Investigation results demonstrated that releases occurred at this site during its operational period. A soil corrective measure was conducted in 2014 for perchlorate to meet the cleanup goal. The storage pads were also removed in 2014.	Soil: No COCs Groundwater: Perchlorate Trichloroethene	VI.6 and VIII.1
RSA-088	Inactive Temporary Waste Storage Pad, Building 7625	This unit was a temporary storage area that consisted of a 200-square foot concrete pad located southeast of Building 7625. The site served as an outdoor temporary storage area for waste generation points in the Redstone Arsenal Rocket Engine North Plant area, principally Building 7625 (RSA-094). The storage area was used from 1981 until approximately 1990 for storage of liquid and solid wastes, including propellant and solvent wastes. Waste cured propellant and waste solvents from casing preparation activities at Building 7625 were placed in drums and stored on the concrete pad at RSA-088 until removed for offsite treatment and/or disposal. In early 1990, the pad was taken out of service and a metal shed (RSA-138H) was erected behind (i.e., southeast of the pad) the pad to provide enclosed storage of wastes. Perchlorate was released from this unit and a soil corrective measure was conducted in 2014 to meet the cleanup goal. The storage pad was also removed in 2014.	Soil: No COCs Groundwater: Perchlorate Trichloroethene	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-089	Inactive Temporary Waste Storage Pad, Building 7726	This unit was a temporary storage unit that was located near Building 7726 within RSA-097. The unit was an asphalt pad, approximately 75 sq. ft. in size, and provided a temporary waste storage location for waste propellants and 1,1,1-trichloroethane contaminated with propellant wastes from cleaning propellant casting equipment near the waste generation points. This unit was operational from 1981 to 1990. This site lies within RSA-097. Perchlorate was released from this unit and a soil corrective measure was conducted in 2010-2011 at RSA-097/089 to remove 2,700 tons of perchlorate-contaminated soil to meet the cleanup goal. COCs remain in groundwater.	Soil: No COCs Groundwater: Perchlorate 2,4,6-Trinitrotoluene 2,4-Dinitrotoluene 1,1-Dichloroethene Bromodichloromethane Tetrachloroethene Trichloroethene	VI.6
RSA-090	Inactive Temporary Waste Storage Pad, Building 7340	This unit was a temporary storage area adjacent to Building 7340 to store waste rocket motor insulation (asbestos and polypropylene) and waste methylene chloride from the motor manufacturing line. The concrete pad measured approximately 25 sq ft in size and did not have runoff controls. This unit was active from approximately 1979 to 1989/1990 when it was replaced by a newer unit (RSA-138B). No releases have been documented for this unit. This unit lies within RSA-206 South.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-091	Inactive Temporary Waste Storage Pad, Building 7595	This unit was an approximately 150-square-foot outdoor concrete storage pad used to temporarily store waste methylene chloride generated during sparging activities associated with Building 7595 (RSA-082). The pad had a wood-covered trench drain (no outlet). The wastes were then transferred to the Hazardous Waste Storage Igloos (RSA-015 through RSA-023). This unit was active beginning in approximately 1981 and was replaced by a covered storage unit (RSA-136I) in approximately 1990. The waste pad was removed in 2012. No releases have been documented at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-092	Temporary Waste Storage Pad, Building 7552	This unit was a temporary storage area that was located at Building 7552 to store Class 1.1 propellant waste. The building walls are concrete block and the floors are made of concrete. The unit was active from approximately 1979 to 1996. This unit was located within RSA-144 and has been removed.	No COCs based on low potential for release (ADEM, 2008).	VI.6
RSA-093	Reclaimed Empty Drum Storage Pad, Building 7368	This unit was an empty drum storage area located adjacent to Building 7368 for the storage of empty 55-gallon metal drums and 30-gallon plastic drums. The drums predominately had held 1.3 waste propellant and methylene chloride. The storage area was approximately 200 square feet. A concrete trench approximately 20 feet long, 1 foot wide, and 1 foot deep collected runoff from this area and discharged to the sanitary sewer system directs runoff to sewer systems. This unit lies within RSA-095. Remedial activities conducted from 2014 to 2017 at RSA-095/093 removed trichloroethene and perchlorate-contaminated vadose zone soil to meet the cleanup goals and also successfully reduced or eliminated trichloroethene as accessible dense nonaqueous phase liquid. COCs remain in groundwater.	Soil: No COCs Groundwater: Trichloroethene Perchlorate	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-094	Chlorinated Solvent Distillation Unit 1, Building 7625	This unit was a solvent degreasing operation which included stills used for distillation and recovery of solvent from vapor degreasers in the former rocket motor manufacturing facilities. It began operation in 1981. The unit used trichloroethene until 1989, when the solvent was changed to 1,1,1-trichloroethane until approximately 1989 when the unit became inactive. During vapor degreasing for the rocket motors, the solvent fluid was volatized with heating coils, circulated through the motors, condensed with cooling coils, reconditioned through the distillation unit, and re-circulated through the system. The degreaser unit was set inside a concrete pit and was equipped with a sump pump to recover solvent during operations. The sump was equipped with a sump pump to recover any solvent into a 55-gallon drum. Various other chemicals or materials, including propellants, were used in the various rocket motor processes at Building 7625. The volume of chemicals used in this facility is unknown. Potential release points include the sump and drainage lines from the degreaser unit, the industrial drains, and the external sump at the north end of Building 7625. No known releases have been documented for this unit.	Soil: No COCs Groundwater: Trichloroethene 1,1,1-Trichloroethane Perchlorate	VI.6
RSA-095	Chlorinated Solvent Distillation Unit 2, Building 7368	RSA-095 was a solvent degreasing operation including stills used for distillation and recovery of solvent from vapor degreasers. This unit began operations in 1981. The unit used trichloroethene until 1989, when the solvent was changed to trichloroethane. During vapor degreasing for the rocket motors, the solvent fluid was volatized with heating coils, circulated through the motors, condensed with cooling coils, reconditioned through the distillation unit, and re- circulated through the system. The degreaser unit was set inside a concrete pit and was equipped with a sump pump to recover solvent during operations. Investigation results demonstrated that releases occurred at this site during its operational period. Remedial activities conducted from 2014 to 2017 at RSA-095/093 removed trichloroethene and perchlorate-contaminated vadose zone soil to meet the cleanup goals and also successfully reduced or eliminated trichloroethene as accessible dense nonaqueous phase liquid. COCs remain in groundwater.	Soil: No COCs Groundwater: Trichloroethene Perchlorate	VI.6 and VIII.1
RSA-096	Chlorinated Solvent Distillation Unit 3, Building 7740	RSA-096 is a former degreaser site at Building 7740 which was built in 1960 and used for rocket motor case preparation and processing until 1995. The rocket motor casings were first grit blasted and then moved by monorail to a solvent degreaser unit. Solvent (trichloroethene and later 1,1,1-trichloroethane) was heated and sprayed into the rocket motor tubes as a vapor wash. The wash liquid flowed from the interior of the rocket tubes to the floor and was cooled using a cooling-condensing core, which was supplied by a cooling-condensing tower outside the building. The recovered liquid was drained to an interior sump and then pumped to a solvent recovery unit, where the condensed solvent was pumped back to the degreaser unit for circulation back through the process and the wastewater was directed to a sump outside the building. The exterior sump originally drained to a ditch to the north and east of the cooling tower; however, in the late 1960s/early 1970s, the sump was tied to the sanitary sewer and modified to include an overflow/underflow baffle sump to remove solvents and oils from the wastewater prior to discharge to the sanitary sewer. Following the solvent wash in the degreaser unit, insulation was applied to the casings in layers. Between applications, the insulation layers were cured in ovens. Cured motor casings were then transported to another facility for loading the propellant and igniters and finishing. Building 7740 is currently used for light equipment and supply storage. Investigation results demonstrated that releases occurred at this site during its operational period. Remedial activities were conducted from 2012-2014 and included in situ thermal treatment using electrical resistance heating was applied to the trichloroethene-contaminated vadose zone soil and to trichloroethene present as dense nonaqueous-phase liquid within the saturated zone. The cleanup goals were met in soil. COCs remain in groundwater.	Soil: No COCs Groundwater: Trichloroethene as dense nonaqueous phase liquid Perchlorate 1,1,1-Trichloroethene 1,1-Dichloroethene Acetone cis-1,2-Dichloroethene Methylene chloride	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-097	Chlorinated Solvent Distillation Unit 4, Building 7726	RSA-097 comprised a former missile manufacturing facility (Building 7726), storage buildings (Buildings 7734, 7735, and 7736), and the RSA-089 temporary storage pad. Building 7726 was built in 1942 for use in the Army's Redstone Ordnance Plant (ROP) Production Line No. 2 for TNT/tetryl melting and pouring operations and ordnance assembly. Buildings 7736, 7735, 7734, and historical Building B-533 were constructed to support these operations. From about 1956 until about 1996, Building 7726 was used to manufacture and prepare solid rocket motors for Maverick missiles. Degreasing operations were conducted in the northern portion of the building and contributed to the groundwater contamination located under this site. The other three buildings at the site (Buildings 7736, 7735, and 7734) were used for chemical and materials storage. Waste chemicals and materials from operations at Building 7726 were collected in 55-gallon drums and temporarily stored at the RSA-089 storage pad before final disposal. Operations ceased in the mid-1990s. The degreasing system has been removed, and the buildings have been demolished. The area that comprised the RSA-089 storage pad has been excavated and removed. Perchlorate was released from this unit and a soil corrective measure was conducted in 2010-2011 at RSA-097/089 to remove 2,700 tons of perchlorate-contaminated soil to meet the cleanup goal. COCs remain in groundwater.	Soil: No COCs Groundwater: Perchlorate 2,4,6-Trinitrotoluene 2,4-Dinitrotoluene 1,1-Dichloroethene Bromodichloromethane Tetrachloroethene Trichloroethene	VI.6
RSA-098	Chlorinated Solvent Distillation Unit 5, Building 7346	This unit was a solvent degreaser used for distillation and recovery of solvent from the former Thiokol plants. It was in operation from 1981 to about 2000. The unit used trichloroethene until 1989, when the solvent was changed to 1,1,1-trichloroethane. During vapor degreasing for the rocket motors, the solvent fluid was volatized with heating coils, circulated through the motors, condensed with cooling coils, reconditioned through the distillation unit, and re-circulated through the system. The degreaser unit was set inside a concrete pit and was equipped with a sump pump to recover solvent during operations.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-099	Abandoned Plating Shop Tank/Sumps, Building 7614	RSA-099 was a core preparation facility in the 1950s in support of processing rocket motor cores. From the late 1970s until 1985, the building was used as a small scale plating operation for coating rocket motor casings. The building was demolished in 1999. No releases have been documented at this facility.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-100	Aboveground Waste Oil Tank, Building 7630	This unit was a 250-gallon capacity aboveground waste oil tank located near Building 7630. The period of operation for this unit is unknown. It was used to store waste oil until the oil could be taken to a holding tank at the central oil/water separator (RSA-030). The oil was then shipped off-site for disposal. The tank has been removed and there were no reported releases.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-101	DDT Contaminated Area DD	This unit includes the Upper and Lower Reaches A of Huntsville Spring Branch that were used as receiving waters for industrial discharges. It is estimated that 1.5 million gallons of DDT-contaminated wastewater was discharged into Huntsville Spring Branch per day from 1974 through August 1970. Upper Reach A is approximately 1.4 miles long and Lower Reach A is approximately 1.6 miles long. Remediation has been conducted along the old channel and the area has been graded to direct surface water runoff away from the area. A new channel was constructed to divert flow in Huntsville Spring Branch away from the DDT-contaminated channel. From April 1986 through October 1987, the Olin Corporation conducted Remedial Action activities which included backfilling, diversion, and reconstruction of Huntsville Spring Branch. This site is managed under an Olin Consent Decree.	Soil/Sediment: DDT	VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-102	DDT Plant Site Q-6	The DDT manufacturing plant was leased in 1947 by the Calabama Chemical Company. The plant manufactured approximately 25 million pounds of DDT per year. The lease of the plant was taken over by the Olin-Mathieson Chemical Company in 1954. In June, 1970 Olin ceased all production of DDT and began cauterizing the associated settling pond and wastewater discharge ditch to neutralize residues. For a period of approximately one month in August 1970, Olin manufactured TECAN (a pesticide) and ground DDT. In late October 1970, Calabama subleased the plant from Olin and manufactured 23,000 pounds of methoxychlor (a pesticide) until June 1971, when production was ceased. The plant was closed and vacated in 1971 and in early 1972, the plant was demolished. In the Fall of 1977, the DDT plant area was cleaned up, the DDT settling basin was filled and sealed, drainage around the area was diverted, retention dams in the Olin ditch were constructed, and carbon absorption treatment of water flowing through the ditch was evaluated. The remedial actions were completed by the end of late 1977. In 1978, the Calgon Corporation built a water treatment plant at the south dam of the Olin ditch and treated the water in the ditch until June 1982. From July 1979 to August 1982, an extensive DDT Migration Abatement Program was initiated by the Army to remove DDT-contaminated wastes. In 1983, Olin initiated remedial actions on the site under a U.S. Department of Justice Consent Decree and initiated a groundwater and surface water monitoring program. The Army in 2009 included this site in the RSA-117 RFI site boundary.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-103	DDT Settling Lagoon	This unit was an unlined settling basin/retention pond constructed in 1965, cauterized in 1970, and sealed in 1977. The structure was designed to separate DDT from wastewater prior to discharge to the Huntsville Spring Branch. It is estimated that 1.5 MGD of DDT-contaminated wastewater and 12,000 pounds of DDT would settle every 4 months during operation. The site lies within RSA-117.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-104	Inactive ISP Wastewater Discharge Ditch	This unit was a former drainage ditch used from 1940 - 1978 to discharge wastewater containing iron from iron carbonyl manufacturing processes at the Government Aircraft Factory facility. The site lies within RSA-117.	See RSA--117	VI.2
RSA-105	DDT Drainage Ditches	This unit is comprised of both the new DDT drainage ditch and the old DDT drainage ditch, which was taken out of service in 1967. Both the new and old DDT drainage ditches conveyed wastewater to Huntsville Spring Branch from the DDT Settling Lagoon, as well as industrial sewer discharges from the chlor-alkali process and the GAF plant discharge (RSA-104) during their operation. The site lies within RSA-117.	See RSA-117	VI.2
RSA-106	DDT Earthen Dams	This unit consists of earthen dams built to intersect the “new” drainage ditch that was operational from 1967 to 1971 and reduce the movement of DDT in the sediments and water within the DDT drainage ditches. The site lies within RSA-117.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-107	Closed DDT Soil/Debris Landfill	DDT waste soils landfill used from 1978 through 1982 to dispose of DDT-contaminated soils from the DDT Plant Site (RSA-102), DDT drainage ditches (RSA-105), and burial areas excavated as part of the DDT Migration Abatement Program. Wastes were placed in several disposal pits (150' x 150' x 10') which are lined with a low permeability clay layer. The site was closed in 1983.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-108	Test Range 4 Missile Impact Site	This unit is the Impact site of a test firing range used since the early 1970s. The site is located on the east side of Bradford Mountain and contains scattered rocket parts including rickets, mortars, casings and unburned rocket fuels. Vegetation in the impact area has been burned off from fires as a result of ignited propellant caused during rocket impact. The scattered materials are still present except when washed away by Indian Creek. No releases were known to have occurred.	Soil: No COCs Surface water: No COCs Sediment: No COCs Groundwater: No COCs	VI.3
RSA-109	Former Chemical Munitions Staging Area	The RSA-109 site consists of a partially wooded area off a former railroad spur that was suspected to have been used as a staging area for chemical agent operations from 1943 to 1944/45 and/or as a disposal area for debris resulting from the demolition of the chemical manufacturing plants in the late 1940s. The site is situated within the Test Area 1 active missile test range. A small-scale release of arsenic to soil has occurred.	Soil: Arsenic Groundwater: No COCs	VI.6
RSA-110	Former Drum Storage/Construction Debris, Area Y	This site was located within the floodplain of the Tennessee River and an operation range and used as rail car storage in the 1940s to 1950s. Rail cars full of chemical ordnance were staged in gravel storage areas waiting to be unloaded. The site now consists of dense brush and wetlands, but remains of the gravel storage areas are still visible. Surface munitions and explosives of concern are present throughout the site. In 2001, the site was fenced with 5-strand barbed wire as part of a Time-Critical Removal Action.	To be determined	VI.2 and VI.5
RSA-111	Construction Debris, Area W	This unit is a former construction debris disposal site in operation during an unknown period. No wastes were believed to be disposed at this unit. The site is present along Huntsville Spring Branch and is partially under water. Scattered waste piles and debris covers an area of approximately 2 to 5 acres. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-112	Suspected Former Demil/Disposal, Area W	RSA-112 consists of former demilitarization and disposal areas which are no longer discernible on the surface. Physical data collected from recent intrusive investigations supports the site was used for demilitarization/disposal of conventional MEC (e.g., fuzes, bursters, and smoke canisters), including possible drum handling. Low level detections of the agent breakdown product, thiodiglycol, in soil samples recently analyzed suggest that chemical agent was present at this site at some point in the past, and that there is a possibility that limited and infrequent management of CWM-containing or contaminated materials on the site could occur in the future. A time critical removal action was conducted in 2000-2001 to fence the site perimeter.	To be determined	VI.2 and VI.5
RSA-113	Inactive Disposal Trenches/Burn Pits. Area W	RSA-113 consists of two historical and inactive disposal trenches, approximately 300 feet long by 20 feet wide, and a suspected fuze burn area. Decomposed 55-gallon drums, a steel-wheeled rail cart, and structural steel are visible in uncovered sections of the trenches. Munitions and explosives of concern are present in the trenches. The period of operation is unknown. A time critical removal action was conducted in 2000-2001 to fence the site perimeter and install and survey monuments at trench ends.	To be determined	VI.2 and VI.5

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-114	Inactive Madkin Mt Rock Quarry	This unit is an inactive limestone quarry that is recharged by groundwater, localized surface runoff, and precipitation. Debris, including Chemical Defense Equipment consisting of discarded individual gas mask canisters, was dumped into the quarry after it was closed in the mid-1940s. A significant amount of debris is present on the quarry floor, including 4.2-inch mortar projectiles, a Mark 6 naval mine (empty case), cylindrical objects, and 30- and 55-gallon drums (reinforced and nonreinforced) – some of these items are considered Material Potentially Presenting an Explosive Hazard.	Soil: Not evaluated Groundwater: Not evaluated Surface Water: Mercury 4,4'-DDT Tetrachloroethene Vinyl chloride Fish Tissue: Copper Lead Selenium Zinc Endrin aldehyde Debris: Material Potentially Presenting an Explosive Hazard Chemical defense equipment waste piles	VI.2 and VI.5
RSA-115	Inactive East Side Slowdown Lagoon, Test Area 5	This site consists of an earthen lagoon that was used as a holding basin for cooling water discharged during test firing of Redstone rocket engines from Attitude Test Stand 8887. A concrete flume, which transported the cooling water used during the tests to the lagoon, leads from the test stand at Building 8877 to the earthen lagoon. The cooling water discharged to the earthen lagoon ultimately evaporated or seeped into the ground. Tests were conducted up to five times a week during the 1960s, using a kerosene-based fuel. Between 1975 and 1990, a variety of rocket motors were tested at the site. The test stand associated with this lagoon is now used exclusively for static tests, which do not require a blowdown lagoon. The concrete flume that once carried water from the test stand is not functional and is inactive. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Arsenic 2,6-Dinitrotoluene 2-Nitrotoluene bis(2-Ethylhexyl)phthalate Dibenz(a,h)anthracene Benzene TCE UDMH	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-116	South Side Slowdown Lagoon, Test Area 5	RSA-116 is a triangular lagoon that began operation in the mid-1960s as a holding basin for cooling water discharged during test firing of rocket engines at nearby Test Stand 8879. Tests were conducted at the site as frequently as once every 10 days. Cooling water may have contained JP-1 and JP-4 fuels and dissolved rocket propellant and rocket engine exhaust from UDMH as the active fuel ingredient and nitric acid as the primary oxidant. Site personnel reported that trichloroethene was used regularly as a solvent on the test stand until the mid- to late 1970s. Cooling water from the test stand was discharged to a concrete apron that channeled the water to the concrete flume and ultimately to the unlined lagoon. In 1993, the lagoon was regraded and a high density polyethylene liner was installed. A contaminant berm was constructed surrounding the lagoon to prevent surface runoff from entering the lagoon. The site is currently inactive, and rocket motor test firings are not being conducted. However, precipitation is allowed to collect in the lagoon and periodically pumped out to maintain the water level in the lagoon. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 2-Nitrotoluene bis(2-Ethylhexyl)phthalate 1,1,2,2-Tetrachloroethane Trichloroethene UDMH	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-117	Former Liquid Caustic Mfg Plant, Area R	This unit was expanded from the boundary surrounding the Former Liquid Caustic Manufacturing Plant to include all areas that were associated with RSA-102, the DDT Plant site. This included adding areas including the locations for RSA-103, RSA-104, RSA-105, RSA-106, and RSA-118. These former sites and plants were grouped into three major subareas that are defined based on their site history, former manufacturing and process activities, and resulting impacts to the surface media and groundwater. The subareas include the Former DDT Manufacturing Area, the Former Chlorine Plant No. 2, and RSA-118, inactive ISP Industrial Discharge Lagoon. The operations conducted at the Former DDT Manufacturing Area have ceased and structures have been demolished, remedied, and backfilled during the Army's abatement activities. The foundations of many structures still exist. The new DDT drainage ditch (part of RSA-105) and its dams (RSA-106, DDD Earthen Dams) remain operational and continue to convey and control surface runoff at RSA-117, but only from DDT Plant Site Q-6 (RSA-102) and the DDT Settling Lagoon (RSA-103) areas. Note: RSA-105, DDT Drainage Ditches, is comprised of both the new DDT drainage ditch and the old DDT drainage ditch, which was taken out of service in 1967. Both the new and old DDT Drainage Ditches conveyed wastewater to Huntsville Spring Branch from the DDT Settling Lagoon, as well as industrial sewer discharges from the chlor-alkali process and the GAF plant discharge (RSA-104, Inactive ISP Wastewater Discharge Ditch), during their operation. The Former Chlorine Plant No.2 subarea is comprised of the following areas that were related to the manufacturing of chlorine: the original RSA-117, Former Liquid Caustic Manufacturing Plant, Area R; Chlorine Manufacturing Plant; Brine Processing Plant; and RSA-104, Inactive ISP Wastewater Discharge Ditch. All that remains of the Former Liquid Caustic Manufacturing Plant, Area R is remnants of building foundations. All that remains of the Brine Processing Plant are remnants of building and tank foundations. The Brine Processing Plant area was located directly south of the former Chlorine Manufacturing Plant area. RSA-118, the Former Ammonia Lagoon, consists of a natural inlet drainage ditch, a 2-acre natural lagoon, and an outlet drainage ditch. The inlet ditch is approximately 6 feet wide, shallow, and drains the area west of the GAF facility. It flows through a grass/small brush area into a forested area where the lagoon is located. The lagoon is characterized by heavily vegetated underbrush and marsh grasses, with very wet soils and sediments.	Soil: Arsenic, Cadmium, Manganese, Mercury, Dioxins, Aroclor 1254, Aroclor 1260, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-BHC, beta-BHC, alpha-chlordane, Dieldrin, Endrin, Heptachlor, Heptachlor epoxide, Benzo[a]pyrene, bis[2-Chloroethyl]ether, Hexachlorobenzene, Chlorobenzene, Tetrachloroethene. Groundwater: Arsenic, Cadmium, Manganese, Selenium, Sodium, Aroclor 1016, Aroclor 1242, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, alpha-BHC, alpha-chlordane, beta-BHC, delta-BHC, Dieldrin, Endrin, gamma-BHC [Lindane], gamma Chlordane, Heptachlor, Heptachlor epoxide, Benzo[a]anthracene, Benzo[b]fluoranthene, bis[2-Chloroethyl]ether, bis[2-Ethylhexyl]phthalate, Dibenz[a,h]anthracene, Hexachloroethane, Indeno[1,2,3-cd]pyrene, Pentachlorophenol, 1,1,2-Trichloroethane, 1,2-Dichloroethane, Benzene, Carbon tetrachloride, Chlorobenzene, Chloroform, cis-1,2-Dichloroethene, Trichloroethene, Vinyl chloride.	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-118	Inactive ISP Industrial Discharge Lagoon	This unit was an ammonia lagoon used from 1949-1980's and was a holding pond for wastewater containing ammonia generated by the GAF chemicals corporation. The site lies within RSA-117.	See RSA-117	VI.2
RSA-119	GAF Manufacturing Facility	The unit was a chemical storage and metal carbonyl processing facility that has been operational since 1949. The facility primarily produces iron carbonyl, but also produced nickel carbonyl for a limited time. The facility consists of the metal carbonyl manufacturing buildings, the inactive nickel carbonyl unit, an iron sludge pile, a former refuse pit, and a waste coke storage area. In the mid-1980s, an “ammonia cracker” was installed to handle scrubber wastewater that was previously discharged through a drainage ditch to a lagoon located southeast of the plant. Process water containing iron was previously discharged through ditches located west of the facility to the Huntsville Spring Branch. Since 1978, wastewater has been discharged under a National Pollutant Discharge Elimination System permit to a drainage ditch east of the plant. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-120	Matthew's Cave and Ravine	Matthew's Cave and ravine were previously used for disposal of wastes generated from training operations. Disposal likely took place at the time the adjacent Explosive Ordnance Disposal School started operations. Some removal of wastes occurred in 1978, but materials were disposed of in the ravine at the mouth of the cave. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-121	Paint Shop/Paint Washout Booth, Building 4762	This unit was a paint shop constructed in the 1980s to support projects undertaken in Building 4762. The shop was originally equipped with a water-curtain paint booth where water circulated through the booth and was then pumped through underground 2-inch polyvinyl chloride lines to two 500-gallon fiberglass aboveground storage tanks outside the building. These aboveground storage tanks were surrounded by a 15-foot by 8-foot concrete secondary containment unit. The aboveground storage tanks went out of service in 1998. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-122	Dismantled Lewisite Mfg. Plant, Area U	The site was used to produce the chemical agent lewisite as well as to produce sulfur monochloride and arsenic trichloride, components of the lewisite manufacturing process. The site areas also includes areas historically used for materials stockpiling, waste processing, and waste disposal. A soil removal action was conducted in 2010-2011 for arsenic- and mercury-contaminated soil. Several units lie within RSA-122: RSA-033, RSA-043, RSA-044, RSA-056, RSA-127, and RSA-139. Investigation results demonstrated that releases occurred at this site during its operational period. Approximately 8,300 tons of arsenic- and mercury-contaminated soil was removed in 2010-2011 during an interim measure removal action. Arsenic remains in locations of the site above the cleanup goal as well as in groundwater under the site.	Soil: Arsenic Surface water: No COCs Sediment: No COCs Groundwater: Arsenic	VI.6 and VIII.1
RSA-123	Inactive Cement Plant Sump	This unit was an in-ground sump, approximately 2 feet wide, 12 feet long, and 2 feet deep, located under the mixer at the former cement plant in former Building 4474. The plant was in operation during the 1950s. The sump discharged through a 1.25-inch metal pipe to open ground west of the concrete pad it was contained in. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-124	Dismantled Calgon DDT Contaminated Water Treatment Plant	This unit was the Calgon water treatment plant that operated from 1979 to 1982. This system was used to reduce concentrations of DDT in the water above the dam prior to discharge to Huntsville Spring Branch. The plant was removed in November 1982. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-125	Satellite Waste Accumulation Area, Building 5477	This unit was a storage area for products and wastes generated from plating operations at Building 5477. Based on the operation period of the Plating Shop, the unit was likely in use starting in 1974. The unit measures 15-feet wide by 50-feet long, has a concrete floor, is covered by a tin roof, and fenced. No releases were known to have occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-126	Inactive Open Burn Trench, Area U	This unit consists of two trenches that were used for open burning, a surface burn area, and a soil mound. Each trench is approximately 200 ft long, 10 to 12 ft wide, and 10 ft deep. The surface burn area is approximately 20 x 20 feet. No information is available about the period of operation or about the types and origin of materials burned in the trenches. The soil mound was believed to consist of soil removed from the trench during excavation. Investigation results demonstrated that releases occurred at this site during its operational period. In 2001, a 5-strand barbed wire fence with a locking gate was installed around the site and one trench was identified and marked as part of a Time-Critical Removal Action. In interim measure was conducted in 2013 to remove copper- and lead-contaminated soil.	Soil: No COCs Groundwater: No COCs	VI.2
RSA-127	Photo Lab Process Wastewater Sump Building 5451	This unit was a concrete sump located outside Building 5451 that received wastes associated with photographic processing, including silver, ferrous cyanide, and corrosive solutions. Building 5451 was a photographic processing laboratory in operation from the late 1940s until it was demolished in 1999. The sump contained three input lines from floor drains in the mechanical room and the chemical room of Building 5451 and two lines which discharged the sump. There were no documented releases.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-128	Inactive Mustard Gas Demi! Area, Area W	Site reportedly used during an unknown time period for the demilitarization of mustard gas. In 2001, a 5-strand barbed wire fence with a locking gate was installed around the site as part of a Time-Critical Removal Action. The unit has been included with RSA-112 for investigation.	See RSA-112	VI.2
RSA-129	Thiokol Burning Pit/Rocket Washout Area	This unit consists of an unlined concrete pit, unlined earthen settling pond, and an open field with various abandoned structures used to support testing by the Thiokol Corporation. In the late 1950s, the site was used as an underwater burnout pit. In the late 1960s and early 1970s, the site was used in water jet cleanout operations. Water from sumps inside the pit was pumped to a settling pond west of the concrete pit and pad. Water from the settling ponds was returned to aboveground storage tanks which drained a piston pump and recycled back into the water jet system. Between 1973 and 1974, the concrete pad and pit was filled and capped with concrete and returned back to the Army. In 1988, this unit was used for explosive testing. All materials were contained or consumed. The waste motors were removed and shipped off for disposal. Solid propellant was disposed at the Open Burn/Open Detonation Area. The process water in the settling pond was recycled or allowed to drain out of the pond via an overflow breach. The pond sediments remained in place.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2
RSA-130	Inactive Radiographic Septic Tank, Building 7345	The septic tank located at Building 7345 was used during an unknown time period. The tank received chemical washdown from film developing including developer, fixers, and treatment solutions. Based on previous investigations, it was determined that the septic tank, septic tank piping, and drain field connected to Building 7345 contained liquid and sludges with elevated levels of heavy metals. As part of a Time-Critical Removal Action performed in 1997 for the site, the sewer lines were cleaned out and approximately 25 cubic yards of sludges were removed from the septic tank and distribution boxes. Later, the septic tank, sewer lines, and potentially contaminated drain field soil and piping were removed. Contaminants in soil were addressed as part of the remedial action.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-131	Active Open Detonation Area (OD)	RSA-131 is associated with RSA-012 and activities are governed by the Subpart X permit. The area is used to thermally treat hazardous energetic and energetic-contaminated waste. This unit has been in use since the 1950s. It consists of an open area surrounded by earthen berms on three sides. Individual pits are dug within the open area to a depth of 2 to 4 feet below ground surface on the day that thermal treatment is to take place; the pits are filled with soil after treatment is completed for the day. The Permit requires annual groundwater monitoring and reporting.	To be determined	VI.4 and VIII.1
RSA-132	Dismantled Popping Furnace	The popping furnace was used to demilitarize ammunition and small explosives. The dismantled popping furnace was active during the 1940s when the Redstone Ordnance Plant was testing charges and manufacturing small arms ordnance. After WW II, the popping furnace was used to demilitarize captured and off-specification ordnance. Small arms ammunition charges were tested and demilitarized in a closed-top metal vessel, or kettle, that was heated by a small diesel fuel burner. The heat exploded the rounds, and the metal was salvaged. The popping furnace was located in the west-central portion of the site. The metal popping furnace was disassembled and removed in the late 1970s. No releases are known to have occurred at this unit. This site lies within RSA-013.	Soil: No COCs Groundwater: Perchlorate 2,6-Dinitrotoluene 2-Nitrotoluene RDX Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene 1,1-Dichloroethene 1,2-Dichloroethane Chloroform Methylene chloride Trichloroethene Dibenz(a,h)anthracene	VI.6
RSA-133	Inactive Rocket Washrack/Sump, Unit 2	This unit is an inactive rocket motor wash rack and concrete sump. The site was designed to clean residual propellant from rocket motors using chlorinated solvents. Shortly after this facility was constructed in the late 1960s, the Army began using rocket motors that did not require cleaning. Available information provides little or no information regarding the operation of this facility, but it is not believed to have been used extensively or for an extended period of time. A 1967 drawing indicates that the 12-foot by 12-foot sump was constructed of concrete and covered by a metal grate. The drawing indicated that the sump was 18 feet deep. During the visual site inspection in 2008, part of the concrete curb and metal grate were missing, and the remaining metal grate was overgrown with vegetation. Explosives, perchlorate, metals, and solvents may have been released to the environment from the washrack/sump used for removal of residual propellant from rocket motors during cleaning; however, no releases have been documented for this unit. This site lies within RSA-013.	Soil: No COCs Groundwater: Perchlorate 2,6-Dinitrotoluene 2-Nitrotoluene RDX Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene 1,1-Dichloroethene 1,2-Dichloroethane Chloroform Methylene chloride Trichloroethene Dibenz(a,h)anthracene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-134	Inactive Disposal Trench/Burn Pit, Area U	This unit consists of a former disposal trench approximately 25 ft by 75 ft by 4 ft deep and an open burning pit that were reported to have been utilized as an open burning pit and/or a disposal trench. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-135A	1.1 Propellant Waste Captive Sump, Building 7353	This concrete captive sump with a white epoxy liner received 1.1 propellant wastes from Building 7353 (mixer facility). The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135B	1.1 Propellant Waste Captive Sump, Building 7354	This concrete captive sump received 1.1 propellant wastes from Building 7354 (pre-mix facility). The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135C	1.1 Propellant Waste Captive Sump, Building 7363	This concrete with metal separator captive sump received 1.1 propellant wastes from Building 7363. The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. The sump has been removed. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135D	1.1 Propellant Waste Captive Sump, Building 7386	This concrete captive sump with a liner received 1.1 propellant wastes from Building 7386 (large mixer research and development facility). The sump was 5' x 10' in size and had a cover. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. This unit lies within RSA-187. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135E	1.1 Propellant Waste Captive Sump, Building 7387	This concrete captive sump with a liner received 1.1 propellant wastes from Building 7387 (small mixer research and development facility). The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. This unit lies within RSA-187. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135F	1.1 Propellant Waste Captive Sump, Building 7521	This concrete captive sump with a non-conductive liner received 1.1 propellant wastes from Building 7521 (RDX/HMX explosive operations). The sump was 5' x 15' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135G	1.1 Propellant Waste Captive Sump, Building 7522	This concrete captive sump with a conductive liner received 1.1 propellant wastes from Building 7522 (grinder facility). The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135H	1.1 Propellant Waste Captive Sump, Building 7593	The unit contained two buildings (Former Buildings 7593 and 7594), a former temporary storage area (RSA-171), a sump and covered trench drain associated with former Building 7593, and a sump and covered trench drain associated with former Building 7594 (RSA-135I). All of the buildings or structures have been demolished or removed. Historical operations within the site boundary began in the mid- to late 1950s; the buildings within RSA-135H were used to support propellant experiments and manufacturing. Releases may have occurred from this unit but none have been documented.	Soil: No COCs Groundwater:: 2-Nitrotoluene RDX TCE Perchlorate 1,1-Dichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-135I	1.1 Propellant Waste Captive Sump, Building 7594	This concrete captive sump received 1.1 propellant wastes from Building 7594 (mixer facility). The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135J	1.1 Propellant Waste Captive Sump, Building 7595	This concrete captive sump with a lead liner received 1.1 propellant wastes from Building 7595 (sparge unit, pre-mix facility [RSA-082]). The sump was 5' x 10' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. This unit lies within RSA-082. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135K	1.1 Propellant Waste Captive Sump, Building 7621	This concrete captive sump with a white epoxy liner received 1.1 propellant wastes from Building 7621 (igniter assembly, developer lab). The sump was 5' x 15' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135L	1.1 Propellant Waste Captive Sump, Building 7654	This concrete captive sump with white epoxy line and metal separator received 1.1 propellant wastes and plating wastes with cyanide, cadmium, silver, and mercury from Building 7664 (igniter assembly). The sump was 5' x 15' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135M	1.1 Propellant Waste Captive Sump, Building 7690	This concrete captive sump received 1.1 propellant wastes from Building 7690 (research and development for RDX/HMX grinding and woodworking shop). The sump was 4' x 4' in size. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. This site lies within RSA-204. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-135N	1.1 Propellant Waste Captive Sump, Buildings 7694 & 7695	This concrete captive sump received 1.1 propellant wastes from Buildings 7694 and 7695 (grinders and drying buildings for RDX/HMX). No size information was available. The sump was periodically cleaned out and the wastes were burned either at RSA-012 or RSA-014. The sump was operational from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136A	1.1 Propellant Waste Drum Storage Pad, Building 7344	This unit was a temporary waste storage area for Building 7344. In 1990, the RSA-084 temporary storage area was rebuilt and renovated into this new storage pad. The concrete pad was used for the storage of latex paint wastes, wastes solvents (including methyl ethyl ketone, trichloroethene, and toluene from missile painting activities), and sludges from the indoor sump at Building 7344. Wastes were temporarily stored in an area of approximately 25 sq. feet prior to off-site disposal. Use of the pad was from 1990 to 1996. No releases are known to have occurred at this unit. This unit lies within RSA-083.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136B	1.1 Propellant Waste Drum Storage Pad, Building 7352	This unit was a temporary waste storage area for Building 7352. This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. This storage pad lies within RSA-311. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136C	1.1 Propellant Waste Drum Storage Pad, Building 7354	This unit was a temporary waste storage area for Building 7354 (premix facility). This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes and waste methylene chloride. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-136D	1.1 Propellant Waste Drum Storage Pad, Building 7354	This unit was a temporary waste storage area for Building 7354 (premix facility). This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes and waste methylene chloride. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136E	1.1 Propellant Waste Drum Storage Pad, Building 7358	This unit was a temporary waste storage area for Building 7358 (mixer facility). This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes and waste methylene chloride. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136F	1.1 Propellant Waste Drum Storage Pad, Building 7363	This unit was a temporary waste storage area for Building 7363. This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 aluminum powder, aluminum paste, and empty drums. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136G	1.1 Propellant Waste Drum Storage Pad, Building 7386	This unit was a temporary waste storage area for Building 7386 (large mixer research and development facility). This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. This unit lies within RSA-187. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136H	1.1 Propellant Waste Drum Storage Pad, Building 7387	This unit was a temporary waste storage area for Building 7387 (small mixer research and development facility). This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes and empty drums. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. This unit lies within RSA-187. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136I	1.1 Propellant Waste Drum Storage Pad, Building 7595	This unit was a temporary waste storage area for Building 7595 (premix facility). In 1990, the RSA-091 temporary storage area was rebuilt and renovated into this new storage pad with an enclosure and in-ground concrete sump for containment. The concrete pad was used for the storage of 1.1 propellant wastes. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. The RSA-136I storage pad, shed, and sump were removed in 2012. This unit lies within RSA-210. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-136J	1.1 Propellant Waste Drum Storage Pad, Building 7724	This unit was a temporary waste storage area for Building 7724 (research and development facility). This storage area contained a metal enclosure (enclosed on three sides) for the temporary storage of 1.1 propellant wastes. The unit had a concrete floor with a containment curb on three sides and a concrete containment sump at the back of the unit. Wastes were temporarily stored prior to off-site disposal. Use of the pad was from 1990 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137A	1.3 Propellant Waste Sump and Captive Sump, Building 7339	This sump received Class 1.3 propellant mixer wastes and ammonium perchlorate-based propellant wastes from Building 7339 (rocket motor manufacturing) at RSA-206 North. The sump had been connected to Building 7339 by open trench drains. The sump discharged wastes to the sanitary sewer and then to the Sewage Treatment Plant #1 (RSA-011). The sump was active since 1981. The trench drains inside the building which led to the sump have been filled with concrete. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-137B	1.3 Propellant Waste Sump and Captive Sump, Building 7340	This sump received 1.3 propellant wastes and was a settling basin for particulates from Building 7340 (casting building for loading propellant into rocket motors). The sump discharged wastes to the sanitary sewer and then to the Sewage Treatment Plant #1 (RSA-011). The sump operated between 1981 and 1996 and was located at RSA-206 South. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137C	1.3 Propellant Waste Sump and Captive Sump, Building 7356	This covered concrete captive sump received 1.1 and 1.3 propellant wastes from Building 7356 (mixer building). The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137D	1.3 Propellant Waste Sump and Captive Sump, Building 7380	This covered concrete captive sump received 1.3 propellant wastes from Building 7380 (filtration operations) (RSA-076). The sump had a capacity of approximately 3,000 gallons. Wastes were pumped to the sanitary sewer and then treated at Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137E	1.3 Propellant Waste Sump and Captive Sump, Building 7601	This concrete sump received 1.3 propellant waste from Building 7601 (plastic shop). The sump discharged wastes to the sanitary sewer and then to Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. This sump lies within RSA-200. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137F	1.3 Propellant Waste Sump and Captive Sump, Building 7604 Boiler House	This concrete sump with metal separators received 1.3 waste from a condensate tank and was located on the east side of Building 7604 (boiler plant). The sump discharged to the sanitary sewer and then treated at Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. This sump lies within RSA-200. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137G	1.3 Propellant Waste Sump and Captive Sump, Building 7625	This concrete covered sump received 1.3 propellant waste from Building 7625 (production facility for rocket motor manufacturing). The sump discharged to the sanitary sewer and then treated at Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. Located within RSA-088. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008) and inclusion within the RSA-088 investigation.	VI.3
RSA-137H	1.3 Propellant Waste Sump and Captive Sump, Building 7636	This captive concrete sump received 1.3 propellant waste from Building 7636. This unit was active from 1981 to 1996 and lies within RSA-194. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137I	1.3 Propellant Waste Sump and Captive Sump, Building 7652	This covered concrete sump received acid wastes from Building 7652 (acid storage). The sump discharged to the sanitary sewer and then treated at Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137J	1.3 Propellant Waste Sump and Captive Sump, Building 7689	This concrete sump received 1.3 propellant waste from Building 7689 (ammonium perchlorate grinder facility). The sump discharged to a storm drain and then the sanitary sewer and was then treated at Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137K	1.3 Propellant Waste Sump and Captive Sump, Building 7691	This concrete sump was located on the northwestern side of Building 7691 which received 1.3 ammonium perchlorate-based grinding and washdown wastes from 1981 through 1996. These sumps have an outlet that discharges to the sanitary sewer and then to the Sewage Treatment Plant #1 (RSA-011). This site lies within RSA-204. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137L	1.3 Propellant Waste Septic Tank and Drainfield, Building 7691	This unit was a septic tank and drain field located northeast of Building 7691. The unit historically received 1.3 ammonium perchlorate-based grinding and washdown wastes from 1981 through 1996. This unit is located at RSA-204. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-137M	Waste Sump and Captive Sump, Building 7722	This concrete sump received solvents and waste methanol from Building 7722. The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137N	1.3 Propellant Waste Sump and Captive Sump, Building 7724	This concrete sump received 1.1 and 1.3 propellant waste from Building 7724 (research and development). This unit discharged to an adjacent field. The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137O	1.3 Propellant Waste Sump and Captive Sump, Building 7729 Boiler House	This concrete sump received 1.3 propellant waste from Building 7729 (boiler house). The sump discharged wastes to the sanitary sewer and then to Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-137P	1.3 Propellant Waste Sumps, Building 7740	This concrete sump with a metal separator received 1.3 propellant waste from Building 7740 (caster case preparation facility/trichloroethene degreaser). The sump discharged wastes to the sanitary sewer and then to Sewage Treatment Plant #1 (RSA-011). The sump was active from 1981 to 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138A	1.3 Propellant Waste Drum Storage Pad, Building 7309	This unit was a temporary storage area for Class 1.3 propellant wastes for Building 7309. The storage area was approximately 8' x 10', had a concrete floor, was covered, had a containment sump, and was fenced. This unit was constructed between 1989 to 1990. The storage pad and shed covering have been removed. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138B	1.3 Propellant Waste Drum Storage Pad, Building 7340	The site is located adjacent to Building 7340 (casting building) in RSA-206 South and replaced RSA-090 between 1989 to 1990. This temporary storage area was approximately 25 square feet in size, had an asphalt floor, and was used to store Class 1.3 propellant wastes and waste methylene chloride. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138C	1.3 Propellant Waste Drum Storage Pad, Building 7359 South Side	This unit was a temporary storage area for Class 1.3 propellant wastes for Building 7359 (South Side). This unit replaced RSA-085 between 1989 to 1990. The storage area was approximately 75 square feet in size, had a concrete floor, was covered, and had a containment curb and sump. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138D	1.3 Propellant Waste Drum Storage Pad, Building 7359 NE Pad	This unit was a temporary storage area for Class 1.3 propellant waste and waste solvent for Building 7359 (Northeast Side). This unit replaced RSA-086 between 1989 to 1990. The storage area was approximately 75 square feet in size, had a concrete floor, was covered, and had a containment curb and sump. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138E	1.3 Propellant Waste Drum Storage Pad, Building 7359 NW Pad	This unit was a temporary storage area for Class 1.3 propellant wastes and waste solvents for Building 7359 (Northwest Side). This unit was constructed between 1989 to 1990. The storage area was approximately 75 square feet in size, had a concrete floor, was covered, and had a containment curb and sump. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138F	1.3 Propellant Waste Drum Storage Pad, Building 7368 N Pad (new)	This unit was a temporary storage area for Class 1.3 propellant wastes and waste solvents for Building 7368 (North Side). This unit was constructed between 1989 to 1990. The storage area was approximately 75 square feet in size, had a concrete floor, was covered, and had a containment curb and sump. This unit replaced the northern concrete storage pad at RSA-087. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-138G	1.3 Propellant Waste Drum Storage Pad, Building 7368 S Pad (new)	This unit was a temporary storage area for Class 1.3 propellant wastes for Building 7368 (south side). The unit was approximately 75 square feet in size, had a concrete floor, was covered, and had a containment curb and sump. This unit replaced RSA-087 between 1989 to 1990 and was inactive after 1996. This unit replaced the southern concrete storage pad at RSA-087. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138H	1.3 Propellant Waste Drum Storage Pad, Building 7625 (new)	This unit was a temporary storage area for Class 1.3 propellant wastes and solvent wastes for Building 7625. The unit was approximately 75 square feet in size, had a concrete floor, was covered, and had a containment curb and sump. This unit replaced RSA-088 between 1989 to 1990 and was inactive after 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138I	1.3 Propellant Waste Drum Storage Pad, Building 7660	This unit was a temporary storage area for Class 1.3 propellant wastes and solvent wastes for Building 7660. This unit was built in 1989 to 1990 and consisted of a concrete pad with no runoff control. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138J	1.3 Propellant Waste Drum Storage Pad, Building 7689	This unit was a temporary storage area for ammonium perchlorate solids for Building 7689. The unit was built in 1989 to 1990 and consisted of a concrete pad. The unit was not covered. This site lies within RSA-204. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138K	1.3 Propellant Waste Drum Storage Pad, Building 7691 West	This unit was a temporary storage area located on the west side of Building 7691 that was used to store waste ammonium perchlorate in drums. The unit consisted of concrete and soil and was active beginning in 1989 to 1990. The pad is inactive. This site lies within RSA-204. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138L	I .3 Propellant Waste Drum Storage Pads	This unit was a temporary storage area located on the northeast side of Building 7691 that was used to store ammonium perchlorate and used desiccant. This unit consisted of an asphalt pad and lacked runoff controls. It was active beginning in 1989 to 1990 and is inactive. This site lies within RSA-204. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138M	ROP Tetryl Processing Line	The site was comprised of several buildings (Buildings 7722, 7723, 7724, and 7725) including ancillary storage pads associated with these buildings; and the drainage control features and outfalls directly connected to the buildings. Original buildings within the RSA-138M site were constructed beginning in 1942 as part of Burster Line 2 and used in the Army's Redstone Ordnance Plant for trinitrotoluene (TNT)/tetryl melting and pouring operations and ordnance assembly. Line No. 2 was used for manufacture of burster shells until the end of World War II. Beginning in 1950s, the buildings were used for processing of components and materials for the rocket motor manufacturing facility. Releases occurred from spills and floor wash down, and subsurface discharge and/or leaking sumps, sewer and drainpipes. The buildings were active until approximately 1996, All buildings were demolished by 2008. Investigation results demonstrated that releases occurred at this site during its operational period. An interim measure was performed from 2010 to 2012 to remove trichloroethene-contaminated soil released from this site to prevent continued leaching to groundwater. COCs remain in groundwater. RSA-136J, RSA-137M, and RSA-137N lie within the site.	Soil: No COCs Groundwater: Zinc Perchlorate 2,4-Dinitrotoluene 2-Nitrotoluene RDX Trichloroethene	VI.6
RSA-138N	1.3 Propellant Waste Drum Storage Pad, Building 7726 (new)	This unit was a temporary storage area for Class 1.3 propellant wastes and 1,1,1-trichloroethane-contaminated propellant for Building 7726. The unit was approximately 75 square feet in size, had a concrete floor and was covered. This unit replaced RSA-089 between 1989 to 1990. The unit was inactive after 1996 and has been removed. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138O	1.3 Propellant Waste Drum Storage Pad, Building 7740	This unit was a temporary storage area for waste solvent and asbestos for Building 7740. The unit consisted of a sand and gravel floor. It was active beginning in 1989 to 1990. It was inactive after 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-138P	1.3 Propellant Waste Drum Storage Pad, Building 7742	This unit was a temporary storage area for Class 1.3 propellant wastes at Building 7742. The unit was approximately 75 square feet in size, had a concrete floor, was covered, locked, and had a containment curb and sump. It was active beginning in 1989 to 1990. It was inactive after 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-138Q	1.3 Propellant Waste Drum Storage Pad, Building 7742	This unit was a temporary storage area for Class 1.3 propellant wastes at Building 7742. The unit was approximately 75 square feet in size, had a concrete floor, was covered, locked, and had a containment curb and sump. It was active beginning in 1989 to 1990. It was inactive after 1996. No releases are known to have occurred at this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-139	Closed Arsenic Waste Pond (Nor t h) Area U	This unit consisted of a single open, unlined pond at RSA-139 was earthen diked and received arsenic-contaminated wastes and wastewater from former Buildings 5436 and 5437 associated with AT production. The pond was constructed by 1943 and active between March 1943 and November 1943. Wastes from the AT manufacturing buildings travelled via an underground drainage line to a disposal collection pit before being pumped via two sump pits to the RSA-139 waste pond. An underground line also discharged material from the AT manufacturing buildings directly to a drainage ditch south of the plant. Waste material from the storage silos and AT bulk storage travelled via underground lines to a pumping pit and then a disposal collection pit before being pumped via two sump pits to the RSA-139 waste pond. Spent caustic from the sulfur dioxide scrubber was also discharged to the disposal collection pit and then pumped into the waste pond. RSA-139 is located within the RSA-122 site boundary. Following a fish kill in the adjacent unnamed creek due to elevated levels of arsenic, the waste pond was covered with a soil cover and vegetated with grass that is periodically mowed. The cap/creek interface is lined with heavy-gauge geotextile fabric, riprap, and shotcrete. RSA-139 is fenced with signage on all sides except along the creek, where the geotextile fabric, riprap, and shotcrete do not permit fencing without compromising the integrity of the cap materials. The unnamed creek that flows along the east sides of both sites discharges to the Huntsville Spring Branch approximately 1 mile downstream.	Soil: Arsenic Surface Water: No COCs Sediment: No COCs Groundwater: Arsenic	VI.6 and VIII.1
RSA-140	Inactive Disposal Area near T/S Tower	RSA-140 is an inactive disposal area and is located within the boundary of RSA-046 (an active laser test sighting range and munitions are not used on this range). RSA-140 contains three debris piles and additional minor debris piles that are buried at shallow depth in two areas east of the access road. The piles are believed to have been from former Defense Reutilization Marketing Office disposal area activities in the late 1960s and early 1970s. The debris piles were found to contain construction-type materials (e.g., corrugated sheet metal, piping, brick, miscellaneous metallic objects, concrete blocks, glass, charcoal, and insulation). No ordnance was found during construction activities.	Soil: Cadmium Lead Aroclor 1254 Dieldrin Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Groundwater: Trichloroethene	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-141	4.2-inch Mortar Disposal Site, Building 4656	Beginning in the 1940s, RSA-141 was part of the Post Engineer heavy equipment and motor pool area as well as the location of a coal storage area. RSA-141 is considered an explosive ordnance disposal area where munitions-related items have been unearthed, and munitions disposal by burial has been verbally reported. Munitions and explosives of concern which poses an explosive hazard may be present. NASA currently uses site for space flight research and support activities.	Soil: Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Groundwater: Manganese Methylene chloride Tetrachloroethene Trichloroethene Soil Vapor: Trichloroethene	VI.6
RSA-142	TCE Spill by Thiokol Degreasing Process	RSA-142 was part of Redstone Ordnance Plant Burster Line 1 in the 1940s. Beginning in the 1950s, Building 7664 (now demolished) housed a vapor degreaser/distillation unit for cleaning rocket motors. In 1989, a valve malfunction on the solvent reclamation still of the degreaser resulted in a reported spill of 30 gallons of trichloroethene to a nearby ditch. Prior to connection to the sewer line, trench drains along the building feature discharged to the ditch and drained east toward the wetlands across East Line Road. The degreaser building was removed in the late 1990s. Within RSA-142 is a permitted 90-day hazardous waste storage area located at Building 7700 (RSA-303). From 2013 to 2016, soil remediation met the remedial goals for trichloroethene in soil and for perchlorate except for one area at Building 7700 where two sidewall segments that still had perchlorate concentrations in excess of the remedial goal could not be excavated further due to the close proximity of this remaining excavation area to the building. Land-use controls were implemented for this area and COCs remain in groundwater.	Soil: Perchlorate Groundwater: Perchlorate Trichloroethene (dense nonaqueous phase liquid)	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-143	Petroleum Contaminated Soil Site, South of Building 3240	This unit is a gasoline spill site which was created by leaking underground storage tanks and past operations. There were four original underground storage tanks that operated at this site for 28 years (1967-1995) south of Building 3240 (Branch Exchange Service Station). The contamination was discovered in 1993 and, in 1995 and 1996, the tanks were removed, as well as approximately 68 cubic yards of contaminated soils around the tanks and lines, and the excavation was backfilled with clean soil and closed. Investigation results demonstrated that releases occurred at this site during its operational period. Between 2004 and 2014, remedial actions to address contaminated groundwater associated with the site were conducted. Additional corrective measures are necessary to address residual contaminants in site soil and groundwater.	Soil: Benzene MTBE 1-Methylnaphthalene Naphthalene Groundwater: Arsenic Cobalt Manganese Nickel 1,3-Dinitrobenzene 2,4,6-Trinitrotoluene 2,4-Dinitrotoluene 2,6-Dinitrotoluene 2-Ntitrotoluene Nitroglycerin PETN RDX 1-Methylnapthalene 2- Methylnaphthalene bis(2-ethylhexyl)phthalate Naphthalene 1,2-Dichloroethane Benzene Ethylbenzene Methylene chloride TCE	VI.2
RSA-144	Degreaser at Building 7554	This unit consisted of several buildings (Buildings 7552, 7554, and 7555) and a motor cleaning shed used for rocket motor casting and processing. Degreasing, painting, and storage activities took place in the buildings for rocket propellant research, development, and manufacturing. Primary buildings associated with RSA-144 were built in the early 1940s as part of the Redstone Ordnance Plant for manufacturing and shipping of munitions. The facilities were used by subsequent tenants for propellant development and testing needs, ballistic research and development, small rocket motor production, and general storage. The buildings were inactive after approximately 1996 and have been demolished. The site also includes RSA-092 and RSA-169.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-145	GW Northeast part of RSA (- 9900 acres)	RSA-145 is the groundwater unit that lies under the northeastern portion of Redstone Arsenal, including an outlying parcel of property that lies north of the main facility boundary. RSA-145 lies in the most upgradient position within the easternmost of three regionally extensive karst groundwater basins that underlie Redstone Arsenal. Plumes of groundwater contamination within RSA-145 exist in shallow groundwater only. The principal plume-forming contaminants in RSA-145 groundwater are volatile organic compounds (primarily trichloroethene and fuel-related chemicals, such as benzene), explosive compounds, and perchlorate. Pesticides are present in RSA-145 groundwater, but they result primarily from off-post agricultural activities, with the exception of a disposal site (RSA-058). As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Metals Pesticides Explosives Perchlorate	VI.2
RSA-146	GW Southeast part of RSA, underlies former Thiokol Plant (- 6600 acres)	RSA-146 is the groundwater unit that lies under the southeastern portion of Redstone Arsenal. RSA-146 occupies the most downgradient position within the easternmost of three regionally extensive groundwater watersheds. Commingled trichloroethene and perchlorate plumes extend to and beyond the Redstone Arsenal boundary at multiple depths. Corrective measures at surface media sites to address dense nonaqueous-phase liquids within several of the plume cores have greatly reduced the contaminant mass available as ongoing secondary sources to the plumes. Explosive compounds are also present within RSA-146 groundwater, but the occurrences are sparse and sporadic. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Metals Pesticides Explosives Perchlorate	VI.2
RSA-147	GW Central part of RSA (- 1300 acres)	RSA-147 is the groundwater unit that lies under the central portion of Redstone Arsenal. RSA-147 was combined with RSA-148 and RSA-149 for the investigations. Chemicals released during historical activities at surface media sites, including those within George C. Marshall Space Flight Center, resulted in groundwater contamination. The principal plume-forming contaminants present in RSA-147/148/149 groundwater are volatile organic compounds (chiefly trichloroethene, chlorobenzene, and carbon tetrachloride), pesticides, and explosive compounds, with additional impacts from semivolatile organic compounds and metals. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Metals Pesticides Explosives Perchlorate	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-148	GW Central Area-East of MSFC (- 3600 acres)	RSA-148 is the groundwater unit that lies under the central portion of Redstone Arsenal. RSA-148 was combined with RSA-147 and RSA-149 for the investigations. Chemicals released during historical activities at surface media sites, including those within George C. Marshall Space Flight Center, resulted in groundwater contamination. For RSA-148, Army is responsible for groundwater outside the George C. Marshall Space Flight Center boundary as well as groundwater associated with MSFC-034. The principal plume-forming contaminants present in RSA-147/148/149 groundwater are volatile organic compounds (chiefly trichloroethene, chlorobenzene, and carbon tetrachloride), pesticides, and explosive compounds, with additional impacts from semivolatile organic compounds and metals. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Metals Pesticides Explosives Perchlorate	VI.2
RSA-149	GW West Central Area - West MSFC (-3900 acres)	RSA-149 is the groundwater unit that lies under the central portion of Redstone Arsenal. RSA-149 was combined with RSA-147 and -148 for the investigations. Chemicals released during historical activities at surface media sites, including those within George C. Marshall Space Flight Center, resulted in groundwater contamination. For RSA-149, the Army is responsible for groundwater outside the George C. Marshall Space Flight Center boundary as well as groundwater associated with MSFC-034. The principal plume-forming contaminants present in RSA-147/148/149 groundwater are volatile organic compounds (chiefly trichloroethene, chlorobenzene, and carbon tetrachloride), pesticides, and explosive compounds, with additional impacts from semivolatile organic compounds and metals. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Metals Pesticides Explosives Perchlorate	VI.2
RSA-150	GW Western part of RSA (- 3900 acres)	RSA-150 is the groundwater unit that lies under the western portion of Redstone Arsenal. RSA-150 was combined with RSA-153 for the investigations. Manufacturing operations were not performed on RSA-150/153. Rather, the land associated with RSA-150/153 has been used primarily for military ranges (test areas) to test and fire munitions and artillery, as well as test laser/radar technologies. The principal contaminants in RSA-150/153 groundwater are volatile organic compounds (primarily trichloroethene), explosive-related compounds, and perchlorate. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: No applicable Groundwater: Volatile organic compounds Explosives Perchlorate	VI.2
RSA-151	GW Southern part of RSA, underlies OB/OD Area (- 570 acres)	RSA-151 is the groundwater unit that lies under the south-central portion of Redstone Arsenal. Activities at the sites above RSA-151 included burning/disposal of materials contaminated with propellant and solvents, chemical agent storage, and demilitarization and disposal of ordnance. The principal plume-forming contaminants are volatile organic compounds, perchlorate, and explosive compounds (primarily RDX). A single commingled plume of contamination is present in shallow and deep groundwater beneath RSA-151, originating historically from releases at four distinct source areas. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Metals Explosives Perchlorate	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-152	GW Southern part of RSA, underlies GCWD (-570 acres)	RSA-152 is the groundwater unit that lies under the southwestern portion of Redstone Arsenal. Activities at the surface sites above RSA-152 were associated with the Gulf Chemical Warfare Depot and were used for materials storage, munitions and chemical storage, and demilitarization and disposal of ordnance. A comingled plume is present in the northern part of the groundwater unit. The principal contaminants are volatile organic compounds, semivolatile organic compounds, and explosives. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Explosives	VI.2
RSA-153	GW Western edge of RSA (- 6300 acres)	RSA-153 is the groundwater unit that lies under the western portion of Redstone Arsenal. RSA-153 was combined with RSA-150 for the investigations. Manufacturing operations were not performed on RSA-150/153. Rather, the land associated with RSA-150/153 has been used primarily for military ranges (test areas) to test and fire munitions and artillery, as well as test laser/radar technologies. The principal contaminants in RSA-150/153 groundwater are volatile organic compounds (primarily trichloroethene), explosive-related compounds, and perchlorate. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Explosives Perchlorate	VI.2
RSA-154	GW South-Central part of RSA (- 3300 acres)	RSA-154 is the groundwater unit that lies under the south-central portion of Redstone Arsenal. RSA-154 was combined with RSA-155 for the investigations. Activities at the surface sites above RSA-154/155 consisted of storage of munitions, rocket/missile testing, and training. The principal contaminants are volatile organic compounds, explosives, and semivolatile organic compounds. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Pesticides Explosives	VI.2
RSA-155	GW Southwestern area of RSA (1600 acres)	RSA-155 is the groundwater unit that lies under the southwestern portion of Redstone Arsenal. RSA-155 was combined with RSA-154 for the investigations. Activities at the surface sites above RSA-154/155 consisted of storage of munitions, rocket/missile testing, and training. The principal contaminants are volatile organic compounds, explosives, and semivolatile organic compounds. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Semivolatile organic compounds Pesticides Explosives	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-156	GW Southern part of RSA (- 1400 acres)	RSA-156 is the groundwater unit that lies under the southernmost portion of the facility. RSA-156 was combined with RSA-157 for the investigations. Activities at the surface sites above RSA-156/157 consisted of munitions testing, training, waste storage, and mentions and supply storage. The principal contaminants are explosives, volatile organic compounds, and perchlorate. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Explosives Perchlorate	VI.6
RSA-157	GW Southeastern part of RSA, underlies GCWD Storage Area (- 100 acres)	RSA-157 is the groundwater unit that lies under the southwest portion of Redstone Arsenal. RSA-157 was combined with RSA-156 for the investigations. Activities at the surface sites above RSA-156/157 consisted of munitions testing, training, waste storage, and mentions and supply storage. The principal contaminants are explosives, volatile organic compounds, and perchlorate. As a groundwater SWMU, no contaminants have been released from this site since no operations occurred within the groundwater zones. Currently, potable use of groundwater is precluded and non-potable uses of groundwater are managed in accordance with the 2007 Installation-wide Interim Record of Decision.	Soil: Not applicable Groundwater: Volatile organic compounds Explosives Perchlorate	VI.6
RSA-158	Flammable Material Storage Bldg, TSA Building 3233	This unit was a temporary storage area beginning in 1994 for paints; petroleum, oils, and lubricants; and batteries. The temporary storage area (Building 3233) was a metal building built on a concrete surface. It had a berm for spill control, but no sump. The building was built in 1994. Flammable material storage building located at Building 3325. More recent use included storing tools, equipment and supplies to repair outdoor recreational items (e.g. campers, trailers, motor homes, etc.). No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-159	Chemical Containment Storage, TSA Building 3327	This unit was a temporary storage area for paints; petroleum, oils, and lubricants; and batteries. The temporary storage area (Building 3327) was a metal building built on a concrete surface. It had a berm for spill control, but no sump. The building was built in 1992, and was in use through 2000. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-160	Mixer Building, TSA Building 7339	This temporary storage area (TSA Building 7339) was used as a storage area for Class 1.3 propellant wastes and waste solvents within RSA-206 North. The building was a metal building with two double doors. The building and concrete pad dimensions were approximately 10.75 feet by 17.5 feet. It had a dike for spill control and a sump, covered by a metal grating and 13 inches deep and 24 inches wide, that ran the length of the building and had a containment capacity of 240 gallons. The building was built in 1960 and used through 1996. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-161	Care Prep Building, TSA Building 7346	This unit was a temporary storage area (TSA Building 7346) which was used as a storage area for 1.1 propellant wastes and waste solvents. The building had no doors. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1988, and was used through 1995. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-162	Small Motor Loading "T", TSA Building 7347A	This unit was a temporary storage area (TSA Building 7347) which was used for storage of 1.1 propellant wastes and waste solvents. The building had no doors. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1988, and was used through 1995. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-163	Propellant Mixer, TSA Building 7353	This unit was a temporary storage area (TSA Building 7353) used for storage of 1.1 propellant wastes and waste solvents. The building had doors made of chain link fence. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1988, and was used through 1995. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-164	Mixer Building, TSA Building 7356	This unit was a temporary storage area (TSA Building 7356) used to store 1.3 propellant wastes and waste solvents. The building was a metal building with one double door. The building and concrete pad dimensions were approximately 10.75' x 9.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 240 gallons. The building was built in 1988, and was used through 1996. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-165	Casting Building, TSA Building 7360	This unit was a temporary storage area (TSA Building 7360) used to store 1.3 propellant wastes and waste solvents. The building was a metal building with one double door. The building and concrete pad dimensions were approximately 10.75' x 9.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1961, and was used through 1995. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-166	Liner Preparation, TSA Building 7369	This unit was a temporary storage area (TSA Building 7369) used as a storage area for inert wastes and waste solvents. The building was a metal building with two double doors. The building and concrete pad dimensions were approximately 10.75' x 17.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 240 gallons. The building was built in 1945, and was used through 1996. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-167	Mixer Building, TSA Building 7382	This unit was a temporary storage area (TSA Building 7382) for storage of 1.3 propellant wastes and waste solvents. The building was a metal building with two double doors. The building and concrete pad dimensions were approximately 10.75' x 17.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 240 gallons. The building was built in 1959, and was used through 1996. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-168	Motor Casting and Processing Building, TSA Building 7554	This unit was a temporary storage area (TSA Building 7554) was used to store 1.1 propellant wastes and waste solvents. The building had doors made of chain link fence. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55 gallon drums, and a dike for spill control. The building was built in 1943, and was used through 1995. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-169	Motor Assembly and Packout, TSA Building 7555	This unit was a temporary storage area (TSA Building 7555) used for storage of 1.1 propellant wastes and waste solvents. The building had doors made of chain link fence. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55 gallon drums, and a dike for spill control. The building was built in 1942, and was used through 1996. The metal building and storage pad have been removed. The unit lies within RSA-144 and any chemicals of concern were determined by the RSA-144 investigation. No releases are known to have occurred.	Soil: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-170	Deaeration Cleanup, TSA Building 7593	This unit was a temporary storage area (TSA Building 7593) used to store 1.3 propellant wastes and waste solvents. The building had doors made of chain link fence. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55 gallon drums. and a dike for spill control. The building was built in 1959, and was used through 1996. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-171	Propellant Mixing, TSA Building 7594	This unit was a temporary storage area (TSA Building 7594) used for storage of 1.3 propellant wastes and waste solvents. The building had doors made of chain link fence. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55 gallon drums, and a dike for spill control. The building was built in 1956, and was used through 1996. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-172	Motor Pool, TSA Building 7630	This unit was a temporary storage area (TSA Building 7630) used for storage of inert wastes and waste solvents. It had capacity for 12 55-gallon drums, a dike for spill control, and a sump with a containment capacity of 150 gallons. The building was built in 1983, and was used through 1996. The metal building and storage pad have been removed. No releases are known to have occurred.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-173	Chemistry Lab. Pad 1, TSA Building 7632	This unit was an open concrete pad (#1) for temporary storage of chemicals used in Building 7632 (chemistry laboratory), including Class 1.1 and Class 1.3 propellants and solvents. The pad had capacity for 24 55-gallon drums, a dike for spill control, and a sump with a containment capacity of 180 gallons. The unit was built in 1955. By the early 1990s, the pad was replaced by an enclosed storage shed, with a 4-inch-thick concrete pad, a containment sump (capacity of 150 gallons), steel siding/roofing, and a set of double doors. The shed was removed in 2003. RSA-173 lies within the site boundary of RSA-201. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-174	Chemistry Lab, Pad 2, TSA Building 7632	This unit was an open concrete pad (#2) for temporary storage of chemicals used in Building 7632 (chemistry laboratory), including Class 1.1 and Class 1.3 propellants and solvents. Storage began in the mid-1950s. By the early 1990s, the pad was replaced by an enclosed storage shed, with a 4-inch-thick concrete pad, a containment sump (capacity of 150 gallons), steel siding/roofing, and a set of double doors. The shed had a capacity to store 12 55-gallon drums. The shed was removed in 2003. RSA-174 lies within the site boundary of RSA-201. No releases are known to have occurred.	Soil: No COC	VI.3
RSA-175	Physical Property Lab, Pad I, TSA Building 7636	This unit was a temporary storage area (TSA Building 7636) for storage of propellant wastes and waste solvents. The building had no doors. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55-gallon drums, and a dike for spill control. The building was built in 1956, and was used through 1996. This unit had the potential for releases but there were no documented released. This unit lies within RSA-194.	Soil: No COCs	VI.3
RSA-176	Physical Property Lad, Pad 2, TSA Building 7636	This unit was a temporary storage area (TSA Building 7636) for storage of 1.3 propellant wastes and waste solvents. The building was a metal building with one double door. The building and concrete pad dimensions were approximately 10.75' x 9.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1956, and was used through 1996. This unit had the potential for releases but there were no documented released. This unit lies within RSA-194.	Soil: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-177	Small Motor Finishing, TSA Building 7654	This unit was a temporary storage area (TSA Building 7654) for storage of 1 .I propellant wastes and waste solvents. The building had no doors. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55 gallon drums, and a dike for spill control. The building was built in 1942, and was used through 1987. The building and pad have been removed. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-178	Control Lab and First Aid, Pad 1, TSA Building 7667	This unit was a temporary storage area (TSA Building 7667) for storage of 1.1 propellant wastes and waste solvents. The building had no doors. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55 gallon drums, and a dike for spill control. The building was built in 1942, and was used through 1996. The pad and building have been removed. This unit lies within RSA-191. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-179	Control Lab and First Aid, Pad 2, TSA Building 7667	This unit was a temporary storage area (TSA Building 7667) for 1.3 propellant wastes and waste solvents. The building was a metal building with one double door. The building and concrete pad dimensions were approximately 10.75' x 9.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1942, and was used through 1996. The building and pad have been removed. Soil contaminated with polynuclear aromatic hydrocarbons was removed in 2005 to meet the remedial goal. This unit lies within RSA-191. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-180	Nitramine Drying Pilot, TSA Building7688	This unit was a temporary storage area (TSA Building 7688) for storage of ammonium perchlorate and inert wastes. The building was a metal building with one double door. The building and concrete pad dimensions were approximately 10.75' x 9.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1978, and was used through 1993. This unit lies within RSA-204. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-181	Nitramine Grinding Pilot, TSA Building 7690	This unit was a temporary storage area (TSA Building 7690) for storage of ammonium perchlorate and inert wastes. The building was a metal building with one double door. The building and concrete pad dimensions were approximately 10.75' x 9.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons. The building was built in 1978, and was used through 1993. This unit lies within RSA-204. No releases are known to have occurred.	Soil: No COCs	VI.3
RSA-182	1.1 Grinder Building "P2", TSA Building 7695	This unit was a temporary storage area (TSA Building 7695) for storage of HMX and RDX wastes. The building had no doors. The building and concrete pad dimensions were approximately 7.5' x 12.5'. It had a dike for spill control, and a sump, covered by a metal grating that ran the length of the building, and had a containment capacity of 150 gallons, capacity for 12 55-gallon drums, and a dike for spill control. The building was built in 1988, and was used through 1995. No releases are known to have occurred.	Soil: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-183	Former Lewi site Manufacturing Lines I & 2	RSA-183 encompasses two areas, the Plants Area (the northern portion), where the Army manufactured the chemical agent lewisite in two plants (Plants 1 and 2), and the Sinkhole Area, which encompasses a large sinkhole south of the Plants Area. In addition to Lewisite Plants 1 and 2, the Plants Area includes a former motor pool (Building 4381, post-lewisite manufacture), a former unit electrical substation, and a former chemical storage facility (Building 4496, post-lewisite manufacture). A north-south-trending drainage ditch exits the Plants Area. RSA-049 (Capped Arsenic Waste Lagoons - West, Area F) also lies within the Plants Area of RSA-183. Arsenic and mercury are known to have been released at this site. Investigation results demonstrated that releases occurred at this site during its operational period. A 2010 interim measure removal action removed 10,334 tons of arsenic- and mercury-contaminated soil. Arsenic and mercury remain in soil at locations above the cleanup goal and arsenic remains in groundwater.	Soil: Arsenic Mercury Groundwater: Arsenic	VI.6 and VIII.1
RSA-187	Northern Thiokol Propellant Mixing Facility	This site included four buildings supporting propellant mixing: Building 7385 (equipment storage), Building 7386 (propellant mixing), Building 7387 (propellant mixing), and Building 7388 (equipment storage). The primary activity was mixing batches of Class 1.1 or 1.3 propellants, which was poured into casting cans on site and then taken to casting facilities for loading into rocket motors at a different location. The buildings were constructed by 1965 and were demolished by 2007. Investigation results demonstrated that releases occurred at this site during its operational period. Groundwater beneath RSA-187 is contaminated with chemicals from possible site releases as well as commingled plumes from adjacent sites; however, no source currently exists in soil. RSA-135D, RSA-135E, RSA-136G, and RSA-136H lie within RSA-187.	Soil: No COCs Groundwater: Perchlorate 2-Nitrotoluene HMX RDX 1,1,1-Trichloroethane 1,1-Dichloroethene Carbon tetrachloride Chloroform cis-1,2-Dichloroethene Methylene chloride Tetrachloroethene Trichloroethene Xylene, Total	VI.6
RSA-188	Northern Burial Area/Burning Ground #3	This site consists of two potential source areas: Burning Ground #3 (BG3) and Northern Burning Area (NBA). BG3 appears to have also been used from the early 1940s into the 1960s for burning small quantities of chemicals and production wastes, munitions after testing, and munitions from Redstone Ordnance Plant operations. The NBA appears to have been used from the early 1940s into the late 1950s. The NBA was identified as a scarred area on aerial photographs from 1943 to 1959. Debris from activities at BG3 were believed to have been disposed in this area; however, investigation results indicated that the majority of material disposed of in the NBA is more consistent with general Redstone Arsenal waste and is not munitions-related or specifically related to BG3. Munitions and explosives of concern and munitions debris were recovered from the shallow subsurface of BG3 during a 2016 intrusive investigation of RSA-188. Although munitions debris was recovered in the NBA, no munitions and explosives of concern was encountered. Uninvestigated geophysical anomalies still remain at BG3 and NBA. Munitions and explosives of concern is suspected to be present in the subsurface of BG3.	To be determined	VI.2 and VI.5

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-189	Motor/Oxidizer Preparation Facilities, ROP Line 2 Area	The site contained former Buildings 7738 and 7739 (demolished in 1997), which were constructed in 1945 and 1942, respectively. During Redstone Ordnance Plant operations, Building 7738 was used as a tetryl service magazine, the primary tetryl receiving and screening facility for Line 2. Tetryl was received by rail at the loading platform, unloaded, and the containerized tetryl was transferred by hand cart into the screening room. The screening process involved raking 100-pound batches of tetryl through a screen with wooden paddles. Similarly, Building 7739 served as the primary TNT service magazine. It later became the primary TNT receiving and screening facility for Line 2. From 1959 to sometime in the 1960s, Building 7738 was used for rocket motor soakout. Motor soakout involved soaking motors in a vat of methylene chloride or benzyl mercaptan until all propellant was removed from the rocket. During the early 1960s, Building 7738 was used for particle separation using a water table. From 1964 to 1969, this facility was used as an oxidizer grinding facility. Oxidizer (ammonium perchlorate) was received and ground in a roller mill to a very fine powder. Subsequently, Building 7738 was used for nozzle flow smoke testing of smoke grenades. Sometime in the 1970s, the facility was again employed as an oxidizer grinding building. In 1982, Building 7738 became a control building for grinding operations in Building 7739. In the 1950s-1960s, Building 7739 was used for rocket motor loading and processing. Motor loading and processing involved loading propellant into rocket motor assemblies. From 1969 on, this facility was used as an oxidizer grinding facility. Oxidizer (ammonium perchlorate) was received at the facility and ground in a roller mill to a very fine powder. Ground oxidizer was containerized and transferred to a mixing building for further processing. Investigation results demonstrated that historical releases may have occurred at this site during its operational period. COCs remain in groundwater.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-190	Disposal/Drainage Area West of ROP Line 2	RSA-190 was a possible surface disposal area evidenced by review of a 1956 aerial photograph. During a 2000 visit, concrete debris and rebar were noted in the wooded portion of the site. Historically, collection basins at Buildings 7738 and 7739 (RSA-189) discharged into a drainage channel that flows into this area. During a 2003 visual site inspection, three piles of soil/debris and two converging drainage channels were observed in the wooded area. One channel received drainage from the area east of Curlew Circle, where Buildings 7726 (RSA-097), 7738 (RSA-189), and 7739 (RSA-189) formerly stood.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-191	ROP Line I Service Facilities	RSA-191 had five historical facilities, former Buildings 7643, 7649, 7666, 7667, and 7686. Former Buildings 7666 (packing and shipping), 7667 (change house), and 7686 (solvent storage) were support facilities for the Redstone Ordnance Plant Line 1 in the 1940s. Later, former Buildings 7643 (rocket motor parts degreasing, spray painting, and carpentry shop), 7666 (control laboratory for testing finished rockets and manufactured propellants), 7667 (first aid station and control laboratory), and 7686 (solvent storage) were used for rocket motor research and production operations conducted at Redstone Arsenal from 1950 to the mid-1990s. No process activities were conducted in Building 7649 (guard/office building). All site buildings have been demolished. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: Trichloroethene Carbon Tetrachloride	VI.6
RSA-192	Tetryl and Igniter Processing, ROP Line 1 Area	This site contained numerous historical facilities in support of Redstone Ordnance Plant activities beginning in 1942 and for rocket motor research and production operations from 1950 to the mid-1990s. Buildings 7651 (tetryl magazine and propellant laboratory), 7652 (explosives and propellant blending), 7653 (tetryl rest house and curing oven), 7654 (tetryl pelleting and reaction laboratory), 7657 (vacuum pump house), 7658 (vacuum collector), 7659 (vacuum pump house) and 7662 (tetryl processing) were support facilities for Redstone Ordnance Plant Line 1. Buildings 7657 and 7659 were later used for storage. Buildings 7651 (thermal stability oven), 7652 (ammonium perchlorate grinding), 7653 (grinding and curing facility), 7654 (reaction laboratory), and 7662 (curing oven) were used for rocket motor research and production operations. Buildings 7655 (machine cleaning) and 7660 (propellant waste storage and tool cleaning) were constructed in the 1950s. Building 7655 was later used as a line office. Building 7685 was used as a lubricant storage building. All site buildings have been demolished. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: Perchlorate Trichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-193	Igniter Preparation Facility	This site included Buildings 7621, 7622, 7623, and 7624. These buildings were constructed in 1957 to support operations associated with igniter preparation. Igniter manufacturing activities included the following: degreasing; painting; stenciling; cleaning, and propellant handling. Building 7621 was constructed in 1957 as an igniter preparation facility. Buildings 7622, 7623, and 7624 were also constructed in 1957 and were auxiliary buildings used to support igniter preparation at Building 7621. Underground storage tanks or aboveground storage tanks are assumed to have been located at or near Building 7622 and removed from the site in the mid-1990s. Operations were conducted in the buildings until 1995. All buildings were demolished by 2002. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-194	Physical Test Laboratory and Storage Facilities	The site consisted of Building 7636 (perchlorate physical test laboratory), Building 7637 (wet collector for propellant dust), Building 7638 (second stage dry collection filter system, and later a storage facility), Building 7639 (storage igloo), RSA-137H (captive sump at former Building 7636), and RSA-175 and RSA-176 (temporary waste storage areas consisting of concrete pads and sheds). The buildings/facilities were active from 1956 until the mid-1990s for propellant manufacturing. Investigation results demonstrated that releases occurred at this site during its operational period. A removal action was conducted in 2018 and perchlorate has been removed from soil to meet the cleanup goal. A corrective measures implementation report was submitted to ADEM in 2019.	Soil: No COCs Groundwater: Perchlorate 2-Nitrotoluene Nitroglycerin RDX Trichloroethene	VI.6 and VIII.1
RSA-195	Propellant Mixing Facility #1, Building 7363	This site consisted of three Buildings (Buildings 7363, 7363A, and 7363B). Beginning in 1959-1960, Building 7363 was used for mixing 300-gallon batches of propellant for use in rocket motors and for making aluminum paste for rocket motor fuel. Solvents may have been used in Building 7363 for cleaning propellants from mixing machines. Building 7363 was active until approximately 1996 and has been demolished. Building 7363A was the control facility for mixing operations for Building 7363 and has been demolished. Building 7363B was used for storage of aluminum powder. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: 1,1,2-Trichloroethane 1,1-Dichloroethene cis-1,2-Dichloroethene Methylene chloride Tetrachloroethene Trichloroethene Vinyl chloride	VI.6
RSA-196	Test Stand and Cleaning Building 7373	This site consists of Buildings 7373 and 7374. Buildings 7373 and 7374 were constructed in 1942 as a static test stand and cleaning facility to remove propellant using physical methods and high pressure water. In 1985, Building 7373 was used for parts cleaning using various solvents. Trichloroethene was used in the operations and may have been released to the environment.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-197	Rocket Motor Static Test Stand	RSA-197 consisted of two buildings, Building 7375 (built in 1942) and Building 7376 (built in 1958); the buildings were demolished between 2000 and 2002. Building 7375 was used as a static test stand for rocket testing and motor firings and Building 7376 was a control building. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: Perchlorate Trichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-198	Equipment/Tool Cleaning Facility, Building 7359	The site consisted of Building 7359, used for cleaning out casting cans, bowls, and equipment for propellant manufacturing. The cleaning operations involved the use of hot water-detergent caustic solution as well as degreasing operations using solvents. Two temporary storage areas associated with Building 7359 (RSA-085 and RSA-086) were used to store Class 1.3 propellant wastes and solvent wastes during cleanup activities. During the early 1990s, the two TSAs were replaced by an enclosed building with a containment sump (RSA-138C replaced RSA-085 and RSA-138E replaced RSA-086). A third enclosed storage building with a containment sump (RSA-138D) was located east of RSA-138C. RSA-198/085 was active from 1967 until the mid-1990s. Investigation results demonstrated that releases occurred at this site during its operational period. Contaminants in soil were addressed when corrective measures were conducted at RSA-198/085 in 2018; perchlorate was removed to the cleanup goal. COCs remain in groundwater.	Soil: No COCs Groundwater: Perchlorate 2,4-Dinitrotoluene 2,6-Dinitrotoluene RDX 1,1,2-Trichloroethane 1,2-Dichloropropane Tetrachloroethene Trichloroethene	VI.6
RSA-199	Propellant Mixing Facility #2, Building 7382	The site consisted of Building 7382, used as a propellant mixing facility. Class 1.1 and 1.3 propellants were processed. Solvents may have been used to clean propellants from the mixers. Additionally, Building 7382A was a control facility for all mixing operations at performed at Building 7382. RSA-167 was a temporary storage area for Class 1.3 propellant. The site was active from 1959 until the mid-1990s. Both buildings have been demolished. Investigation results demonstrated that releases occurred at this site during its operational period. Contaminants in soil were addressed when corrective measures were conducted in 2018; perchlorate was removed to the cleanup goal. COCs remain in groundwater. .	Soil: No COCs Groundwater: Perchlorate 1,1-Dichloroethene Carbon tetrachloride Tetrachloroethene Trichloroethene	VI.6 and VIII.1
RSA-200	ROP Line 5 Area Operations Facilities	This site consisted of Buildings 7601, 7602, 7603, 7608, 7610, 7616, 7618, and 7619. Buildings 7601, 7603, 7602, 7608, 7610, and 7619 were originally used in the 1940s for the production of ordnance associated with ROP Line 5 and included 155-millimeter shell loading, assembly, packing and shipping. Later uses of these buildings beginning in the 1950s included pilot line research operations, machining operations, propellant mixing, laboratory, sand/grit blasting and cleaning of mechanical parts, propellant mixing, curing ovens, gas station, and solvent storage. The uses of the remaining buildings included maintenance services, cleaning facility, and carpentry. Several buildings present within RSA-200 served various purposes including a boiler house (Building 7604), a gasoline station (Building 7619), a carpentry shop (Building 7616), a ground transformer station, and a plating shop identified as RSA-099 (Building 7614). Two additional solid waste management units identified as RSA-137E and RSA-137F (building sumps) were located within RSA-200. With the exception of Building 7609, all the buildings have been demolished. Investigation results demonstrated that releases occurred at this site during its operational period. Contaminants in soil were addressed when during a remedial action was conducted in 2013-2015 for perchlorate-, trichloroethene-, benzo(a)pyrene-, and dibenz(a,h)anthracene-contaminated soil. The action achieved the remedial goals but COCs remain in groundwater.	Soil: No COCs Groundwater: Perchlorate Trichloroethene cis-1,2-Dichloroethene	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-201	Research Laboratory, Building 7632	This unit contained three buildings and six temporary storage areas. Building 7632 was constructed in 1955 as a chemistry laboratory for propellant research including propellant mixing, casting, curing, remote motor preparation, deaeration of rocket motor propellants, manual sawing and sanding of unconfined insensitive explosives, and grinding of energetic materials. The building housed numerous pieces of equipment, including but not limited to analytical testing apparatus, furnaces, refrigerators, microscopes, balances, pressure vessels, mixers, vacuum pumps, x-ray machinery, exhaust fans/hoods, and cutting and casting tools. A large variety of chemicals were used in the laboratory, including propellants, explosives, metals, solvents, liquid nitrogen, and various gases. Three exterior sumps (no outlets) were located on the west side of Building 7632 and accumulated wastes from floor drains in the bays/laboratories. Building 7632 was razed in early 2001. Building 7634 was constructed in 1954 on the west side of Building 7632 and used as a vacuum pump building for propellant mixing in Building 7632. Building 7635 was constructed in 1955 and used as a storage igloo for explosives used during operations at Building 7632. Shallow open trench drains were present on both sides of the storage igloo and drained to the outside surface. The building was used until decommissioning in 1995 and remains present on site. Six temporary storage units are present at RSA-201 including former Building 7635A for temporary storage of various chemicals from the mid-1970s until 2002, RSA-173 and RSA-174 temporary storage areas, a small shed for storage in the 1990s, and two concrete pads where wastes were stored prior to creation of the RSA-173 and RSA-174 temporary storage areas. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Groundwater: Trichloroethene Carbon tetrachloride 1,1-Dichloroethene 2-nitrotoluene RDX Perchlorate 4-Nitrotoluene Benzo(a)anthracene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	VI.6 and VIII.1
RSA-202	Graded Area Northeast of ROP Storage Igloos	Features at RSA-202 include debris piles, a graded area, and drainage ditches. There is no documented indication of activity at RSA-202, but observation of these features led to speculation that the area may have been used as a soil borrow area or disposal area in the past. No releases were known to have occurred at this site.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-203	Igloo Area Loading Dock, Building 7351	This unit consisted of a loading dock at Building 7351. This building was constructed in 1942 for shipping and receiving of materials and munitions from the igloo storage area. By 1951, Building 7351 was used for packout and shipping of assembled rocket motors. The loading dock area was located on the eastern side of Building 7351. Two small concrete storage pads approximately 10 square feet in size were located west of the building and are believed to have been temporary storage areas for waste solvents. A shed located west of Building 7351 contained two drum racks and was used for storage of paint and various chemicals. An elevated and uncovered exterior truck loading dock used for loading/unloading was also present approximately 150 feet north of Building 7351. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene 2-Nitrotoluene	VI.6
RSA-204	Oxidizer Facility, Building 7691	This site encompasses five existing buildings (Buildings 7687 through 7691) that were constructed in 1978 in support of propellant research. Oxidizer (ammonium perchlorate) was received at the service facility (Building 7687) and explosives (HMX and RDX) were dried at Building 7688. The oxidizer and explosives were transported to the grinding and processing facilities (Buildings 7689, 7690, and 7691), where they were screened and ground. Following processing, the propellant powder was transported to nearby mixing facilities outside of RSA-204. The entire operation was deactivated between 1993 and 1996. A number of sumps and temporary storage areas were associated with the building operations (RSA-135M, RSA-137J, RSA-137K, RSA-137L, RSA-138J, RSA-138K, RSA-138L, RSA-180, and RSA-181). Investigation results demonstrated that releases occurred at this site during its operational period. Corrective measures have been initiated to address COCs in soil and groundwater at this site.	Soil: Perchlorate Groundwater: Perchlorate 2,6-Dinitrotoluene 2-nitrotoluene RDX Trichloroethene	VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-205	Photo Lab and Motor Service Facility, Former Building 7628	Building 7628 constructed in 1957 and used as a motor services facility (change house for employees) from 1957 to 1976 and as a photographic and x-ray film development laboratory for inspection of rocket motors from 1983 until 2000. The building was demolished sometime between 2000 and 2002. Photographic chemicals such as developers, fixers, and toners were used, stored, and disposed at this building. This facility contained a floor drain and sinks that drained into the sewer. An 8,000-gallon fuel oil underground storage tank was located north of the building to store the fuel oil used by the building's boiler. It is believed that the tank was removed in the mid-1990s or early 2000s. No releases were known to have occurred at this site.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-206	Propellant Mixing Facility #2 and Casting Facility, Buildings 7339/40	RSA-206 comprises two separate and distinct parcels, RSA-206 North and RSA-206 South. Buildings 7339 and 7339A are within the northern parcel. The primary operations at Building 7339 were mixing 420-gallon batches of Class 1.3 propellant. Residual ammonium perchlorate was washed into an industrial drain with large quantities of water, which then flowed to a sump on the west side of the building (RSA-137a). The sump initially discharged to a drainage ditch and was later plumbed to drain to the sanitary sewer. Remote handling of propellants during mixing and casting in Building 7339 was controlled from a separate control facility (Building 7339-A). A temporary storage area (RSA-160) was present near Building 7339 to store Class 1.3 propellant wastes. Building 7340 is within the southern parcel. Building 7340 functioned as a secondary casting and finishing facility for rocket motors. Waste particulate was collected in a sump with a settling basin (RSA-137b) located on the northwest side of Building 7340. This sump initially allowed collected liquids to discharge to a ditch. The sump was later plumbed to drain to the sanitary sewer. Two temporary storage areas (RSA-090 and RSA 138b) were located on the west side of Building 7340. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Perchlorate Trichloroethene 1,1-Ddichloroethene cis-1,2-Dichloroethene Carbon tetrachloride Tetrachloroethene Vinyl chloride 2-Nitrotoluene RDX	VI.6
RSA-207	Gorgas Laboratory, Building 7770	This site included the Gorgas Laboratory consisting of Building 7770 (Gorgas Laboratory for propellant research and development), Building 7768 (Remote Operations Laboratory), Building 7767 (equipment storage), Building 7769 (Sewage Lift Station), Building 7771 (Oven Shelter), Building S-7772 (Oven Shelter), Building 7775 (5-Day Storage Building), Building 7776 (5-Day Storage Building/Heater House), Building 7779 (5-Day Storage Building), Building 7780 (Solvent Storage); Building S-7773 (Oven Shelter), Building 7774 (5-Day Storage Building), Building 7777 (5-Day Storage Building), and Building 7778 (5-Day Storage Building). Several site buildings were demolished between 1976 and 1983. This site also included several site features: reagent pit (concrete and gravel filled), solvent and acid pits (filled with concrete and/or gravel), former transformer pad, former laser target range, chemical aboveground storage tank, and drum storage area. No releases were known to have occurred at this site.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-208	South Plant Testing Facilities	This site included six buildings (Former Buildings 7544 [equipment storage], 7555 [rocket motors testing], 7565 [paint house, static test stand and photo lab], 7567 [detonation test pad], 7569 [constructed as a remelt building and modified to serve as a static test stand], and 7587 [static test stand]), a former No. 2 fuel oil underground storage tank, former firing stands (Building 7550), and a former blast berm (7567A). All of the building or structures have been demolished. Historical operations within the site boundary date to WW II; several buildings within RSA-208 were used as part of Chemical Ammunition Assembly Line 3. Following WW II, the facility was used for ballistic research and development and propellant and rocket motor production through 1996 as part of the former Redstone Arsenal Rocket Engine South Plant. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 2-Nitrotoluene Dibenz(a,h)anthracene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-209	Propellant Crushing/Grinding and Fuse Production	Former Building 7568 was constructed in 1955 and initially used as an ammonium perchlorate and potassium perchlorate crushing and grinding facility until 1971. Grinding operations included receiving/storing raw materials and processing them through a hopper into large mills to grind the oxidizer into powder. Vacuums were typically used during grinding to mitigate dust. The western side of the building had seven divided bays that were used for grinding, analytical laboratories, ovens for removing solvent from nitroglycerin, instrumentation, and storage. The northeastern corner of the building contained X-ray facilities, a photographic laboratory, an analytical laboratory, and an air conditioning room. The southeast corner of the building contained offices and two storage bays. The second floor of the building housed equipment for the operations performed on the first floor. There was a loading dock directly south of the building with a recessed ramp that was used for loading trucks. A settling tank was located on the southern side of the building and received flow from floor drains on the east and west sides of the building. A nitroglycerin storage shed was approximately 20 yards from the northeast corner of the building. Building 7568 later served as a research and development science laboratory from 1971 to 1975 and was used for guided missile maintenance between 1975 and 1982. The facility was utilized for fuse production before its demolition by 2000. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene Tetrachloroethene Perchlorate 2-Nitrotoluene RDX	VI.6
RSA-210	Nitroglycerine Wash House	This site includes Building 7559 used beginning in the early to mid-1950s as a nitroglycerine wash house to remove acids from nitroglycerine using a warm water and an alkaline solution. Building 7559 was later used as a heat treatment plant before it was demolished in the early to mid-1970s. One former storage shed was located east of former Building 7559 and demolished after 2010. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 2-Nitrotoluene Tetrachloroethene Trichloroethene	VI.6
RSA-211	South Plant Storage Magazines	This unit consisted of storage magazines in support of the propellant development activities in South Plant. This site is comprised of former Buildings 7521 through 7528 (propellant magazines), former Buildings 7529 through 7531 (nitroglycerine magazines), former Building 7532 (heater house), and former Buildings 7533, 7534, and 7536 through 7539 (service magazines). Following demolition of many of the propellant magazines in the 1970s, replacement Buildings 7523 through 7525 (oxidizer storage) were built in 1985 and demolished by 2012. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 2-Nitrotoluene RDX Trichloroethene	VI.6
RSA-212	Propellant Dry Houses	This unit contained two historical facilities, Buildings 7590 and 7591, which were propellant dry houses. These buildings were used for propellant drying beginning in 1951. Each building was outfitted with three 216-cubic-foot drying ovens separated by 1-foot-thick reinforced concrete. The rear of each building contained a heater room where large ovens used for drying propellant (oxidizer [ammonium perchlorate] and explosives) were located. From 1976 to 1982, the buildings were used to store flammable materials. The two buildings were vacated in 1982 and demolished by 2000. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 2,4-Dinitrotoluene 2,6-Dinitrotoluene Nitrobenzene 2-Nitrotoluene 3-Nitrotoluene RDX Trichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-213	ROP Line 4 Area Operations Facilities	This unit consisted of a number of buildings which were used from 1942 to 1945 as a Chemical Ammunition Assembly Line and a Munitions Renovation Line. After 1945, the site was used primarily for propellant research and development operations. These operations may have included small-scale oxidizer grinding and drying, propellant mixing, casting, and finishing, motor assembly, and core and liner preparation (including degreasing and painting). Building uses included: Building 7549 (Aluminum Powder Storage), Building 7575 (Case Loading/Machine Shop), Building 7578 (Powder Magazine/Motor Casting), Building 7581 (Case Preparation/Change House), Building 7571 (Munitions Receiving Laboratory), Building 7572 (Propellant/Chemical Storage), Building 7573 (Booster Magazine), Building 7574 (Shipping and Propellant Testing), Building 7576 (Heat Treating Facility), Building 7577 (Welding Shop), Building 7582 (Storage), and Building 7585 (Solvent Storage/Propulsion Systems). Many of the buildings were built by 1950 and most were demolished by 2007. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Perchlorate 2-Nitrotoluene Nitrobenzene RDX 1,1,1-Trichloroethane 1,1-Dichloroethene Bromodichloromethane Carbon tetrachloride Chlorobenzene Chloroform cis-1,2-Dichloroethene Tetrachloroethene Toluene Trichloroethene	VI.6
RSA-214	ROP Line 6 Area Operations Facilities	RSA-214 consisted of Buildings 8971, 8972, and 8973, which were constructed in 1945 to support Redstone Ordnance Plant operations on Line 6; this line was utilized for ammunition renovation operations. Specifically, Line 6 was used to unpack, inspect, disassemble obsolete or poor-condition ammunition; repair or replace defective components; reassemble rounds; and repack ammunition. Subsequent to the cessation of Redstone Ordnance Plant operations in 1945, the US Army used Line 6 as a research and development laboratory (shop area and support functions such as physics, electronics, and carpentry shops). Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: COCs to be addressed under RSA-146	VI.6
RSA-215	RSA-146 Historic Service Facilities	This unit consists of various support facilities for operations in the former Thiokol North and South Plants. Facilities included Building 7103 (machine shop), Building 7104 (carpenter shop and change house), Building 7106 (motor pool wash and grease rack), Building 7107 (gas station), Building 7116 (motor pool and grease rack), Building 7117 (motor pool and grease rack), Building 7118 (motor pool and grease rack), Building 7119 (generating station and machine shop), Building T-7139 (pattern shop), Building 7140 (paint storage and maintenance field office), Building 7141 (oil storage), and 7142 (forge and heat treatment shop). Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene	VI.6
RSA-216	Laboratory Injection Test Facility, Building 5475	This unit was a laboratory injection test facility. Operations were performed in three small test cells in Building 5475 beginning in 1962. Floor drains located inside the test cells were connected to exterior concrete containment basins. The containment basins contained grate drains which then directed the collected discharge through drain lines to a circular concrete sump located northwest of Building 5475. This holding sump was periodically sampled and the materials were properly disposed; this sump was removed in 2006. Early research operations in building 5475 were believed to have involved hydrazine (a liquid used in rocket fuels) and hydrazine was stored in adjacent Building 5474. A former septic tank (now demolished) and leach field were located north of Building 5475. More recently, Building 5475 has been used for rocket actuation, guidance system testing, and inertia research. Hydrazine is not used in current operations. Because current operations were determined to have limited potential to release hazardous constituents to the environment, the containment basins have remained in service and any discharge directly to a surface drainage ditch. No releases were known to have occurred at this site.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-217	Inert Storage Warehouse Facilities	This site was a warehouse and administrative building complex constructed in 1942. The buildings were used as engineering laboratories, administrative and photographic ID facilities, and storage structures for inert materials. It also included those structures that were supported by underground storage tanks and oil water separation systems associated with boilers and other petroleum-fueled equipment. During the period of use as a warehousing area, the site also had tracks passing by most of the buildings to allow railcars to load and unload. This unit had the potential for releases but there were no documented releases.	Soil: Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Groundwater: Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	VI.2
RSA-218	Defense Reutilization Material Office (DRMO) Open Storage Area	This unit was used by the former Defense Reutilization Material Office (now the Defense Logistics Agency) as an Open Storage Area for short-term storage of materials and debris/scrap pile placement as part of the Army's recycle/reuse program. Storage activities began at the site in 1943 and were discontinued by the early 2000s. Debris/scrap piles contained metal, concrete, and wood, and may have contained residuals of any chemicals and products used in the materials stored at the site. A visual site inspection conducted in 2003 documented several debris/scrap piles, a concrete slab that may have been used to stage materials, and two drum/scrap piles. A majority of the materials and piles were removed by 2004. No evidence of munitions debris or chemical storage has been found at the site. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene	VI.6
RSA-219	Chemical Storage Area in Salvage Yard	This unit was an open storage area from the 1950s to 2000 and used to store scrap metal, drums of solvents, and various chemicals. The area is currently being used as a scrap metal salvage yard by the Defense Logistics Agency. The site also includes a shallow, ephemeral drainage ditch which flows east to west across the northern portion of the site. A historical burn pit located south of the site has been included in this unit; it is unknown what materials may have been burned in the pit during its active period around the late 1950s to early 1960s. There were reports that some of the drums of solvents had leaked and potential releases may have occurred at the burn pit. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene cis-1,2-Dichloroethene Vinyl chloride 2-Nitrotoluene Aldrin Dibenz(a,h)anthracene 1,3-Dinitrobenzene Nitrobenzene Nitroglycerin RDX	VI.2
RSA-220	Construction Material Storage Yard	This site was used to store various construction debris and surplus materials from 1943 to 2003. Subsurface disposal via debris mounds may have occurred in this area. The site was not used for storage of munitions debris or chemicals of any kind.	Soil: No COCs Groundwater: 2-Nitrotoluene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-221	Fuse Storage and Munitions Disposal Area	The site contains six former fuze storage buildings (Buildings 7261 through 7266) and a 785-foot-long drainage swale east of Building 7261. The fuze storage magazines were constructed in 1942 (and first used in 1943) for small component storage in support of activities at the Redstone Ordnance Plant and then later for fuze storage. The storage magazines were serviced by railroad. A large amount of wholly inert munitions and munition components remain in the drainage swale at the site including 155-millimeter projectiles (unfuzed and not filled), lifting lugs, and base plates. It is not known how these items were disposed in the swale. No munitions and explosives of concern were discovered on the ground surface or in the subsurface but there is potential for munitions and explosives of concern to be present. No releases were known to have occurred.	Soil: Munitions and explosives of concern Groundwater: No COCs	VI.6
RSA-222	Roads and Grounds Maintenance Shop, Building 5494	RSA-222 was a paint shop at the east end of Building 5494 (constructed in 1960). An oil/water separator was located southeast of the building. Waste generation included waste paints and solvents from painting operations and sludge from the paint booth. Water and paint sludge accumulated in a sump which was pumped to the oil/water separator and ultimately discharged to the sanitary sewer. The oil/water separator was in poor repair and was replaced in 2001. Current operations at Building 5494 involve the limited maintenance of equipment and painting operations. Paint shop activities include small-scale (1 to 5 gallons) paint mixing and use of the paint booth to paint equipment, signs, and other items. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-223	Central Railroad Classification Yard	The classification yard was completed in November 1941 and had seven tracks and a 116-car capacity. Additional construction in the rail yard and vicinity continued in 1942 and a rail spur to the southwest through the eastern corner of the yard was constructed sometime in 1942 or 1943. The classification yard was used for incoming and outbound railroad cars at Redstone Arsenal. Classification activities reportedly included sorting incoming and outgoing cars for ultimate destination elsewhere at Redstone Arsenal or off the installation. Any item or good that was brought into or out of the installation could have been on rail cars that were classified in the yard. Loading and unloading activities were not part of operations at the classification yard, and review of the historical aerial photographs for this area further indicates that the area was very limited in space such that significant loading and unloading would not be possible and the photographs do not show such activities taking place. Rail cars were sorted onto holding tracks and later towed to their destination. Records indicate that expendable items such as chemicals, salt, coal, fuel oil, and miscellaneous supplies were the primary inbound items. Outbound items consisted of containers of goop (an incendiary material composed of gasoline, magnesium particles, and asphalt), ton containers of various contents (mustard, lewisite, and phosgene), scrap iron, lumber, and miscellaneous supplies. There were no reported releases of chemicals or any other product in the rail yard. The installation railway system was discontinued in July 1973 and was removed before 1983. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-224	Container Storage Area	This unit was used to store ton containers potentially containing mustard and lewisite, 55-gallon drums reportedly containing “Goop”, and coal. An exact location of the storage area has not been determined, but aerial photographs from 1943, 1947, and 1950 show storage of Type “D” and “E” ton containers, 55-gallon drums, and stockpiling of coal in the area south of the quarry at Madkin Mountain and along the east side of Mills Road to the Wernher Von Braun Complex. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-225	Fuse Modification Line 7	RSA-225 consists of two noncontiguous areas within the former Plants Area No. 2, which included facilities for the manufacture of toxic agents, smoke munitions, and incendiary munitions. The site contains four buildings primarily associated with former Fuze Modification Line No. 7 in the 1950s: Building 5429 (fuze modification in the early 1950), Building 5477 (magazine for Building 5429 operations), Building T-5478 (paint storage and shop), and Building 5479 (magazine). Building 5477 and T-5478 have been demolished. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 2,4-Dinitrotoluene 2,6-Dinitrotoluene 2-Nitrotoluene RDX Benzo(a)anthracene Benzo(b)fluoranthene 1,1,2,2-Tetrachloroethane Tetrachloroethene Trichloroethene	VI.6
RSA-226	Open Storage 54-2	This site is an open storage area outside Building 5488 (formerly Building 788, constructed in 1942) that is still in use and currently stores chemically-treated utility poles and large pipe sections on above-grade racks. Documentation indicates that chemicals (unknown or unidentified) and electrical items, including transformers (1.5 to 150 kilovolt-ampere capacities), were stored in the area. The outside storage area is opposite the former rail spur that serviced the southwest side of Building 5488. Review of the 1943, 1950, and 1964 aerial photographs indicated that there was activity (presumably continuous) at the storage area during this time frame. Documentation of building use from 1961 indicated that the building was occupied by three separate occupants: field service, industrial operations, and a central office. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Dieldrin Aldrin Tetrachloroethene 1,1,2,2-Tetrachloroethane Trichloroethene	VI.6
RSA-227	Inactive Washrack (adjacent to Building 5492)	RSA-227 was a wash rack and sump on the south side of Building 5492. Site drainage is controlled by an unlined drainage ditch to the south of RSA-227. This drainage ditch collects runoff from both the northwest of RSA-227 and the east of RSA-227 and directs the combined flow to another drainage ditch that extends south of RSA-227. The washrack and sump were in operation from 1962 to 1984. Investigation results demonstrated that releases occurred at this site during its operational period. Arsenic- and polynuclear aromatic hydrocarbon-contaminated soil was addressed in a corrective measure conducted in 2017. A total of 247.77 tons of soil was removed as well as removal of the concrete pad for the former washrack and associated concrete sump. COCs remain in groundwater.	Soil: No COCs Groundwater: Benzo(a)anthracene 1,1-Dichloroethene Trichloroethene	VI.6
RSA-228	Sewage Treatment Plant 2	Former Sewage Treatment Plant 2 (Building 3239), active from 1942 to 1948, consisted of a primary and secondary clarifier, a sludge digester, a trickling filter, a pump station, and sludge drying beds. The plant processed wastes for administrative and temporary areas of Redstone Arsenal, which included a hospital, base housing, and small-scale, short-term support facilities that included a photographic film processing facility, carpenter shop, fire/police station, maintenance shop, steam plant, and automobile wash rack/garage. All former site-related features have been demolished. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-229	Former PX Service Station (Building 3 197)	Building 3197 was a PX service station (gas station) beginning in the 1950s. A septic tank was connected to floor drains in the lift bays, as well as two 10,000-gallon underground storage tanks. The building was a PX annex through the 1960s and 1970s. In the 1980s, it was used for social and recreational activities. Since 2000, Building 3197 has been used for offices and storage space. No documentation has been found regarding any spills or leaks at this unit. Underground storage tanks have been removed from this site. Semi-annual groundwater monitoring was conducted in 2007-2008.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-230	Abandoned Rubble Pile	This site was active in the 1940s as a disposal area for Redstone Arsenal construction debris. It is unknown when disposal activities ceased. A number of soil mounds with metal debris, rusted drums, and railroad ties were present on the ground surface. Shallow trenches also appear to have been used for disposal activities of municipal-type material. Part of this area was used for field training exercises from the 1960s through the 1990s. No releases were known to have occurred.	Soil: No COCs Groundwater: 2-Nitrotoluene Benzo(a)anthracene bis(2-Ethylhexyl)phthalate Trichloroethene 3-Nitrotoluene Dieldrin Naphthalene Aldrin	VI.6
RSA-231	SMF # I Mixing& Prep Facilities	This site is comprised of six noncontiguous buildings that supported the Smoke Munitions Filling Plant #1 Mixing and Preparation Facilities. The facilities included Building 3474 (Starter Mix Building), Building 3475 (Starter Tube Assembly Building), Building 3478 (Black Powder Mixing Building), Building 3479 (Sleeve Impregnating Building), Building 3490 (Smoke Mix and Blending Building), and Building 3491 (Smoke Mix and Blending Building). These buildings were used to support the manufacture of a number of smoke munitions within Plant #1 beginning in the early to mid-1940s. The buildings were built in 1942 and 1943. The only remaining building associated with former processes is Building 3474. This unit had the potential for releases but there were no documented releases.	To be determined	VI.2
RSA-232	SMF #1 Service Station	This site contained a gas station that included former Building 655 and an underground storage tank of unknown size. The station was operated in the 1940s and was demolished by 1954. The underground storage tank was believed to have been removed based on geophysics. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-233	SMF #2 Mixing & Prep Facilities	This site was comprised of four noncontiguous buildings to support operations for Smoke Munitions Filling #2 Mixing and Preparation Facilities in the 1940s. The four buildings were constructed in 1943 and included Building 3641 (Sleeve Impregnating Building), Building 3642 (Starter Mix Building) (RSA-233B), Building 3643 (Starter Tube Assembly Building), and Building 3645 (Mixing and Blending Building). An additional building, Building 3644, was constructed in 1993 for use as an administrative building and was not involved in munitions processing. A soil/debris pile was observed west of former Building 3642. The origin of the soil pile is unknown but potentially associated with former Building 3642 demolition. Former Building 3645 was demolished by 1988. Buildings 3642 and 3643 were demolished by 2002, and Building 3641 was demolished between 2012 and 2015. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene Dibenz(a,h)anthracene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-234	Waste Disposal Pit	This site was originally the location of Building 642 that burned down in 1942. Former Building 642 was constructed in 1942, initially as an incendiary bomb filling plant, and then used as an M-54 incendiary bomb loading plant beginning in March 1942. The M-54 loading process utilized black powder, primers, and Thermate mix (magnesium-based thermite, barium nitrate, ferric oxide, and aluminum powder and flakes). Former Building 642 was 220 feet long by 51 feet wide and 30 feet tall and constructed of corrugated asbestos board siding and roofing on an uncoated concrete slab. A railroad spur and loading dock structure ran the entire length of the west side of the building, and the former access road was located to the north and northeast. In April 1942, the entire building and approximately 4 tons of Thermate were destroyed in a fire, and the remaining structure was razed. Historical information indicates that waste burns occurred on the concrete slab of the former building. The site was used to dispose a wide variety of smoke mixes, waste explosives, primers, and rejected 105-mm smoke canisters. These operations appear to have continued until sometime before 1974. No munitions and explosives of concern are present on the surface or subsurface of the site; however, munitions debris, consisting primarily of smoke grenades parts and components, were found and removed from the shallow subsurface. The concrete slab base of former Building 642 remains in place and is deteriorated in many areas, with some small trees and brush growing through cracks. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Lead Zinc Dioxins/Furans Groundwater: 2-Nitrotoluene Tetrachloroethene Trichloroethene Benzo(a)anthracene Hexachloroethane	VI.6
RSA-235	Bulk Fuel Storage Facility	This site consisted of former Buildings 3611 and 3612 used from 1943 to the 1950s for bulk fuel storage. Building 3611 was built in 1943 and was a fuel oil pump station believed to be used to pump fuel oil to various warehouses and change houses in Plant Area 3 for heating. Building 3611 was demolished between 1988 and 1991. Building 3612 Bulk Fuel Storage Area was built in 1943. The aboveground storage tank (84,000 gallons) was used to store oil for heating various warehouses and change houses in the Plant Area 3 into the mid to late-1990s. By 2000, the tank was removed. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-236	Grenade Packing & Assembly	This site contains former Building 636-1 that was constructed in 1943 as an assembly and packing facility for the grenade filling plant. It was originally an assembly and packing building for the GFP in the early to mid-1 940s. Specifically, the building was used for the final assembly, packing, and shipping of AN-M8 hand grenades, M-20 rifle grenades, and M-22 rifle grenades. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: To be addressed with RSA-145	VI.6
RSA-237	Propellant Cutting and Drying	This site contained former Building 7556 which was used as a primer storage magazine after it construction in 1942. The building has also been used to store solvent, binder, propellant mixtures, and general storage as well as to conduct air drying of propellants. Two loading docks for former Building 7556 were used to load and unload railcars. Building 7556 was demolished between 2003 and 2007. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 1,3-Dinitrobenzene 2-Nitrobenzene Trichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-238	Plant 2, Mustard Lines 5 and 6	This site consists of former mustard manufacturing lines 5 and 6, accessory structures, and supporting warehouses. Remaining structures associated with Army use at the two manufacturing lines include the former ethylene generation buildings, the mustard reactor buildings, and portions of the sulphur monochloride plant buildings. Each mustard manufacturing plant consisted of an ethylene generating plant with associated fuel oil (two 8,000-gallon capacity each) and alcohol (four 16,000-gallon capacity each) underground storage tanks, ethylene gas holders, a mustard reactor building (typically with four reactors), a 1-ton container filling area, mustard storage tanks, a sulfur monochloride plant, tail gas scrubbers, a caustic tank, a disposal reactor (8,400-gallon capacity), and a lunchroom. Chemicals used in the mustard manufacturing process included but were not limited to fuel oil, sulphur monochloride, ethyl alcohol, chlorine, and kerosene. Chemicals used in decontamination processes included carbon tetrachloride, acetylene tetrachloride, lime slurry, and sodium hypochlorite solutions. Coked coal was used in the ethylene scrubber operations. In addition, no filling building was operated in conjunction with the manufacturing operations formerly conducted at Lines 5 and 6. The facilities were operational from September 1942 to May 1943. The chemical agents associated with RSA-238 included mustard and lewisite. The RSA-238 site is currently occupied by multiple historic buildings. Buildings 5661 and 5663 are currently unoccupied. Buildings 5662, 5669, 5670, 5671, 5672, and 5673 are currently in use to support mission-related activities. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Arsenic Barium Cadmium Cobalt Iron Magnesium Manganese Nickel Thallium 1-Methylnaphthalene 2-Methylnaphthalene Naphthalene Groundwater: bis(2-Cchloroethyl)ether Benzo(a)anthracene Trichloroethene	VI.2
RSA-239	ROP Line #1 Boiler House	Building 7668 was constructed in 1942 as a boiler house. The water used to generate steam for the North Plant area was treated with various water treatment chemicals. The chemicals were mixed within four stainless-steel tanks located within Building 7668. The four boilers within Building 7668 were fueled by four 10,000-gallon-capacity steel underground storage tanks located on the west side of Building 7668. Two of the tanks were replaced in 1979. In 1980, a valve leak in one of the new tanks released the entire contents of one 10,000-gallon tank containing No. 2 fuel oil into the subsurface soil and sanitary sewer before being discovered. The fuel oil was reportedly recovered from the subsurface soil after discovery and the broken valve was replaced. In 1982, the other two tanks were replaced. From at least the early 1980s, the boilers in Building 7668 were fueled by No. 2 fuel oil and natural gas. All four tanks were removed in January 1998. Building 7668 continues to operate as a natural gas boiler house. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene Carbon tetrachloride	VI.6
RSA-240	Substation No. 7, Former Building 5290 (Demolished)	Former Substation No. 7, Building 5290, covered an area of approximately 5,625 square feet (75 by 75 feet) prior to its demolition by 1996. It was originally designated Building 5286 and was moved from the original location along Martin Road north to an area east of the former railroad classification yard. The substation building was renumbered 5290 and remained in that location from 1960 until at least 1996. Substation No. 7, Building 5290 was then replaced by Substation No. 8 to support the newly constructed Sparkman Center. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-241	Hazardous Waste Storage Igloo, Building 7313	In the 1940s, Building 7313 was used for storage of high explosives, chemical high explosives, and munitions in support of operations at the Redstone Ordnance Plant. From 1950 until 1996, the igloo was used to store various chemicals, including solvents, explosives, ammonium perchlorate, various propellants, and various assembled rocket motors. Hazardous waste warning signs and miscellaneous chemicals were observed within the facility in 1996. Spills or releases (solvents, explosives, perchlorate, and metals) within the igloo would flow to the trench drains within the igloo and then discharge to the ground surface through trench drain outlets located on the northeast and northwest corners of the building exterior. A rail spur formerly provided access to the north side (single point entrance) of Building 7313, where materials would have been loaded and offloaded prior to construction of Plover Road. An interim measure soil removal was conducted in 2009 on the northwest corner of Building 7313; approximately 8 cubic yards (9.85 tons) of polynuclear aromatic hydrocarbon-contaminated surface and subsurface soil were removed. Soil met cleanup goals.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-242	Hazardous Waste Storage Igloo, Building 7314	Building 7314 is an igloo that was constructed in 1942 and is located adjacent to numerous other igloos. It was constructed using a typical single-bay design with features that include a concrete floor, footers, and front wall; ground cable and an arched concrete roof with an applied waterproofing membrane; and a sand, earth, and grass cover over the entire structure. Two interior trench drains are adjacent to the east and west walls of the structure and the floor slopes slightly from the center to the trench drains. A rail spur provided access to the north side (entrance) of Building 7314, where materials would have been loaded and offloaded in the 1940s and 1950s. In the 1940s, the building was used primarily for storage of explosives in support of operations at the Redstone Ordnance Plant. After 1950, the igloo was used to store chemicals including solvents and propellants, and munitions. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Arsenic Benzo(a)pyrene Groundwater: 1,1,2,2-Tetrachloroethane Benzo(a)anthracene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene	VI.6 and VIII.1
RSA-243	Propellant Storage, Building 7342	RSA-243 is a storage igloo constructed in 1942. The building is approximately 1,206 square feet in size and was constructed with a concrete floor and arched roof covered with earth and grass. It consists of a single bay with two interior trench drains adjacent to the east and west walls of the structure. The floor slightly sloped from its center to each of the trench drains. The drains discharge to the ground surface on the northern building exterior and would likely flow to the drainage ditch on the south side of Eagle Road. From 1942 to 1950 it was used primarily for storage of high explosives and chemical high explosives in support of operations at the Redstone Ordnance Plant. After 1950, the igloo was used to store munitions and chemicals including possibly propellant until 1996. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-244	Propellant Mixing Building 7356	Building 7356 was constructed in 1988 and used for mixing 5-gallon batches of Class 1.3 propellant (non-detonable). The building was part of a propellant mixing facility which also included Buildings 7384 (control bunker), 7385 (equipment building), 7386 (5- and 20-gallon mixing), 7387 (50-gallon mixing), and 7388 (equipment building). The building was in use until 1996.The building and its foundation were removed in February 2008. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-245	Steam Heating Plant, Building 7579	Building 7579 was constructed in 1942 as the primary steam heating plant (boiler house) for Redstone Ordnance Plant Lines 3 and 4. The original footprint of the building was expanded several times during the period when it remained operational. The steam plant was decommissioned around 1996 and is currently abandoned and slated for future demolition. The facility has three underground storage tanks and their associated piping which were potential sources due to overfilling, spills, and structural integrity failures (i.e., tank rupture, joint failure, etc.) but there were no documented releases. The boilers were fired by No. 2 diesel fuel and large industrial compressors are located inside Building 7579. The concrete flooring around this machinery is stained dark from many years of use and many small spills. Trench drains from inside Building 7579 continue through the building's exterior walls to one or more surface release points, which received discharges from the interior of Building 7579. An oil/water separator that discharged to a surface water ditch was formerly located on the east side of the building. Steam condensate from the return steam lines was discharged to a sump inside of Building 7579. A 2-foot-by 4-foot-deep, concrete-lined sump is located on the south side of Building 7579. Two double-wall diesel aboveground storage tanks were formerly located approximately 90 feet northwest of Building 7579. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Antimony Cobalt Manganese Perchlorate 1-Methylnaphthalene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Bis(2-Ethylhexyl)phthalate Dibenz(a,h)anthracene n-Nitroso-di-n-propylamine Phenanthrene Chlorobenzene Cis-1,2-Dichloroethene Tetrachloroethene Trichloroethene Vinyl chloride	VI.2
RSA-246	Sewer Ejector & Motor Pool, Building 7630	This unit consisted of the following features: Building 7630 (Sewer Ejector Station), Building 7630 (Motor Pool and Painting Facility), an Oil/Water Separator, and a storage shed. Building 7630 was constructed in 1959 as a sewer ejector station (i.e., sewer lift station) and demolished by 1983. A new Building 7630 was constructed over the former building location in 1983 and used as a motor pool and painting facility until 1996. The replacement Building 7630 housed an equipment wash bay, repair bay, large paint booth, and a pit that allowed for access under vehicles to facilitate repairs. Two floor drains within this newer Building 7630 led to an exterior two-chambered, baffled oil/water separator, which has an outlet to the sewer line. Chemicals known or suspected to have been formerly used at the motor pool include gasoline; miscellaneous oils, greases, and lubricants; No. 2 fuel oil; antifreeze; brake fluid; Freon; mineral spirits; miscellaneous paints; lacquers; transmission fluid; motor oil; hydraulic oil; and detergent used in cleaning vehicles. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-247	Steel Fabrication/ Maintenance Facility, Building 7644	RSA-247 contained Building 7644 which was used as a metal plating shop (coating tooling with cadmium, nickel, and chromium and other electrochemical processes) from 1958 to 1959. Building 7644 was then converted to a steel pipe fabrication and maintenance shop and operated until 1996; activities included metal work such as pipe fitting, threading, and drilling of metal parts. The building was demolished in 1998. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Cadmium Groundwater: Trichloroethene 1,1,2,2-Tetrachloroethane Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	VI.6 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-248	Battery Maintenance Shop, Building 3633	Building 3633 was constructed in 1943 as a storage warehouse supporting a smoke munitions filling plant. The building was converted in 1954 for use as a transportation department motor shop. Battery maintenance activities began during the 1950s, servicing lead-acid and nickel-cadmium batteries in support of development of the Nike missile system, and changed over to battery filling and charging only in the mid-1980s. Wastes such as sulfuric acid, lead, and other metals may have been potentially released to the sewer during past operations. Currently, the northern half of the facility is used as a forklift maintenance area and the southern portion is used for battery maintenance and storage. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-249	Inactive Old Bone Yard Disposal Site 2	This site is a former salvage yard that started in May 1942 as a scrap lumber pile; these operations were discontinued in the early 1960s. The salvage yard handled the collection of empty munitions boxes, drums, barrels, wire, and numerous other items. The salvage yard was serviced by a former railroad line that ran through a portion of the northwest of the site, the gravel bed of which is still visible on the surface. In the late 1940s and into the 1950s, the site was reportedly used for munitions disposal and demilitarization operations. There was no evidence that any surplus items processed at the salvage yard contained chemical warfare materiel; however, munitions manufacturing equipment was decontaminated on the site. Previous environmental sampling at the site indicated the presence of the chemical constituents of Decontamination Agent Non-Corrosive, which was sometimes used as a decontaminant for mustard and lewisite during the 1940s and 1950s. Results from geophysical surveys and intrusive investigations conducted at the site between 2014-2016 indicated that no munitions and explosives of concern are present on the surface of the site; however, the recovery of an unfuzed 4.2-inch mortar body during test trench investigations in the subsurface of RSA-249-R-01 confirms historical records indicating that out-of-specification munitions were managed at this location and that a potentially complete pathway exists for munitions and explosives of concern in the subsurface. Significant amounts of metallic items remain buried at the site. The site is currently inactive. Investigation results demonstrated that releases occurred at this site during its operational period.	To be determined	VI.2
RSA-250	Former Storage Warehouse, Building 778/5678	Former Building 778 was constructed as a warehouse in 1943, was used to store coke (used in phosgene production), unidentified components, automotive parts, blank gas mask faceplates, conveyor lines (potentially for chemical warfare manufacturing), and other inert materials. The warehouse has mostly been refurbished for use as office space. Investigation results demonstrated that releases occurred at this site during its operational period. A soil removal was conducted for arsenic in 2017. A total of 180 cubic yards of arsenic-contaminated soil was removed during the corrective measures. The cleanup goal was met except for arsenic beneath the northern side of the heating, ventilation, and air conditioning concrete pad. Land-use controls were implemented to protect potential receptors.	Soil: Arsenic Groundwater: No COCs	VIII.1
RSA-251	Former Phosgene Plant	This site includes the former Phosgene Filling Plant (Building 5686). RSA-251 was expanded to include the former Phosgene Manufacturing Plant (initially part of RSA-104) just to the east. The former Phosgene Filling Plant Building 5686 was constructed in 1943 as a warehouse storage building. The Phosgene Filling Plant was operation from April 1944 to January 1945. The building was demolished by 1959. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-252	Incendiary Bomb Facility Plant 2 Area	RSA-252 was a site within the former 4,4'-DDT areas. Building 5681 was constructed in 1942 for the purpose of being used to fill mortars and artillery shells with mustard gas. A scrubber tower (Building 5682) was built on the east side of Building 5681 and removed by 1950. These buildings, however, were never used for the intended purpose. In 1943, Building 5681 was converted for use to fill bombs (M47A2 100-pound bomb, M4 cluster bomb, M76 500-pound bomb, and M19 cluster bomb) with incendiary oil. The facility operated from 1943 to 1945. Waste incendiary oil or material contaminated with incendiary oil from operations at Building 5681 was routinely burned in burn pits located approximately 200 yards west of the building in two areas. The various gels used for bomb filling were napalm mixtures commonly known as "goop" and required immediate disposal because of the tendency to ignite spontaneously. Filled reject munitions were also transported to the pits for burning. Support structures associated with Building 5681 included gasoline pump houses, gasoline storage tanks, and storage magazines. Former Building 5684 was a gasoline pump house that was located west of Building 5681; the area of the pump house was converted to a parking area by 1956. Building 5681 was also used as a carbon dioxide production facility. Tanks under the building that were initially installed to hold mustard were filled with dry ice that was allowed to evaporate. The carbon dioxide given off was then piped to a phosgene plant northwest of the building (RSA-251). From 1947 until 1952, Building 5681 was used for the grinding and bagging of pesticides that were manufactured at other locations. In 1949, the Army rented the building to the John Powell Chemical Company. The northern half of the building was used to grind and compound 4,4'-DDT. In addition to 4,4'-DDT, chlordane, dieldrin, and other insecticides, possibly including toxaphene, parathion, malathion, pyrethrins, beta-BHC, cube root (i.e., rotenone [C23H22O6]), aldrin, and lindane were handled in the building. The southern half of the building was used for storage. Beginning in 1952, Building 5681 has been used for administrative purposes. Over the years, contaminated building materials have been removed or encapsulated during various building renovations. Investigation results demonstrated that releases occurred at this site during its operational period. A time critical removal action was conducted in 2008 to remove 4,4-DDT-contaminated soil in utility corridors and security fence post areas. COCs remain in soil and groundwater at this site.	Soil: 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin beta-BHC Dieldrin Endrin Heptachlor epoxide Toxaphene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Groundwater: 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC beta-BHC Dieldrin Heptachlor epoxide Toxaphene 1,1,2,2-Tetrachloroethane Trichloroethene Dibenz(a,h)anthracene	VI.6
RSA-253	Utility/Flammable Materials Storage (B6109)	Building 6109 was constructed in 1956 as a utility building to support Range 7 activities until it was designated for use as a "flammable materials storage building" between 1991 and 2001. Observations from the 2004 investigation of the site indicated that Building 6109 was in disrepair. The building, foundation, and associated concrete pads were removed sometime between 2007 and 2010. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-254	Range 1 Bombing Targets	This site includes four bombing targets: RSA-254A-Bombing Mat 1, RSA-254B-Bombing Target 2, RSA-254C-Bombing Target, and RSA-254D: High Explosives/Chemical Munitions Impact Area J (includes RSA-051S). The bombing targets were used during the 1940s and 1950s for drop testing skip bombs, high explosives, and smoke incendiary bombs, as well as detonation testing. Historical documentation indicates that this site lies within Area 10, portions of which were reportedly impacted by munitions containing mustard and white phosphorus. This unit had the potential for releases but there were no documented releases.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-255	Former Manganese Ore Storage Area, OU-8	This site lies within the former Gulf Chemical Warfare Depot area and was used for the government stockpiling of manganese ore, a strategic material. The manganese ore was stockpiled along a former rail spur in the southern portion of the site. The stockpiles have been removed, although residual manganese ore and metal impurities had remained in the site soil. The residual manganese remaining at the site has been removed to the cleanup goal in 2018-2019.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-256	Scarred Area #2-NE of RSA-032 w/in Historic RR Spur Line	This unit consisted of two discrete areas of scarred ground that were noted from 1943 and 1956 aerial photographs. The specific cause of the scarring in the two areas is not known and very little is known about the activities that may have taken place in these two areas. The area may have been linked to the former railroad line spur and former Gulf Chemical Warfare Depot's Toxic Gas Storage Area #1 and served for open staging of materials in the 1940s-1950s. This site contains two areas located close to Toxic Gas Storage Area 1. The proximity suggests that these areas may have been used for open storage or as a soil borrow area. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-257	Rock Pond	Rock Pond within this unit was historically used to mine gravel and sand and then was later used in 1943 as a burn pit and disposal area for smoke-filled (HC and colored smokes) and incendiary munitions. The resulting melted material (slag) has been found at the site. This site may have been used as a quarry, borrow area, and/or a waste disposal area from the 1940s to 1950s. The majority of the site is under water and contains a large pond with several islands. The central island been used as a burn pit and disposal area for incendiary munitions. Munitions and explosives of concern were not identified in the slag areas or surrounding areas but are potentially present.	To be determined	VI.2 and VI.5
RSA-258	Guard Shack Waiting Shelter/Paint Spray, Building 7862	RSA-258 is the former location of a building identified as a “paint spray” building in a 1957 building use list; it may have been built as early as 1954. As late as 1961, the site has been occupied by a guard house or waiting shelter for visitors entering Redstone Arsenal Test Area 2, with the current structure being a Plexiglas shelter. The current shelter appears to have been constructed atop the concrete slab of the former structure. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-259	TA #2 Leach Field	This site contains a leach field that served Buildings 7853, 7855, and 7856 beginning in the late 1950s. The leach field is not currently in use.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-260	Test Stand C, TA#2 Building 7843	This site contains Building 7843 which is a missile centrifuge test stand bounded on three sides by a V-shaped, earth-filled, cross-tie berm. Concrete curbs surround the central test area within the earth- filled berm, and a pipe directs drainage to a plastic collection tank immediately west of the test stand. Prior to the construction of Building 7843, Former Test Stand C, Building 7859 was located in this area. Building 7859 was constructed in 1953 as a two-bay vertical test stand for simultaneous checkout of a two-stage missile system with a 250,000-pound thrust capability. This unit had the potential for releases but there were no documented releases.	To be determined. Investigation deferred to range closure (Section V.B.2 of RSA AHWMMA permit)	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-261	Lance Missile Conditioning Facility, Building 7847	RSA-261 contains Building 7847, constructed in 1967 as a facility for conditioning petroleum-based and hypergolic liquid rocket propellant and instrumentation. Building 7847 was described as a series of eight small instrument sheds and one control building surrounded by paving and gravel, each of which is connected to an earth-covered conditioning chamber via a 24-inch concrete pipe through a linear earthen berm. A 2-inch-diameter steel drain line at the bottom of the conditioning chamber went to a subsurface concrete drum container that held a 55-gallon drum which received wastewater from the conditioning chamber. The site was used for low-temperature testing of Lance rocket propellant and other petroleum-based rocket propellants; discharged wastewater was collected in buried 55-gallon drums and disposed of with other wastes from Test Area (TA) 2. Interviews with on-site personnel indicated that the conditioning chambers were open-ended prior to installation of garage-type rollup doors in 2002. Currently, the instrument buildings and conditioning chambers are used for storage of various inert materials. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene 1,1,2,2-tetrachloroethane unsymmetrical dimethyl hydrazine	VI.6
RSA-262	CWS Warehouse Area (Buildings 8021, 8022, 8023, 8024, 8025, 8026, and 8027)	This site includes seven Chemical Warfare Service GCWD warehouses (Buildings 8021, 8022, 8023, 8024, 8025, 8026, and 8027) which were built in 1942 for the storage of inert materials, such as spare parts and shipping crates, and for rehabilitation of unserviceable munitions and equipment for the Gulf Chemical Warfare Depot. Rehabilitation of unserviceable items involved the inspection, classification, and repackaging of materials received from other facilities, including those overseas. Each of the warehouse buildings occupy/occupied an area of approximately 110,370 square feet. Two warehouses (8025 and 8027) were demolished in 2004. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Groundwater: 2-Nitrotoluene Dibenz(a,h)anthracene 1,1,2,2-Ttetrachloroethane 1,1,2-Trichloroethane Carbon tetrachloride Tetrachloroethene Trichloroethene	VI.6
RSA-263	CWS Motor Pool (Building 8017)/Change House (Building 8020)	RSA-263 formally consisted of the following building: Building B-8017 (Motor Repair Shop, Storage, and Repair Shop), B-8020 (Change House and laboratory and testing facility), B-8015 (Gasoline Pump Station), B-8016 (Motor Grease and Wash Stall). All buildings at the site have been demolished. A gasoline underground storage tank was located to the east of Buildings 8015 and 8016. The tank (size unknown) was removed during the 1980s. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Manganese Dibenz(a,h)anthracene Benzo(a)anthracene Carbon tetrachloride	VI.6
RSA-264	RR Spring	This site was a potential disposal area for munitions items following World War II. The eastern site border is an abandoned railway line which was active beginning in the 1940s. Reportedly, a former employee stated that World War II-era munitions items were historically dumped from railcars into the Railroad Spring at this site. However, this activity was unlikely due to the approximate 500-foot distance from the rail line to the spring as well as the presence of authorized munitions staging, demilitarization, and disposal locations just north of RSA-264. RSA-264 is located on the active TA-1 range and debris from current-day munitions has been found on the site. No World War II-era munitions and explosives of concern or munitions debris that would indicate munitions demilitarization or disposal operations have been found at RSA-264.	To be determined	VI.2 and VI.5

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-265	Gasoline Drum Storage Area	The site was used to store drums of gasoline within earthen-bermed cells scattered across the site when active from 1943 to approximately 1950. The area had a capacity of 12,000 drums within approximately 23 areas surrounded by soil berms. The site was also an open storage area for bauxite/aluminum ore. Test Area 4 lies within the site and activities include testing of rocket motors, explosive devices and components, and insensitive munitions. Environmental impacts of Test Area 4 operations are included as part of the Army's Operational Range Assessment program. Potential releases stored materials may have released fuel-related volatile organic compounds, semivolatile organic compounds, and metals to the environment. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Benzene Carbon tetrachloride Dibenz(a,h)anthracene Trichloroethene.	VI.6
RSA-266	Gulf Chemical Depot Storage Magazines	RSA-266 was part of the former Gulf Chemical Warfare Depot in the 1940s to 1950s. This unit includes 56 brick-and-mortar magazines designated as Buildings 8800 through 8855, which were built in 1942. The magazines are small, single-story buildings with flat roofs and concrete floors. Numerous magazines have already been demolished, and many of the remaining magazines are in a state of disrepair. According to historical records, the magazines were used for storage of general depot materials. In later years, many of the buildings were assigned to the Ordnance Guided Missile School or to other Army contractors. Although no specific records detailing the materials stored in the magazines exist, it is believed that they housed finished ammunition consistent with similar storage at other locations on Redstone Arsenal. This unit had the potential for releases but there were no documented releases.	Soil: COCs Groundwater: No COCs	VI.3
RSA-267	Drainage Ditch #4	This site is an area of scarred land was noted in aerial photographs from 1943 through 1964 west of a storage igloo (Building 8856) within the very northern portion of the Ammunition Division's igloo area historically occupied by the Redstone Depot and Gulf Chemical Warfare Depot in the 1940s and 1950s. It is unknown what caused the land scarring but it was thought that the Redstone Depot or the Gulf Chemical Warfare Depot may have staged materials in the scarred land area. There were no documented releases. This site is located within an active range.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-268	Sewage Treatment Plant, Building 8018	Building 8018 was constructed in 1943 to provide limited wastewater treatment services for the Gulf Chemical Warfare Depot. The treatment plant was originally designed to treat sewage for a population of 1,200 people and consisted of an Imhoff tank, dosing chamber, filter beds, and sludge drying beds. At some point after 1950, a chlorination system was added to the process. In 1970, the flow through the plant was estimated to be between 5,000 and 8,000 gallons per day. During the early 1980s, the treatment plant was upgraded to add secondary waste treatment capability to the process. The plant was removed from service in 1992 and Building 8018 was demolished. The Imhoff tank and dosing chamber were filled with gravel and are the only remaining structures on site. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-269	Former UST, Building 7852	RSA-269 consists of Building 7852 and a former underground storage tank east of the building. Building 7852 was constructed in 1959 as a pump house in support of operations on Test Area 2, which is an area for hazardous assembly, dynamic testing, and environmental conditions testing. Building 7852 contained two 1,500-gallon per minute electrical motor pumps and one 3,500-gallon per minute diesel engine pump used to supply water to the a missile centrifuge test stand located at Building 7843 (RSA-260). Building 7852 is currently used as a fuse test facility and contains a centrifuge. Currently, a sanitary sewer lift station is located on the east side of the building. A 1,000-gallon diesel fuel underground storage tank was located east of Building 7852 to power the diesel engine pump in Building 7852; this tank is believed to have been removed. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-270	Hazardous Waste TSA & Recycling Facility Building 5423	Building 5423 was constructed in 1942 as an inert storage warehouse. This facility currently houses an active 90-day hazardous waste storage area and serves as a satellite accumulation point for various wastes generated by maintenance activities completed throughout Redstone Arsenal. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-271	Former Boiler House, Building 7729	Building 7729 housed a steam boiler that was fueled from a 2,800-gallon underground storage tank. The tank was used to fuel the boiler and compressor, two blow-off/hot well oil separation systems, and the former sanitary sewer junction associated with the oil separation systems. A small oil/water separator consisting of a blow-off/hot well pit was located on the west end of Building 7729. This system was removed from use but left in place, and a larger, high-capacity blow-off/hot well was installed south of Building 7729 in 1974. The junction of both oil/water separator systems with the sanitary sewer system was located northwest of the building. The boiler was utilized until 1982. Building 7729 was then utilized solely to store spare piping and valves, and no chemicals were either stored or used within the site boundaries. Building 7729 was still in place but emptied of all equipment in 1996. RSA records list the 2,800-gallon UST as being removed in September 1998. The replacement blow-off/hot well was still in place in 2004. During ongoing Missile Production Complex construction activities in October 2011, the replacement blow-off/hot well overflow pit was inadvertently breached, and the contents were released onto the ground surface. A spill response for a petroleum release was completed, including collection and analysis of post-response samples. The data showed that the spill response had adequately removed the assumed petroleum contamination and prevented further release to the site environment. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Naphthalene 1-Methylnaphthalene Methylene chloride Groundwater: 1-Methylnaphtalene 2-Nitrotoluene Trichloroethene Perchlorate Manganese	VIII.1
RSA-272	Former UST for Boiler Unit, Building 7650	The site consists of the former location of an underground storage tank of unknown capacity which was located on the west side of Building 7650. A 1975 historical document shows that funding was budgeted for a tank removal at Building 7650; however, documentation of its completion was not found. This unit had the potential for releases but there were no documented releases.	Soil: COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-273	Propellant Conditioning & Motor Cycling, Building 7364	This site includes Building 7364 built in 1945 as a service magazine and rest house. In the 1950s, the building was used for motor cycling and propellant conditioning. Building 7364 reportedly contains a floor drain and trench drains that were connected to an exterior sump. Propellants, methylene chloride, and 1,1,1-TCA were used in this building. This unit had the potential for releases but there were no documented releases.	Soil: No COCs Groundwater: To be addressed under RSA-146	VI.6
RSA-274	Physics Laboratory & High Explosives Storage Magazine, Building 7540	RSA-274 was the site of an earthen-bermed bunker containing former Building 7540, Physics Laboratory and High Explosives Storage Magazine, and former Building 7541, which was a building constructed as a temporary storage area to support operations at former Building 7540. Building 7541 housed a vacuum pump and a hydraulic pump; it is unknown when the building was demolished. Building 7540 was constructed in 1963 as a propellant mixer building but the building was never used for propellant mixing. From 1970 to 1975, it was used as a physics laboratory. In 1985 it was used as a magazine for nitramine storage. From 1985 to 1992, it was used for high explosive storage. The building was demolished in 2014. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Trichloroethene 2-Nitrotoluene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-275	Film Processing Laboratory, Former Building S-7173	Building S-7173 was built in the early 1950s and used as a film processing laboratory. The activities supported operations at adjacent Building S-7172 (Post Engineer, Administration and Engineering Building), which is not within RSA-275. Both buildings were demolished by 1986. Within the RSA-275 site boundary are a pair of aboveground tank saddles, constructed of concrete and without a tank. Investigation results demonstrated that releases occurred at this site during its operational period	Soil: Arsenic Groundwater: Trichloroethene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	VI.6
RSA-276	Former Boiler House, Building 7362	RSA-276 is the site of the former Building 7362, including a former 5,000-gallon underground storage tank, located to the northeast of the building. Building 7362 was built in 1959 as a boiler house to support rocket casting and finishing operations conducted in adjacent Building 7360. During the steam house/boiler house operations, the underground storage tank was used to store No. 2 fuel oil to power the boiler house. The facility was used for storage of inert materials in the mid-1980s and continued to be used as such until deactivation in the 1990s. The building was demolished before 2000. No releases were known to have occurred at this site.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-277	Building 5487, Wastewater Maintenance Shop Acid Bath Wash Down Area	This unit is in the area of the former acid rinse wash-down basin. The acid rinse wash-down basin has not been in use since 1992. This site has the other following potential contaminant release locations: underground portion of discharge pipe, including the elbow/joint located directly beneath the basin drain, the acid bath wash-down basin discharge pipe outfall, and a surface drainage ditch. Prior to 1992, the heating, ventilation, and air conditioning shop in Building 5487 used the acid bath to clean tube bundles from heating and cooling systems. Following the acid bath, the tube bundles were transferred to the acid bath wash-down basin to be rinsed. Wash water from the basin discharged via an underground polyvinyl chloride pipe to a drainage ditch located approximately 20 feet to the north. In 2009, a total of 12.64 tons of surface soil containing concentrations of metals and polynuclear aromatic hydrocarbons above screening criteria were excavated in an interim measure soil removal at the site and transported to an approved landfill for disposal. Metals and polynuclear aromatic hydrocarbons meet the cleanup goals.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-278	Highway 565 Area	The Highway 565 Area is located off post, north of the northwestern corner of RSA and adjacent to Interstate spur 565. RSA-278-R-01 was once part of the following World War II era range fans: “4.2-Inch Mortar Range (RSA-072)”, “North Bombing Range (RSA-071)” and “Little Tokyo”, and “High Explosive Duds Bomb Drop Zone”. These ranges were known to use: mortars filled with sand, high explosives, FS smoke, and white phosphorous; bombs filled with PT1, IM-AE, and NP; and projectiles filled with white phosphorous, FM, and high explosives. A certificate issued in 1950 states that all lands bounded in what is now RSA-278-R-01 have been given a careful visual search and have been cleared of all dangerous and/or explosive material possible to detect.	To be determined	VI.2
RSA-279	Smoke Grenade Area	The specific historical use of this area is possibly as a smoke grenade test area in the 1940s but it is unknown if it may have been used for testing, training, disposal, or manufacturing. Several historic Redstone Arsenal maps from 1946 showed this location as a Smoke Grenade Area. One historic memo from 1948 referenced 143,716 HC smoke grenades to be demilitarized at an un-named location on Redstone. The area is included in the inventory because there is a potential that it may have been used for munitions-related purposes. No releases were known to have occurred at this site.	Investigation results demonstrated that releases occurred at this site during its operational period.	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-280	Skunk Hollow Small Arms Range	RSA-280-R-01 was constructed in 1991 and consisted of a 25-meter rifle range with an impact berm primarily used for small arms firing, including M-16 rifles, 40-millimeter practice grenades, and pistols. The small arms range was believed to have been in limited use for only two years and was closed in approximately 2001-2002 due to the potential for small arms to ricochet. The range included a covered firing and target area (Building 3520), an automatic target turning system, and a parking lot to the north of Building 3520. In 2012, the partially baffled Building 3520 was demolished. The wooden baffles, which were part of the structure and contained lead bullets, were left on site until 2014 when wood sampling was completed. After building demolition, a clear plastic tarp was placed over the exposed impact berm to minimize contaminant runoff/erosion. Former small arms range that has been inactive due to safety issues. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Lead Groundwater: No COCs	VI.6
RSA-281	Disposal Trenches at RSA-046 Range	RSA-281 contained probable disposal trenches. The disposal trenches within the two areas of the site (RSA-281N and RSA-281S) appear to have been operational from the late 1940s to the mid-1950s. RSA-281 was believed to have been used for the following: an impact area for white phosphorus rounds, disposal trenches were part of range clearance activities in the 1940s and 1950s for a historical range identified as RSA-046, and demilitarization of white phosphorus shells. Recent studies indicate that munitions and explosives of concern were found in the subsurface, and that chemical warfare materiel was neither found on the surface nor buried at the site. However, a low-level concentration of an agent breakdown product of mustard was detected in the subsurface at one location. Investigation results demonstrated that releases occurred at this site during its operational period.	To be determined	VI.2 and VI.5
RSA-282	Former Mortar Test Site (Not in Range)	RSA-282 (also known as RSA-072-R-01) was once a downrange portion of RSA-072, which was a mortar-tube proofing range during the early 1940s. As a result of the changes in operational range boundaries identified in the 2005 Operational Range Inventory Sustainment, RSA-072-R-01 was removed as an operational range and thus became Military Munitions Response Program eligible. Three potential source area sites, which are no longer active, were partially or completely within the boundary of RSA-072-R-01. Troop Training Area C slightly overlapped RSA-072-R-01 along its eastern boundary. Range 1B overlapped the southern portion of RSA-072-R-01 and was identified as a former 4.2-inch mortar impact area. Powder Storage Magazines were located within the boundary of RSA-072-R-01. More recently, munitions and explosives of concern have been discovered during redevelopment and construction at RSA-072-R-01. However, no munitions and explosives of concern were found during a recent intrusive investigation at the site. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Munitions and explosives of concern (potential) Groundwater: 2-Nitrotoluene Trichloroethene	VI.6[2]

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-283	Former Primary Substation No. 2, Building 3796	RSA-283, Primary Substation No. 2, Building 3796, was initially used by the Tennessee Valley Authority and then by the Army beginning in the early 1940s. The substation originally included three transformers that were used to reduce 161-kilovolt electrical service to 44 kilovolts for distribution. Numerous improvements and changes to the facility and equipment occurred over its operating period. The facility was taken out of service by 1997 and decommissioned in 2007, when a majority of the site equipment was removed. The following features were noted at the site during decommissioning: 23 transformers with the largest transformers situated on concrete foundation slabs and separated by concrete blast walls; numerous insulators and breakers; Building 3796 (control room); 2 stationary aboveground storage tanks and portable aboveground storage tanks for storage of transformer oil for use in transformers, insulators, and breakers; underground piping; and a former rail spur to deliver the transformers and other large equipment. Building 3796 remains but is presently abandoned. Several concrete blast walls, concrete slabs, and remnants of support structures for the former substation equipment remain at the site. However, all former electrical substation equipment (transformers, large insulators, breakers, and other electrical equipment) was removed from the site during decommissioning. The site area has remained inactive. Investigation results demonstrated that releases occurred at this site during its operational period. Contaminants in soil were addressed as an interim measure removal action in 2009. Approximately 185 cubic yards of polychlorinated biphenyl-contaminated soil was removed. COCs remain in groundwater.	Soil: No COCs Groundwater: Trichloroethene Dibenz(a,h)anthracene	VI.6
RSA-284	Fire Training Area	RSA-284 is fire training area that covers an area approximately 900 feet by 400 feet. The unit contains a burn pit, a diesel fuel aboveground storage tank, a drafting pit (used for extended testing of water pumping apparatus), a propane aboveground storage tank, and a structural training tower with a burn room. Discharges from the burn pit are routed to an oil/water separator. The oil/water separator discharges directly to surface drainage. During a site visit completed in May of 2007, it was determined that at least two documented releases of diesel fuel occurred at the fire training area in 2002 and 2007, which were properly responded to and cleaned up.	To be determined	VI.2
RSA-285	Former WP Grenade Test Area	This site is under the Military Munitions Response Program as a former white phosphorous grenade test area. This area is known as former Area 3 in the 1940s. Historical records list Areas 3, 9 and 15 as the White Phosphorous Grenade and M74 Bomb Test Stations where the original degree of contamination included: M69 Bombs, M74 Bombs, M15 Hand Grenades, M5 Smoke Pots, M1 Smoke Pots, M18 Colored Grenades, and AN-M6 Grenades. Area 3 was located in the Chemical Plants Area No. 1 location behind the white phosphorous production facility. It is anticipated that bombs would not have been tested at the Chemical Plants Areas because of the proximity to the buildings. Therefore, Area 3 is thought to only be a white phosphorous grenade and/or smoke pot testing area.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-286	Boiler/Steam Plant, Building 3624	RSA-286 consists of former building 3624 (formerly Steam Plant #3), which was constructed in 1943 and used as a steam plant until the 1990s. Multiple modifications to Building 3624 occurred since the original building construction. The four original boilers were replaced in 1960, two-large capacity aboveground storage tanks were installed in 1970, and the facility pollution control devices were updated in the 1990s. The aboveground storage tanks, designated as Tank 3620 and Tank 3621, were installed approximately 200 feet south of Building 3624. The aboveground storage tanks were dismantled and removed in 2000. Investigation results demonstrated that releases occurred at this site during its operational period. An interim measure soil removal action for petroleum-contaminated soil was completed in 2002 at Tank 3621 from historical tank leaks.	Soil: No COCs Groundwater: No COCs	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-287	Component Storage Warehouse, Building 3634	Building 3634 built in 1943 is a 12,780 sq. ft. storage warehouse for components in the Smoke Munitions Filling Area 2. In 1954, the building was used by the transportation organization as a shop for vehicle maintenance. Historical documents noted potential releases during vehicle oil changes and lubrications. The 1977 Water Quality Engineering Special Study No. 24-0034-78 documented the fact that releases identified as significant due to grease and oil associated with maintenance activities and oil spills. Based on current aerial photos it appears that any discharges from this building would likely flow to the southwest and enter a small ditch that is likely associated with another solid waste management unit. The discharge would have continued southward towards a large ditch and drainage system that receives run off from other solid waste management units.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-288	Drinking WTP #1, Sludge Thickener & Drying Beds, Buildings 8043 & 8044	RSA-288 was built in 1942 as the primary water treatment facility (Plant #1) for Redstone Arsenal. The plant served as the primary plant for industrial use and potable water for Redstone Arsenal until the 1990s, when the Army contracted with the City of Huntsville for its water supply. Since then, the plant has remained in use supplying industrial use water on an as-needed basis when the City of Huntsville cannot meet the full demand of Redstone Arsenal. Drinking WTP #1 also maintains potable water treatment capability. Water treatment consists primarily of particulate removal, polishing, and chlorination. The plant processes utilize aluminum sulfate, caustic, and gaseous chlorine. At its peak, the plant produced over 25 million gallons per day of industrial and potable use water, with the majority (22 million gallons per day) being for industrial use. RSA-288 consists of the sludge thickener tank (Building 8043) and drying beds (Building 8044), which were constructed in the late 1970s and are used to solidify and dewater treatment sludge periodically removed from the plant's settling basins and tanks prior to its disposal in the RSA landfills. At no time has the plant accepted or treated waste or storm water influent. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Arsenic Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	VI.6
RSA-289	Drinking WTP #2, Sludge Thickener (Building 9102) & Sludge Drying Beds	RSA-289 is part of Drinking Water Treatment Plant #2, which was built in 1943 and is still operational. The plant served as the secondary source for primarily industrial use water. The plant did add capacity for potable use supply, mainly to supply itself and the limited needs of a nearby outdoor recreational area. However, the gaseous chlorination process was removed from use in the mid-1980s. In 1991, the plant was converted to strictly industrial supply use. During the 1990s, Redstone Arsenal contracted with the City of Huntsville for its water supply. Since then, the plant has remained in an operational standby mode in case of an issue with Drinking WTP #1 or the City of Huntsville cannot meet the full demand of Redstone Arsenal. Drinking Water Treatment Plant #2 is maintained in operating condition and only used to treat and supply industrial use water, if necessary. Water treatment consists primarily of particulate removal and polishing. The plant processes currently utilize aluminum sulfate and caustic. Gaseous chlorine was also used until the mid-1980s. The plant is capable of producing up to 22 million gallons of industrial use water per day. The RSA-289 site has been defined as the sludge thickener tank (Building 9102) and the sludge drying beds that are still in place. Both have been utilized to solidify and dewater treatment sludge for disposal. Drinking Water Treatment Plant #2 is a source water treatment plant and has never accepted or treated wastewater or storm water influent. No releases have been documented at this site.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-290	Drinking WTP #3, Sludge Thickener & Drying Beds, Buildings 5431 & 5433	This unit is Drinking Water Treatment Plant #3, which began operating in 1959 and is still operating primarily to provide further polish and chlorination to supply water on a daily basis to portions of Redstone Arsenal using the industrial supply water as its source. The RSA-290 site has been defined as the previously removed sludge thickener tank and the sludge drying beds, which were removed sometime between 2002 and 2007. They were historically utilized to solidify and dewater treatment sludge for disposal in the Redstone Arsenal landfill. It is unknown if any releases from the sludge beds occurred. The Drinking Water Treatment Plant #3 is a source water treatment plant and has never accepted or treated wastewater or storm water influent.	Soil: No COCs Groundwater: No COCs	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-291	UST at Former Building T-3162 (Steam Plant)	Building T-3162 was built in 1942 as a boiler house. It continued as a steam plant through 1976 and was demolished by 1983. Records documenting the removal of underground storage tanks at T-3162 are not available. A boiler was identified as a secondary potential release mechanisms in addition to the underground storage tank at the site. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: 1-Methylnaphthalene 2-Methylnaphthalene n-Nitrosodiphenylamine	VI.6
RSA-292	UST at Building 3311 (Boiler & Compressor House)	Building 3311 was a boiler and compressor house from the late 1950s until the late 1990s. It was demolished by 2000. Two 16,500-gallon underground storage tanks were located on the east side of the building and removed in the 1980s. Petroleum-contaminated soil was encountered near Building 3311 during installation of steam lines. No releases have been documented at this site.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-293	Former USTs at Building 3639 (Screening & Proportioning Smoke Components Building)	Building 3639 was used as a screening and proportioning building for various mix components in the 1940s for the 105 mm M-1 white and M-2 colored smoke canisters. During the 1950s, Building 3639 was converted from a smoke grenade filling operation to a government vehicle filling station. Five underground storage tanks for gasoline and diesel fuel were installed in three separate tank areas, and a fuel dispenser island covered by a canopy was constructed on the west side of the building to support the operation of the filling station. Reportedly, the following were removed in 1996: two 10,000-gallon regular unleaded gasoline underground storage tanks, one 5,000-gallon diesel underground storage tank, and two 5,000-gallon gasoline underground storage tanks. The underground storage tanks were replaced by aboveground storage tanks in 1996. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: To be determined	VI.2
RSA-294	Field Training Exercise Area E	This unit encompasses the portion of historical Field Training Exercise Area E located south of Martin Road. The training area was reportedly used by National Guard and rescue units for conducting training exercises in the 1960s and 1970s. It was initially thought that smoke grenades, flares, and blank small-arms ammunition were possibly used as training munitions. However, no visible signs of training activities have been found at the site. Based on being identified as a field training exercise area and the potential use of munitions, RSA-294-R-01 has been assigned to the U.S. Department of Defense Military Munitions Response Program for investigation and cleanup. No releases have been documented at this site.	Soil: Potential for munitions and explosives of concern Sediment: No COCs Surface Water: No COCs Groundwater: No COCs	VI.6[2]
RSA-295	Hazardous Waste TSA, Building S-3335	This unit was a chemical storage building (Building S-3335) used for a less-than-90-day storage area for hazardous waste. The building was 178 sq ft in size and began operation in 1994. During the 2008 visual site inspection by the Alabama Department of Environmental Management, the unit was no longer storing hazardous waste but was used for "product in use" items.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-296	Disposal Area North of RSA-011I	This site lies just south of RSA-011, Sewage Treatment Plant #1 and was thought to be a historical disposal area based on the presence of debris piles. Materials identified in the piles included brick, metal, piping, siding, concrete, paint cans, trash cans, roof vents, and fencing/posts. However, no evidence of any disposal activities was found and the origin of the construction/demolition materials present in unknown. No releases have been documented at this site.	Soil: No COCs Groundwater: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-297	Ammunition Packing/Shipping, Building 7551	Former Building 7551 was a packing and shipping facility for cartridge cases, shells, and other prefabricated ammunition components during the 1940s. Smoke and white phosphorus shells were inspected and cleaned. From 1950 to 1977, it was used for missile/propellant research, development, and testing. From 1977 to 1993, the building was used for storage and administration. Historically, Building 7551 discharged some potable, industrial, cooling, and boiler blowdown water to an open ditch. No releases have been documented at this site.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-298	Hazardous Waste TSA, Building 8408	Building 8408 was constructed in 1953 to provide storage for the adjacent demolition area (open burning/open detonation). Building lists indicate that it has remained a storage facility throughout its history. Building 8408 is used to store lumber and 55-gallon drums filled with burn pan ash. The earth-covered concrete structure has a large rollup door (approximately 20 ft by 20 ft) on the southern side. The concrete floor is painted and sealed. A small concrete pad with a safety shower and eye wash station lies outside the southeast corner of the building. No releases have been documented at this site.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-299	Hazardous Waste TSA, Building 7216	The unit began operating in 1987, and it is 12,230 square feet in size. Wastes currently managed in the building include nonhazardous waste and universal waste, primarily lead acid batteries. Building 7216 is one of many warehouses located near the DRMO main office. It is a brick building with a concrete floor. It is available in the event there is a special project which might generate a large amount of hazardous waste, for which Redstone Arsenal would not have sufficient storage capability in the permitted hazardous waste storage igloos. No releases have been documented at this site.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-300	Hazardous Waste TSA, Building 7172	This unit is a less than 90-day hazardous waste storage area in Building 7172 which began operating in 1993. Release controls for the unit include secondary containment sumps, secondary spill pallets, liquid tight drums/containers, and liquid spill absorbent materials contained within the shed. The shed is 87.6 square feet in size. Typically waste streams include D003 (reactive) wastes due to their potentially explosive nature (e.g., explosives/propellant contaminated solvents, water, and solid media [disposable personal protective clothing and personal protective equipment, wooden tongue depressors, Q-Tips, Kim-Wipes, etc.]). At times, some off-spec propellant formulations and small-lab scale explosive materials that are classed as hazardous waste have been stored in this unit. Waste streams (disposable media as stated above) from energetic liquid propellant research and development programs (e.g., hydrazine family of fuels and monopropellant formulations, classed as D003) have been stored in this unit. Waste streams may also have other F-code and D001, D002, and toxic metals hazardous waste characteristics as determined by chemical analysis, user knowledge, and material safety sheets. All D003 waste is disposed at the Redstone Arsenal Open Burn/Open Detonation area. The volume of waste managed is unknown. Handheld radios and/or cell phones are used for emergency communication in the event of an incident. No releases have been documented at this site.	No COCs based on low potential for release (ADEM, 2008).	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-301	Hazardous Waste TSA, Building 7173	This unit is a less than 90-day hazardous waste storage area in Building 7173 which began operating in 1993. Release controls for the unit include secondary containment sumps, secondary spill pallets, liquid tight drums/containers, and liquid spill absorbent materials contained within the shed. The shed is 87.6 square feet in size. Typically waste streams include D003 (reactive) wastes due to their potentially explosive nature (e.g., explosives/propellant contaminated solvents, water, and solid media [disposable personal protective clothing and personal protective equipment, wooden tongue depressors, Q-Tips, Kim-Wipes, etc.]). At times, some off-spec propellant formulations and small-lab scale explosive materials that are classed as hazardous waste have been stored in this unit. Waste streams (disposable media as stated above) from energetic liquid propellant R & D programs (e.g., hydrazine family of fuels and monopropellant formulations, classed as D003 have been stored in this unit). Waste streams may also have other F-code and D001, D002, and toxic metals hazardous waste characteristics as determined by chemical analysis, user knowledge, and material safety sheets. All DO03 waste is disposed at the Redstone Arsenal Open Burn/Open Detonation area. The volume of waste managed is unknown. Handheld radios and/or cell phones are used for emergency communication in the event of an incident. The unit has no known history of releases.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-302	Hazardous Waste TSA, Building 3802	The unit is a less than 90-day hazardous waste storage area in Building 3802 which began operating in 2003. Release controls for the unit include curbing, secondary containment, and abundant spill containment kits/media stored on-site. The building is 225 square feet, and is used to store universal waste (spent florescent bulbs and lead acid batteries); toner cartridges; petroleum, oil, and lubricants; and antifreeze. The wastes are collected from Building 5423, and all wastes (except lead acid batteries) are recycled. The lead acid batteries are managed through a direct exchange program. Wastes are also collected from a vehicle maintenance shop in Building 3799. The storage unit manages approximately 2 boxes of spent florescent bulbs per year, approximately 4 to 5 toner cartridges per year, approximately 1,500 gallons of petroleum per year, approximately 150 gallons of antifreeze per year, and approximately 150 lead acid batteries per year. The unit has no known history of releases.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-303	Hazardous Waste TSA, Building 7700	The unit is a less than 90-day hazardous waste storage area in Building 7700 which began operating in 2004. The area used to store hazardous waste is limited to only a portion of the 3,034 square foot building. It is estimated that less than 1,000 square feet of the building is used for waste storage. The unit is has been used to store investigative-derived and remediation-drive wastes resulting from environmental investigations/remediation. The unit was inactive during the 2008 visual site inspection by the Alabama Department of Environmental Management. All wastes were stored in an area underlain by steel reinforced concrete that is sloped to retain any spills within the storage area. All waste is also placed on spill pallets to prevent the release of wastes to the concrete surface. The unit has no known history of releases.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-304	OWS, Washrack & Sump, Adjacent to Building 5498	RSA-304 consisted of a vehicle washrack, an underground settling basin, and an adjacent underground oil/water separator that are located in the parking lot adjacent to Building 5498. The vehicle washrack has been in continuous operation since its construction in 1979 and was replaced in 2002. The purpose of the settling basin was to capture dirt and solids generated during washing operations and prevent solid materials from reaching the oil/water separator. When the liquid level in the basin reached the height of the effluent discharge pipe, it is designed to flow via gravity siphon to the oil/water separator via a 6-inch-diameter discharge pipe. Due to the length of time the original oil/water separator was in operation and imperfections in the concrete construction of the unit, there is a high potential that the original oil/water separator may have released waste into the surrounding subsurface soil and that this waste could have contained regulated substances. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Aldrin Dieldrin Heptachlor epoxide	VI.6
RSA-305		Building 3664 was constructed in 1952 as a Dispatcher's Office in support of the Motor Pool Area. The building is currently active. A washrack was constructed east of Building 3664 prior to 1977, and an oil/water separator was	Soil: No COCs	

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
	Dispatcher's Office with Washrack, Building 3664	added to the washrack after 1977. The washrack was historically used for washing the exterior of vehicles maintained in the motor pool. Prior to 1977, the discharges from the washrack were likely routed via a 4-inch cast iron pipe to a sump located to the east of the washrack. There are no current visible indications of releases in the ditch located to the east. There is no information available that indicates that the washrack was ever used for the management or disposal of wastes. Investigation results demonstrated that releases occurred at this site during its operational period.	Groundwater: Trichloroethene	VI.6
RSA-306	Steam Heating Plant, Building 7291	RSA-306 is an active steam heating plant (Building 7291) used to support operations in the adjacent rocket motor conditioning facility, Building 7290. Building 7291 was constructed in 1961 with two Number 2 fuel oil-fired boilers. Features within or surrounding the site include Building 7291, a concrete sump, an oil/water separator, a 10,000-gallon aboveground storage tank storing Number 2 fuel oil, and a water conditioning vault. Potential releases at Building 7291 include petroleum, oils, lubricants, leaks and spills during boiler operation, overflows of boiler water or boiler blow-down, and brine from water softening to the pipe trench. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Iron 1-Methylnaphthalene Benzo(a)anthracene Benzo(b)fluoranthene Dibenz(a,h)anthracene Benzene	VIII.1
RSA-307	Hazardous Waste TSAs B and C, Building 7347	This unit consisted of two metal flammable storage cabinets (Temporary Storage Area B and Temporary Storage Area C) equipped with locks and built-in secondary containment. These storage cabinets began operations in 2002 and occupy approximately 100 square feet. The cabinets stored solids contaminated with flammable liquids (Qtips, wipes, and swabs contaminated with sealants and solvents). Approximately 1,000 pounds of waste were managed per year. The waste was disposed offsite. There have been no known releases from this unit.	No COCs based on low potential for release (ADEM, 2008).	VI.3
RSA-308	Exterior Sump at Building 7120	RSA-308 is an exterior lead-lined sump at Building 7120 to support the propulsion laboratory test bays (small-scale propellant mixing, casting, curing, testing, painting, and/or degreasing). 20. The exterior sump includes a total of three sumps. Open, lead-lined trenches from various test bays collected floor washings and spills and drained in succession to Sumps 1, 2, and 3. After Sump 3, wastewater flowed to a concrete drainage channel, which then flowed into Sump 4 before emptying to an outfall and storm water collection area. Additional lead-lined trenches with steel grate covers drained the newer test bays on the north end of Building 7120. These trenches drained into a larger open, lead-lined channel that runs adjacent and parallel to the concrete drainage channel leading from Sumps 1, 2, and 3 and emptied into Sump 4. Overflow from Sump 4 drained into the same storm water collection area as the concrete drainage system. Perchlorate has been released to soils at this site. The current mission of Building 7120 is the mixing and testing of small batches of propellants; however, only small quantities of waste are currently generated, drummed, and managed for disposal. Sumps 1, 2, and 3 are not part of the current operations at Building 7120 and the Army has plans to permanently close them in the near future. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Perchlorate Groundwater: RDX Perchlorate Dibenz(a,h,)anthracene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-309	Covered Trench & Sump at Building 7155	RSA-309 consists of a covered trench and sump that drains from Building 7155. Building 7155 and covered trench and sump were built in 1988. Building 7155 is 10,330 square feet in size and has been used as a laboratory since its construction. Laboratory activities as Building 7155 consist of testing both inert and energetic materials (propellants) related to the Ordnance Missile Laboratories operations. The majority of the tests are conducted to determine the causes of malfunctions in rocket and missile components for design improvements. Nine test bays are present along the north side of Building 7155. Trench drains within the test bays have open steel grating and are designed to capture spills and releases and route the releases to the RSA-309 metal-covered trench and eventually to the sump. Little to no documentation of historical waste activities is available for the test bays at Building 7155 or of any materials discharged through the covered trench to the sump. It is unknown if any releases of hazardous materials has occurred from RSA-309.	Soil: No COCs Groundwater: No COCs	VI.2
RSA-310	Former OWS & Suspected OWS at Building 7289	RSA-310 contained one historical facility, Building 7289, which was constructed by the Army in 1961 and operated until 1996 as a boiler house to support heating operations in the nearby rocket motor conditioning facility. An oil/water separator located northwest of the building was connected to the sanitary sewer and only received discharges from Building 7289. There are no details on the type of wastes managed by the oil/water separator. This oil/water separator and surrounded contaminated soil was removed in 2001-2002 and disposed of at the Huntsville City Landfill. A suspected second oil/water separator is located just south of the building and likely served as the oil/water separator for Building 7289 prior to the installation of the removed unit. When the removed unit was installed northwest of Building 7289, it is possible that the existing suspected oil/water separator was abandoned without removal.	Soil: No COCs Groundwater: No groundwater encountered	VI.3
RSA-311	Exterior Sump & Interior Concrete Pits at Building 7352	Building 7352 was constructed in 1989 and was originally used as a cleaning facility for equipment and tools used in propellant mixing and casting operations at nearby facilities. Beginning in 2009, the southern bays were used for a missile recycling program feasibility study and used anhydrous ammonia to dissolve explosives, energetics, and propellants and to remove the materials from missile housings. On May 10, 2010, an explosion occurred at Building 7352 when workers were working on a new process to separate ammonium perchlorate from other components in the missile fuel. The explosion killed two workers and injured a third and resulted in damage to Bay 1. The building has not been occupied or repaired since the accident. The features associated with Building 7352 include: 1) A north bay (Truck Ramp Bay) with an interior concrete pit (Pit 1) that is 8 feet square and 8 feet deep. Smaller equipment was cleaned in this bay and wastewater collected in the pit was pumped to Pit 2 in the center bay where it was treated with a wastewater treatment system. 2) A center bay with an interior concrete pit [Impoundment Tank (Pit 2)] that is 36 feet by 16 feet by 3.5 feet deep. Larger equipment was cleaning cleaned in this bay using high-pressure washers above the concrete pit. 3) Three smaller bays in the southern portion of the building (Bay 1, Bay 2 and Bay 3) with Bays 1 and 2 having floor trench drains for floor wash down that flowed to exterior sumps on the east and west sides of the building. Bay 3 was used as a storage room. Bay 1 was destroyed in the explosion. These bays were used for large component cleaning, small parts cleaning, and equipment storage between 1989 and 1995. 4) Three exterior sumps (Sumps 1, 2, and 3) approximately 5 feet by 10 feet in size and 4 feet deep. The sumps were built to contain water and do not have drains or outlets to the soil. The RSA-136B temporary waste storage area located east of Building 7352 was used to store propellant wastes. Investigation results demonstrated that releases occurred at this site during its operational period. COCs are present in groundwater.	Soil: No COCs Groundwater: Dibenz(a,h)anthracene 2,6-Dinitrotoluene 2-Nitrotoluene RDX TCE Perchlorate cis-1,2-Dichloroethene Vinyl chloride 1,3-Dinitrotoluene 2,4-dinitrobenzene 3-nitrotoluene Nitroglycerin Nitrobenzene	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-312	Former Range Area for Gate 7 Expansion	Beginning in the 1940s, a majority of RSA-312-R-01 was a buffer area between the western boundary of Redstone Arsenal and the adjacent ranges (Test Areas 3 and 6); it was not used as an impact or explosive testing area. However, a subarea of RSA-312-R-01 known as RSA-073 (former M50 testing area) was used for explosives training and munitions testing of AN-M50X incendiary bomblets during 1940s and 1950s. Munitions and explosives of concern and munitions debris have been recovered from the shallow subsurface of the former M50 testing area. With the exception of the AN-M50 thermate bomb found on the surface in 2014, no munitions and explosives of concern have been found outside of the former M50 testing area. Investigation results demonstrated that releases may have occurred at this site during its operational period. COCs are present in groundwater.	Soil: Munitions and explosives of concern Groundwater: 2-Nitrotoluene 1,3-Dinitrobenzene	VI.6
RSA-313	Western Side of Former High Explosive Drop Area A	Beginning in the 1940s, the site represents the area that has been transferred to the City of Huntsville for the widening of Zierdt Road and is within the buffer zone for two former bombing and mortar range areas: Area 2 and RSA-071. Available historical information indicates that the areas within RSA-313-R-01 were not used as impact or explosives testing areas. During Zierdt Road widening activities, a 4.2-inch illumination mortar was identified on the ground surface in the north-central portion of the site, treated as munitions and explosives of concern, relocated nearby, and blown in place. No munitions and explosives of concern or munition-related items were found on the surface of the entire site but two munitions-related items (4.2-inch mortars) were recovered during the single point anomaly investigation excavations in the northern portion of RSA-313-R-01. Numerous uninvestigated single point anomalies detected above project threshold limits still remain in the northern portion of the site. There is currently insufficient information to determine whether these items are inert. Investigation results demonstrated that releases may have occurred at this site during its operational period. COCs are present in groundwater.	Soil: Munitions and explosives of concern Groundwater: 2,4-Dinitrotoluene 2,6-Dinitrotoluene 2-Nitrotoluene Bis(2-ethylhexyl)phthalate Trichloroethene 1,3-dinitrobenzene Nitrobenzene Nitroglycerin Benzo(a)anthracene Dibenz(a,h)anthracene Naphthalene	VI.6
RSA-314	Used Oil AST & Spill Site, Building 3670	In August 2010, an estimated 25 gallons of used oil were released from a 2,000-gallon aboveground storage tank (Tank 3670) located on the southeast corner of Building 3670. The tank had internal secondary containment spill protection, but the spill occurred due to failure of the overfill alarm. Used oil was observed seeping into the soil below. At the time of the spill, the external concrete secondary containment had not been installed and the tank was located directly on the ground surface. Following the spill, the soil was removed beneath the tank to a depth of 4 feet. An estimated 1,300 cubic feet of excavated soil were taken to the Redstone Arsenal soil recycling facility. No further releases have been reported at the tank location. The tank was subsequently moved to the west side of Building 3670, where it is currently located. Free product was discovered in groundwater about 50 feet south of Building 3670 in 2014. Due to the presence of a 10,000-gallon Number 2 fuel oil aboveground storage tank (3668) and fuel oil pump house (3669) associated with Building 3670, the RSA-314 area of concern was expanded to include Building 3670, the 3668 aboveground storage tank, and the 3669 pump house as possible sources of contamination.	Soil: Arsenic Groundwater: Cobalt Manganese 1-Methylnaphthalene Dibenz(a,h)anthracene bis(2-Ethylhexyl)phthalate n-Nitroso-di-n-propylamine Trichloroethene	VI.2

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-315	Abandoned Drum Area near the Golf Course	This site consists of three debris areas that were discovered in 2011 and designated as Areas 1, 2, and 3. Debris consists of steel containers, steel drums, tire casings, concrete, metal, rubber hoses, spent oil filters, and other miscellaneous debris. Some of the rusted drums and other debris were removed in 2011. The source of the debris piles is believed to be from the golf course or possibly from construction of the Officers Club (Building 130). Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: Arsenic Lead Groundwater: No groundwater encountered	VI.6
RSA-316	7500 Area Hardstand Parking	RSA-316 was created in 2012 when three used oil spill areas were discovered, presumably from military vehicles that were parked at the site. This area was historically used as a parking area. RSA-209 lies just east of RSA-316, and a 0.7-acre area of the RSA-209 site boundary overlaps with RSA-316). Former Building 7568 within RSA-209 was used for perchlorate crushing and grinding operations.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-317	Construction Site East of Building 5674 off Technology Road	A debris pile is present at this site that was generated during site clearing operations and several loads of gravel are present that were intended for use in the construction activities. The area was being cleared and graded as part of ongoing construction activities at Redstone Arsenal. During soil grading operations associated with construction activities, an area of soil that appeared to be burning and emitting a white smoke was observed after the soil had been removed from the area during leveling operations. The area was re-covered with soil and the burning and white smoke ceased. The cause of the smoke is unknown. Visual inspection of the site did not reveal an obvious cause for the burning or smoke. Additionally, the visual inspection did not indicate the presence unexploded ordnance or pieces of scrap metal that would suggest that munitions were present. During an additional visual inspection of the site, a thin layer of black material was observed in the area where the burning and smoking was observed and in many other areas across the site. The origin of the black material is unknown.	To be determined	VI.2
RSA-318	Smoke Pot Disposal Area	RSA-318 is an area where M4A2 smoke pots were likely used or disposed either during WW II (1941 to 1945) or during the numerous demilitarization projects that were completed at Redstone Arsenal from 1945 to 1949. The M4A2 smoke pot was produced in very large numbers at Redstone Arsenal during WW II. The M4A2 smoke pot was typically filled with a mixture of hexachloroethane, zinc oxide, and aluminum. This site is located along the banks of McDonald Creek. A stabilization action has been conducted to prevent items from transport into the creek.	To be determined	VI.2
RSA-319	Former Oil/Water Separator, Building 4812 & Pad	During soil excavation operations associated with installation of a new eyewash stand in 2014, the contractor observed areas of discolored soil and an oily sheen on water in the hole being excavated for the purpose of tapping into the existing water line to install the eyewash stand. A petroleum odor was also noted by the individuals involved. Based on observations from multiple site visits, a brief review of the historical use of the area, and results of soil sampling it is believed that the soils were impacted from one or more past activities in the immediate area, which historically involved fueling operations. In addition, several potential sources of petroleum contamination are located in the immediate vicinity to RSA-319 including: the initial stage of the oil/water separator at RSA-035, the former Airfield underground storage tank, storage of flammable liquids in Building 4812 on site, fuel truck parking area and historical open storage areas next to Building 4812, the existing airfield fuel dispenser and underground storage tank located north of the site, runoff from the fueling apron located along the west side of the site, and underground surface drainage piping for the aforementioned potential sources.	To be determined	VI.2
RSA-320	Parking/Equipment Staging Area	RSA-320 is a parking and equipment staging area between Buildings 5494 and 5495 to the north and Building 5487 to the south. The area is covered by old asphalt and gravel. Oil, grease, and hydraulic fluid leaks from equipment being parked/staged in the area may have occurred.	To be determined	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-321	Cleared Area East and Northeast of Building 3639	RSA-321 is in the area identified with the former Smoke Munitions and Filling Plant #2 of the Army's Redstone Ordnance Plant. The general area has been active since 1943. RSA-321 was behind Building 3639 which was used as a screening and proportioning smoke components facility. A powder magazine was across Patriot Drive. Buildings to the west were used for warehousing operations and maintenance activities. 1956 and 1961 aerial photographs indicated an area of soil disturbance (cleared area) east and northeast of Building 3639 but the origin is unknown.	To be determined	VI.6
RSA-322	Hazardous Waste Storage Igloo, Building 8205	This unit is a hazardous waste storage unit (Building 8205). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for the Operations building.	To be determined.	VI.4
RSA-323	Hazardous Waste Storage Igloo, Building 8208	This unit is a hazardous waste storage unit (Building 8208). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of conventional unexploded ordnance.	To be determined.	VI.4
RSA-324	Hazardous Waste Storage Igloo, Building 8209	This unit is a hazardous waste storage unit (Building 8209). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of donor explosives.	To be determined.	VI.4
RSA-325	Hazardous Waste Storage Igloo, Building 8210	This unit is a hazardous waste storage unit (Building 8210). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of donor explosives.	To be determined.	VI.4
RSA-326	1-lazardous Waste Storage Igloo, Building 8211	This unit is a hazardous waste storage unit (Building 8211). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of unknown liquid-filled items and recovered chemical warfare materiel.	To be determined.	VI.4
RSA-327	Hazardous Waste Storage igloo, Building 8212	This unit is a hazardous waste storage unit (Building 8212). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for the Operations Building.	To be determined.	VI.4
RSA-328	Hazardous Waste Storage Igloo, Building 8213	This unit is a hazardous waste storage unit (Building 8213). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of unknown liquid-filled items and recovered chemical warfare materiel.	To be determined.	VI.4
RSA-329	Hazardous Waste Storage Igloo, Building 8214	This unit is a hazardous waste storage unit (Building 8214). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of unknown liquid-filled items and recovered chemical warfare materiel.	To be determined.	VI.4
RSA-330	Hazardous Waste Storage Igloo, Building 8216	This unit is a hazardous waste storage unit (Building 8216). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of conventional unexploded ordnance.	To be determined.	VI.4
RSA-331	Hazardous Waste Storage Igloo, Building 8217	This unit is a hazardous waste storage unit (Building 8217). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of waste in this unit (unassigned).	To be determined.	VI.4

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-332	Hazardous Waste Storage Igloo, Building 8218	This unit is a hazardous waste storage unit (Building 8218). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimension are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of donor explosives.	To be determined.	VI.4
RSA-333	Hazardous Waste Storage Igloo, Building 8219	This unit is a hazardous waste storage unit (Building 8219). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of hazardous and toxic waste (unassigned).	To be determined.	VI.4
RSA-334	Hazardous Waste Storage igloo, Building 8220	This unit is a hazardous waste storage unit (Building 8220). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of hazardous and toxic waste (unassigned).	To be determined.	VI.4
RSA-335	Hazardous Waste Storage Igloo, Building 8221	This unit is a hazardous waste storage unit (Building 8221). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of hazardous and toxic waste (unassigned).	To be determined.	VI.4
RSA-336	Hazardous Waste Storage Igloo, Building 8222	This unit is a hazardous waste storage unit (Building 8222). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the stored waste in this unit (unassigned).	To be determined.	VI.4
RSA-337	Hazardous Waste Storage Igloo, Building 8223	This unit is a hazardous waste storage unit (Building 8223). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the stored waste in this unit (unassigned).	To be determined.	VI.4
RSA-338	Hazardous Waste Storage Igloo, Building 8224	This unit is a hazardous waste storage unit (Building 8224). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of conventional unexploded ordnance.	To be determined.	VI.4
RSA-339	Hazardous Waste Storage Igloo, Building 8225	This unit is a hazardous waste storage unit (Building 8225). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the stored waste in this unit (unassigned).	To be determined.	VI.4
RSA-340	Hazardous Waste Storage Igloo, Building 8226	This unit is a hazardous waste storage unit (Building 8226). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of hazardous and toxic waste (unassigned).	To be determined.	VI.4
RSA-341	Hazardous Waste Storage Igloo, Building 8227	This unit is a hazardous waste storage unit (Building 8227). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of hazardous and toxic waste in this unit (unassigned).	To be determined.	VI.4
RSA-342	Hazardous Waste Storage Igloo, Building 8228	This unit is a hazardous waste storage unit (Building 8228). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the stored waste in this unit (unassigned).	To be determined.	VI.4

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-343	Hazardous Waste Storage Igloo, Building 8229	This unit is a hazardous waste storage unit (Building 8229). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. The facility use is primarily designated for storage of donor explosives.	To be determined.	VI.4
RSA-344	Hazardous Waste Storage Igloo, Building 8230	This unit is a hazardous waste storage unit (Building 8230). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the stored waste in this unit (unassigned).	To be determined.	VI.4
RSA-345	Hazardous Waste Storage Igloo, Building 8231	This unit is a hazardous waste storage igloo (Building 8231). Primary containment and a spill pallet are used for the storage of hazardous waste requiring secondary containment. The storage dimensions are 26'5" x 81' and maximum volume is 13,200 gallons. No primary designation has been made for the storage of hazardous and toxic waste in this unit (unassigned).	To be determined.	VI.4
RSA-346	White Phosphorous Smoke Grenades near TA-5	This unit was defined as the area where during a natural gas line construction project near the entrance gate of Training Area 5, 23 M15 white phosphorus smoke grenades were unearthed. RSA-346 is within the former Gulf Chemical Warfare Depot, an area that historically stored, shipped and received munitions. This area was not directly involved in the production, storage, or disposal of M15 WP grenades and the M15 WP grenades were improperly disposed of at this location; however, this improper disposal appears to be an isolated, localized incident.	To be determined	VI.2
RSA-347	Small Arms Range near Vincent Park	This unit was a small arms range that operated between 1952 and 1962. A berm appears to have been abandoned years ago and lead bullets from black powder shot were present on the ground west of the berm. The berm itself had primarily jacketed ammunition that appeared to be 45 rounds. This could indicate that the area was in use for black powder shot prior to the official small arms	To be determined	VI.2
RSA-A	Inactive Propellant Storage Wells South	This unit had facilities, Buildings 7598, 7599, and 7580, and the propellant wells supporting rocket propellant research and experimentation. Building 7598 was a chemical processing building for experimental rocket propellants until 1971. From 1975 to 1982, Building 7598 was as part of a side thruster motor manufacturing and assembly process. In the early 1990s Building 7598 was used as a missile laboratory. Building 7580 was a small utility shed probably used to store drummed chemicals and/or fuel from the mid-1950s to the early 1970s. Building 7599 was an earthen bunker used in support of chemical processing at Building 7598, with storage operations continuing until the mid-1990s. The propellant storage wells consist of 51 steel-cased, 4-inch diameter wells less than 4 feet deep. The wells were used as temporary storage for experimental explosives, propellants, and/or motors. The wells are located in a 36- by 64-foot fenced area northwest of former Building 7598. No propellants or other waste remain in the wells. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Perchlorate Lead 1,3-Dinitrobenzene 2,4-Dinitrotoluene 2-Nitrotoluene 3-Nitrotoluene Nitrobenzene Nitroglycerin RDX 1,1-Dichloroethene 1,2-Dichlorobenzene 1,2-Dichloroethane Acetone Chlorobenzene Chloroform cis-1,2-Dichloroethene Freon 113 Methylene chloride Tetrachloroethene	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-B	Abandoned Army Propellant Mfg Bldg 7598	Building 7598 was constructed in 1955 and used as a chemical processing building for experimental rocket propellants until 1971. The building was then used between 1975 and 1982 for rocket side-thruster motor manufacturing. In the early 1990s, it was used as a missile laboratory. Cells and bays contained within the building structure were sloped to drain to open floor gutters connected to aluminum-covered floor drains that exited the building approximately 20 feet west of the northeast corner. The drain was connected outside to a 6-by-6 by 5-foot-deep concrete-lined sump. Chemicals listed as having been used in the building include hydrogen fluoride, nitrogen-based explosives, and various solvents. Building 7598 was demolished in the late 1990s. No releases were known to have occurred.	Soil: No COCs Groundwater: No COCs	VI.3
RSA-C	Abandoned Anny Propellant Mixing Bldg 7596	This unit was part of the former chemical shell production Lines Number 3 and Number 4 of the Army's Redstone Ordnance Plant in the 1940s. During the 1950s, facilities were built at what is now RSA-C to support propellant experiments and manufacturing as part of the Redstone Arsenal Rocket Engine South Plant. The site encompasses three buildings: Building 7595, Building 7596, and Building 7597. Building 7596 was used as a chemical processing facility for experimental rocket propellant mixing from 1956 to 1989; it was demolished in 2002. Building 7596 was used from 1955 to 1971 for wetting, rolling, and cutting petrin acrylate propellants as part of the missile assembly process and then as a maintenance facility for the Dragon missile program until 1982; the building was demolished in 1997. Building 7597 was used for casting and curing large rocket motors and propellant mixing for preparation of petrin acrylate propellant from 1955 until the early 1970s. Building 7597 was used for general storage from 1975 to 1982 and then demolished between 2002 and 2007. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: RDX	VI.6
RSA-D	Paint Storage Shed, Bldg 3547	This site contained a paint shed and a paint storage shed. The paint shed (12' x 20') was used for spray painting special cyanide-based paints, which were discharged into a sump. The paint storage shed (8' x 8') was mobile and was used for storing paint, Freon, acetone, and aerosols. No releases were known to occur.	Soil: No COCs Groundwater: Addressed with RSA-145	VI.6

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
RSA-E	No. 2 Fuel Oil Spill, Tank 5693 at the Fuel Farm	RSA-E resulted from a 1985 release of approximately 58,584 gallons of No. 2 fuel oil from aboveground storage tank 5693 within the adjacent bulk fuel farm (RSA-028). Immediately after the spill, recovery efforts were implemented in the form of a product recovery trench approximately 300 feet long, 6 to 8 feet wide, and 14 feet deep and located approximately 200 feet south of Tank 5693. Ultimately, 366,000-gallons of an oil/water mixture were recovered. At the end of the effort, an estimated 30,000 gallons of the No. 2 fuel oil may have seeped into the ground and migrated to the groundwater. Free product was not found in downgradient monitoring wells or in a nearby tributary of the Huntsville Spring Branch. Investigation results demonstrated that releases occurred at this site during its operational period.	Soil: No COCs Groundwater: Iron Manganese Mercury 1-Methylnaphthalene Dibenz(a,h)anthracene Benzene Trichloroethene 2-Methylnaphthalene Benzo(a)anthracene Dibenzofuran Naphthalene Methyl-tert-butyl ether Surface water: Iron	VI.2
RSA-F	Fenced Open Storage/Laydown Yard	This unit was a gravel-covered storage area. The site currently includes open and covered areas that store Defense Reutilization and Marketing Office scrap materials and equipment until disposition (sale or recycle). Laydown areas stored a variety of materials, including transformers; empty drums; scrap metal; and petroleum, oils, and lubricant products. The southern portion of the site contained a former 90-day Resource Conservation and Recovery Act waste accumulation area for hazardous waste storage. There are no documented releases from the hazardous waste storage area, although soil staining was reported near the northern site boundary. A polychlorinated biphenyl spill may have occurred in the northern portion of the site. However, investigations determined that a source is not present in soil and no COCs are present in groundwater.	Soil: No COCs Groundwater: No COCs	VI.2
MSFC-002/087	Inactive Abandoned Drum Disposal Site/Inactive Cyanide Lagoon	This site consisted of several waste piles from the 1950s in the 100-year floodplain. An inactive cyanide lagoon (MSFC-087) is located within the boundary of MSFC-002. In 2004, the U.S. Environmental Protection Agency requested that MSFC-087 be administratively combined with MSFC-002. A non-time-critical removal action was conducted at the site in 2007 to address contaminated soil (select pesticides and polynuclear aromatic hydrocarbons) from past disposal of construction and general debris in the piles and mounds at the site. The removal action achieved the remedial goals.	Soil: No COCs Groundwater: No COCs	VI.3 and VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
MSFC-003-R-01	Inactive Old Bone Yard Disposal Site #1	This site was used for the disposal and/or treatment of chemical munitions, toxic materials, chemical wastes, and phosphorous-filled munitions. MSFC-003-R-01 was divided into three munition response sites based on historical site knowledge: MRS-1 includes historical waste disposal area MSFC-3E, which is a historical landfill (records indicate that all of the miscellaneous debris within the footprint of the water reservoirs created for the Saturn Test Stand in MSFC-3 was relocated to MSFC-3E); MRS-2 includes historical waste disposal area MSFC-3 and the northern third of historical waste disposal area MSFC-082, which was the historical "Boneyard" site and reference was made in 1957 that it was used by various laboratories and construction contractors to dispose of scrap material that would normally be disposed of at the sanitary landfill or turned into salvage; and MRS-3 includes the southern two-thirds of historical waste disposal area MSFC-082 and historical waste disposal area MSFC-082S, which was historically associated with operations related to Area 11 and RSA-052. MSFC-082 was reported to be contaminated with mustard, arsenic, white phosphorus (WP), and lewisite and may contain burn pits where chemical munitions (i.e., 4.2-inch chemical mortars) were demilitarized and likely buried. The Army performed digital geophysical mapping and Advanced Geophysical Classification mapping in 2013/2014 in all three munitions response sites to identify suspected munitions burial trenches and single point anomalies. Intrusive investigations were performed at MRS-1 and MRS-2. Due to the nature of disposal at MRS-3, it was not included in the intrusive activities. The Army has determined munitions and explosives of concern and potential chemical warfare materiel exist at MRS-1 and MRS-2. Investigation results demonstrated that releases occurred at this site during its operational period.	To be determined	VI.2 and VI.5
MSFC-027	Inactive (M-1) Waste Accumulation Area	This unit was a waste accumulation area active from the early-mid-1960s to approximately 1987. Discarded materials from Army and NASA maintenance activities such as scrap metal, waste oils, and solvents were stored within the original waste accumulation area footprint. Soil piles suspected to contain sludge from a sewage treatment plant were placed outside the active area of operations (east side). The site was later expanded to include a bulk aboveground storage tank farm for fuel oil and ethanol (alcohol) supporting the production of ethylene gas in the manufacture of the chemical agent mustard in 1943. A pump station located in the fuel farm distributed the constituents to the respective underground storage tanks associated with the ethylene generation buildings of former mustard production lines 1 through 4. The aboveground storage tanks (11 in total) were removed between 1956 and 1959. The Army conducted missile component testing in the eastern portion of the site in the late 1950s through early 1960s. In the extreme western portion of the site, a former liquid oxygen fueling test stand operated from the mid-1950s to early 1960s. Fueling operations conducted at the test stand included the use of kerosene, alcohol/water mixture, liquid oxygen, and unsymmetrical dimethylhydrazine. Investigation results demonstrated that releases occurred at this site during its operational period. Soil contaminated with arsenic, Aroclor 1260, 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were addressed by corrective measures in 2018. Approximately 4,036 tons of soil were removed and disposed in a landfill as nonhazardous waste to meet the cleanup goals. A corrective measures implementation report has been submitted to ADEM in 2019.	Soil: No COCs Groundwater: Responsibility of George C. Marshall Space Flight Center	VIII.1

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
MSFC-033A	Surface Soils East of Building 4816 Adjacent to MSFC-033	MSFC-033A was inadvertently created from MSFC-033, which was a Former Waste Accumulation Area operated by NASA Maintenance and Supply Operations at the RSA Airfield and located southeast of the original Building 4815. Drummed wastes such as JP-4 jet propellant, lube oil, mineral spirits, EMC-13 cleaner, Formula 512M mixture, and sandblast residue (including metals) were stored on a 3-foot by 16-foot concrete apron for an approximate period of 10 to 15 years at MSFC-033. The wastes were generated at nearby Buildings 4815, 4816, and 4817. Wastes were transferred to the George C. Marshall Space Flight Center Hazardous Waste Container Storage Area (MSFC-031) before off-site disposal. Polynuclear aromatic hydrocarbons required an action at MSFC-033 but before the removal action could be completed, the Army's expansion of Building 4815 in 2009-2010 resulted in approximately 3.7 cubic yards of polynuclear aromatic hydrocarbon-contaminated soils from MSFC-033 being inadvertently relocated to the east at MSFC-033A. The original MSFC-033 site area ended up being covered with the expanded Building 4815 addition. In 2010, the newly formed MSFC-033A was then partially covered by a concrete utility pad for storage of electrical equipment and various utilities needed for Building 4815 and a concrete walkway for the Building 4815 addition.	Soil: Benzo[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene Benzo[k]fluoranthene Indeno[1,2,3-cd]pyrene (under concrete utility pad/walkway) Groundwater: Responsibility of George C. Marshall Space Flight Center	VI.6 and VIII.1
MSFC-034	Former Chemical Production Area	This site consisted of mustard manufacturing lines 1 through 4 and two mustard filling buildings. Each mustard manufacturing plant consisted of an ethylene generating plant with associated fuel oil (two 8,000-gallon capacity each) and alcohol (four 16,000-gallon capacity each) underground storage tanks, ethylene gas holders, a mustard reactor building (typically with four reactors), a 1-ton container filling area, mustard storage tanks, a sulfur monochloride plant, tail gas scrubbers, a caustic tank, a disposal reactor (8,400-gallon capacity), and a lunchroom. Based on available documentation, chemicals used in the mustard manufacturing process included but were not limited to fuel oil, sulfur monochloride, ethyl alcohol, chlorine, and kerosene. Chemicals documented as being used in decontamination processes included carbon tetrachloride, acetylene tetrachloride, lime slurry, and sodium hypochlorite solutions. Coked coal was used in the ethylene scrubber operations. The former facilities within the site were used from 1942 to 1943 and resulted in releases to the environment. The site is now occupied by former building foundations, parking lots, open grassy fields, and two buildings. Investigation results demonstrated that releases occurred at this site during its operational period.	To be determined	VI.2
MSFC-035	Inactive Sump/Tiled Drain Field- East TA	MSFC-035 was used by the Army as a prisoner-of-war camp from 1944-1946. The former shower house foundation, latrine pit/sump, and several brick sewer grates remained at the site. A 1-foot-diameter outlet pipe near the sump was presumed to discharge to a drain field. After 1946 burning of waste "Goop" (a magnesium paste and gasoline/asphalt-based incendiary similar to napalm) reportedly occurred in an unlined trench at the site. NASA used the site beginning in 1960 for staging equipment that may have been used to record data during nearby testing operations. Although the site is adjacent to a test area, no munitions and explosives of concern have been found within the site. Munitions debris and smoke canisters have been uncovered during intrusive investigations at the site. Investigation results demonstrated that releases may have occurred at this site during its operational period.	To be determined	VI.2 and VI.5
MSFC-052E	Portion of Industrial Sewer East of MSFC Property	This site is an industrial sewer that operated in the George C. Marshall Space Flight Center within the boundary of RSA-183. MSFC-052E is the portion of industrial sewer east of the George C. Marshall Space Flight/Redstone Arsenal boundary that serviced former Lewisite Plants 1 and 2 (RSA-183 Plants Area). Groundwater is part of RSA-183.	Soil: No COCs Groundwater: Responsibility of RSA-183	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

Solid Waste Management Unit Number	Site Name	Site Description and Operational History	Known or Suspected Contaminants	Permit Table[1]
MSFC-053	Former Propellant Storage Area and Test Stand Site	This site was a propellant storage and test site. From 1950s to 1960, Army conducted two separate testing operations at MSFC-053. Hydrocarbon-based propellants were tested at the liquid propellant storage and testing facility, which consisted of a propellant storage area, a test stand, and test cells and support buildings. Hot firing of small rocket systems using alcohol and kerosene fuels, environmental studies, and simulated high-altitude ignition tests were completed at the high-altitude testing facility, which consisted of a high-pressure air battery and a separate testing facility. A wastewater collection facility for industrial activities conducted north of the site was constructed within the boundaries of the site in the 1970s and removed between 1988 and 1994. The site currently contains two buildings (Wastewater Treatment Facility and High Pressure Air Battery) and is crossed by two surface drainage features which are a portion of the NASA Operable Unit 5 Main Drainage Ditch. Groundwater under the site is the responsibility of NASA in MSFC Operable Unit 3.	Soil: No COCs Groundwater: Responsibility of MSFC	VI.3
MSFC-055	Dismantled Stauffer Chemical Mfg Plant	Former chemical manufacturing plant built in 1943 and was used to manufacture chemicals (chlorine and caustic) involved in the production of mustard gas; other chemicals such as solvents may have been used at the site. The plant was demolished in 1965. No releases were known to occur.	No COCs based on low potential for release (ADEM, 2008).	VI.3
MSFC-060	Drainage System for Historic Redstone Test Site	Operational during the 1950s and 1960s. This site consisted of a system of drainage ditches that received water and some diluted solvents from the Historic Redstone Test Stand. The solutions were used to flush rocket motors following test firings and were carried from the test site by the ditch system. The test stand is now inactive and the drainage ditches carry only rainwater.	No COCs based on low potential for release (ADEM, 2008).	VI.3
MSFC-065	1800-Ft Surface Drainage D itch/Area	This site is an unconfined surface drainage area with related shallowly buried drainage pathways. This drain provided surface drainage for Building 4241 which was used for pesticide storage. Operation probably began in the 1940s. No known releases occurred.	No COCs based on low potential for release (ADEM, 2008).	VI.3
MSFC-074	Inactive Disposal Site, East Test Area	MSFC-074 was a disposal area used from approximately 1949 to 1954. The area was used for disposal of construction debris.	Soil: No COCs Groundwater: To be determined with MSFC-035	VI.3
MSFC-077	Former Burning Pits	This site consisted of two burn pits that were operational from approximately 1950 to 1956. The burn pits were believed to have been for limited burning and disposal of construction materials from early building activities or possibly from the demolition of the white phosphorus plants.	Soil: No COCs Groundwater: Not present	VI.3
MSFC-082	Former Mustard Gas Demil Site and Mustard Shell Disposal Trenches	This site was formerly used to demilitarize and dispose of mustard gas artillery shells during the mid-1940s. This site has been divided and grouped for investigation/corrective actions with either MSFC-003-R-01 or Area 11 and RSA-052.	To be determined.	VI.2
MSFC-D	Containment Area for Tanks 4234 A, B & C	The site formerly consisted of a bermed area designed to contain spills or leaks from three galvanized steel 100,000-gallon fuel oil storage tanks installed in the 1940s. In 1988, one of the fuel oil tanks leaked approximately 20,000 gallons of fuel into an adjacent drainage ditch through a drain pipe which was reportedly left open and was connected to the bermed area. The discharge was subsequently stopped and immediately cleaned up.	Soil: No COCs	VI.3

Table J-1
List of SWMUs and/or AOCs Managed under RCRA
Redstone Arsenal, Alabama

ADEM – Alabama Department of Environmental Management.
AHWMMA – Alabama Hazardous Wastes Management and Minimization Act.
AOC – Area of concern
COC – Chemical of concern.
RSA – Redstone Arsenal.
SWMU – Solid waste management unit.
[1] Permit Table refers to the location (Tables VI.2 through VI.6) each site resides in the SWMU Identification and Evaluation Section of the Permit (Part VI) or Corrective Measures Implementation (Part VIII) (Table VIII.1). The Permit table status is current as of Modification No. 14 (August 20, 2019).
Table VI.2 – List of SWMUs and AOCs requiring a RCRA Facility Investigation.
Table VI.3 – List of SWMUs and AOCs requiring no further action at this time.
Table VI.4 – List of SWMUs and AOCs regulated by Parts I – II and VI.
Table VI.5 – SWMUs and AOCs require Interim Measures (IM) and/or Source Removal.
Table VI.6 – Corrective Measure Implementation Plan (CMIP).
Table VIII.1 – List of SWMUs and AOCs requiring Corrective Measures.
[2] Site is located in Table VI.6 in Permit Modification No. 14 but has received ADEM concurrence on the CMIP. The site will move to Table VIII.1 in the next Permit modification.
References:
Alabama Department of Environmental Management (ADEM), 2019, *Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility, Thermal Treatment, Solid Waste Management Unit Corrective Action Permit, Modification No. 14*, dated August 20, 2019.
Alabama Department of Environmental Management, 2008, RCRA Facility Assessment, Redstone Arsenal, Huntsville, Alabama, September.

Guerrero, Heather L

From: Rice, Kajuana D CIV (USA) <kajuana.d.rice.civ@army.mil>
Sent: Tuesday, October 17, 2023 10:02 AM
To: Guerrero, Heather L; Mastin, Ashley T; Land-GHWBmail@adem.alabama.gov; Cobb, Stephen
Cc: Braxton, Jason K CIV USARMY USAG (USA); Howard, J C (Clint) CIV USARMY USAG (USA); Keely Watts; Pam G. Foti; Burton, Don; Watson, Jason N CIV USARMY USAG (USA); Xanthos, George CIV USARMY IMCOM AEC (USA); Fluck, Paul V CIV USARMY CESAM (USA); Hutchinson, Xavier D CIV USARMY IMCOM AEC (USA); Roeske, Ashley E CIV USARMY CEHNC (USA); Robert Pope; York, Austin S CIV USARMY USAG (USA); Anderson, Nicholas A CIV USARMY USAG (USA)
Subject: U.S Army Garrison - Redstone Arsenal's Response to ADEM's ENOD/NOD on AHWMMA Permit Modification No. 2
Attachments: Transmittal Letter to ADEM NOD_ENOD on the AHWMMA Permit Modification No. 2 Request (PRINTED).pdf; Updated EPA Form 8700-12_13 (Oct 2023).pdf; GC Signature Page (AHWMMA Permit Mod.2).pdf; RCMD Signature Page_PRINTED.pdf; DEVCOM Signature Page (AvMC Director Signature 2023).pdf; Section E (Updated AHWMMA Permit Mod No. 2).docx; Table E-2 (Updated AHWMMA Permit Mod No. 2).docx; RSA_Map_Book_2020_Lawrence-J1_A1.pdf; RSA_Map_Book_2020_Lawrence-J2_A2.pdf

Heather,

Please find attached Redstone's response to ADEM's NOD on the AHWMMA Permit Modification No. 2 submitted to the Department on August 3, 2023.

If there are any additional questions and/or concerns regarding this matter, please feel free to contact me.

Respectfully Submitted,

Kajuana D. Rice
Environmental Engineer
Installation Restoration Branch
U.S. Army Garrison – Redstone Arsenal
O: 256-313-0368
Kajuana.d.rice.civ@army.mil

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO ATTENTION OF

October 17, 2023

Environmental Management Division

Mr. Stephen A. Cobb
Chief, Land Division
Alabama Department of Environmental Management
PO Box 301463
Montgomery, Alabama 36130-1463

Reference:

a. The Installation Restoration Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
b. Resource Conservation and Recovery Act Corrective Action Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
c. Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X (AHWMMA) Permit, Modification #1 dated August 12, 2022
d. Modification Request No. 2 to Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X (AHWMMA) Permit dated August 3, 2023
e. Notice of Deficiency - Modification Request No. 2 to Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X (AHWMMA) Permit dated August 3, 2023 (September 29, 2023)

Dear Mr. Cobb:

In accordance with Part VII of Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/ Solid Waste Management Unit Corrective Action/Subpart X Permit (Permit) Modification No. 1, dated August 12, 2022.

This purpose of this letter is to transmit the U.S Army Garrison – Redstone's response to the Notice of Deficiency on Modification Request No. 2 to the AHWMMA Permit that was issued on September 29, 2023. Included with the Response to the Notice of Deficiency are the items that we considered deficient in the initial submittal, along with supporting documentation and applicable updated Permit Application pages.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to 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 fine and imprisonment for knowing violations."

My point of contact for this matter is Ms. Kajuana Rice, Environmental Management Division, 256-313-0368 or email at Kajuana.d.rice.civ@army.mil.

Sincerely,

BRAXTON.JASON.KENARD.1112730032

Digitally signed by BRAXTON.JASON.KENARD.1112730032
Date: 2023.10.17 09:42:27 -05'00'

Jason Braxton, Chief
Environmental Management Division

United States Environmental Protection Agency
RCRA SUBTITLE C SITE IDENTIFICATION FORM

1. Reason for Submittal (Select only one.)

☐	Obtaining or updating an EPA ID number for on-going regulated activities (Items 10-17 below) that will continue for a period of time.
☐	Submitting as a component of the Hazardous Waste Report for _____ (Reporting Year)
	☐ Site was a TSD facility, a reverse distributor, and/or generator of ≥ 1,000 kg of non-acute hazardous waste, > 1 kg of acute hazardous waste, or > 100 kg of acute hazardous waste spill cleanup in **one or more months of the reporting year** (or State equivalent LQG regulations)
☐	Notifying that regulated activity is no longer occurring at this Site
☐	Obtaining or updating an EPA ID number for conducting Electronic Manifest Broker activities
☑	Submitting a new or revised Part A (permit) Form

2. Site EPA ID Number

A	L	7	2	1	0	0	2	0	7	4	2

3. Site Name

US ARMY GARRISON - REDSTONE

4. Site Location Address

Street Address	**4488 Martin Road**				
City, Town, or Village	**Redstone Arsenal**			County	**Madison**
State	**Alabama**	Country	**United States**	Zip Code	**35898**
Latitude	**34.6333**	Longitude	**-86.6458**	☐ Use Lat/Long as Primary Address	

5. Site Mailing Address ☑ Same as Location Street Address

Street Address	**4488 Martin Road**				
City, Town, or Village	**Redstone Arsenal**				
State	**Alabama**	Country	**United States**	Zip Code	**35898**

6. Site Land Type

☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

7. North American Industry Classification System (NAICS) Code(s) for the Site (at least 5-digit codes)

A. (Primary)	**928110**	C.	**336411**
B.	**541712**	D.	

8. Site Contact Information

☑ Same as Location Address

First Name **Jason**	MI **K**	Last Name **Braxton**
Title **Chief, Environmental Management Division**		
Street Address **4488 Martin Road**		
City, Town, or Village **Redstone Arsenal**		
State **Alabama**	Country **United States**	Zip Code **35898**
Email **jason.k.braxton.civ@army.mil**		
Phone **256-876-8607**	Ext	Fax

9. Legal Owner and Operator of the Site

A. Name of Site's Legal Owner

☑ Same as Location Address

Full Name **US Army Garrison - Redstone**	Date Became Owner (mm/dd/yyyy) **1/1/1941**

Owner Type

☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

Street Address **4488 Martin Road**		
City, Town, or Village **Redstone Arsenal**		
State **Alabama**	Country **United States**	Zip Code **35898**
Email **jason.k.braxton.civ@army.mil**		
Phone **256-876-8607**	Ext	Fax
Comments **Garrison Environmental Contact**		

B. Name of Site's Legal Operator

☑ Same as Location Address

Full Name **US Army Garrison - Redstone**	Date Became Operator (mm/dd/yyyy) **1/1/1941**

Operator Type

☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

Street Address **4488 Martin Road**		
City, Town, or Village **Redstone Arsenal**		
State **Alabama**	Country **United States**	Zip Code **35898**
Email **jason.k.braxton.civ@army.mil**		
Phone **256-876-8607**	Ext	Fax
Comments **Garrison Environmental Contact**		

10. Type of Regulated Waste Activity (at your site)

Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities

☑ Y ☐ N	1. Generator of Hazardous Waste—If "Yes", mark only one of the following—a, b, c	
☑	a. LQG	-Generates, in any calendar month, 1,000 kg/mo (2,200 lb/mo) or more of non-acute hazardous waste (includes quantities imported by importer site); or - Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lb/mo) of acute hazardous waste; or - Generates, in any calendar month or accumulates at any time, more than 100 kg/mo (220 lb/mo) of acute hazardous spill cleanup material.
☐	b. SQG	100 to 1,000 kg/mo (220-2,200 lb/mo) of non-acute hazardous waste and no more than 1 kg (2.2 lb) of acute hazardous waste and no more than 100 kg (220 lb) of any acute hazardous spill cleanup material.
☐	c. VSQG	Less than or equal to 100 kg/mo (220 lb/mo) of non-acute hazardous waste.
☑ Y ☐ N	2. Short-Term Generator (generates from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section. *Note: If "Yes", you MUST indicate that you are a Generator of Hazardous Waste in Item 10.A.1 above.*	
☑ Y ☐ N	3. Treater, Storer or Disposer of Hazardous Waste—Note: Part B of a hazardous waste permit is required for these activities.	
☐ Y ☑ N	4. Receives Hazardous Waste from Off-site	
☐ Y ☑ N	5 Recycler of Hazardous Waste	
☐	a. Recycler who stores prior to recycling	
☐	b. Recycler who does not store prior to recycling	
☐ Y ☑ N	6. Exempt Boiler and/or Industrial Furnace—If "Yes", mark all that apply.	
☐	a. Small Quantity On-site Burner Exemption	
☐	b. Smelting, Melting, and Refining Furnace Exemption	

B. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g. D001, D003, F007, U112). Use an additional page if more spaces are needed.

See	**Att.**	**1**				

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes. Please list the waste codes of the State hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

None						

Attachment 1

10.B – Waste Codes for Federally Regulated Hazardous Waste

D001	F001	P047	P120	U053	U121	U185	U243
D002	F002	P048	P121	U055	U122	U186	U244
D003	F003	P050	P122	U056	U123	U187	U246
D004	F004	P054	P123	U057	U124	U188	U247
D005	F005	P056	U001	U060	U125	U190	U359
D006	F006	P062	U002	U061	U126	U191	
D007	F007	P063	U003	U067	U127	U194	
D008	F008	P064	U004	U068	U128	U196	
D009	F009	P065	U006	U069	U129	U200	
D010	F027	P067	U007	U070	U130	U201	
D011	K045	P068	U008	U071	U131	U203	
D012	P001	P069	U009	U072	U132	U204	
D013	P003	P071	U010	U074	U133	U205	
D014	P005	P073	U011	U075	U134	U207	
D015	P006	P074	U012	U077	U135	U208	
D016	P009	P076	U014	U078	U136	U209	
D017	P010	P077	U015	U079	U138	U210	
D018	P011	P078	U017	U080	U139	U211	
D019	P012	P081	U019	U081	U140	U212	
D020	P013	P085	U020	U082	U141	U213	
D021	P014	P087	U021	U083	U142	U214	
D022	P015	P092	U022	U084	U144	U215	
D023	P016	P093	U023	U086	U145	U216	
D024	P020	P094	U025	U088	U146	U217	
D025	P021	P095	U028	U090	U147	U218	
D026	P022	P096	U029	U091	U148	U219	
D027	P023	P097	U031	U092	U150	U220	
D028	P024	P098	U032	U098	U151	U221	
D029	P028	P099	U033	U099	U153	U222	
D030	P029	P101	U034	U101	U154	U223	
D031	P030	P102	U036	U102	U158	U225	
D032	P031	P104	U037	U103	U159	U226	
D033	P033	P105	U039	U105	U160	U227	
D034	P034	P106	U042	U106	U161	U228	
D035	P036	P109	U043	U107	U162	U230	
D036	P038	P110	U044	U108	U165	U231	
D037	P039	P111	U045	U109	U167	U232	
D038	P040	P112	U046	U112	U169	U233	
D039	P041	P113	U047	U113	U170	U234	
D040	P042	P114	U048	U115	U171	U236	
D041	P043	P115	U050	U117	U182	U239	
D042	P044	P116	U051	U118	U183	U240	
D043	P045	P119	U052	U120	U184	U242	

11. Additional Regulated Waste Activities (NOTE: Refer to your State regulations to determine if a separate permit is required.)

A. Other Waste Activities

☐ Y ☑ N	1. Transporter of Hazardous Waste—If "Yes", mark all that apply.
☐	a. Transporter
☐	b. Transfer Facility (at your site)
☐ Y ☑ N	2. Underground Injection Control
☐ Y ☑ N	3. United States Importer of Hazardous Waste
☐ Y ☑ N	4. Recognized Trader—If "Yes", mark all that apply.
☐	a. Importer
☐	b. Exporter
☐ Y ☑ N	5. Importer/Exporter of Spent Lead-Acid Batteries (SLABs) under 40 CFR 266 Subpart G—If "Yes", mark all that apply.
☐	a. Importer
☐	b. Exporter

B. Universal Waste Activities

☐ Y ☑ N	1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) - If "Yes" mark all that apply. Note: Refer to your State regulations to determine what is regulated.
☐	a. Batteries
☐	b. Pesticides
☐	c. Mercury containing equipment
☐	d. Lamps
☐	e. Aerosol Cans
☐	f. Other (specify) _____
☐	g. Other (specify) _____
☐ Y ☑ N	2. Destination Facility for Universal Waste Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities

☐ Y ☑ N	1. Used Oil Transporter—If "Yes", mark all that apply.
☐	a. Transporter
☐	b. Transfer Facility (at your site)
☐ Y ☑ N	2. Used Oil Processor and/or Re-refiner—If "Yes", mark all that apply.
☐	a. Processor
☐	b. Re-refiner
☐ Y ☑ N	3. Off-Specification Used Oil Burner
☐ Y ☑ N	4. Used Oil Fuel Marketer—If "Yes", mark all that apply.
☐	a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
☐	b. Marketer Who First Claims the Used Oil Meets the Specifications

D. Pharmaceutical Activities

☑ Y ☐ N	1. Operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals—if "Yes", mark only one. Note: See the item-by-item instructions for definitions of healthcare facility and reverse distributor.
☑	a. Healthcare Facility
☐	b. Reverse Distributor
☐ Y ☑ N	2. Withdrawing from operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals. Note: You may only withdraw if you are a healthcare facility that is a VSQG for all of your hazardous waste, including hazardous waste pharmaceuticals.

12. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262, Subpart K.

☐ Y ☑ N	A. Opting into or currently operating under 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories— If "Yes", mark all that apply. Note: See the item-by-item instructions for definitions of types of eligible academic entities.
☐	1. College or University
☐	2. Teaching Hospital that is owned by or has a formal written affiliation with a college or university
☐	3. Non-profit Institute that is owned by or has a formal written affiliation with a college or university
☐ Y ☑ N	B. Withdrawing from 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories.

13. Episodic Generation

☐ Y ☑ N	Are you an SQG or VSQG generating hazardous waste from a planned or unplanned episodic event, lasting no more than 60 days, that moves you to a higher generator category. If "Yes", you must fill out the Addendum for Episodic Generator.

14. LQG Consolidation of VSQG Hazardous Waste

☐ Y ☑ N	Are you an LQG notifying of consolidating VSQG Hazardous Waste Under the Control of the Same Person pursuant to 40 CFR 262.17(f)? If "Yes", you must fill out the Addendum for LQG Consolidation of VSQG hazardous waste.

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) OR Entire Facility (required)

☐ Y ☑ N	LQG Site Closure of a Central Accumulation Area (CAA) or Entire Facility.
	A. ☐ Central Accumulation Area (CAA) or ☐ Entire Facility
	B. Expected closure date: _____ mm/dd/yyyy
	C. Requesting new closure date: _____ mm/dd/yyyy
	D. Date closed : _____ mm/dd/yyyy ☐ 1. In compliance with the closure performance standards 40 CFR 262.17(a)(8) ☐ 2. Not in compliance with the closure performance standards 40 CFR 262.17(a)(8)

16. Notification of Hazardous Secondary Material (HSM) Activity

☐ Y ☑ N	Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), (25), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.

17. Electronic Manifest Broker

☐ Y ☑ N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

18. Comments (include item number for each comment)

10.A.2 - Redstone is Research, Development, Test and Evaluation area - not a production facility.

19. Certification 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. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy) 10/02/2023
Printed Name (First, Middle Initial Last) **Brian M. Cozine**	Title **COLONEL, Garrison Commander**
Email **brian.m.cozine.mil@army.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

16. Notification of Hazardous Secondary Material (HSM) Activity

☐ Y ☑ N	Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), (25), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.

17. Electronic Manifest Broker

☐ Y ☑ N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

18. Comments (include item number for each comment)

10.A.2 - Redstone is Research, Development, Test and Evaluation area - not a production facility.

19. Certification 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. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11)**.

Signature of legal owner, operator or authorized representative James C. Kirsch Digitally signed by KIRSCH.JAMES.C.1230666586 Date: 2023.10.04 11:09:02 -05'00'	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last) **James C. Kirsch, Ph.D.**	Title **Dir, DEVCOM Aviation & Missile Center**
Email **james.c.kirsch2.civ@mail.smil.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

16. Notification of Hazardous Secondary Material (HSM) Activity

☐ Y ☑ N	Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), (25), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.

17. Electronic Manifest Broker

☐ Y ☑ N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

18. Comments (include item number for each comment)

10.A.2 - Redstone is Research, Development, Test and Evaluation area - not a production facility.

19. Certification 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. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11)**.

Signature of legal owner, operator or authorized representative BENTON.DONALD.R.1229134988 Digitally signed by BENTON.DONALD.R.1229134988 Date: 2023.08.28 12:01:20 -04'00'	Date (mm/dd/yyyy) 28 Aug 2023
Printed Name (First, Middle Initial Last) **Donald R. Benton**	Title **Director, Recovered Chemical Materiel**
Email **donald.r.benton18.civ@army.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

United States Environmental Protection Agency

HAZARDOUS WASTE PERMIT PART A FORM

1. Facility Permit Contact

First Name	**Jason**	MI	**K**	Last Name	**Braxton**
Title	**Chief, Environmental Management Division**				
Email	**jason.k.braxton.civ@army.mil**				
Phone	**256-876-8607**	Ext		Fax	

2. Facility Permit Contact Mailing Address

Street Address	**4488 Martin Rd.**	
City, Town, or Village	**Redstone Arsenal**	
State **Alabama**	Country **United States**	Zip Code **35898**

3. Facility Existence Date (mm/dd/yyyy)

1/1/1941

4. Other Environmental Permits

A. Permit Type	B. Permit Number	C. Description
P	**709-0007**	**CAA Title V Permit**
R	**45-03**	**Solid Waste Landfill**
U	**2017-5211**	**Drinking Water**
N	**ALG000001 9**	**NPDES**
N	**ALR040033**	**NPDES**
N	**ALG890055**	**NPDES**
N	**ALG895094**	**NPDES**

5. Nature of Business

Redstone Arsenal's mission includes: research, development, engineering, testing, procurement, production, and logistics support of operational missile and rocket systems. Also included are training, production, verification, and stockpile reliability activities.

6. Process Codes and Design Capacities

Line Number		A. Process Code			B. Process Design Capacity (1) Amount	B. Process Design Capacity (2) Unit of Measure	C. Process Total Number of Units	D. Unit Name
0	1	S	0	1	435,600	G	033	Storage Igloos
0	2	X	0	1	5.175	N	06	(5) OB Pans & (1) OD
0	3	T	0	4	0.0043544	S	02	Explosive Destruction Sys
					See	Attachment	2, 3	& Section 11. Comments

7. Description of Hazardous Wastes (Enter codes for Items 7.A, 7.C and 7.D(1))

Line No.		A. EPA Hazardous Waste No.				B. Estimated Annual Qty of Waste	C. Unit of Measure	D. Processes (1) Process Codes								D. Processes (2) Process Description (if code is not entered in 7.D1))
0	1	D	0	0	1	75,000	P	S	0	1						
0	2	D	0	0	2	25,000	P	S	0	1						
0	3	D	0	0	3	100,000	P	S	0	1						
0	4	D	0	0	4	10,000	P	S	0	1						
0	5	D	0	0	5	200,000	P	S	0	1						
0	6	D	0	0	6	400,000	P	S	0	1						
0	7	D	0	0	7	400,000	P	S	0	1						
0	8	D	0	0	8	300,000	P	S	0	1						
0	9	D	0	0	9	3,000	P	S	0	1						
1	0	D	0	1	0	100	P	S	0	1						
																See Cont. Sheet

8. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

9. Facility Drawing

All existing facilities must include a scale drawing of the facility. See instructions for more detail.

10. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas. See instructions for more detail.

11. Comments

Reason for Update - Garrison Commander Change and Name Change for CCDC Director
See additional comments on 11., continued

Attachment 2

Calculation Assumptions

Hazardous Waste Storage Units (total of 33 Units) for storing recovered munitions and other waste material for up to one year.

The estimated quantity of waste to be stored is based on design capacity of a storage unit (igloo) housing 55-gallon sized storage containers. The storage units are 26'5" wide by 81' long. However, because of the shape of the igloos and the need to provide adequate access for drum transport and inspection, each igloo can hold a maximum of 240 drums.

- 240 drums (55-gallon) in each igloo (storage unit) x 55-gallons per drum = 13,200 gallons per igloo
- 33 igloos x 240 drums (55-gallons per drum) per igloo = 7,920 drums (55-gallon) total or 435,600 gallon capacity

Note:

The maximum estimated quantity of hazardous waste that may be stored in the 33 storage units (igloos) is 435,600 gallons or 7,920 drums (55-gallon).

Attachment 3

Explosive Destruction System (EDS) Process Design Calculation

Treatment using the EDS is a batch process where one or more items may be processed at a time. The maximum number of items that can be treated is based on the amount of explosives (burster and fuse) items contained and the amount of donor charge needed to access the items. At no time will the total net explosive weight (NEW)[a] limit of an EDS be exceeded.

Each EDS Phase 2 unit is capable of safely withstanding up to 4.8 pounds of TNT equivalent explosives for each detonation and one detonation per day. Up to two EDS units will be operated at the EDS site.

The following calculation represents the maximum treatment design capacity scenario.

Estimated quantity of waste treated in the EDS:

A single EDS Phase 2 can process 4.8 lbs/day NEW[a]

- 4.8 pounds/day x 1 metric ton/2204.62 pounds = 0.0021772 metric tons per EDS unit/day
- 0.0021772 metric tons/day x 2 EDS Units = 0.0043544 metric tons/day maximum capacity

Note:

[a] New = The actual weight (in pounds) of explosive mixtures or compounds, including the trinitrotoluene (TNT) equivalent of energetic material that is used in determining explosive limits.

Section 7. Description of Hazardous Waste (Enter Codes for Items 7.A, 7.C and 7.D(1))

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
11	D011	2,500	P	S01	
12	D012	5	P	S01	
13	D013	5	P	S01	
14	D014	5	P	S01	
15	D015	5	P	S01	
16	D016	2,000	P	S01	
17	D017	2,000	P	S01	
18	D018	125,000	P	S01	
19	D019	5,000	P	S01	
20	D020	30,000	P	S01	
21	D021	1,000	P	S01	
22	D022	10,000	P	S01	
23	D023	10	P	S01	
24	D024	10	P	S01	
25	D025	10	P	S01	
26	D026	301	P	S01	
27	D027	7,500	P	S01	
28	D028	30,000	P	S01	
29	D029	50,000	P	S01	
30	D030	5	P	S01	
31	D031	5	P	S01	
32	D032	5	P	S01	
33	D033	10,000	P	S01	
34	D034	100	P	S01	
35	D035	15,000	P	S01	
36	D036	20	P	S01	
37	D037	1,000	P	S01	
38	D038	100	P	S01	
39	D039	125,000	P	S01	
40	D040	200,000	P	S01	
41	D041	24,000	P	S01	
42	D042	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
43	D043	25,000	P	S01	
44	F001	200,000	P	S01	
45	F002	150,000	P	S01	
46	F003	40,000	P	S01	
47	F004	1,500	P	S01	
48	F005	80,000	P	S01	
49	F006	10	P	S01	
50	F007	10	P	S01	
51	F008	5	P	S01	
52	F009	5	P	S01	
53	F027	5	P	S01	
54	K045	3,000	P	S01	
55	P001	5	P	S01	
56	P003	5	P	S01	
57	P005	5	P	S01	
58	P006	5	P	S01	
59	P009	5	P	S01	
60	P010	5	P	S01	
61	P011	5	P	S01	
62	P012	10	P	S01	
63	P013	5	P	S01	
64	P014	5	P	S01	
65	P015	15	P	S01	
66	P016	5	P	S01	
67	P020	5	P	S01	
68	P021	5	P	S01	
69	P022	10	P	S01	
70	P023	5	P	S01	
71	P024	5	P	S01	
72	P028	10	P	S01	
73	P029	5	P	S01	
74	P030	10,000	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
75	P031	5	P	S01	
76	P033	5	P	S01	
77	P034	5	P	S01	
78	P036	5	P	S01	
79	P038	5	P	S01	
80	P039	5	P	S01	
81	P040	5	P	S01	
82	P041	5	P	S01	
83	P042	10	P	S01	
84	P043	5	P	S01	
85	P044	5	P	S01	
86	P045	5	P	S01	
87	P047	5	P	S01	
88	P048	10	P	S01	
89	P050	5	P	S01	
90	P054	5	P	S01	
91	P056	5	P	S01	
92	P062	5	P	S01	
93	P063	5	P	S01	
94	P064	5	P	S01	
95	P065	5	P	S01	
96	P067	5	P	S01	
97	P068	5	P	S01	
98	P069	5	P	S01	
99	P071	5	P	S01	
100	P073	5	P	S01	
101	P074	5	P	S01	
102	P076	5	P	S01	
103	P077	5	P	S01	
104	P078	5	P	S01	
105	P081	5	P	S01	
106	P085	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
107	P087	5	P	S01	
108	P092	5	P	S01	
109	P093	5	P	S01	
110	P094	5	P	S01	
111	P095	5	P	S01	
112	P096	5	P	S01	
113	P097	5	P	S01	
114	P098	2,000	P	S01	
115	P099	5	P	S01	
116	P101	10	P	S01	
117	P102	10	P	S01	
118	P104	10	P	S01	
119	P105	5	P	S01	
120	P106	5	P	S01	
121	P109	5	P	S01	
122	P110	5	P	S01	
123	P111	5	P	S01	
124	P112	5	P	S01	
125	P113	5	P	S01	
126	P114	5	P	S01	
127	P115	5	P	S01	
128	P116	5	P	S01	
129	P119	20	P	S01	
130	P120	5	P	S01	
131	P121	5	P	S01	
132	P122	5	P	S01	
133	P123	5	P	S01	
134	U001	5	P	S01	
135	U002	50	P	S01	
136	U003	7	P	S01	
137	U004	5	P	S01	
138	U006	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
139	U007	5	P	S01	
140	U008	10	P	S01	
141	U009	21	P	S01	
142	U010	5	P	S01	
143	U011	5	P	S01	
144	U012	5	P	S01	
145	U014	5	P	S01	
146	U015	100	P	S01	
147	U017	5	P	S01	
148	U019	100	P	S01	
149	U020	5	P	S01	
150	U021	5	P	S01	
151	U022	5	P	S01	
152	U023	5	P	S01	
153	U025	5	P	S01	
154	U028	10	P	S01	
155	U029	5	P	S01	
156	U031	25	P	S01	
157	U032	50	P	S01	
158	U033	5	P	S01	
159	U034	5	P	S01	
160	U036	5	P	S01	
161	U037	200	P	S01	
162	U039	5	P	S01	
163	U042	5	P	S01	
164	U043	5	P	S01	
165	U044	50	P	S01	
166	U045	5	P	S01	
167	U046	5	P	S01	
168	U047	5	P	S01	
169	U048	5	P	S01	
170	U050	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
171	U051	5	P	S01	
172	U052	10	P	S01	
173	U053	5	P	S01	
174	U055	5.5	P	S01	
175	U056	5	P	S01	
176	U057	20	P	S01	
177	U060	5	P	S01	
178	U061	5	P	S01	
179	U067	5	P	S01	
180	U068	5	P	S01	
181	U069	10	P	S01	
182	U070	5	P	S01	
183	U071	5	P	S01	
184	U072	5	P	S01	
185	U074	5	P	S01	
186	U075	5	P	S01	
187	U077	2,300	P	S01	
188	U078	5	P	S01	
189	U079	5	P	S01	
190	U080	3,400	P	S01	
191	U081	5	P	S01	
192	U082	5	P	S01	
193	U083	5	P	S01	
194	U084	5	P	S01	
195	U086	5	P	S01	
196	U088	5	P	S01	
197	U090	5	P	S01	
198	U091	5	P	S01	
199	U092	5	P	S01	
200	U098	360	P	S01	
201	U099	5	P	S01	
202	U101	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
203	U102	5	P	S01	
204	U103	5	P	S01	
205	U105	5	P	S01	
206	U106	5	P	S01	
207	U107	5	P	S01	
208	U108	50	P	S01	
209	U109	5	P	S01	
210	U112	200	P	S01	
211	U113	5	P	S01	
212	U115	5	P	S01	
213	U117	5	P	S01	
214	U118	5	P	S01	
215	U120	5	P	S01	
216	U121	5	P	S01	
217	U122	20	P	S01	
218	U123	5	P	S01	
219	U124	5	P	S01	
220	U125	5	P	S01	
221	U126	5	P	S01	
222	U127	5	P	S01	
223	U128	5	P	S01	
224	U129	5	P	S01	
225	U130	5	P	S01	
226	U131	5	P	S01	
227	U132	5	P	S01	
228	U133	12,000	P	S01	
229	U134	5	P	S01	
230	U135	5	P	S01	
231	U136	5	P	S01	
232	U138	5	P	S01	
233	U139	5	P	S01	
234	U140	10.5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
235	U141	5	P	S01	
236	U142	5	P	S01	
237	U144	5	P	S01	
238	U145	5	P	S01	
239	U146	5	P	S01	
240	U147	75	P	S01	
241	U148	5	P	S01	
242	U150	50	P	S01	
243	U151	10	P	S01	
244	U153	5	P	S01	
245	U154	1,000	P	S01	
246	U158	400	P	S01	
247	U159	500	P	S01	
248	U160	5	P	S01	
249	U161	5	P	S01	
250	U162	5	P	S01	
251	U165	5	P	S01	
252	U167	5	P	S01	
253	U169	20	P	S01	
254	U170	5	P	S01	
255	U171	5	P	S01	
256	U182	5	P	S01	
257	U183	5	P	S01	
258	U184	5	P	S01	
259	U185	5	P	S01	
260	U186	5	P	S01	
261	U187	5	P	S01	
262	U188	100	P	S01	
263	U190	20	P	S01	
264	U191	5	P	S01	
265	U194	5	P	S01	
266	U196	10	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
267	U200	5	P	S01	
268	U201	5	P	S01	
269	U203	5	P	S01	
270	U204	5	P	S01	
271	U205	5	P	S01	
272	U207	5	P	S01	
273	U208	5	P	S01	
274	U209	5	P	S01	
275	U210	500	P	S01	
276	U211	500	P	S01	
277	U212	400	P	S01	
278	U213	5	P	S01	
279	U214	5	P	S01	
280	U215	5	P	S01	
281	U216	5	P	S01	
282	U217	5	P	S01	
283	U218	5	P	S01	
284	U219	10	P	S01	
285	U220	400	P	S01	
286	U221	5	P	S01	
287	U222	10	P	S01	
288	U223	10	P	S01	
289	U225	5	P	S01	
290	U226	500	P	S01	
291	U227	100	P	S01	
292	U228	1,000	P	S01	
293	U230	5	P	S01	
294	U231	5	P	S01	
295	U232	5	P	S01	
296	U233	5	P	S01	
297	U234	5	P	S01	
298	U236	5	P	S01	

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
299	U239	250	P	S01	
300	U240	5	P	S01	
301	U242	5	P	S01	
302	U243	5	P	S01	
303	U244	5	P	S01	
304	U246	5	P	S01	
305	U247	5	P	S01	
306	U359	5	P	S01	
307	D001	68.75	T	X01	
308	D002			X01	Included with above
309	D003			X01	Included with above
310	D004			X01	Included with above
311	D005			X01	Included with above
312	D006			X01	Included with above
313	D007			X01	Included with above
314	D008			X01	Included with above
315	D009			X01	Included with above
316	D010			X01	Included with above
317	D011			X01	Included with above
318	D018			X01	Included with above
319	D019			X01	Included with above
320	D021			X01	Included with above
321	D022			X01	Included with above
322	D023			X01	Included with above
323	D024			X01	Included with above
324	D025			X01	Included with above
325	D026			X01	Included with above
326	D027			X01	Included with above
327	D028			X01	Included with above
328	D029			X01	Included with above
329	D030			X01	Included with above
330	D032			X01	Included with above

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
331	D035			X01	Included with above
332	D036			X01	Included with above
333	D038			X01	Included with above
334	D039			X01	Included with above
335	D040			X01	Included with above
336	F001			X01	Included with above
337	F002			X01	Included with above
338	F003			X01	Included with above
339	F004			X01	Included with above
340	F005			X01	Included with above
341	U133			X01	Included with above
342	D001	1,500	P	T04	
343	D002			T04	Included with above
344	D003			T04	Included with above
345	D004			T04	Included with above
346	D005			T04	Included with above
347	D006			T04	Included with above
348	D007			T04	Included with above
349	D008			T04	Included with above
350	D009			T04	Included with above
351	D010			T04	Included with above
352	D011			T04	Included with above
353	D018			T04	Included with above
354	D019			T04	Included with above
355	D022			T04	Included with above
356	D028			T04	Included with above
357	D029			T04	Included with above
358	D030			T04	Included with above
359	D034			T04	Included with above
360	D039			T04	Included with above
361	D040			T04	Included with above
362	D043			T04	Included with above

ID Number (Enter from Page 1) AL7210020742					
7. Description of Hazardous Waste (Continued. Use additional Sheet(s) as necessary; number pages					
Line #	A. EPA Hazardous Waste No.	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes	
				Process Code	Process Description
363	P036			T04	Included with above
364	P095			T04	Included with above

Section 11. Comments, continued

The weights for line 2 (process code X01) are expressed as net explosive weight.

Section 6: Process Codes and Design Capacities
The treatment capacity of an Explosive Destruction System (EDS) Phase 2 unit is 4.8 lbs. net explosive weight per day. See Attachment 3 for process design calculations. Explosives shaped charges are used to detonate a munition burster (if present) and breach the munition wall exposing the chemical fill. A predetermined amount of reagent is added to treat the chemical fill and explosive residue. Agitation with heat (if required) follows. Liquid and solid wastes generated from the treatment process are then removed from the Containment Vessel, containerized (in 55-gallon drums) and placed in a hazardous waste storage area for offsite disposition.

Section 8: Map
See Topographical Map(s) referenced in Section B of this Permit Renewal Application.

Sections 9 and 10: Facility Drawing and Photographs
See Section B of this Permit Renewal Application.

RSA-278
RSA-071-R-01
RSA-150
RSA-071
Indian Creek
Indian Creek
RSA-313
RSA-153
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Installation Area
- Grid 8000'x12800' (1"=800')
- Groundwater Unit Boundary
- Solid Waste Management Unit (SWMU)
- NFA
- RSA-071_New_Site
- Water Bodies
- Surface Drainage Features (Some Ephemeral)

Notes:
1) The No Further Action status is accurate as of July 2020. Changes related to permit modification will be incorporated by reference.
2) Aerial photo year = 2019.
3) Additional aerial photo (along theedges of grids E2, E3, E4, and E5) year = 2018. City of Huntsville, AlabamaService Layer Credits: City of Huntsville, Alabama.

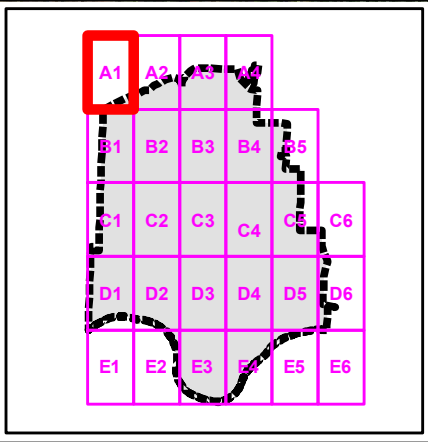

Figure J-1

RSA SWMU Map Grid A1

Redstone Arsenal
Madison County, Alabama
Contract No. W91278-016-D-0059

1 inch=1,000 feet
0 600 1,200 2,400 Feet
N
NAD 1983 State Plane Alabama East Feet

RSA-120
RSA-150
RSA-278
RSA-071-R-01
RSA-253
RSA-071
Indian Creek
Indian Creek
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Installation Area
- Grid 8000'x12800' (1"=800')
- Groundwater Unit Boundary
- Solid Waste Management Unit (SWMU)
- NFA
- RSA-071_New_Site
- Water Bodies
- Surface Drainage Features (Some Ephemeral)

Notes:
1) The No Further Action status is accurate as of July 2020. Changes related to permit modification will be incorporated by reference.
2) Aerial photo year = 2019.
3) Additional aerial photo (along theedges of grids E2, E3, E4, and E5) year = 2018. City of Huntsville, AlabamaService Layer Credits: City of Huntsville, Alabama.

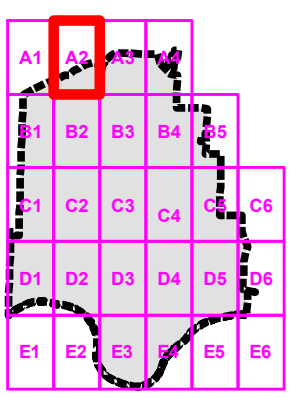

Figure J-2

RSA SWMU Map Grid A2

Redstone Arsenal
Madison County, Alabama
Contract No. W91278-016-D-0059

1 inch=1,000 feet
0 600 1,200 2,400 Feet
N
NAD 1983 State Plane Alabama East Feet

Section E: Groundwater Monitoring

This part of the permit renewal application provides information on groundwater monitoring in accordance with the applicable sections of 40 CFR and ADEM Administrative Code Division 14.

E-1 Exemption from Groundwater Protection Requirements [40 CFR 270.14(c), 264.90(b); ADEM 335-14-8-.02(5)(c), 335-14-5-09, 335-14-5-24]

RSA's operations under the existing AHWMMA permit AL7 210 020 742 exempt groundwater monitoring for the Hazardous Waste Storage Area (HWSA) (namely the individual Hazardous Waste Storage Units addressed in this permit renewal application) (S01) and for the EDS Unit(s) (TO4) as both of these are related to storage and treatment in containers. The groundwater monitoring requirements apply only to surface impoundments, waste piles, land treatment units, and landfills. The HWSA and EDS will not contain these types of waste management units. Therefore, the groundwater monitoring requirements are not applicable to the HWSA and EDS treatment units.

E-2 Interim Status and Permit Renewal Application Groundwater Monitoring Results [40 CFR 270.14(c)(1); ADEM 335-14-8-.02(5)(c)(1)]

While RSA has not been an interim status facility, the ADEM regulations also require a summary of the previous permit period groundwater monitoring results if the application is for a permit renewal. The only regulated unit at RSA with groundwater monitoring data from the previous permit period is the OB/OD.

The OB/OD has been undergoing compliance monitoring since 2003. Based on groundwater sampling data reported to ADEM from samples collected in December 2017 at the OB/OD, metals, explosives, VOCs, SVOCs, pesticides, and perchlorate are present in groundwater at concentrations exceeding RSLs, as summarized in Table E-1. Additional information regarding the contaminant plume located beneath the OB/OD is provided in Section E-5.

E-3 General Hydrogeologic Information [40 CFR 270.14(c)(2); ADEM 335-14-8-.02(5)(c)(2)]

RSA is underlain by Mississippian-age carbonate bedrock (Tuscumbia Limestone and Fort Payne Chert) mantled by unconsolidated clay-rich overburden ranging up to 100 feet thick in places. Over most of RSA, the overburden consists of low-permeability, residual red, yellowish-red, and brown clay and silty clay with varying amounts of chert and chert fragments. However, beneath areas of RSA adjacent to the Tennessee River, the overburden typically contains sand and gravel-rich fluvial sediments. Karst features of varying scales have developed in the water-

soluble portions of the Tuscumbia/Fort Payne where chemical dissolution has enlarged joints, bedding planes, and other water-transmitting openings.

Several interconnected factors have created a complex groundwater flow system beneath RSA. Hydraulic conductivities/transmissivities are highly variable; groundwater must percolate through the low-permeability overburden prior to entering the highly transmissive network of karst conduits and solutionally-enlarged fractures that ultimately discharge to the Tennessee River. The un-altered limestone bedrock contains very low matrix permeability and therefore has a low hydraulic conductivity. However, karst development has not occurred uniformly throughout the bedrock underlying RSA and conduit patterns (i.e., flowpaths) within the bedrock are at a scale which is beyond resolution. Locally, groundwater flow is directed through the overburden into the bedrock, while regionally groundwater flow is directed from north to south (towards the Tennessee River) within the karstified bedrock. The system is further complicated by the presence of Wheeler Dam (constructed in 1936) which is located on the Tennessee River, downstream of RSA. Construction of the dam raised the river's base level approximately 15 feet and flooded the active karst conduits at depth. In addition, reservoir management operations have created unique seasonal hydrogeologic conditions beneath RSA, including, but not limited to, the reversal of the southerly hydraulic gradient and the development of overflow springs in the interior portions of RSA, particularly along the major creeks that flow within the Arsenal property (Indian Creek, McDonald Creek, and Huntsville Spring Branch).

E-4 Topographic Map Requirements [40 CFR 270.14(c)(3),(4)(i) and (ii); ADEM 335-14-8-.02(5)(c)(3),(4)(i) and (iii)]

The OB/OD is located near the Tennessee River and, is therefore, at the downgradient end of the watershed beneath RSA (Figures E-1 and E-2). At the OB/OD Area and surrounding area, historically first-encountered groundwater occurs from approximately 2 feet below ground surface in topographically low areas to over 20 feet bgs in topographically high areas. In the OB/OD Area, groundwater zones are divided into two components; an upper component referred to as the "shallow overburden groundwater zone," and a deeper component referred to as the "bedrock groundwater zone." The OB/OD Area is located on an elevated area and is bounded on three sides (west, north, and east) by wetlands that are influenced by the stage of the Tennessee River. A potentiometric surface high for the shallow overburden groundwater zone exists in the center of the site (well RS100) with lower groundwater elevations measured near surface water bodies and wetlands. The potentiometric surface measured for the bedrock groundwater zone slopes generally to the south and west at the OB/OD area towards the Tennessee River.

A topographic map illustrating the monitoring wells used for compliance groundwater monitoring at the OB/OD is presented in Figure E-1.

E-5 Contaminant Plume Description [40 CFR 270.14(c)(2),(4),(7); ADEM 335-14-8-.02(5)(c)(2),(4),(7)]

ADEM and federal regulations require that a plume description be included for the regulated unit, OB/OD.

OB/OD Unit

Groundwater beneath the OB/OD Unit has been contaminated from releases from multiple sources. Groundwater beneath the OB/OD Unit is entirely within the RSA-151 groundwater unit. A commingled RSA-151 groundwater plume is attributed to historical releases from local surface media sites, namely RSA-013, RSA-012 (OB pans), RSA-131 (OD area), RSA-014 South, and RSA-110. Constituents of the commingled plume detected at the highest frequencies and concentrations include chlorinated volatile organic compounds (VOC) (1,1,2,2-tetrachloroethane, cis-1,2-dichloroethene [DCE], tetrachloroethene, trichloroethene (TCE), 1,1-dichloroethane, 1,1-DCE, and vinyl chloride), explosive compounds (particularly RDX), and perchlorate. A secondary source of contamination exists at RSA-014 South, where high concentrations of TCE are present in groundwater. The RSA-151 shallow groundwater plume was sourced from several discrete locations within the unit. However, over time, the main solvent/perchlorate plume has become commingled. Fluvial channel deposits associated with historical Tennessee River channels likely contribute to plume commingling. Because of their high ADEM regional screening level (RSL) exceedance frequency and relative mobility, TCE and perchlorate serve as tracers for the overall extent of the groundwater plumes. Almost all of the exceedances for other VOCs and explosives occur within the footprints of the TCE and/or perchlorate plumes. In addition, TCE and perchlorate were the most commonly detected contaminants in the OB/OD Unit monitoring.

Results for groundwater unit RSA-151 are presented in the RCRA Facility Investigation Report for RSA-151 approved by ADEM in a letter dated May 16, 2018. TCE is the most commonly detected and widely distributed VOC within the RSA-151 groundwater unit. It was detected in 67 shallow groundwater samples at concentrations exceeding the RSL (5 micrograms per milliliter [µg/L]). The 67 RSL exceedances in shallow groundwater ranged in concentration from 6.8 to 221,000 µg/L, with the highest concentrations (greater than 10,000 µg/L) found in the RSA-014 South area near the two former unlined burn trenches and north of RSA-110. TCE was released into the environment at locations within the RSA-151 groundwater unit and has formed a single commingled plume in the shallow groundwater flow zone (Figure E-2). The overall

extent of TCE suggests multiple sources that have commingled into one plume. Source areas indicated by various studies include RSA-013 – Unlined Inactive Open Burn Pad, RSA-014 South – Unlined Inactive Burn Trenches, and RSA 110 – Former Drum Storage/Construction Debris. Activities at sites RSA-013 and RSA-014 South included the burning of solvent containing wastes that contained TCE.

Perchlorate was detected in 63 shallow zone groundwater samples collected under the RSA-151 investigation at concentrations exceeding the RSL (15 µg/L). The 63 exceedances in shallow groundwater ranged in concentration from 16.3 to 74,700 µg/L, with the highest concentrations of perchlorate (greater than 10,000 µg/L) associated with RSA-013. Perchlorate was released from several surface media sites and forms a single commingled plume in shallow groundwater (Figure E-3). The overall extent of RSL exceedances supports that the plume is sourced from several surface media sites and has commingled into one large plume. Source areas include RSA-013, Unlined Inactive Open Burn Pad, and RSA-014 South, Unlined Inactive Burn Trenches. Both of these sites included the burning of perchlorate-containing wastes.

Groundwater sampling data collected in December 2017 at the OB/OD Unit indicate that metals, explosives, VOCs, SVOCs, pesticides, and perchlorate are present in groundwater at concentrations exceeding RSLs, as summarized in Table E-1. This table presents results from the wells sampled for the OB/OD and not for all wells sampled during the RFI for RSA-151.

There are multiple commingled plumes at RSA that have sources not related to the hazardous waste units. Information related to groundwater below the RSA SWMUs and commingled plumes for areas outside the OB and OD units is presented in Section E-9.

E-6 General Monitoring Program Requirements [40 CFR 270.14(c)(5), 264.90(b)(4), 264.97; ADEM 335-14-5-.06(6), 335-14-5-.06(9), 335-14-5-.06(10), 335-14-5-.06(11), 335-14-8-.02(5)(c)(5), 335-14-5-.06(1)(b)(4), 335-14-5-.06(8)]

RSA has installed and designated groundwater monitoring wells in order to maintain a groundwater monitoring system to comply with ADEM regulations. RSA will maintain all groundwater monitoring wells at the facility as identified in Table E-2, which is current as of August 20, 2019. Additions to this table will be incorporated by reference from RSA's permit once renewed.

RSA will maintain all groundwater monitoring wells in accordance with ADEM Admin. Code Rule 335-14-5-.06 and will not remove a groundwater monitoring well from any monitoring program specified in this permit without an approved permit modification.

If a groundwater monitoring well is damaged, RSA will immediately notify the Department in writing, with a notification that includes a description of the well repair activities to be conducted. Within 30 calendar days after the well is repaired, RSA will submit a written notification to the Department that the well repair activities were conducted in accordance with the approved procedures.

If a groundwater monitoring well is deleted from the monitoring program(s) required by this permit, RSA will abandon the well within 90 calendar days after deletion using procedures to be approved by the Department unless the department concurs that the well should be left in place to support other investigations. Within 30 calendar days after a well is abandoned, RSA will submit a written notification to the Department that the well abandonment activities were conducted in accordance with the approved procedures.

RSA will maintain the background monitoring well(s) listed in Table E-2 to assess the groundwater quality for the respective units.

RSA will install and/or designate groundwater monitoring wells as necessary to assess changes in the rate and extent of any plume of contamination or as otherwise deemed necessary to maintain compliance with ADEM regulations. RSA will submit a plan in the form of a permit modification request specifying the design, location and installation of any additional monitoring wells to the Department at least 90 calendar days prior to installation which, at a minimum, will include:

i. Well construction techniques including casing depths and proposed total depth of well(s);

ii. Well development method(s);

iii. A complete description of well construction materials;

iv. A schedule of implementation for construction; and,

v. Provisions for determining the lithologic characteristics, hydraulic conductivity, grain size distribution, and porosity for the applicable aquifer unit(s) at the location of the new well(s).

General Groundwater Monitoring Requirements

RSA will determine the groundwater surface elevation from all monitoring wells listed in Table E-2 at least annually and each time a sampling event is conducted. The results of these determinations will be submitted to the Department. Elevation data will be recorded and reported as mean sea level (MSL) and referenced to an appropriate North American Vertical Datum

(NAVD) benchmark. Applicable groundwater protection standards are discussed in Sections E-8 and E-9.

Compliance Period

The compliance period, during which the permit-specified groundwater protection standard applies, will begin at the time of the first sampling event of the compliance monitoring program, or the corrective action monitoring program, whichever is earlier. The compliance period will continue until the permit-specified groundwater protection standard has not been exceeded for a period of three consecutive years. Where RSA is engaged in a corrective action program, the compliance period will continue as required until the permit-specified groundwater protection standard has not been exceeded for a period of three consecutive years after corrective action has been terminated and this permit has been modified.

RSA will submit to the Department written reports to include all analytical sampling data, established background values, statistical evaluations, groundwater elevations, associated potentiometric maps, and the annual groundwater flow rate and direction determinations. The analytical method and the method detection limit (MDL) for each constituent will be integrated into all reports of analysis. RSA will submit the reports within 60 calendar days after the first sampling events and on an annual basis thereafter. RSA will keep copies of these reports at the facility.

RSA will submit progress reports to the Department describing implementation of groundwater monitoring and/or corrective action activities at the site as required by this permit on a quarterly basis. RSA will submit the first progress report to the Department within 90 calendar days after the effective date of this permit. The progress reports will be submitted until such time as the required monitoring and/or corrective action systems and activities required by this permit are fully constructed and operational. In the event that additional monitoring and/or corrective action requirements are imposed through a permit modification, the quarterly reporting requirement will resume, commencing upon the effective date of the permit modification and continuing until the required monitoring and/or corrective action systems and activities are again fully constructed and operational.

E-6a Description of Wells [40 CFR 270.14(c)(5), 264.97(a),(b),(c); ADEM 335-14-8-.02(5)(c)(5), 335-14-5-.06(8)(a)(b)(c)]

A description of the wells included in all of RSA's monitoring program is included in Table E-2. Note that this information is current as of August 20, 2019. Additions to this table will be incorporated by reference from RSA's permit once renewed.

E-6b Description of Sampling and Analysis Procedures [40 CFR 270.14(c)(5), 264.97(d),(e),(f); ADEM 335-14-8-.02(5)(c)(6)(iv), 335-14-5-.06(2)(d),(e),(f)]

Sampling and analysis procedures are described in standard operating project procedures included in RSA's *Installation-Wide Quality Assurance Program Plan for the Program Management Contract* (Revision 2 dated May 2013 or most recent version) (Shaw, 2013) and include the following topics:

- Field Documentation (including chain of custody)
- Field Equipment Decontamination
- Investigation-Derived Waste
- Groundwater Sampling
- Field-Generated Records Management
- Field Measurable Physical Characteristics
- Field Measurable Chemical Characteristics
- Continuous Water Level Monitoring
- Non-Hazardous Sample Handling, Packaging, and Shipping
- Groundwater Level Measurements
- Field Equipment Calibration.

Analytical Procedures

The analytes to be included in the monitoring program for the OB/OD Units are discussed in Section E-8c and in Section E-9a for the SWMUs.

Sampling and Analysis Procedures

RSA will use the following techniques and procedures when obtaining and analyzing samples from the groundwater monitoring wells to provide a reliable indication of the quality of the groundwater. RSA will collect, preserve, and ship samples (when shipping off-site for analysis) in accordance with the permit application including the groundwater sampling plans in applicable reports incorporated by reference.

RSA will analyze samples according to the procedures specified in the permit application, the most recent edition of SW-846 or other appropriate methods approved by the Department. Analytical method detection limits will be less than or equal to the concentration limits, unless otherwise approved in writing by the Department. RSA will track and control samples using the chain-of-custody procedures specified in the permit application.

RSA will use statistical analyses to evaluate the groundwater monitoring data as described in ADEM Admin. Code Rule 335-14-5-.06(8)(h).

Samples will not be filtered prior to analysis unless specified in the analytical procedure (e.g., the method for perchlorate requires field filtration to prevent sample degradation).

RSA will keep and maintain all monitoring, testing, and analytical data obtained in accordance with RSA's IW QAPP (Shaw, 2013 and as updated).

E-6c Procedures for Establishing Background Quality [40 CFR 270.14(c)(5), 264.97(a)(1),(g); ADEM 335-14-8-.02(5)(c)(5), 335-14-5-.06(8)(a)(1),(g)]

The background well for the OB/OD units is RS243. Data from the OB/OD Unit point-of-compliance (POC) wells are compared to data from the background well using the statistical procedures described in Section E-6d below. Monitoring wells designated as background wells for the OB/OD Unit, RSA-049, and RSA-060 are provided in Table E-2.

E-6d Statistical Procedures [40 CFR 270.14(c)(5), 264.97(h),(i)(1),(5),(6); ADEM 335-14-8-.02(5)(c)(5), 335-14-5-.06(8)(h),(i)(1),(5),(6)]

Statistical analysis of groundwater data includes the Wilcoxon rank sum (WRS) test as the "interwell comparison." This test essentially compares the medians of the POC well data versus the background well data to see if the POC data set is shifted higher, with statistical significance, relative to that of the background well. Any analyte at a POC well that fails the WRS test then undergoes temporal trend analysis (Kendall's tau) to determine if there is an upward or downward trend in concentration over the monitoring period. Data sets that undergo trend analysis are also visualized using plots of concentration versus time.

E-7 Detection Monitoring Program [40 CFR 270.14(c)(6); 264.91(a)(4); 264.98; ADEM 335-14-8-.02(5)(c)(6); 335-14-5-.06(2)(a)(4); 335-14-5-.06(9)]

This section is not applicable to any regulated units at RSA.

E-8 Compliance Monitoring Program [40 CFR 270.14(c)(7); 264.99; ADEM 335-14-8-.02(5)(c)(7); 335-14-5-.06(10)]

RSA's OB and OD units are regulated miscellaneous units subject to compliance monitoring. Figure E-1 shows the locations of the permit-listed wells and other site wells for the OB/OD Unit. The monitoring program for the RSA SWMUs is discussed in Sections E-9 and E-10.

E-8a Waste Description [40 CFR 270.14(c)(7)(i); ADEM 335-14-8-.02(5)(c)(7)(i)]

The wastes treated at the OB/OD Unit consist of fired and unfired munitions items (rocket motors, warheads, shells, grenades, flares), munitions components (e.g., fuses), bulk energetics (propellants and explosives), and energetic-contaminated materials.

RSA treats reactive (D003) hazardous wastes by OB/OD. All hazardous wastes that are treated by OB/OD possess the Resource Conservation and Recovery Act (RCRA) hazardous characteristic of reactivity (D003) defined in ADEM Administrative Code R.335-14-2-.02(4)(a)6,7, and 8, and in 40 CFR 261.23(a)(1),(3),(6),(7), and (8) as follows:

- It is normally unstable and readily undergoes violent change without detonating.
- It forms potentially explosive mixtures with water.
- It is capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
- It is a forbidden explosive as defined in 49 CFR 173.51, a Class A explosive as defined in 49 CFR 173.53, or a Class B explosive as defined in 49 CFR 173.88.

In addition to the reactivity characteristic, wastes treated by OB/OD may also be classified as hazardous due to the hazardous characteristics of ignitability (D001), corrosivity (D002), and/or certain toxicity (D004 through D043) codes. Some of the wastes treated by OB are listed F001 through F005 or U wastes. The wastes treated by OB/OD do not contain pesticides, herbicides, dioxins, or PCBs. Pentachlorophenol (PCP) – treated wood and beryllium and/or waste containing beryllium are prohibited from treatment at OB/OD. Treatment of recovered liquid-filled rounds, chemical warfare materiel or components thereof, liquid agent-contaminated components and items containing depleted uranium either loaded or expended are prohibited. Treatment of loaded munitions or components containing colored smokes, white phosphorus, red phosphorus, hexachloroethane or riot control agents are prohibited.

E-8b Characterization of Contaminated Groundwater [40 CFR 270.14(c)(7)(ii); ADEM 335-14-8-.02(5)(c)(7)(ii)]

In addition to the information for the RSA-151 groundwater unit summarized in Section E-5 above, numerous sampling events have been conducted specifically at the OB/OD Area and have provided considerable data to characterize groundwater at the site. The groundwater at the OB/OD Area was originally sampled on a semiannual basis for a period of two years beginning in November 2003. Based on recommendations from RSA, an additional two-year monitoring period was approved by ADEM in February 2006. The groundwater at the OB/OD Area was sampled on a semiannual basis for an additional period of two years beginning in May 2006. Additional sampling events were performed in June and October 2008, July and October 2009 and have been performed annually since 2010 as detailed in annual groundwater monitoring

reports prepared in accordance with the current Part VII of RSA's AHWMMA permit. Based on the analytical data from these numerous sampling events, constituents of interest persist in groundwater at concentrations above the ADEM groundwater RSLs, most notably explosive compounds, perchlorate, and VOCs.

E-8c Hazardous Constituents to be Monitored in Compliance Program [40 CFR 270.14(c)(7)(iii); 264.98 (g)(3); 264.99(a)(1); ADEM 335-14-8-.02(5)(c)(7)(iii); 335-14-5-.06(9)(g)(3); 335-14-5-.06(10)(a)(1)]

The constituents to be monitored in groundwater at the OB/OD Unit are presented in Table E-3. The Army is recommending deletion of some COCs in the general lists of analytical groups such as VOCs, pesticides, SVOCs and others. The supporting rationale for retaining or reducing analytes in the lists of permit-specified analytes for this site is presented in Appendix E-1.

E-8d Concentration Limits [40 CFR 270.14(c)(7)(iv); 264.94, 264.97(g),(h); 264.99(a)(2); ADEM 335-14-8-.02(5)(c)(7)(iv); 335-14-5-.06(5); 335-14-5-.06(8)(g)(h); 335-14-5-.06(10)(a)(2)]

The groundwater protection standards for the OB/OD Unit are provided in Table E-4, which lists the hazardous constituents and their respective concentration limits.

E-8e Alternate Concentration Limits [40 CFR 270.14(c)(7)(iv); 264.94(b), 264.97(g),(h); 264.99(a)(2); ADEM 335-14-8-.02(5)(c)(7)(iv); 335-14-5-.06(5)(b); 335-14-5-.06(8)(g)(h); 335-14-5-.06(10)(a)(2)]

This section is not applicable. RSA is not proposing alternate concentration limits at this time.

E-8f Engineering Report Describing Groundwater Monitoring Systems [40 CFR 270.14(c)(7)(v); 264.95; 264.97(a)(2),(b),(c); 264.99(b); ADEM 335-14-8-.02(5)(c)(7)(v); 335-14-5-.06(6); 335-14-5-.06(8)(a)(2)(b)(c); 335-14-5-.06(10)(b)]

Groundwater Monitoring System at the OB/OD

The groundwater monitoring system for the OB/OD Unit is described in the annual groundwater monitoring reports, which are prepared and submitted to ADEM. This monitoring program follows the requirements outlined in Section E-6, the site-specific field sampling plan for the OB/OD Area, and the RSA installation-wide quality assurance program plan.

In addition to the general groundwater monitoring requirements, RSA will sample all point of compliance wells and background wells as listed in Table E-2 and analyze for the constituents listed in Table E-3 annually throughout the compliance monitoring period.

Samples will be analyzed for temperature (degrees F or C), specific conductance (Mhos/cm), and pH (standard units), at all background and point of compliance monitoring well locations each time the well is sampled. The data obtained will be submitted as on field data collection forms in the reports.

Reporting

RSA will report the compliance monitoring program results to ADEM annually. RSA will submit the reports to the Department within 60 calendar days of each annual anniversary of this permit or on a date agreed to between RSA and ADEM. In this report, RSA will provide data from groundwater monitoring along with an analysis of that data, identify constituents of interest at the OB/OD Unit and any conclusions regarding the effectiveness of the program. If the analysis of the data warrants any change to the compliance monitoring program, RSA will include these revisions in the annual report which will be followed up within 90 calendar days with an application for permit modification.

E-8g Proposed Sampling and Statistical Analysis Procedures for Groundwater Data [40 CFR 270.14(c)(7)(vi); 264.97(d),(e),(f);264.99(c)-(g); ADEM 335-14-8-.02(5)(c)(7)(vi); 335-14-5-.06(8)(d)(e)(f); 335-14-5-.06(10)(c)-(g)]

Sampling and analysis procedures and statistical analysis procedures are discussed in Sections E-6b and E-6d, respectively.

E-8h Groundwater Protection Standard Exceeded at Compliance Point Monitoring Well [40 CFR 270.14(c)(8); 264.99(h),(i); ADEM 335-14-8-.02(5)(c)(8); 335-14-5-.06(10)(h)(i)]

Part VII.D.2.b of RSA's AHWMMA permit states "If the Permittee determines pursuant to Permit Conditions VII.B.5 and VII.D.1.c and ADEM Admin. Code Rule 335-14-5-.06(10)(d) that any concentration limits listed in Table VII.3 of this permit exceeded in any monitoring well at the point of compliance, he or she must comply with ADEM Admin. Code Rule 335-14-5-.06(10)(h)." Admin. Code Rule 335-14-5-.06(10)(h)2 states that if the owner or operator determines, pursuant to 335-14-5-.06(10)(d) that any concentration limits under 335-14-5-.06(5) are being exceeded at any monitoring well at the point of compliance, he or she must "submit to the Department an application for a permit modification to establish a corrective action program meeting the requirements of 335-14-5-.06(11) within 180 days …."

RSA and ADEM are aware that multiple SWMUs, including RSA-013 and RSA-014, in addition to the hazardous waste units RSA-012 (OD area) and RSA-131 (OB pans) have contributed to groundwater contamination beneath these adjacent units. Because of the contaminant contributions to groundwater from multiple sources, the RSLs listed in Table E-1 are currently

exceeded at one or more of the point of compliance wells identified in Table E-2. As discussed in Section E-5 above, all groundwater beneath these sites is considered to be part of groundwater unit RSA-151. ADEM has approved RFI reports for RSA-013 (which includes no further action sites RSA-132 and RSA-133), RSA-014, and RSA-151, and the Army is in the process of performing corrective measures at these sites. It is the Army's understanding that the corrective measures for groundwater to be performed as part of the RSA-151 groundwater unit and the corrective measures for soil to be performed as part of RSA-013 and RSA-014 will be sufficient to meet the requirements of 335-14-5-.06(10)(d) assuming that there is no increasing trend of contaminant concentrations at any monitoring well at the point of compliance. A schedule for implementation of corrective measures is presented in the corrective measures implementation (CMI) work plan.

In addition, in February 2017, RSA submitted a CMI work plan for the OB/OD Area to ADEM. This CMI work plan described the corrective measures necessary to upgrade the OB/OD Area in order to meet state requirements and provide protection of human health and the environment. In early 2019, RSA completed the corrective measures to bring the facility into compliance with ADEM Administrative Code 335-14-5-.01(1)(j)7 by raising the OD unit above the floodplain. In addition, the corrective measures included installation of a new liner/underdrain, surface water collection system, and holding pond, all above flood elevation. These corrective measures will prevent or minimize leaching of contaminants from soil to groundwater and effectively mitigate runoff and infiltration as well as mitigate flooding potential.

E-9 Corrective Action Program [40 CFR 270.14(c)(8); 264.99(j); 264.100; ADEM 335-14-8-.02(5)(c)(8); 335-14-5-.06(10)(j); 335-14-5-.06(11)]

Sites undergoing corrective action for groundwater include RSA-009, RSA-049, RSA-053, RSA-054/055, RSA-056/139, RSA-060, RSA-083, and RSA-204. ADEM has approved the RSA-003 CMI work plan which includes a groundwater action; however, this site is not yet included in RSA's permit. This site should be included in this section in the future. In addition, the Facility-wide groundwater monitoring program is listed as corrective action monitoring. RSA intends to implement the corrective action monitoring programs in accordance with the approved CMI Plans, Corrective Action Plans (CAP) or groundwater monitoring work plans submitted to and approved by ADEM. Wells included in the corrective actions for groundwater are presented on Figure E-4.

RSA will conduct a Corrective Action Program, as described in the approved CMI Plans or groundwater monitoring plans, to remove or treat in place all hazardous constituents that exceed their respective groundwater protection standards at the point of compliance. In addition, RSA

will complete a Corrective Action Program to remove or treat in place all hazardous constituents that exceed their respective groundwater protection standards between the points of compliance and the downgradient facility property boundary, and beyond the facility boundary in accordance with ADEM Admin. Code Rule 335-14-5-.06(11)(e)2.

In addition, RSA will continue to implement the corrective action program as described in the approved CMI Plans within 120 calendar days after the effective date of this permit.

E-9a Characterization of Contaminated Groundwater [40 CFR 270.14(c)(8)(i); ADEM 335-14-8-.02(5)(c)(8)(i)]

Groundwater characterization was performed as summarized in the annual monitoring reports or background reports for the sites included in corrective action monitoring. These results are summarized in Table E-5.

E-9b Concentration Limits [40 CFR 270.14(c)(8)(ii); 264.94; 264.100(a)(2); ADEM 335-14-8-.02(5)(c)(8)(ii); 335-14-5-.06(5); 335-14-5-.06(11)(a)(2)]

The list of COCs for the sites under corrective action monitoring is included in Table E-6 while the list of COCs for the Facility-wide corrective action monitoring is included in Table E-7. The concentration limits for COCs for the sites under corrective action monitoring (RSA-009, RSA-049, RSA-053, RSA-054/055, RSA-056/139, RSA-060, RSA-083, and RSA-204) are provided in Table E-8. The concentration limits for COCs for the Facility-wide corrective action monitoring are provided in Table E-9.

For sites RSA-054/055, RSA-204 and the Facility-wide monitoring program, the Army is recommending deletion of some COCs in the general lists of analytical groups such as VOCs, metals, explosives, and SVOCs. The supporting rationale for retaining or reducing analytes in the lists of permit-specified analytes for each of these sites is presented in Appendix E-1. Consideration has been given to weight-of-evidence criteria such as whether screening values are available; whether the constituent is not detected and detection limits are less than the RSL, or if detected whether any results exceed the RSL. Lastly for the OB/OD where the conceptual site model (CSM) is well established, the CSM is considered in the weight of evidence evaluation.

E-9c Alternate Concentration Limits [40 CFR 270.14(c)(8)(ii); 264.94(b); 264.100(a)(2); ADEM 335-14-8-.02(5)(c)(8)(ii); 335-14-5-.06(5)(b); 335-14-5-.06(11)(a)(2)]

This section is not applicable. RSA is not proposing alternate concentration limits at this time.

E-9d Corrective Action Plan [40 CFR 270.14(c)(8)(iii); 264.100(b); ADEM 335-14-8-.02(5)(c)(8)(iii); 335-14-5-.06(11)(b)]

The corrective action plans for groundwater at the SWMUs included in RSA's corrective action program have been included in the corrective measures work plan (CMIP) or comparable document for each SWMU. These CMIPs are incorporated by reference into this permit renewal application and are listed in Table E-10.

These CMIPs or comparable plans provide detailed plans and engineering reports on corrective actions proposed for each SWMU, including maps of engineered structures, construction details, plans for removing waste, description of treatment technologies, plans to assess the effectiveness of corrective action programs, descriptions of injection systems, plus appropriate hydrogeologic data, operation and maintenance plans, and closure plans.

E-9e Groundwater Monitoring Program [40 CFR 270.14(c)(8)(iv); 264.100(d); ADEM 335-14-8-.02(5)(c)(8)(iv); 335-14-5-.06(11)(d)]

E-9e(1) Description of Monitoring System

In addition to the point of compliance and background well monitoring systems identified in Table E-2, RSA will maintain the following wells for units included in the corrective action program as shown on Figure E-4, including:

a. **Facility Boundary Monitoring**- Maintain groundwater monitoring wells RS065, RS065A, RS066, RS070, RS643, RS961, RS1111, RS1114, RS1121, RS1148, RS1149, RS1151, RS1152, RS1153, RS1154, RS1157, RS1158, RS1159, RS1160, RS1164, RS1167, RS1294, RS1353, RS1413 (shallow and deep), RS1414, RS1416, RS1418, RS1419, RS1483, RS1486c, RS1488e, RS1489e, RS1514 (shallow and deep), RS1518 (all screened intervals), RS1520 (all screened intervals), RS1522 (shallow and deep), RS1523, RS1527, RS1534 (all screened intervals), RS1673a, RS1675 (shallow and deep), RS1711, RS1779, RS1783 (shallow and deep), RS1785 (shallow and deep), RS1786 (shallow and deep), RS1806 (all screened intervals), RS2109, RS2801, RS2802, RS2803, RS2804, MSW13, MSW14, MSW16, MSW18a, INCRK-01, OFF-SW27 and P-SW11.

b. **RSA-009**- Maintain groundwater monitoring well RS1428 as an effectiveness well for RSA-009 as listed in Table E-2.

c. **RSA-049-** Maintain groundwater monitoring wells RS054, RS263, RS633, RS635, RS636, RS1074, RS1090, RS1589, RS1590, RS1591, RS1592, and RS1973 as effectiveness wells for RSA-049 as listed in Table E-2. Wells RS634, RS1087, RS1593, and RS1594 will be maintained as background wells for RSA-049.

d. **RSA-053-** Maintain groundwater monitoring wells RS138, RS139, RS179, RS192, RS273, RS274, RS348, RS349, RS1996, and RS1997 as effectiveness wells for RSA-053, as listed in

Table E-2. RS270, RS2003, and RS2175 will be maintained as upgradient wells for RSA-053 and monitoring well RS195 will be maintained as a point of compliance for RSA-053.

e. **RSA-054/055-** Maintain groundwater monitoring wells RS038, RS039, RS165, RS166, RS200, RS201, RS223, RS297, RS384 and RS385 as effectiveness wells for RSA-054/055, as listed in Table E-2.

f. **RSA-056/139**- Maintain groundwater monitoring wells RS048, RS518, RS521, RS630, RS1255, RS1257, RS1259, RS1261, RS1267, RS1273, and RS1275 as effectiveness wells for RSA-056/139, as listed in Table E-2. Monitoring well RS517 will be maintained as a point of compliance for RSA-056/139, as listed in Table E-2.

g. **RSA-060-** Maintain groundwater monitoring wells RS020, RS022, RS197, RS282, RS552, RS555, RS556, RS2723, RS2876 and RS2877 as effectiveness wells for RSA-060, as listed in Table E-2. RS285 will be maintained as a background well for RSA-060.

h. **RSA-083**- Maintain groundwater monitoring wells RS708, RS709, RS710, RS808, RS3054, RS2545, RS2548, RS2549, RS2550, RS2637, RS2639, and RS2640 as effectiveness wells for RSA-083, as listed in Table E-2. RS2547, RS2638, and RS2641 will be maintained as upgradient wells for RSA-083, as listed in Table E-2.

i. **RSA-204-** Maintain groundwater monitoring wells RS690, RS691, RS1223, RS1550, RS2027, RS2029, RS2030, RS2031, RS2032, RS2033, RS2034, RS2668, RS2670, RS2671, RS2672, RS2673, RS2674, RS2675, RS2676, RS2677, RS2678, RS2683, RS2791, RS2793, and RS2824 as effectiveness wells for RSA-204, as listed in Table E-2.

E-9e(2) Description of Sampling and Analysis Procedures

A description of sampling and analysis procedures is presented in Section E-6.

E-9e(3) Monitoring Data and Statistical Analysis Procedures

A description of monitoring data and statistical analysis procedures is presented in Section E-6.

In addition to the general groundwater monitoring requirements specified in Section E-6, RSA will sample all background, upgradient, point of compliance, and effectiveness monitoring wells shown in Table E-2 and analyze for the constituents listed in Table E-6 or Table E-7 on an annual basis beginning within 120 calendar days of the effective date of this permit and continuing through the end of the compliance period.

- At RSA-009, RSA will sample the groundwater monitoring well listed in Table E-2 on a semiannual basis for the constituents listed in Table E-6.
- At RSA-049, RSA will sample the groundwater monitoring wells listed in Table E-2 on a semiannual basis for the constituents listed in Table E-6.

- At RSA-053, RSA will sample groundwater wells listed in Table E-2 on a quarterly basis for the constituents listed in Table E-6. After two years of quarterly sampling, RSA may request a permit modification to modify the sampling frequency based on sampling results presented in the Annual Effectiveness Reports.

- At RSA-054/055, RSA will sample the groundwater wells listed in Table E-2 on a quarterly basis for the constituents listed in Table E-6. After one year of quarterly sampling, RSA may request a permit modification to modify the sampling frequency based on sampling results presented in the Annual Effectiveness Report.

- At RSA-056/139, RSA will sample the groundwater wells listed in Table E-2 on a semiannual basis for the constituents listed in Table E-6. After three years, RSA may request a permit modification to modify the sampling frequency based on sampling results presented in the Annual Effectiveness Report.

- At RSA-060, upon submittal of the CMI report, RSA will initiate sampling of the groundwater wells listed in Table E-2 on a quarterly basis for the constituents listed in Table E-6. After three years of quarterly monitoring, RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-083, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. Two of the fifteen wells, RS2545 and RS2548, will be sampled during the baseline sampling event and then considered contingency wells for the remainder of the groundwater monitoring program. RSA will sample the remaining groundwater wells on a quarterly basis during Year 1, on a semiannual basis during Years 2 and 3, and on an annual basis through the remainder of the remedial action. RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-204, upon submittal of the CMI report, RSA will initiate sampling of the groundwater wells listed in Table E-2 on a quarterly basis for the first year and then on a semiannual basis for the next two years as prescribed in the CMI Plan for the constituents listed in Table E-6. After two years of semiannual monitoring, RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- RSA will sample all background, upgradient, point of compliance, effectiveness, and boundary monitoring wells shown in Table E-2 and analyze for the constituents listed in Table E-7 on an annual basis beginning within 120 calendar days of the effective date of this permit and continuing through the end of the compliance period.

All wells whether background, upgradient, point of compliance, effectiveness, and boundary monitoring wells shown in Table E-2 will be analyzed for temperature (degrees F or C), specific

conductance (Mhos/cm), and pH (standard units) each time the well is sampled. The data obtained will be submitted on the field forms in the reports.

When evaluating the monitoring results to determine the effectiveness of the corrective measures, RSA will:

i. Determine if the corrective action system effectively addresses the entire plume of contamination;

ii. Determine if the concentration of the hazardous constituents are decreasing (pH increasing or decreasing toward neutrality, as applicable) in the effectiveness wells; and

iii. Determine if RSA suspects that additional hazardous waste or hazardous constituents are being released into the environment.

RSA and ADEM are aware that hazardous constituents have been detected in the boundary wells at concentrations greater than the Groundwater Protection Standards. For the IW Boundary Monitoring Program, RSA will assess whether concentrations in boundary wells with results that exceed the Groundwater Protection Standards are increasing, stable, or decreasing. RSA expects that concentrations will decrease as a result of groundwater corrective measures completed at sites that were major contributors to the offsite plumes. The most abundant contaminants found in groundwater potentially migrating off post from RSA are nitrobenzene, 2-nitrotoluene, TCE, and vinyl chloride. Trend analysis for the 2017 data indicates that concentrations of perchlorate are decreasing in wells K-RS961, OFF-RS1520a, and Z-RS1294 and VOCs, including 1,1-DCE, benzene, carbon tetrachloride, chlorobenzene, chloroform, cis-1,2-DCE, tetrachloroethene, toluene, TCE, and vinyl chloride at 1 to 10 wells each. Of note is that temporary increases in degradation products, such as cis-1,2-DCE and vinyl chloride, provide evidence that microbial degradation of the primary contaminants is effectively proceeding.

E-9e(4) Reporting Requirements

In addition to the recordkeeping and reporting requirements specified in Section E-6, RSA will report the effectiveness of the corrective action program annually. If the analysis of the data warrants any change to the corrective action program, RSA will include these revisions in the annual report which will be followed up within 90 calendar days with an application for permit modification.

If corrective action is terminated, RSA will sample all background, point of compliance, effectiveness, and boundary sampling locations for the compounds listed in Appendix IX of ADEM Admin. Code Rule 335-14-5. Based upon the sampling results, RSA may petition the

Department for a permit modification to implement either a detection monitoring program or a compliance monitoring program.

E-10 Groundwater Monitoring Well Design [40 CFR 264.97(c); ADEM 335-14-5-.06(8)(c)]

Information on groundwater monitoring well design is presented in Table E-2. RSA will design groundwater monitoring wells in accordance with American Society for Testing and Materials standards. Any well within loess will be designed to minimize turbidity.

TABLES

FIGURES

APPENDIX E-1

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
OB and OD									
RS107	POC	34°34' 15.98"N	86°39' 56.34"W	OB and OD	43.0	569.29	571.58	30.0-40.0	Overburden
RS108	POC	34°34' 11.93"N	86°39' 54.58"W	OB and OD	27.5	563.09	565.32	15.0-25.0	Overburden
RS209	POC	34°34' 15.71"N	86°40' 07.07"W	OB and OD	35.0	566.83	568.88	21.0-31.0	Overburden
RS211	POC	34°34' 20.28"N	86°40' 02.06"W	OB and OD	32.0	562.33	565.18	18.0-28.0	Overburden
RS243	BKG	34°34' 90.95"N	86°39' 59.62"W	OB and OD	39.8	572.82	575.68	24.3-33.3	Overburden
RS2882	POC	34°34' 18.92”N	86°40' 04.18”W	OB and OD	23.1	566.62	566.32	12.7-22.7	Overburden
RS2883	POC	34°34' 15.78"N	86°40' 06.09”W	OB and OD	39.8	563.39	563.13	29.4-39.4	Overburden
RS2884	POC	34°34' 15.97”N	86°40' 01.03”W	OB and OD	23.8	566.75	566.34	13.6-23.6	Overburden
RSA-009									
RS1428	EFF	34° 38’ 24.00”N	86° 40’ 48.00”W	RSA-009	10.0	562.40	565.48	5.0-10.0	Overburden
RSA-049									
RS054	EFF	34° 39' 14.28"N	86° 39' 26.15"W	RSA-049	56.8	613.56	616.66	41.8-51.8	Overburden
RS263	EFF	34° 39' 13.23”N	86° 39' 24.34"W	RSA-049	42.4	608.86	610.76	32.4-41.8	Overburden
RS633	EFF	34° 39' 17.36"N	86° 39' 15.89"W	RSA-049	50.0	613.47	615.97	29.0-44.0	Overburden
RS634	BKG	34° 39' 21.04"N	86° 39' 20.58"W	RSA-049 (GW RSA-149)	33.5	612.93	615.43	17.8-32.8	Overburden
RS635	EFF	34° 39' 22.67"N	86° 39' 24.64"W	RSA-049	40.5	619.78	622.28	25.0-40.0	Overburden
RS636	EFF	34° 39' 17.36"N	86° 39' 27.79"	RSA-049	43.5	621.77	624.44	27.5-42.5	Overburden
RS1074	EFF	34° 39' 13.29"N	86° 39' 16.54"W	RSA-049	106.0	608.57	611.36	95.7-105.7	Bedrock
RS1087	BKG	34° 39' 21.23"N	86° 39' 20.35"W	RSA-049 (GW RSA-149)	76.5	612.86	616.4	66.2-76.2	Bedrock
RS1090	EFF	34° 39' 18.46"N	86° 39' 27.81"W	RSA-049	95.0	623.20	626.04	83.0-92.7	Bedrock
RS1589	EFF	34° 39' 16.25"N	86° 39' 15.91"W	RSA-049	49.0	611.03	614.61	34.0-49.0	Overburden
RS1590	EFF	34° 39' 14.30"N	86° 39' 19.93"W	RSA-049	79.0	610.16	612.48	69.0-79.0	Bedrock

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1591	EFF	34° 39' 14.16"N	86° 39' 21.80"W	RSA-049	66.0	610.53	613.71	51.0-66.0	Bedrock
RS1592	EFF	34° 39' 14.17"N	86° 39' 21.91"W	RSA-049	48.0	610.53	613.71	33.0-48.0	Overburden
RS1593	BKG	34° 39' 14.81"N	86° 39' 31.67"W	RSA-049 (GW RSA-149)	117.0	620.67	623.91	107.0-117.0	Bedrock
RS1594	BKG	34° 39' 14.68"N	86° 39' 31.78"W	RSA-049 (GW RSA-149)	45.0	620.32	623.86	30.0-45.0	Overburden
RS1973	EFF	34°39'9.878"N	86°39' 16.988"W	RSA-049	46.0	614.83	617.54	36.0-46.0	Overburden
RSA-053									
RS138	EFF	34°37'40.16"N	86°38' 42.51"W	RSA-053	43.0	568.54	571.54	21.5-41.5	Overburden
RS139	EFF	34°37'39.98"N	86°38' 47.00"W	RSA-053	40.0	580.83	583.32	30.0-40.0	Overburden
RS179	EFF	34°37'37.09"N	86°38' 47.35"W	RSA-053	24.9	559.27	561.31	19.7-24.7	Overburden
RS192	EFF	34°37'45.18"N	86°38' 44.03"W	RSA-053	66.0	600.29	602.45	57.0-66.0	Overburden
RS195	POC	34°37' 37.50"N	86°38' 43.76"W	RSA-053	40.5	557.99	560.46	28.0-38.0	Overburden
RS270	UPG	34°37'55.88"N	86°38' 57.55"W	RSA-053	46.6	591.48	594.2	36.6-45.6	Overburden
RS273	EFF	34°37'50.13"N	86°38' 46.19"W	RSA-053	40.2	603.59	605.89	27.7-36.7	Overburden/ Perched
RS274	EFF	34°37'50.19"N	86°38' 46.32"W	RSA-053	71.6	603.46	606.00	59.1-68.1	Overburden
RS348	EFF	34°37'56.87"N	86°38' 52.45"W	RSA-053	38.0	603.51	606.36	26.0-36.0	Overburden/ Perched
RS349	EFF	34°37'56.89"N	86°38' 52.32"W	RSA-053	63.0	603.67	606.34	52.0-62.0	Overburden
RS1996	EFF	34°37'48.09"N	86°38' 51.83"W	RSA-053	52.5	605.77	607.97	42.1-52.1	Overburden
RS1997	EFF	34°37'47.49"N	86°38' 51.39"W	RSA-053	90.0	605.13	607.85	80.0-90.0	Bedrock
RS2003	UPG	34°37'52.58"N	86°38' 55.08"W	RSA-053	58.0	603.33	604.48	47.0-57.0	Overburden
RS2175	UPG	34°37'52.58"N	86°38' 55.01"W	RSA-053	92.0	603.71	605.04	81.0-91.0	Bedrock
RSA-054/055									
RS038	EFF	34° 38' 30.46"N	86° 38' 28.93"W	RSA-054/055	52.5	625.69	628.56	37.5-47.5	Overburden
RS039	EFF	34° 38' 24.35"N	86° 38' 31.13"W	RSA-054/055	46.0	634.77	638.49	30.0-41.0	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS165	EFF	34° 38' 41.58"N	86° 38' 29.24"W	RSA-054/055	44.0	609.28	611.99	21.0-41.0	Overburden
RS166	EFF	34° 38' 24.53"N	86° 38' 41.24"W	RSA-054/055	66.0	615.61	617.93	51.0-61.0	Overburden
RS200	EFF	34° 38' 44.88"N	86° 38' 33.19"W	RSA-054/055	41.0	604.26	607.00	26.0-37.0	Overburden
RS201	EFF	34° 38' 30.25"N	86° 38' 43.05"W	RSA-054/055	60.0	611.82	614.23	47.0-57.0	Overburden
RS223	EFF	34° 38' 36.33"N	86° 38' 29.49"W	RSA-054/055	44.0	614.13	616.86	29.0-39.0	Overburden
RS297	EFF	34° 38' 42.21"N	86° 38' 43.02"W	RSA-054/055	44.4	627.86	630.65	31.9-40.9	Overburden
RS384	EFF	34° 38' 25.94"N	86° 38' 43.36"W	RSA-054/055	42.0	614.74	617.69	27.0-42.0	Overburden
RS385	EFF	34° 38' 37.37"N	86° 38' 45.74"W	RSA-054/055	40.0	630.40	632.66	30.0-40.0	Overburden
RSA-056/139									
RS048	EFF	34°38'36.101"N	86°38'3.962" W	RSA-056/139	23.6	587.34	590.87	8.6-18.6	Overburden
RS517	POC	34°38'29.72"N	86°38' 0.909"W	RSA-056/139	22.1	583.12	585.82	16.3-21.3	Overburden
RS518	EFF	34°38'34.317"N	86°38' 1.093"W	RSA-056/139	28.1	586.36	587.96	22.6-27.6	Overburden
RS521	EFF	34°38'34.093"N	86°38' 7.729"W	RSA-056/139	36.5	587.72	590.88	30.7-35.7	Overburden
RS630	EFF	34°38'32.798"N	86°38' 4.85"W	RSA-056/139	24.0	589.69	592.19	9.0-23.8	Overburden
RS1255	EFF	34°38'36.243"N	86°38' 9.776"W	RSA-056/139	27.0	589.38	591.46	17.0-27.0	Overburden
RS1257	EFF	34°38'36.041"N	86°38' 8.098"W	RSA-056/139	25.0	586.68	588.91	15.0-25.0	Overburden
RS1259	EFF	34°38'34.513"N	86°38' 8.435"W	RSA-056/139	27.0	586.89	586.67	17.0-27.0	Overburden
RS1261	EFF	34°38'35.495"N	86°38' 9.956"W	RSA-056/139	28.0	589.63	591.72	18.0-28.0	Overburden
RS1267	EFF	34°38'32.508"N	86°38' 0.51"W	RSA-056/139	23.0	585.09	587.08	13.0-23.0	Overburden
RS1273	EFF	34°38'30.591"N	86°38' 5.545"W	RSA-056/139	28.0	584.27	586.04	18.0-28.0	Overburden
RS1275	EFF	34°38'32.203"N	86°38' 7.181"W	RSA-056/139	34.5	587.85	589.94	24.5-34.5	Overburden
RSA-060									
RS020	EFF	34°37'31.66"N	86°38' 22.77"W	RSA-060	26.0	556.36	570.56	10.0-21.0	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS022	EFF	34°37'29.49"N	86°38' 32.71"W	RSA-060	41.0	567.05	570.12	14.0-25.0	Overburden
RS197	EFF	34°37'36.97"N	86°38' 36.23"W	RSA-060	52.2	574.78	576.50	39.0-49.0	Overburden
RS282	EFF	34°37'37.03"N	86°38'24.85" W	RSA-060	28.3	568.23	570.92	15.8-24.8	Overburden
RS285	BKG	34°37'44.14"N	86°38' 34.66"W	RSA-060	43.5	572.87	575.25	31.0-40.0	Overburden
RS552	EFF	34°37'29.88"N	86°38' 32.58"W	RSA-060	62.0	569.90	572.61	52.0-62.0	Bedrock
RS555	EFF	34°37'32.45"N	86°38' 33.60"W	RSA-060	47.0	573.10	575.94	37.0-47.0	Overburden
RS556	EFF	34°37'25.615"N	86°38' 31.30"W	RSA-060	35.5	563.50	566.31	25.5-35.5	Interface
RS2723	EFF	34°37' 31.05"N	86°38' 27.67"W	RSA-060	18.0	571.04	573.38	7.6-17.6	Overburden
RS2876	EFF	34° 37' 35.76"N	86° 38' 34.77"W	RSA-060	54.0	576.32	578.7	43.6-53.6	Overburden
RS2877	EFF	34° 37' 40.01"N	86° 38'33.72"W	RSA-060	36.5	572.11	574.14	26.1-36.1	Overburden
RSA-083									
RS708	EFF	34°37'16.029"N	86°37' 13.622"W	RSA-083	10.5	575.28	578.19	5.5-10.5	Overburden
RS709	EFF	34°37'14.649"N	86°37' 11.879"W	RSA-083	14.0	569.58	572.10	4.0-14.0	Interface
RS710	EFF	34°37'15.931"N	86°37' 10.863"W	RSA-083	15.0	571.81	574.75	5.0-15.0	Interface
RS808	EFF	34°37'12.068"N	86°37' 14.784"W	RSA-083	8.0	569.71	571.80	3.0-8.0	Overburden
RS3054	EFF	34°37'14.471"N	86°37' 13.592"W	RSA-083	12.0	568.58	570.88	2.0-12.0	Overburden
RS2545	EFF	34°37'14.766"N	86°37' 15.682"W	RSA-083	19.3	572.47	574.875	8.9-18.9	Interface
RS2547	UPG	34°37'12.858"N	86°37' 12.065"W	RSA-083	12.2	570.34	572.58	1.8-11.8	Interface
RS2548	EFF	34°37'17.798"N	86°37' 10.897"W	RSA-083	15.3	570.24	574.10	4.9-14.9	Interface
RS2549	EFF	34°37'20.072"N	86°37' 7.786"W	RSA-083	14.6	571.84	574.27	4.2-14.2	Interface
RS2550	EFF	34°37'18.138"N	86°37' 6.179"W	RSA-083	21.4	573.58	576.11	11.0-21.0	Interface
RS2637	EFF	34°37'14.604"N	86°37' 4.931"W	RSA-083	17.8	573.83	576.25	7.4-17.4	Interface
RS2638	UPG	34°37'12.522"N	86°37' 8.214"W	RSA-083	17.5	572.50	574.86	7.0-17.1	Interface

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS2639	EFF	34°37'20.956"N	86°37' 8.605"W	RSA-083	16.3	571.74	574.10	5.9-15.9	Interface
RS2640	EFF	34°37'20.336"N	86°37' 4.782"W	RSA-083	19.5	573.16	575.62	9.1-19.1	Interface
RS2641	UPG	34°37'9.859"N	86°37' 9.793"W	RSA-083	14.5	572.76	575.08	4.1-14.1	Interface
RSA-204									
RS690	EFF	34° 37' 13.65"N	86° 36' 38.47"W	RSA-204	23.5	579.47	582.59	13.5-23.5	Overburden
RS691	EFF	34° 37' 17.50"N	86° 36' 35.04"W	RSA-204	22.0	577.53	580.64	12.0-22.0	Interface
RS1223	EFF	34° 37' 18.60"N	86° 36' 38.61"W	RSA-204	29.0	578.65	581.43	18.7-28.7	Interface
RS1550	EFF	34° 37' 21.73"N	86° 36' 35.61"W	RSA-204	26.0	575.04	575.28	16.0-26.0	Overburden
RS2027	EFF	34° 37' 21.09"N	86° 36' 40.47"W	RSA-204	34.7	580.94	583.40	24.3-34.3	Interface
RS2029	EFF	34° 37' 18.48"N	86° 36' 40.55"W	RSA-204	32.2	585.66	588.11	21.7-31.7	Interface
RS2030	EFF	34° 37' 13.79"N	86° 36' 36.26"W	RSA-204	24.2	581.54	584.12	13.8-23.8	Interface
RS2031	EFF	34° 37' 14.67"N	86° 36' 33.72"W	RSA-204	25.7	576.94	579.83	15.3-25.3	Interface
RS2032	EFF	34° 37' 18.92"N	86° 36' 35.04"W	RSA-204	32.5	577.66	576.91	22.1-32.1	Interface
RS2033	EFF	34° 37' 22.72"N	86° 36' 34.51"W	RSA-204	42.8	571.54	574.29	32.4-42.4	Interface
RS2034	EFF	34° 37' 22.84"N	86° 36' 37.54"W	RSA-204	24.6	576.73	579.13	14.2-24.2	Interface
RS2668	EFF	34° 37' 20.85"N	86° 36' 39.40"W	RSA-204	55	580.92	583.71	45-55	Bedrock
RS2670	EFF	34° 37' 16.15"N	86° 36' 36.89"W	RSA-204	50	579.45	582.23	40-50	Bedrock
RS2671	EFF	TBD	TBD	RSA-204	65	TBD	TBD	55-65	Bedrock
RS2672	EFF	34° 37' 14.25"N	86° 36' 35.87"W	RSA-204	29.9	581.40	581.12	19.5-29.5	Interface
RS2673	EFF	34° 37' 15.16"N	86° 36' 36.59"W	RSA-204	27.2	582.14	582.05	16.8-26.8	Interface
RS2674	EFF	34° 37' 15.84"N	86° 36' 35.23"W	RSA-204	27.8	579.80	582.12	17.4-27.4	Interface
RS2675	EFF	34° 37' 16.24"N	86° 36' 36.60"W	RSA-204	30.3	579.17	581.99	19.9-29.9	Overburden
RS2676	EFF	34° 37' 17.46"N	86° 36' 37.23"W	RSA-204	20.5	578.89	581.06	10.1-20.1	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS2677	EFF	34° 37' 19.12"N	86° 36' 38.21"W	RSA-204	29.5	578.31	580.75	19.1-29.1	Overburden
RS2678	EFF	34° 37' 20.02"N	86° 36' 37.65"W	RSA-204	28.4	578.348	580.788	18.0-28.0	Overburden
RS2683	EFF	34° 37' 21.49"N	86° 36' 39.73"W	RSA-204	28.8	579.491	581.813	18.4-28.4	Overburden
RS2791	EFF	TBD	TBD	RSA-204	TBD	TBD	TBD	TBD	Interface
RS2793	EFF	TBD	TBD	RSA-204	TBD	TBD	TBD	TBD	Interface
RS2824	EFF	34° 37' 22.84"N	86° 36' 40.33"W	RSA-204	24.5	578.13	580.47	13.6-23.6	Interface
Facility-Wide									
RS065	BDY	34°40'58.86"N	86°36'41.71" W	Facility-Wide	58.0	596.85	597.98	43.0-58.0	Interface
RS066	BDY	34°40' 02.80"N	86°36' 38.08"W	Facility-Wide	47.0	583.98	583.98	32.0-47.0	Interface
RS070	BDY	34° 35' 46.53"N	86° 35' 12.39"W	Facility-Wide	48.0	571.12	572.27	33.0-48.0	Interface
RS961	BDY	34°37'37.52"N	86°35' 22.155"W	Facility-Wide	45.5	566.46	568.92	35.5-45.5	Interface
RS1111	BDY	34° 41' 46.97"N	86° 41' 58.25"W	Facility-Wide	25.0	605.75	608.36	15.0-25.0	Overburden
RS1114	BDY	34° 41' 00.30"N	86° 42' 52.73"W	Facility-Wide	61.0	598.59	601.27	50.6-60.6	Overburden
RS1121	BDY	34° 39' 42.59"N	86° 42' 50.81"W	Facility-Wide	16.0	584.49	587.36	5.6-15.6	Overburden
RS1153 EP3- 3	BDY	34° 34' 17.14"N	86° 40' 20.69"W	Facility-Wide	45.0	564.95	567.61	34.6-44.6	Interface
RS1159 EP3- 5	BDY	34° 35' 3.22"N	86° 36' 8.30"W	Facility-Wide	40.6	565.21	567.69	25.0-40.0	Interface
RS1353	BDY	34° 38' 43.58"N	86° 42' 35.94"W	Facility-Wide	36.0	581.39	584.01	25.8-35.8	Overburden
RS1414	BDY	34°41'27.246"N	86°42' 44.679"W	Facility-Wide	85.0	643.30	645.47	75.0-85.0	Interface
RS1419	BDY	34°41'0.625"N	86°37' 18.301"W	Facility-Wide	25.0	578.34	580.56	10.0-25.0	Overburden
RS1523	BDY	34° 37' 02.71"N	86° 35' 12.16"W	Facility-Wide	22.0	568.09	571.10	11.8-21.8	Interface
RS1527 (off site)	BDY	34° 36' 38.96"N	86° 35' 14.10"W	Facility-Wide	21.0	567.38	570.80	11.0-21.0	Interface
RS1711	BDY	34°36'9.326"N	86°35' 15.345"W	Facility-Wide	54.0	565.72	568.23	44.0-54.0	Interface
RS2109	BDY	34°35' 46.53"N	86° 35' 12.39"W	Facility-Wide	30.8	571.12	572.27	20.4-30.4	Overburden
RS2801	BDY	34° 36' 27.28"N	86° 35' 21.67"W	Facility-Wide	16.3	568.88	571.27	5.9-15.9	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS2802	BDY	34° 36' 17.77"N	86° 35' 20.66"W	Facility-Wide	18.5	568.53	571.02	8.1-18.1	Overburden
RS2803	BDY	34° 36' 10.52"N	86° 35' 19.40"W	Facility-Wide	30.3	566.23	568.74	19.9-29.9	Overburden
RS2804	BDY	34° 36' 01.56"N	86° 35' 18.59"W	Facility-Wide	50.0	568.71	570.34	39.6-49.6	Overburden
MSW13	BDY	34°41'48.127"N	86°41' 56.881"W	Facility-Wide	0.0	NA	NA	NA	Surface water
MSW14	BDY	34°42'32.59"N	86°38' 21.466"W	Facility-Wide	0.0	NA	NA	NA	Surface water
MSW16	BDY	34°39'40.587"N	86°36' 17.672"W	Facility-Wide	0.0	NA	NA	NA	Surface water
MSW18a	BDY	34°37'18.974"N	86°35' 15.024"W	Facility-Wide	0.0	NA	NA	NA	Surface water
INCRK-01	BDY	34°34'54.971"N	86°43' 47.586"W	Facility-Wide	0.0	556.00	NA	NA	Surface water
OFF-SW27 (off site)	BDY	34°35'48.045"N	86°35' 9.743"W	Facility-Wide	0.0	NA	NA	NA	Surface water
P-SW11	BDY	34°34'21.525"N	86°40' 20.909"W	Facility-Wide	0.0	556.00	NA	NA	Surface water
RS065A	BDY	34°40'46.52"N	86°36' 37.19"W	Facility-Wide Bedrock	142.0	585.89	588.89	57.0-77.0 127.0-142.0	Bedrock
RS643	BDY	34°37' 29.87"N	86°35' 21.23"W	Facility-Wide Bedrock	56.0	577.66	580.11	44.7-55.1	Bedrock
RS1148 EP3- 1	BDY	34°35' 21.629"N	86° 41' 28.22"W	Facility-Wide Bedrock	194.0	565.09	568.07	182.3-192.3	Bedrock
RS1149 EP3- 1	BDY	34° 35' 21.65"N	86° 41' 28.31"W	Facility-Wide Bedrock	274.4	565.23	567.80	259.4-274.4	Bedrock
RS1151 EP3- 2	BDY	34° 35' 00.22"N	86° 40' 39.41"W	Facility-Wide Bedrock	235.5	560.22	565.00	225.0-235.0	Bedrock
RS1152 EP3- 2	BDY	34° 35' 00.11"N	86° 40' 39.24"W	Facility-Wide Bedrock	300.3	560.16	564.79	270.0-285.0	Bedrock
RS1154 EP3- 3	BDY	34°34'17.042"N	86°40' 20.77"W	Facility-Wide Bedrock	191.0	565.06	567.73	176.0-191.0	Bedrock
RS1157 EP3- 4	BDY	34° 34' 41.19"N	86° 37' 00.55"W	Facility-Wide Bedrock	200.3	562.99	565.43	190.0-200.0	Bedrock
RS1158 EP3- 4	BDY	34° 34' 41.30"N	86° 37' 00.48"W	Facility-Wide Bedrock	327.8	562.81	565.34	316.0-326.0	Bedrock
RS1160 EP3- 5	BDY	34° 35' 03.17"N	86° 36' 08.41"W	Facility-Wide Bedrock	205.5	565.24	567.85	195.5-205.5	Bedrock
RS1164 EP3- 6	BDY	34° 35' 7.55"N	86° 35' 16.45"W	Facility-Wide Bedrock	278.8	563.31	566.47	268.8-278.8	Bedrock

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1167	BDY	34° 38' 15.09"N	86° 36' 08.57"W	Facility-Wide Bedrock	198.0	566.36	568.28	182.2-192.2	Bedrock
RS1294 EP4- 6	BDY	34° 35' 07.73"N	86° 35' 16.61"W	Facility-Wide Bedrock	119.5	563.29	565.85	109.0-119.0	Bedrock
RS1413S	BDY	34°41'47.371"N	86°41' 54.903"W	Facility-Wide Bedrock	175.0	609.56	612.28	90.0-120.0	Nested Bedrock
RS1413D	BDY	34°41'47.371"N	86°41 '54.903"W	Facility-Wide Bedrock	175.0	609.56	612.28	155.0-175.0	Nested Bedrock
RS1416	BDY	34°42'33.373"N	86°39' 3.342"W	Facility-Wide Bedrock	56.0	683.69	685.69	36.0-56.0	Bedrock
RS1418	BDY	34°42'32.778"N	86°38' 25.385"W	Facility-Wide Bedrock	92.0	629.14	631.32	82.0-92.0	Bedrock
RS1483	BDY	34°41'27.095"N	86°42' 44.787"W	Facility-Wide Bedrock	101.0	642.52	644.76	91.0-101.0	Bedrock
RS1486c	BDY	34°42'33.373"N	86°39' 3.342"W	Facility-Wide Bedrock	258.0	683.30	685.65	144.0-154.5	CMT Bedrock
RS1488e	BDY	34°42'32.817"N	86°38' 25.297"W	Facility-Wide Bedrock	125.0	628.99	631.63	121.5-124.5	CMT Bedrock
RS1489e	BDY	34°41'0.625"N	86°37' 18.301"W	Facility-Wide Bedrock	200.0	578.75	581.18	184.5-197.0	CMT Bedrock
RS1514S	BDY	34° 37' 16.10"N	86° 35' 30.17"W	Facility-Wide Bedrock	150.0	569.55	572.07	121.0-126.0	Nested Bedrock
RS1514D	BDY	34° 37' 16.10"N	86° 35' 30.17"W	Facility-Wide Bedrock	150.0	569.55	572.07	144.0-149.0	Nested Bedrock
RS1518a	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	55.5-61.0	FLUTe Bedrock
RS1518b	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	83.0-89.0	FLUTe Bedrock
RS1518c	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	100.0-110.0	FLUTe Bedrock
RS1518d	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	152.0-163.0	FLUTe Bedrock
RS1518e	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	213.0-229.0	FLUTe Bedrock
RS1520a	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	67.0-75.0	FLUTe Bedrock
RS1520b	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	99.0-113.0	FLUTe Bedrock
RS1520c	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	130.0-143.0	FLUTe Bedrock
RS1520d	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	164.0-175.0	FLUTe Bedrock
RS1520e	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	210.0-214.0	FLUTe Bedrock

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1520f	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	230.5-244.5	FLUTe Bedrock
RS1522S (off site)	BDY	34° 36' 39.14"N	86° 35' 14.43"W	Facility-Wide Bedrock	182.0	567.56	570.06	100.0-110.0	Nested Bedrock
RS1522D (off site)	BDY	34° 36' 39.14"N	86° 35' 14.43"W	Facility-Wide Bedrock	182.0	567.56	570.06	172.0-182.0	Nested Bedrock
RS1534a	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	99.5-103.5	FLUTe Bedrock
RS1534b	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	127.3-134.3	FLUTe Bedrock
RS1534c	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	182.2-186.2	FLUTe Bedrock
RS1534d	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	218.6-225.9	FLUTe Bedrock
RS1534e	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	235.0-235.9	FLUTe Bedrock
RS1534f	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	252.0-257.0	FLUTe Bedrock
RS1673a	BDY	34° 40' 59.57"N	86° 37' 37.65"W	Facility-Wide Bedrock	125.0	595.82	597.48	72.9-77.9	Bedrock
RS1675S	BDY	34°39'27.698"N	86°36' 41.371"W	Facility-Wide Bedrock	171.0	567.42	569.77	102.0-117.0	Nested Bedrock
RS1675D	BDY	34°39'27.698"N	86°36' 41.371"W	Facility-Wide Bedrock	171.0	567.42	569.77	161.0-171.0	Nested Bedrock
RS1779	BDY	34° 41' 00.44"N	86° 42' 52.97"W	Facility-Wide Bedrock	121.0	600.69	603.19	116.0-121.0	Bedrock
RS1783S	BDY	34° 38' 08.09"N	86° 42' 32.72"W	Facility-Wide Bedrock	122.0	584.20	586.61	44.0-54.0	Nested Bedrock
RS1783D	BDY	34° 38' 08.09"N	86° 42' 32.72"W	Facility-Wide Bedrock	122.0	584.20	586.61	117.0-122.0	Nested Bedrock
RS1785S	BDY	34° 36' 36.12"N	86° 42' 31.56"W	Facility-Wide Bedrock	120.0	560.86	563.31	38.5-48.5	Nested Bedrock
RS1785D	BDY	34° 36' 36.12"N	86° 42' 31.56"W	Facility-Wide Bedrock	120.0	560.86	563.31	110.0-120.0	Nested Bedrock
RS1786S	BDY	34° 35' 46.68"N	86° 43' 14.14"W	Facility-Wide Bedrock	190.0	571.66	574.26	38.0-48.0	Nested Bedrock
RS1786D	BDY	34° 35' 46.68"N	86° 43' 14.14"W	Facility-Wide Bedrock	190.0	571.66	574.26	178.0-188.0	Nested Bedrock
RS1806a	BDY	34° 33' 20.19"N	86° 39' 07.77"W	Facility-Wide Bedrock	257.0	567.86	570.15	51.0-64.0	FLUTe Bedrock
RS1806b	BDY	34° 33' 20.19"N	86° 39' 07.77"W	Facility-Wide Bedrock	257.0	567.86	570.15	96.0-101.0	FLUTe Bedrock
RS1806c	BDY	34° 33' 20.19"N	86° 39' 07.77"W	Facility-Wide Bedrock	257.0	567.86	570.15	248.0-257.0	FLUTe Bedrock

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

[1] Well Type:
POC – Point of Compliance Well.
EFF – Effectiveness Monitoring Well.
BDY – Boundary Well.
BKG – Background Well.
UPG – Upgradient Well.

[2] Monitored Zone:
Interface – Well screened across the overburden and bedrock.
CMT – Continuous Multichannel Tubing, multi-screened well in a single borehole.
FLUTe – Flexible Liner Underground Technologies, multi-screened well in a single borehole.
Nested – Two separate wells in a single borehole.
EP – Exit Pathway Well Clusters along southern boundary.
ft – Feet.
bgs - Below ground surface.
MSL - Above mean sea level.
NA – Not applicable.
TBD – To be determined (proposed new monitoring well).

Guerrero, Heather L

From: Rice, Kajuana D CIV (USA) <kajuana.d.rice.civ@army.mil>
Sent: Wednesday, December 6, 2023 4:23 PM
To: Cobb, Stephen
Cc: Guerrero, Heather L; Mastin, Ashley T; Howard, J C (Clint) CIV USARMY USAG (USA); Braxton, Jason K CIV USARMY USAG (USA); York, Austin S CIV USARMY USAG (USA); kwatts@cci-alliance.com; Robert Pope; Xanthos, George CIV USARMY IMCOM AEC (USA); Fluck, Paul V CIV USARMY CESAM (USA); Land-GHWBmail@adem.alabama.gov
Subject: U.S Army Garrison Redstone Arsenal's Response to 2nd NOD on AHWMMA Permit Modification No. 2 Request
Attachments: Transmittal Letter for Response to Second NOD for Request for Modification No. 2 AHWMMA Permit.pdf; Section E (Updated AHWMMA Permit Mod No2.docx; Table E-1 (Mod No.2).docx; Table E-2 r1.docx; Table E-5 (Mod No. 2).docx; Table E-6 (Mod No. 2).docx; Table E-8 (Mod No. 2).docx; Table E-10 (Mod No. 2).docx

Steve,

Please find attached the U.S Army Garrison – Redstone Arsenal's response to the Department's Second Notice of Deficiency, dated November 20, 2023.

If there are any questions and/or concerns regarding this matter, please feel free to contact me.

Respectfully Submitted,

Kajuana D. Rice
Environmental Engineer
Installation Restoration Branch
U.S. Army Garrison – Redstone Arsenal
O: 256-313-0368
Kajuana.d.rice.civ@army.mil

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO ATTENTION OF

December 4, 2023

Mr. Stephen A. Cobb
Chief, Land Division
Alabama Department of Environmental Management
PO Box 301463
Montgomery, Alabama 36130-1463

Reference:

a. The Installation Restoration Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
b. Resource Conservation and Recovery Act Corrective Action Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
c. Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X (AHWMMA) Permit, Modification #1 dated August 12, 2022
d. Modification Request No. 2 to Redstone Arsenal's Alabama Hazardous Waste Management and Minimization Act (AHWMMA) Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X Permit, dated August 3, 2023
e. Notice of Deficiency – Modification Request No. 2 to Redstone Arsenal's Alabama Hazardous Waste Management and Minimization Act (AHWMMA) Hazardous Waste Storage Facility/Solid Waste Management Unit Corrective Action/Subpart X Permit, dated August 3, 2023 (September 29, 2023)
f. Second Notice of Deficiency (NOD) – Response to NOD for Modification Request No. 2 to AHWMMA Hazardous Waste Storage/SWMU Corrective Action/Subpart X Permit (July 19, 2021) dated October 17, 2023 (November 20, 2023)

Dear Mr. Cobb:

In accordance with Part VII of Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/ Solid Waste Management Unit Corrective Action/Subpart X Permit (Permit) Modification No. 1, dated August 12, 2022.

This purpose of this letter is to transmit the U.S Army Garrison – Redstone Arsenal's (Redstone's) response to the Second Notice of Deficiency (NOD) on Modification Request No. 2 to the AHWMMA Permit that was issued on November 20, 2023. Included with the Response to the Second NOD are the Sections that were considered deficient in the response to the initial NOD, along with supporting documentation and applicable updated Permit Application pages.

"I certify under penalty of law that this document and all attachments

were prepared under my direction or supervision according to 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 fine and imprisonment for knowing violations."

My point of contact for this matter is Ms. Kajuana Rice, Environmental Management Division, 256-313-0368 or email at Kajuana.d.rice.ctr@army.mil.

Sincerely,

BRAXTON.JASON.KENARD.1112730032

Digitally signed by BRAXTON.JASON.KENARD.1112730032
Date: 2023.12.06 15:55:03 -06'00'

Jason Braxton, Chief
Environmental Management
Division

Section E: Groundwater Monitoring

This part of the permit renewal application provides information on groundwater monitoring in accordance with the applicable sections of 40 CFR and ADEM Administrative Code Division 14.

E-1 Exemption from Groundwater Protection Requirements [40 CFR 270.14(c), 264.90(b); ADEM 335-14-8-.02(5)(c), 335-14-5-09, 335-14-5-24]

Redstone Arsenal's (RSA's) operations under the existing Alabama Hazardous Waste Management and Minimization Act (AHWMMA) Permit AL7 210 020 742 exempt groundwater monitoring for the Hazardous Waste Storage Area (HWSA) (namely the individual Hazardous Waste Storage Units addressed in this permit renewal application) (S01) and for the Explosive Destruction System (EDS) Unit(s) (TO4) as both of these are related to storage and treatment in containers. The groundwater monitoring requirements apply only to surface impoundments, waste piles, land treatment units, and landfills. The HWSA and EDS will not contain these types of waste management units. Therefore, the groundwater monitoring requirements are not applicable to the HWSA and EDS treatment units.

E-2 Interim Status and Permit Renewal Application Groundwater Monitoring Results [40 CFR 270.14(c)(1); ADEM 335-14-8-.02(5)(c)(1)]

While RSA has not been an interim status facility, the ADEM regulations also require a summary of the previous permit period groundwater monitoring results if the application is for a permit renewal. The only regulated unit at RSA with groundwater monitoring data from the previous permit period is the Open Burn (OB)/Open Detonation (OD) Unit.

The OB/OD has been undergoing compliance monitoring since 2003. Based on groundwater sampling data reported to ADEM from samples collected in December 2017 at the OB/OD, metals, explosives, volatile organic compounds (VOCs,) semivolatile organic compounds (SVOCs), pesticides, and perchlorate are present in groundwater at concentrations exceeding regional screening levels (RSLs), as summarized in Table E-1. Additional information regarding the contaminant plume located beneath the OB/OD is provided in Section E-5.

E-3 General Hydrogeologic Information [40 CFR 270.14(c)(2); ADEM 335-14-8-.02(5)(c)(2)]

RSA is underlain by Mississippian-age carbonate bedrock (Tuscumbia Limestone and Fort Payne Chert) mantled by unconsolidated clay-rich overburden ranging up to 100 feet thick in places. Over most of RSA, the overburden consists of low-permeability, residual red, yellowish-red, and brown clay and silty clay with varying amounts of chert and chert fragments. However,

beneath areas of RSA adjacent to the Tennessee River, the overburden typically contains sand and gravel-rich fluvial sediments. Karst features of varying scales have developed in the water-soluble portions of the Tuscumbia/Fort Payne where chemical dissolution has enlarged joints, bedding planes, and other water-transmitting openings.

Several interconnected factors have created a complex groundwater flow system beneath RSA. Hydraulic conductivities/transmissivities are highly variable; groundwater must percolate through the low-permeability overburden prior to entering the highly transmissive network of karst conduits and solutionally-enlarged fractures that ultimately discharge to the Tennessee River. The un-altered limestone bedrock contains very low matrix permeability and therefore has a low hydraulic conductivity. However, karst development has not occurred uniformly throughout the bedrock underlying RSA and conduit patterns (i.e., flowpaths) within the bedrock are at a scale which is beyond resolution. Locally, groundwater flow is directed through the overburden into the bedrock, while regionally groundwater flow is directed from north to south (towards the Tennessee River) within the karstified bedrock. The system is further complicated by the presence of Wheeler Dam (constructed in 1936) which is located on the Tennessee River, downstream of RSA. Construction of the dam raised the river's base level approximately 15 feet and flooded the active karst conduits at depth. In addition, reservoir management operations have created unique seasonal hydrogeologic conditions beneath RSA, including, but not limited to, the reversal of the southerly hydraulic gradient and the development of overflow springs in the interior portions of RSA, particularly along the major creeks that flow within the Arsenal property (Indian Creek, McDonald Creek, and Huntsville Spring Branch).

E-4 Topographic Map Requirements [40 CFR 270.14(c)(3),(4)(i) and (ii); ADEM 335-14-8-.02(5)(c)(3),(4)(i) and (iii)]

The OB/OD is located near the Tennessee River and, is therefore, at the downgradient end of the watershed beneath RSA (Figures E-1 and E-2). At the OB/OD Area and surrounding area, historically first-encountered groundwater occurs from approximately 2 feet below ground surface in topographically low areas to over 20 feet bgs in topographically high areas. In the OB/OD Area, groundwater zones are divided into two components; an upper component referred to as the "shallow overburden groundwater zone," and a deeper component referred to as the "bedrock groundwater zone." The OB/OD Area is located on an elevated area and is bounded on three sides (west, north, and east) by wetlands that are influenced by the stage of the Tennessee River. A potentiometric surface high for the shallow overburden groundwater zone exists in the center of the site (well RS100) with lower groundwater elevations measured near surface water bodies and wetlands. The potentiometric surface measured for the bedrock groundwater zone slopes generally to the south and west at the OB/OD area towards the Tennessee River.

A topographic map illustrating the monitoring wells used for compliance groundwater monitoring at the OB/OD is presented in Figure E-1.

E-5 Contaminant Plume Description [40 CFR 270.14(c)(2),(4),(7); ADEM 335-14-8-.02(5)(c)(2),(4),(7)]

ADEM and federal regulations require that a plume description be included for the regulated unit, OB/OD.

OB/OD Unit

Groundwater beneath the OB/OD Unit has been contaminated from releases from multiple sources. Groundwater beneath the OB/OD Unit is entirely within the RSA-151 groundwater unit. A commingled RSA-151 groundwater plume is attributed to historical releases from local surface media sites, namely RSA-013, RSA-012 (OB pans), RSA-131 (OD area), RSA-014 South, and RSA-110. Constituents of the commingled plume detected at the highest frequencies and concentrations include chlorinated volatile organic compounds (VOC) (1,1,2,2-tetrachloroethane, cis-1,2-dichloroethene [DCE], tetrachloroethene, trichloroethene (TCE), 1,1-dichloroethane, 1,1-DCE, and vinyl chloride), explosive compounds (particularly RDX), and perchlorate. A secondary source of contamination exists at RSA-014 South, where high concentrations of TCE are present in groundwater. The RSA-151 shallow groundwater plume was sourced from several discrete locations within the unit. However, over time, the main solvent/perchlorate plume has become commingled. Fluvial channel deposits associated with historical Tennessee River channels likely contribute to plume commingling. Because of their high ADEM regional screening level (RSL) exceedance frequency and relative mobility, TCE and perchlorate serve as tracers for the overall extent of the groundwater plumes. Almost all of the exceedances for other VOCs and explosives occur within the footprints of the TCE and/or perchlorate plumes. In addition, TCE and perchlorate were the most commonly detected contaminants in the OB/OD Unit monitoring.

Results for groundwater unit RSA-151 are presented in the RCRA Facility Investigation Report for RSA-151 approved by ADEM in a letter dated May 16, 2018. TCE is the most commonly detected and widely distributed VOC within the RSA-151 groundwater unit. It was detected in 67 shallow groundwater samples at concentrations exceeding the RSL (5 micrograms per milliliter [µg/L]). The 67 RSL exceedances in shallow groundwater ranged in concentration from 6.8 to 221,000 µg/L, with the highest concentrations (greater than 10,000 µg/L) found in the RSA-014 South area near the two former unlined burn trenches and north of RSA-110. TCE was released into the environment at locations within the RSA-151 groundwater unit and has formed a single commingled plume in the shallow groundwater flow zone (Figure E-2). The overall

extent of TCE suggests multiple sources that have commingled into one plume. Source areas indicated by various studies include RSA-013 – Unlined Inactive Open Burn Pad, RSA-014 South – Unlined Inactive Burn Trenches, and RSA 110 – Former Drum Storage/Construction Debris. Activities at sites RSA-013 and RSA-014 South included the burning of solvent containing wastes that contained TCE.

Perchlorate was detected in 63 shallow zone groundwater samples collected under the RSA-151 investigation at concentrations exceeding the RSL (15 µg/L). The 63 exceedances in shallow groundwater ranged in concentration from 16.3 to 74,700 µg/L, with the highest concentrations of perchlorate (greater than 10,000 µg/L) associated with RSA-013. Perchlorate was released from several surface media sites and forms a single commingled plume in shallow groundwater (Figure E-3). The overall extent of RSL exceedances supports that the plume is sourced from several surface media sites and has commingled into one large plume. Source areas include RSA-013, Unlined Inactive Open Burn Pad, and RSA-014 South, Unlined Inactive Burn Trenches. Both of these sites included the burning of perchlorate-containing wastes.

Groundwater sampling data collected in October 2015 to Spring 2021 at the OB/OD Unit indicate that metals, explosives, VOCs, SVOCs, pesticides, and perchlorate are present in groundwater at concentrations exceeding RSLs, as summarized in Table E-1. This table presents results from the wells sampled for the OB/OD and not for all wells sampled during the RFI for RSA-151.

There are multiple commingled plumes at RSA that have sources not related to the hazardous waste units. Information related to groundwater below the RSA SWMUs and commingled plumes for areas outside the OB and OD units is presented in Section E-9.

E-6 General Monitoring Program Requirements [40 CFR 270.14(c)(5), 264.90(b)(4), 264.97; ADEM 335-14-5-.06(6), 335-14-5-.06(9), 335-14-5-.06(10), 335-14-5-.06(11), 335-14-8-.02(5)(c)(5), 335-14-5-.06(1)(b)(4), 335-14-5-.06(8)]

RSA has installed and designated groundwater monitoring wells in order to maintain a groundwater monitoring system to comply with ADEM regulations. RSA will maintain all groundwater monitoring wells at the facility as identified in Table E-2, which is current as of August 30, 2021. Additions to this table will be incorporated by reference from RSA's permit once renewed.

RSA will maintain all groundwater monitoring wells in accordance with ADEM Admin. Code Rule 335-14-5-.06 and will not remove a groundwater monitoring well from any monitoring program specified in this permit without an approved permit modification.

If a groundwater monitoring well is damaged, RSA will immediately notify the Department in writing, with a notification that includes a description of the well repair activities to be conducted. Within 30 calendar days after the well is repaired, RSA will submit a written notification to the Department that the well repair activities were conducted in accordance with the approved procedures.

If a groundwater monitoring well is deleted from the monitoring program(s) required by this permit, RSA will abandon the well within 90 calendar days after deletion using procedures to be approved by the Department unless the department concurs that the well should be left in place to support other investigations. Within 30 calendar days after a well is abandoned, RSA will submit a written notification to the Department that the well abandonment activities were conducted in accordance with the approved procedures.

RSA will maintain the background monitoring well(s) listed in Table E-2 to assess the groundwater quality for the respective units.

RSA will install and/or designate groundwater monitoring wells as necessary to assess changes in the rate and extent of any plume of contamination or as otherwise deemed necessary to maintain compliance with ADEM regulations. RSA will submit a plan in the form of a permit modification request specifying the design, location and installation of any additional monitoring wells to the Department at least 90 calendar days prior to installation which, at a minimum, will include:

i. Well construction techniques including casing depths and proposed total depth of well(s);

ii. Well development method(s);

iii. A complete description of well construction materials;

iv. A schedule of implementation for construction; and,

v. Provisions for determining the lithologic characteristics, hydraulic conductivity, grain size distribution, and porosity for the applicable aquifer unit(s) at the location of the new well(s).

General Groundwater Monitoring Requirements

RSA will determine the groundwater surface elevation from all monitoring wells listed in Table E-2 at least annually and each time a sampling event is conducted. The results of these determinations will be submitted to the Department. Elevation data will be recorded and reported as mean sea level (MSL) and referenced to an appropriate North American Vertical Datum (NAVD) benchmark. Applicable groundwater protection standards are discussed in Sections E-8 and E-9.

Compliance Period

The compliance period, during which the permit-specified groundwater protection standard applies, will begin at the time of the first sampling event of the compliance monitoring program, or the corrective action monitoring program, whichever is earlier. The compliance period will continue until the permit-specified groundwater protection standard has not been exceeded for a period of three consecutive years. Where RSA is engaged in a corrective action program, the compliance period will continue as required until the permit-specified groundwater protection standard has not been exceeded for a period of three consecutive years after corrective action has been terminated and this permit has been modified.

RSA will submit to the Department written reports to include all analytical sampling data, established background values, statistical evaluations, groundwater elevations, associated potentiometric maps, and the annual groundwater flow rate and direction determinations. The analytical method and the method detection limit (MDL) for each constituent will be integrated into all reports of analysis. RSA will submit the reports within 60 calendar days after the first sampling events and on an annual basis thereafter. RSA will keep copies of these reports at the facility.

RSA will submit progress reports to the Department describing implementation of groundwater monitoring and/or corrective action activities at the site as required by this permit on a quarterly basis. RSA will submit the first progress report to the Department within 90 calendar days after the effective date of this permit. The progress reports will be submitted until such time as the required monitoring and/or corrective action systems and activities required by this permit are fully constructed and operational. In the event that additional monitoring and/or corrective action requirements are imposed through a permit modification, the quarterly reporting requirement will resume, commencing upon the effective date of the permit modification and continuing until the required monitoring and/or corrective action systems and activities are again fully constructed and operational.

E-6a Description of Wells [40 CFR 270.14(c)(5), 264.97(a),(b),(c); ADEM 335-14-8-.02(5)(c)(5), 335-14-5-.06(8)(a)(b)(c)]

A description of the wells included in all of RSA's monitoring program is included in Table E-2. Note that this information is current as of August 30, 2021. Additions to this table will be incorporated by reference from RSA's permit once renewed.

E-6b Description of Sampling and Analysis Procedures [40 CFR 270.14(c)(5), 264.97(d),(e),(f); ADEM 335-14-8-.02(5)(c)(6)(iv), 335-14-5-.06(2)(d),(e),(f)]

Sampling and analysis procedures are described in standard operating project procedures included in RSA's *Installation-Wide Quality Assurance Program Plan (QAPP)* (Shaw Environmental, Inc., 2013, HydroGeoLogic, Inc., 2019 and updates) and include the following topics:

- Field Documentation (including chain of custody)
- Field Equipment Decontamination
- Investigation-Derived Waste
- Groundwater Sampling
- Field-Generated Records Management
- Field Measurable Physical Characteristics
- Field Measurable Chemical Characteristics
- Continuous Water Level Monitoring
- Non-Hazardous Sample Handling, Packaging, and Shipping
- Groundwater Level Measurements
- Field Equipment Calibration.

Analytical Procedures

The analytes to be included in the monitoring program for the OB/OD Units are discussed in Section E-8c and in Section E-9a for the SWMUs.

Sampling and Analysis Procedures

RSA will use the following techniques and procedures when obtaining and analyzing samples from the groundwater monitoring wells to provide a reliable indication of the quality of the groundwater. RSA will collect, preserve, and ship samples (when shipping off-site for analysis) in accordance with the permit application including the groundwater sampling plans in applicable reports incorporated by reference.

RSA will analyze samples according to the procedures specified in the permit application, the most recent edition of SW-846 or other appropriate methods approved by the Department. Analytical method detection limits will be less than or equal to the concentration limits, unless

otherwise approved in writing by the Department. RSA will track and control samples using the chain-of-custody procedures specified in the permit application.

RSA will use statistical analyses to evaluate the groundwater monitoring data as described in ADEM Admin. Code Rule 335-14-5-.06(8)(h).

Samples will not be filtered prior to analysis unless specified in the analytical procedure (e.g., the method for perchlorate requires field filtration to prevent sample degradation).

RSA will keep and maintain all monitoring, testing, and analytical data obtained in accordance with RSA's IW QAPP (Shaw, 2013 and as updated).

E-6c Procedures for Establishing Background Quality [40 CFR 270.14(c)(5), 264.97(a)(1),(g); ADEM 335-14-8-.02(5)(c)(5), 335-14-5-.06(8)(a)(1),(g)]

The background well for the OB/OD units is RS243. Data from the OB/OD Unit point-of-compliance (POC) wells are compared to data from the background well using the statistical procedures described in Section E-6d.

It is important to be aware that while this well is upgradient from the OB/OD, it is within the existing perchlorate and TCE plumes that have originated from unregulated historical activities at SWMUs RSA-013 and RSA-014. These plumes are illustrated on Figures E-3 and E-4. The potentiometric map on Figure E-5 illustrates that the OB/OD is downgradient from well RS243. Well RS243 is downgradient to RSA-014 and its associated plume and it is sidegradient to the plume that originates at RSA-013. The statistical analysis performed in the Annual Monitoring Report for the OB/OD takes into account that the upgradient background well results are impacted by the historical release from the surrounding SWMUs which are not regulated units.

To address the groundwater contamination in the RSA-151 groundwater unit, the Army has contracts in place to develop implementation plans for corrective measures for groundwater under the OB/OD, RSA-013, and RSA-014 as part of the corrective measures for groundwater unit RSA-151. Because actions for contaminated groundwater will occur once planning is completed, this supports retaining well RS243 as the background upgradient well for the OB/OD at this time.

Monitoring wells designated as background wells for the OB/OD Unit, RSA-049, and RSA-060 are provided in Table E-2.

E-6d Statistical Procedures [40 CFR 270.14(c)(5), 264.97(h),(i)(1),(5),(6); ADEM 335-14-8-.02(5)(c)(5), 335-14-5-.06(8)(h),(i)(1),(5),(6)]

Statistical analysis of groundwater data includes the Wilcoxon rank sum (WRS) test as the "interwell comparison." This test essentially compares the medians of the POC well data versus the background well data to see if the POC data set is shifted higher, with statistical significance, relative to that of the background well. Any analyte at a POC well that fails the WRS test then undergoes temporal trend analysis (Kendall's tau) to determine if there is an upward or downward trend in concentration over the monitoring period. Data sets that undergo trend analysis are also visualized using plots of concentration versus time.

E-7 Detection Monitoring Program [40 CFR 270.14(c)(6); 264.91(a)(4); 264.98; ADEM 335-14-8-.02(5)(c)(6); 335-14-5-.06(2)(a)(4); 335-14-5-.06(9)]

This section is not applicable to any regulated units at RSA.

E-8 Compliance Monitoring Program [40 CFR 270.14(c)(7); 264.99; ADEM 335-14-8-.02(5)(c)(7); 335-14-5-.06(10)]

RSA's OB and OD units are regulated miscellaneous units subject to compliance monitoring. Figure E-2 shows the locations of the permit-listed wells and other site wells for the OB/OD Unit. The monitoring program for the RSA SWMUs is discussed in Sections E-9 and E-10.

E-8a Waste Description [40 CFR 270.14(c)(7)(i); ADEM 335-14-8-.02(5)(c)(7)(i)]

The wastes treated at the OB/OD Unit consist of fired and unfired munitions items (rocket motors, warheads, shells, grenades, flares), munitions components (e.g., fuses), bulk energetics (propellants and explosives), and energetic-contaminated materials.

RSA treats reactive (D003) hazardous wastes by OB/OD. All hazardous wastes that are treated by OB/OD possess the Resource Conservation and Recovery Act (RCRA) hazardous characteristic of reactivity (D003) defined in ADEM Administrative Code R.335-14-2-.02(4)(a)6,7, and 8, and in 40 CFR 261.23(a)(1),(3),(6),(7), and (8) as follows:

- It is normally unstable and readily undergoes violent change without detonating.
- It forms potentially explosive mixtures with water.
- It is capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

- It is a forbidden explosive as defined in 49 CFR 173.51, a Class A explosive as defined in 49 CFR 173.53, or a Class B explosive as defined in 49 CFR 173.88.

In addition to the reactivity characteristic, wastes treated by OB/OD may also be classified as hazardous due to the hazardous characteristics of ignitability (D001), corrosivity (D002), and/or certain toxicity (D004 through D043) codes. Some of the wastes treated by OB are listed F001 through F005 or U wastes. The wastes treated by OB/OD do not contain pesticides, herbicides, dioxins, or PCBs. Pentachlorophenol (PCP) – treated wood and beryllium and/or waste containing beryllium are prohibited from treatment at OB/OD. Treatment of recovered liquid-filled rounds, chemical warfare materiel or components thereof, liquid agent-contaminated components and items containing depleted uranium either loaded or expended are prohibited. Treatment of loaded munitions or components containing colored smokes, white phosphorus, red phosphorus, hexachloroethane or riot control agents are prohibited.

E-8b Characterization of Contaminated Groundwater [40 CFR 270.14(c)(7)(ii); ADEM 335-14-8-.02(5)(c)(7)(ii)]

In addition to the information for the RSA-151 groundwater unit summarized in Section E-5 above, numerous sampling events have been conducted specifically at the OB/OD Area and have provided considerable data to characterize groundwater at the site. The groundwater at the OB/OD Area was originally sampled on a semiannual basis for a period of two years beginning in November 2003. Based on recommendations from RSA, an additional two-year monitoring period was approved by ADEM in February 2006. The groundwater at the OB/OD Area was sampled on a semiannual basis for an additional period of two years beginning in May 2006. Additional sampling events were performed in June and October 2008, July and October 2009 and have been performed annually since 2010 as detailed in annual groundwater monitoring reports prepared in accordance with the current Part VII of RSA's AHWMMA permit. Based on the analytical data from these numerous sampling events, constituents of interest persist in groundwater at concentrations above the ADEM groundwater RSLs, most notably explosive compounds, perchlorate, and VOCs.

E-8c Hazardous Constituents to be Monitored in Compliance Program [40 CFR 270.14(c)(7)(iii); 264.98 (g)(3); 264.99(a)(1); ADEM 335-14-8-.02(5)(c)(7)(iii); 335-14-5-.06(9)(g)(3); 335-14-5-.06(10)(a)(1)]

The constituents to be monitored in groundwater at the OB/OD Unit are presented in Table E-3. The Army is recommending deletion of some COCs in the general lists of analytical groups such as VOCs, pesticides, SVOCs and others. The supporting rationale for retaining or reducing analytes in the lists of permit-specified analytes for this site is presented in Appendix E-1.

E-8d Concentration Limits [40 CFR 270.14(c)(7)(iv); 264.94, 264.97(g),(h); 264.99(a)(2); ADEM 335-14-8-.02(5)(c)(7)(iv); 335-14-5-.06(5); 335-14-5-.06(8)(g)(h); 335-14-5-.06(10)(a)(2)]

The groundwater protection standards for the OB/OD Unit are provided in Table E-4, which lists the hazardous constituents and their respective concentration limits.

E-8e Alternate Concentration Limits [40 CFR 270.14(c)(7)(iv); 264.94(b), 264.97(g),(h); 264.99(a)(2); ADEM 335-14-8-.02(5)(c)(7)(iv); 335-14-5-.06(5)(b); 335-14-5-.06(8)(g)(h); 335-14-5-.06(10)(a)(2)]

This section is not applicable. RSA is not proposing alternate concentration limits at this time.

E-8f Engineering Report Describing Groundwater Monitoring Systems [40 CFR 270.14(c)(7)(v); 264.95; 264.97(a)(2),(b),(c); 264.99(b); ADEM 335-14-8-.02(5)(c)(7)(v); 335-14-5-.06(6); 335-14-5-.06(8)(a)(2)(b)(c); 335-14-5-.06(10)(b)]

Groundwater Monitoring System at the OB/OD

The groundwater monitoring system for the OB/OD Unit is described in the annual groundwater monitoring reports, which are prepared and submitted to ADEM. This monitoring program follows the requirements outlined in Section E-6, the site-specific field sampling plan for the OB/OD Area, and the RSA installation-wide quality assurance program plan.

In addition to the general groundwater monitoring requirements, RSA will sample all point of compliance wells and background wells as listed in Table E-2 and analyze for the constituents listed in Table E-3 annually throughout the compliance monitoring period.

Samples will be analyzed for temperature (degrees F or C), specific conductance (Mhos/cm), and pH (standard units), at all background and point of compliance monitoring well locations each time the well is sampled. The data obtained will be submitted as on field data collection forms in the reports.

Reporting

RSA will report the compliance monitoring program results to ADEM annually. RSA will submit the reports to the Department within 60 calendar days of each annual anniversary of this permit or on a date agreed to between RSA and ADEM. In this report, RSA will provide data from groundwater monitoring along with an analysis of that data, identify constituents of interest at the OB/OD Unit and any conclusions regarding the effectiveness of the program. If the analysis of the data warrants any change to the compliance monitoring program, RSA will

include these revisions in the annual report which will be followed up within 90 calendar days with an application for permit modification.

E-8g Proposed Sampling and Statistical Analysis Procedures for Groundwater Data [40 CFR 270.14(c)(7)(vi); 264.97(d),(e),(f);264.99(c)-(g); ADEM 335-14-8-.02(5)(c)(7)(vi); 335-14-5-.06(8)(d)(e)(f); 335-14-5-.06(10)(c)-(g)]

Sampling and analysis procedures and statistical analysis procedures are discussed in Sections E-6b and E-6d, respectively.

E-8h Groundwater Protection Standard Exceeded at Compliance Point Monitoring Well [40 CFR 270.14(c)(8); 264.99(h),(i); ADEM 335-14-8-.02(5)(c)(8); 335-14-5-.06(10)(h)(i)]

Part VII.D.2.b of RSA's AHWMMA permit states "If the Permittee determines pursuant to Permit Conditions VII.B.5 and VII.D.1.c and ADEM Admin. Code Rule 335-14-5-.06(10)(d) that any concentration limits listed in Table VII.3 of this permit exceeded in any monitoring well at the point of compliance, he or she must comply with ADEM Admin. Code Rule 335-14-5-.06(10)(h)." Admin. Code Rule 335-14-5-.06(10)(h)2 states that if the owner or operator determines, pursuant to 335-14-5-.06(10)(d) that any concentration limits under 335-14-5-.06(5) are being exceeded at any monitoring well at the point of compliance, he or she must "submit to the Department an application for a permit modification to establish a corrective action program meeting the requirements of 335-14-5-.06(11) within 180 days …."

RSA and ADEM are aware that multiple SWMUs, including RSA-013 and RSA-014, in addition to the hazardous waste units RSA-012 (OD area) and RSA-131 (OB pans) have contributed to groundwater contamination beneath these adjacent units. Because of the contaminant contributions to groundwater from multiple sources, the RSLs listed in Table E-1 are currently exceeded at one or more of the point of compliance wells identified in Table E-2. As discussed in Section E-5 above, all groundwater beneath these sites is considered to be part of groundwater unit RSA-151. ADEM has approved RFI reports for RSA-013 (which includes no further action sites RSA-132 and RSA-133), RSA-014, and RSA-151, and the Army is in the process of performing corrective measures at these sites. It is the Army's understanding that the corrective measures for groundwater to be performed as part of the RSA-151 groundwater unit and the corrective measures for soil to be performed as part of RSA-013 and RSA-014 will be sufficient to meet the requirements of 335-14-5-.06(10)(d) assuming that there is no increasing trend of contaminant concentrations at any monitoring well at the point of compliance. A schedule for implementation of corrective measures is presented in the corrective measures implementation (CMI) work plan.

In addition, in February 2017, RSA submitted a CMI work plan for the OB/OD Area to ADEM. This CMI work plan described the corrective measures necessary to upgrade the OB/OD Area in order to meet state requirements and provide protection of human health and the environment. In early 2019, RSA completed the corrective measures to bring the facility into compliance with ADEM Administrative Code 335-14-5-.01(1)(j)7 by raising the OD unit above the floodplain. In addition, the corrective measures included installation of a new liner/underdrain, surface water collection system, and holding pond, all above flood elevation. These corrective measures will prevent or minimize leaching of contaminants from soil to groundwater and effectively mitigate runoff and infiltration as well as mitigate flooding potential. A corrective measures implementation report was completed and submitted to ADEM on June 29, 2021.

E-9 Corrective Action Program [40 CFR 270.14(c)(8); 264.99(j); 264.100; ADEM 335-14-8-.02(5)(c)(8); 335-14-5-.06(10)(j); 335-14-5-.06(11)]

Sites undergoing corrective action for groundwater include RSA-003, RSA-009, RSA-045, RSA-049, RSA-053, RSA-054/055, RSA-056/139, RSA-060, RSA-083, RSA-204, RSA-206, RSA-209, RSA-225, RSA-252, RSA-269 and RSA-306.. In addition, the Facility-wide groundwater monitoring program is listed as corrective action monitoring. RSA intends to implement the corrective action monitoring programs in accordance with the approved CMI Plans, Corrective Action Plans (CAP) or groundwater monitoring work plans submitted to and approved by ADEM. Wells included in the corrective actions for groundwater are presented on Figure E-6.

RSA will conduct a Corrective Action Program, as described in the approved CMI Plans or groundwater monitoring plans, to remove or treat in place all hazardous constituents that exceed their respective groundwater protection standards at the point of compliance. In addition, RSA will complete a Corrective Action Program to remove or treat in place all hazardous constituents that exceed their respective groundwater protection standards between the points of compliance and the downgradient facility property boundary, and beyond the facility boundary in accordance with ADEM Admin. Code Rule 335-14-5-.06(11)(e)2.

In addition, RSA will continue to implement the corrective action program as described in the approved CMI Plans within 120 calendar days after the effective date of this permit.

E-9a Characterization of Contaminated Groundwater [40 CFR 270.14(c)(8)(i); ADEM 335-14-8-.02(5)(c)(8)(i)]

Groundwater characterization was performed as summarized in the annual monitoring reports or background reports for the sites included in corrective action monitoring. These results are summarized in Table E-5.

E-9b Concentration Limits [40 CFR 270.14(c)(8)(ii); 264.94; 264.100(a)(2); ADEM 335-14-8-.02(5)(c)(8)(ii); 335-14-5-.06(5); 335-14-5-.06(11)(a)(2)]

The list of COCs for the sites under corrective action monitoring is included in Table E-6 while the list of COCs for the Facility-wide corrective action monitoring is included in Table E-7. The concentration limits for COCs for the sites under corrective action monitoring (RSA-003, RSA-009, RSA-045, RSA-049, RSA-053, RSA-054/055, RSA-056/139, RSA-060, RSA-083, RSA-204, RSA-206, RSA-209, RSA-225, RSA-252, RSA-269 and RSA-306) are provided in Table E-8. The concentration limits for COCs for the Facility-wide corrective action monitoring are provided in Table E-9.

For sites RSA-054/055, RSA-204 and the Facility-wide monitoring program, the Army is recommending deletion of some COCs in the general lists of analytical groups such as VOCs, metals, explosives, and SVOCs. The supporting rationale for retaining or reducing analytes in the lists of permit-specified analytes for each of these sites is presented in Appendix E-1. Consideration has been given to weight-of-evidence criteria such as whether screening values are available; whether the constituent is not detected and detection limits are less than the RSL, or if detected whether any results exceed the RSL. Lastly for the OB/OD where the conceptual site model (CSM) is well established, the CSM is considered in the weight of evidence evaluation. Note that during the permit application renewal process, ADEM only accepted the Army's recommendation for a reduced analytical list as presented in Appendix E-1 for RSA-204.E-9c Alternate Concentration Limits [40 CFR 270.14(c)(8)(ii); 264.94(b); 264.100(a)(2); ADEM 335-14-8-.02(5)(c)(8)(ii); 335-14-5-.06(5)(b); 335-14-5-.06(11)(a)(2)]

This section is not applicable. RSA is not proposing alternate concentration limits at this time.

E-9d Corrective Action Plan [40 CFR 270.14(c)(8)(iii); 264.100(b); ADEM 335-14-8-.02(5)(c)(8)(iii); 335-14-5-.06(11)(b)]

The corrective action plans for groundwater at the SWMUs included in RSA's corrective action program have been included in the corrective measures work plan (CMIP) or comparable document for each SWMU. These CMIPs are incorporated by reference into this permit renewal application and are listed in Table E-10.

These CMIPs or comparable plans provide detailed plans and engineering reports on corrective actions proposed for each SWMU, including maps of engineered structures, construction details, plans for removing waste, description of treatment technologies, plans to assess the effectiveness of corrective action programs, descriptions of injection systems, plus appropriate hydrogeologic data, operation and maintenance plans, and closure plans.

E-9e Groundwater Monitoring Program [40 CFR 270.14(c)(8)(iv); 264.100(d); ADEM 335-14-8-.02(5)(c)(8)(iv); 335-14-5-.06(11)(d)]

E-9e(1) Description of Monitoring System

In addition to the point of compliance and background well monitoring systems identified in Table E-2, RSA will maintain the following wells for units included in the corrective action program as shown on Figure E-4, including:

a. **Facility Boundary Monitoring**- Maintain groundwater monitoring wells RS065, RS065A, RS066, RS070, RS643, RS961, RS1111, RS1114, RS1121, RS1148, RS1149, RS1151, RS1152, RS1153, RS1154, RS1157, RS1158, RS1159, RS1160, RS1164, RS1167, RS1294, RS1353, RS1413 (shallow and deep), RS1414, RS1416, RS1418, RS1419, RS1483, RS1486c, RS1488e, RS1489e, RS1514 (shallow and deep), RS1518 (all screened intervals), RS1520 (all screened intervals), RS1522 (shallow and deep), RS1523, RS1527, RS1534 (all screened intervals), RS1673a, RS1675 (shallow and deep), RS1711, RS1779, RS1783 (shallow and deep), RS1785 (shallow and deep), RS1786 (shallow and deep), RS1806 (all screened intervals), RS2109, RS2801, RS2802, RS2803, RS2804, MSW13, MSW14, MSW16, MSW18a, INCRK-01, OFF-SW27 and P-SW11.

b. **RSA-003**- Maintain groundwater monitoring wells RS842, RS1301, RS1302, RS1332, RS1333, RS1470, RS1471, and RS2816 as effectiveness wells during in situ enhanced bioremediation and/or monitored natural attenuation for RSA-003, as listed in Table E-2. RS1355 and RS1562 will be maintained as point of compliance wells for RSA-003 and RS1560 and RS2455 will be maintained as upgradient wells for RSA-003, as listed in Table E-2.

c. **RSA-009**- Maintain groundwater monitoring well RS1428 as an effectiveness well for RSA-009 as listed in Table E-2.

d. **RSA-045** - Maintain groundwater monitoring wells RSP-1684 (spring), RS1743, RS1745, RS1821, RS2149, RS2153, RS2167, RS2169, RS2691, RS2692, RS2693, RS2788, RS2937, RS2938, RS2939, RS2940, RS2941, and RS2942 as effectiveness wells for RSA-045, as listed in Table E-2. Wells RS1744 and RS2788 will be maintained as upgradient wells for RSA-045, as listed in Table E-2.

e. **RSA-049-** Maintain groundwater monitoring wells RS054, RS263, RS633, RS635, RS636, RS1074, RS1090, RS1589, RS1590, RS1591, RS1592, and RS1973 as effectiveness wells for RSA-049 as listed in Table E-2. Wells RS634, RS1087, RS1593, and RS1594 will be maintained as background wells for RSA-049.

f. **RSA-053-** Maintain groundwater monitoring wells RS138, RS139, RS179, RS192, RS273, RS274, RS348, RS349, RS1996, and RS1997 as effectiveness wells for RSA-053, as listed in Table E-2. RS270, RS2003, and RS2175 will be maintained as upgradient wells for RSA-053 and monitoring well RS195 will be maintained as a point of compliance for RSA-053.

g. **RSA-054/055-** Maintain groundwater monitoring wells RS038, RS039, RS165, RS166, RS200, RS201, RS223, RS297, RS384 and RS385 as effectiveness wells for RSA-054/055, as listed in Table E-2.

h. **RSA-056/139**- Maintain groundwater monitoring wells RS048, RS518, RS521, RS630, RS1255, RS1257, RS1259, RS1261, RS1267, RS1273, and RS1275 as effectiveness wells for RSA-056/139, as listed in Table E-2. Monitoring well RS517 will be maintained as a point of compliance for RSA-056/139, as listed in Table E-2.

i. **RSA-060-** Maintain groundwater monitoring wells RS020, RS022, RS197, RS282, RS552, RS555, RS556, RS2723, RS2876 and RS2877 as effectiveness wells for RSA-060, as listed in Table E-2. RS285 will be maintained as a background well for RSA-060.

j. **RSA-083**- Maintain groundwater monitoring wells RS708, RS709, RS710, RS808, RS3054, RS2545, RS2548, RS2549, RS2550, RS2637, RS2639, and RS2640 as effectiveness wells for RSA-083, as listed in Table E-2. RS2547, RS2638, and RS2641 will be maintained as upgradient wells for RSA-083, as listed in Table E-2.

k. **RSA-204-** Maintain groundwater monitoring wells RS690, RS691, RS1223, RS1550, RS2027, RS2029, RS2030, RS2031, RS2032, RS2033, RS2034, RS2668, RS2670, RS2671, RS2672, RS2673, RS2674, RS2675, RS2676, RS2677, RS2678, RS2683, RS2791, RS2793, and RS2824 as effectiveness wells for RSA-204, as listed in Table E-2.

l. **RSA-206**- Maintain groundwater monitoring wells RS1215, RS1654, RS1856, RS1857, RS1896, RS2024, RS2183, RS2184, RS2185, RS2186, RS2187, RS2188, RS2189, RS2190, RS2554, RS2555, RS2556, and RS2777 as effectiveness wells for RSA-206, as listed in Table E-2. RS1653 and RS1897 will be maintained as upgradient wells for RSA-206, as listed in Table E-2.

m. **RSA-209**- Maintain groundwater monitoring wells RS649, RS652, RS654, RS662, RS1110, RS1748, RS1753, RS2019, RS2020, RS2021, RS2022, RS2660, RS2661, RS2690, and RS2766 as effectiveness wells for RSA-209, as listed in Table E-2. RS2657, RS2658, RS2659, and RS2665 will be maintained as upgradient wells for RSA-209, as listed in Table E-2.

n. **RSA-225**- Maintain groundwater wells RS1899, RS1900, RS1901, RS1902, RS2044, and RS2471 as effectiveness wells for RSA-225, as listed in Table E-2. RS2043 will be maintained as an upgradient well for RSA-225, as listed in Table E-2.

o. **RSA-252**- Maintain groundwater monitoring wells RS349, RS350, RS1679, RS1682, RS1686, RS1885, RS1888, RS1889, RS1892, RS1994, RS2401, RS2402, RS2761, and RS2767 as effectiveness wells for RSA-252, as listed in Table E-2. RS2400, RS2845, RS2846, RS2847, RS2934, RS2935, and RS2936 will be maintained as background wells for RSA-252, as listed in Table E-2.

p. **RSA-269**- Maintain groundwater monitoring wells RS1622 and RS1623 as effectiveness wells for RSA-269, as listed in Table E-2. RS1625 will be maintained as an upgradient well, as listed in Table E-2.

q. **RSA-306**- Maintain groundwater monitoring wells RS2340, RS2341, RS2342, RS2343, RS2344, RS2346, RS2805, RS2806, and RS2807 as effectiveness wells for RSA-306, as listed in Table E-2.

E-9e(2) Description of Sampling and Analysis Procedures

A description of sampling and analysis procedures is presented in Section E-6.

E-9e(3) Monitoring Data and Statistical Analysis Procedures

A description of monitoring data and statistical analysis procedures is presented in Section E-6.

In addition to the general groundwater monitoring requirements specified in Section E-6, RSA will sample all background, upgradient, point of compliance, and effectiveness monitoring wells shown in Table E-2 and analyze for the constituents listed in Table E-6 or Table E-7 on an annual basis beginning within 120 calendar days of the effective date of this permit and continuing through the end of the compliance period.

- At RSA-003, RSA will sample the groundwater monitoring wells listed in Table E-2 for the constituents listed in Table E-6. These groundwater wells shall be sampled during the baseline sampling event prior to injection activities and then followed by sampling on a quarterly basis during Years 1 and 2, on a semiannual basis during Years 3 and 4, and on an annual basis for the remainder of the corrective measures. RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report

- At RSA-009, RSA will sample the groundwater monitoring well listed in Table E-2 on a semiannual basis for the constituents listed in Table E-6.

- At RSA-045, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. These groundwater wells will be sampled during the baseline sampling event prior to injection activities and then on an annual basis. Supplementary sampling events will be conducted as needed to satisfy the requirements of the Underground Injection Control permit. RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-049, RSA will sample the groundwater monitoring wells listed in Table E-2 on a semiannual basis for the constituents listed in Table E-6.

- At RSA-053, RSA will sample groundwater wells listed in Table E-2 on a quarterly basis for the constituents listed in Table E-6. After two years of quarterly sampling, RSA may request a permit modification to modify the sampling frequency based on sampling results presented in the Annual Effectiveness Reports.

- At RSA-054/055, RSA will sample the groundwater wells listed in Table E-2 on an annual basis for the constituents listed in Table E-6..

- At RSA-056/139, RSA will sample the groundwater wells listed in Table E-2 on a semiannual basis for the constituents listed in Table E-6. After three years, RSA may request a permit modification to modify the sampling frequency based on sampling results presented in the Annual Effectiveness Report.

- At RSA-060, upon submittal of the CMI report, RSA will initiate sampling of the groundwater wells listed in Table E-2 on a quarterly basis for the constituents listed in Table E-6. After three years of quarterly monitoring, RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-083, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. Two of the fifteen wells, RS2545 and RS2548, will be sampled during the baseline sampling event and then considered contingency wells for the remainder of the groundwater monitoring program. RSA will sample the remaining groundwater wells on a quarterly basis during Year 1, on a semiannual basis during Years 2 and 3, and on an annual basis through the remainder of the remedial action. RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-204, upon submittal of the CMI report, RSA will initiate sampling of the groundwater wells listed in Table E-2 on a quarterly basis for the first year and then on a semiannual basis for the next two years as prescribed in the CMI Plan for the constituents listed in Table E-6. After two years of semiannual monitoring, RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-206, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. These groundwater wells shall be sampled during the baseline sampling event prior to the injection activities. During the injection activities, RSA will also sample these groundwater wells as part of the supplementary sampling events conducted as needed to satisfy the requirements of the Underground Injection Control permit and then on an annual basis. RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-209, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. These groundwater wells shall be sampled during the baseline sampling event prior to injection activities and then on an annual basis. Excluding groundwater wells RS649, RS652, RS1748, RS1753, RS2657, and RS2658, RSA will sample the remaining groundwater wells as a part of the supplementary sampling events conducted as needed to satisfy the requirements of the Underground Injection Control permit. RSA may request a permit modification to

modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-225, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. The wells will be sampled on a quarterly basis during Year 1 and on a semiannual basis during Years 2 and 3. After two years of semiannual monitoring, RSA may request a permit modification to modify the sampling frequency, to abandon the upgradient monitoring well RS2043, or modify the analyte list based on sampling results presented in the Annual Effectiveness Report.

- At RSA-252, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. Groundwater monitoring will begin with a baseline sampling event then continue on a semiannual basis until the groundwater analytical results indicate the cleanup goals have been attained for the groundwater constituents listed in Table E-6 for three consecutive years. Long-term monitoring will continue and an annual report will be submitted to the Department to evaluate the effectiveness of monitored natural attenuation at RSA-252. RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- RSA-269, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. Monitoring wells RS1622, RS1623, and RS1625 will be sampled during the baseline sampling event and then on a quarterly basis. Following Year 1, RSA may request a permit modification to modify the sampling frequency or analyte list based on sampling results presented in the Annual Effectiveness Report.

- RSA-306, RSA will sample the groundwater wells listed in Table E-2 for the constituents listed in Table E-6. The wells will be sampled on a quarterly basis throughout the duration of the remedial action period. Passive recovery of light non-aqueous phase liquid (LNAPL) shall be performed at monitoring well RS2340 using absorbent socks. LNAPL recovery shall be performed on a quarterly basis during years 1-10. RSA may request a permit modification to the sampling or LNAPL recovery frequency or the analyte list based on the sample results presented in the Annual Effectiveness Report.

- RSA will sample all background, upgradient, point of compliance, effectiveness, and boundary monitoring wells shown in Table E-2 and analyze for the constituents listed in Table E-7 on an annual basis beginning within 120 calendar days of the effective date of this permit and continuing through the end of the compliance period.

All wells whether background, upgradient, point of compliance, effectiveness, and boundary monitoring wells shown in Table E-2 will be analyzed for temperature (degrees F or C), specific conductance (Mhos/cm), and pH (standard units) each time the well is sampled. The data obtained will be submitted on the field forms in the reports.

When evaluating the monitoring results to determine the effectiveness of the corrective measures, RSA will:

i. Determine if the corrective action system effectively addresses the entire plume of contamination;

ii. Determine if the concentration of the hazardous constituents are decreasing (pH increasing or decreasing toward neutrality, as applicable) in the effectiveness wells; and

iii. Determine if RSA suspects that additional hazardous waste or hazardous constituents are being released into the environment.

RSA and ADEM are aware that hazardous constituents have been detected in the boundary wells at concentrations greater than the Groundwater Protection Standards. For the IW Boundary Monitoring Program, RSA will assess whether concentrations in boundary wells with results that exceed the Groundwater Protection Standards are increasing, stable, or decreasing. RSA expects that concentrations will decrease as a result of groundwater corrective measures completed at sites that were major contributors to the offsite plumes. The most abundant contaminants found in groundwater potentially migrating off post from RSA are nitrobenzene, 2-nitrotoluene, TCE, and vinyl chloride. Trend analysis for the 2017 data indicates that concentrations of perchlorate are decreasing in wells K-RS961, OFF-RS1520a, and Z-RS1294 and VOCs, including 1,1-DCE, benzene, carbon tetrachloride, chlorobenzene, chloroform, cis-1,2-DCE, tetrachloroethene, toluene, TCE, and vinyl chloride at 1 to 10 wells each. Of note is that temporary increases in degradation products, such as cis-1,2-DCE and vinyl chloride, provide evidence that microbial degradation of the primary contaminants is effectively proceeding.

E-9e(4) Reporting Requirements

In addition to the recordkeeping and reporting requirements specified in Section E-6, RSA will report the effectiveness of the corrective action program annually. If the analysis of the data warrants any change to the corrective action program, RSA will include these revisions in the annual report which will be followed up within 90 calendar days with an application for permit modification.

If corrective action is terminated, RSA will sample all background, point of compliance, effectiveness, and boundary sampling locations for the compounds listed in Appendix IX of ADEM Admin. Code Rule 335-14-5. Based upon the sampling results, RSA may petition the Department for a permit modification to implement either a detection monitoring program or a compliance monitoring program.

E-10 Groundwater Monitoring Well Design [40 CFR 264.97(c); ADEM 335-14-5-.06(8)(c)]

Information on groundwater monitoring well design is presented in Table E-2. RSA will design groundwater monitoring wells in accordance with American Society for Testing and Materials standards. Any well within loess will be designed to minimize turbidity.

TABLES

FIGURES

APPENDIX E-1

Table E-1
(Page 1 of 2)

Summary of Groundwater Results for Open Burn/Open Detonation Unit
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Analytes	Range of Concentrations[1] (µg/L)	RSL[1] (µg/L)
Metals		
Aluminum	19 – 6680	2,000
Iron	38 - 6,250	1,400
Manganese	3.88 - 510	43
Mercury	0.087 - 6.7	2
Explosives		
1,3-Dinitrobenzene	0.0807 - 0.347	0.2
2,4-Dinitrotoluene	0.612	0.24
2,6-Dinitrotoluene	0.155 - 0.39	0.049
2-Amino-4,6-dinitrotoluene	0.0814 - 0.91	0.19
3-Nitrotoluene	0.0863 - 4	0.17
Nitrobenzene	0.129 - 2.58	0.14
Nitroglycerin	0.338 - 1.03	0.2
PETN	0.348 - 4.2	3.9
RDX	0.0885 - 22.3	0.97
Volatile Organic Compounds		
1,1,2,2-Tetrachloroethane	2.59	0.076
1,1-Dichloroethane	0.267 - 3.6	2.8
cis-1,2-Dichloroethene	0.262 -187	70
Trichloroethene	0.309 - 541	5
Vinyl chloride	4.03 – 45.5	2
Semivolatile Organic Compounds		
1,4-Dioxane	0.24 – 20	2
Benzo(a)anthracene	0.0091 - 0.0483	0.03
Dibenz(a,h)anthracene	0.0124 - 0.0469	0.025
Naphthalene	0.04 - 0.2	0.12
Pesticides		
4,4'-DDD	0.00219 - 0.0148	0.0063
Aldrin	0.00285 - 0.0229	0.00092
alpha-BHC	0.0016 - 0.0319	0.0072
beta-BHC	0.00279 - 0.234	0.025
delta-BHC	0.00722 - 0.0197	0.0042
Dieldrin	0.00245 - 0.0129	0.0018
Miscellaneous		
Perchlorate	0.44 – 24,800	15
Formaldehyde	25.5- 560	0.39

Notes:

Only the chemicals present in groundwater at concentrations above ADEM regional screening levels are shown.

Data represent annual monitoring results from October 2015 through 2021.

[1] ADEM regional screening level (RSL) for groundwater based on the following hierarchy:

Table E-1
(Page 2 of 2)

Summary of Groundwater Results for Open Burn/Open Detonation Unit
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

a) Maximum contaminant level (EPA, 2018, *2018 Edition of the Drinking Water Standards and Health Advisories*, EPA 822-F-18-001, Office of Water, Washington, D.C., March).

b) Tap water regional screening levels (RSL); values are the lower of either the cancer-based RSL or the noncancer RSL adjusted to reflect a hazard index of 0.1 (EPA, 2021, Regional Screening Levels for Chemical Contaminants at Superfund Sites, May).

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
OB and OD									
RS107	POC	34°34' 15.98"N	86°39' 56.34"W	OB and OD	43.0	569.29	571.58	30.0-40.0	Overburden
RS108	POC	34°34' 11.93"N	86°39' 54.58"W	OB and OD	27.5	563.09	565.32	15.0-25.0	Overburden
RS209	POC	34°34' 15.71"N	86°40' 07.07"W	OB and OD	35.0	566.83	568.88	21.0-31.0	Overburden
RS211	POC	34°34' 20.28"N	86°40' 02.06"W	OB and OD	32.0	562.33	565.18	18.0-28.0	Overburden
RS243	BKG	34°34' 90.95"N	86°39' 59.62"W	OB and OD	39.8	572.82	575.68	24.3-33.3	Overburden
RS2882	POC	34°34' 18.92"N	86°40' 04.18"W	OB and OD	23.1	566.62	566.32	12.7-22.7	Overburden
RS2883	POC	34°34' 15.78"N	86°40' 06.09"W	OB and OD	39.8	563.39	563.13	29.4-39.4	Overburden
RS2884	POC	34°34' 15.97"N	86°40' 01.03"W	OB and OD	23.8	566.75	566.34	13.6-23.6	Overburden
RSA-003									
RS842	EFF	34°40' 19.70"N	86°38' 1.57"W	RSA-003	66.0	606.2259	605.9334	51.0-66.0	Bedrock
RS1301	EFF	34°40' 19.72"N	86°38' 2.40"W	RSA-003	21.5	606.15	606.4	11.25-21.25	Overburden
RS1302	EFF	34°40' 19.83"N	86°38' 1.97"W	RSA-003	20.0	605.86	606.15	9.0-19.0	Overburden
RS1332	EFF	34°38' 1.95"N	86°38' 1.95"W	RSA-003	39.0	606.08	605.6	29.0-39.0	Overburden
RS1333	EFF	34°38' 5.19"N	86°38' 5.19"W	RSA-003	70.0	610.3144	609.9366	55.0-70.0	Bedrock
RS1355	POC	34°40' 21.58"N	86°37' 58.62"W	RSA-003	44.0	604.0996	606.8677	34.0-44.0	Overburden
RS1470	EFF	34°40' 20.63"N	86°38' 1.69"W	RSA-003	41.0	605.8484	605.6725	21.0-41.0	Overburden
RS1471	EFF	34°40' 19.99"N	86°38' 1.14"W	RSA-003	32.0	606.3112	608.7089	12.0-32.0	Overburden
RS1560	UPG	34°40' 21.35"N	86°38' 10.05"W	RSA-003	60.0	613.42	613.19	45.0-60.0	Bedrock
RS1562	POC	34°40' 17.63"N	86°37' 55.86"W	RSA-003	66.0	600.46	600.23	51.0-66.0	Bedrock
RS2455	UPG	34°40' 20.57"N	86°38' 05.21"W	RSA-003	32.0	610.1692	609.8576	22.0-32.0	Overburden
RS2816[3]	EFF	34°40' 21.14"N	86°38' 1.58"W	RSA-003	40.0	606	606	20.0-40.0	Overburden
RSA-009									
RS1428	EFF	34° 38' 24.00"N	86° 40' 48.00"W	RSA-009	10.0	562.40	565.48	5.0-10.0	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RSA-045									
RSP- 1684	EFF	34° 39' 46.73" N	86° 37' 11.97" W	RSA-045	NA	567.20	NA	NA	Spring
RS1743	EFF	34° 39' 52.01" N	86° 37' 28.14" W	RSA-045	39.8	592.27	594.80	29.1-39.1	Overburden
RS1744	UPG	34° 39' 48.43" N	86° 37' 16.69" W	RSA-045	36.0	585.92	585.67	25.2-35.2	Overburden
RS1745	EFF	34° 39' 43.89" N	86° 37' 16.83" W	RSA-045	21.9	586.57	588.93	11.2-21.2	Overburden
RS1821	EFF	34° 39' 46.36" N	86° 37' 9.24" W	RSA-045	38.3	568.85	571.00	25.4-35.4	Overburden
RS2149	EFF	34° 39' 52.42" N	86° 37' 27.82" W	RSA-045	61.2	591.69	594.31	47.6-57.6	Overburden
RS2153	EFF	34° 39' 43.65" N	86° 37' 17.37" W	RSA-045	48.5	586.34	589.05	38.1-48.1	Overburden
RS2167	EFF	34° 39' 53.92" N	86° 37' 32.37" W	RSA-045	48.6	596.7	599.15	38.2-48.2	Overburden
RS2169	EFF	34° 39' 41.18" N	86° 37' 18.35" W	RSA-045	42.4	588.44	591.06	32.0-42.0	Overburden
RS2691	EFF	34° 39' 43.42" N	86° 37' 14.88" W	RSA-045	26.8	573.31	575.65	13.9-23.9	Overburden
RS2692	EFF	34° 39' 42.17" N	86° 37' 23.21" W	RSA-045	35.9	586.83	589.39	23.0-33.0	Overburden
RS2693	EFF	34° 39' 38.66" N	86° 37' 18.76" W	RSA-045	33.0	580.72	582.79	20.1-30.1	Overburden
RS2787	UPG	34° 39' 40.33" N	86° 37' 27.17" W	RSA-045	54.3	579.30	581.57	41.4-51.4	Overburden
RS2788	EFF	34° 39' 39.6" N	86° 37' 20.83" W	RSA-045	84.5	577.86	580.22	71.6-81.6	Bedrock
RS2937	EFF	34° 39' 43.07" N	86° 37' 21.14" W	RSA-045	NA	NA	NA	NA	Overburden
RS2938	EFF	34° 39' 41.56" N	86° 37' 21.76" W	RSA-045	NA	NA	NA	NA	Overburden
RS2939	EFF	34° 39' 42.79" N	86° 37' 23.88" W	RSA-045	NA	NA	NA	NA	Overburden
RS2940	EFF	34° 39' 43.40" N	86° 37' 25.09" W	RSA-045	NA	NA	NA	NA	Overburden
RS2941	EFF	34° 39' 40.97" N	86° 37' 23.99" W	RSA-045	NA	NA	NA	NA	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS2942	EFF	34° 39' 42.12" N	86° 37' 20.17" W	RSA-045	NA	NA	NA	NA	Overburden
RSA-049									
RS054	EFF	34° 39' 14.28"N	86° 39' 26.15"W	RSA-049	56.8	613.56	616.66	41.8-51.8	Overburden
RS263	EFF	34° 39' 13.23"N	86° 39' 24.34"W	RSA-049	42.4	608.86	610.76	32.4-41.8	Overburden
RS633	EFF	34° 39' 17.36"N	86° 39' 15.89"W	RSA-049	50.0	613.47	615.97	29.0-44.0	Overburden
RS634	BKG	34° 39' 21.04"N	86° 39' 20.58"W	RSA-049 (GW RSA-149)	33.5	612.93	615.43	17.8-32.8	Overburden
RS635	EFF	34° 39' 22.67"N	86° 39' 24.64"W	RSA-049	40.5	619.78	622.28	25.0-40.0	Overburden
RS636	EFF	34° 39' 17.36"N	86° 39' 27.79"	RSA-049	43.5	621.77	624.44	27.5-42.5	Overburden
RS1074	EFF	34° 39' 13.29"N	86° 39' 16.54"W	RSA-049	106.0	608.57	611.36	95.7-105.7	Bedrock
RS1087	BKG	34° 39' 21.23"N	86° 39' 20.35"W	RSA-049 (GW RSA-149)	76.5	612.86	616.4	66.2-76.2	Bedrock
RS1090	EFF	34° 39' 18.46"N	86° 39' 27.81"W	RSA-049	95.0	623.20	626.04	83.0-92.7	Bedrock
RS1589	EFF	34° 39' 16.25"N	86° 39' 15.91"W	RSA-049	49.0	611.03	614.61	34.0-49.0	Overburden
RS1590	EFF	34° 39' 14.30"N	86° 39' 19.93"W	RSA-049	79.0	610.16	612.48	69.0-79.0	Bedrock
RS1591	EFF	34° 39' 14.16"N	86° 39' 21.80"W	RSA-049	66.0	610.53	613.71	51.0-66.0	Bedrock
RS1592	EFF	34° 39' 14.17"N	86° 39' 21.91"W	RSA-049	48.0	610.53	613.71	33.0-48.0	Overburden
RS1593	BKG	34° 39' 14.81"N	86° 39' 31.67"W	RSA-049 (GW RSA-149)	117.0	620.67	623.91	107.0-117.0	Bedrock
RS1594	BKG	34° 39' 14.68"N	86° 39' 31.78"W	RSA-049 (GW RSA-149)	45.0	620.32	623.86	30.0-45.0	Overburden
RS1973	EFF	34° 39' 9.878"N	86°39' 16.988"W	RSA-049	46.0	614.83	617.54	36.0-46.0	Overburden
RSA-053									
RS138	EFF	34° 37' 40.16"N	86° 38' 42.51"W	RSA-053	43.0	568.54	571.54	21.5-41.5	Overburden
RS139	EFF	34° 37' 39.98"N	86° 38' 47.00"W	RSA-053	40.0	580.83	583.32	30.0-40.0	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS179	EFF	34° 37' 37.09"N	86° 38' 47.35"W	RSA-053	24.9	559.27	561.31	19.7-24.7	Overburden
RS192	EFF	34° 37' 45.18"N	86° 38' 44.03"W	RSA-053	66.0	600.29	602.45	57.0-66.0	Overburden
RS195	POC	34° 37' 37.50"N	86° 38' 43.76"W	RSA-053	40.5	557.99	560.46	28.0-38.0	Overburden
RS270	UPG	34° 37' 55.88"N	86° 38' 57.55"W	RSA-053	46.6	591.48	594.2	36.6-45.6	Overburden
RS273	EFF	34° 37' 50.13"N	86° 38' 46.19"W	RSA-053	40.2	603.59	605.89	27.7-36.7	Overburden/ Perched
RS274	EFF	34° 37' 50.19"N	86° 38' 46.32"W	RSA-053	71.6	603.46	606.00	59.1-68.1	Overburden
RS348	EFF	34° 37' 56.87"N	86° 38' 52.45"W	RSA-053	38.0	603.51	606.36	26.0-36.0	Overburden/ Perched
RS349	EFF	34° 37' 56.89"N	86° 38' 52.32"W	RSA-053	63.0	603.67	606.34	52.0-62.0	Overburden
RS1996	EFF	34° 37' 48.09"N	86° 38' 51.83"W	RSA-053	52.5	605.77	607.97	42.1-52.1	Overburden
RS1997	EFF	34° 37' 47.49"N	86° 38' 51.39"W	RSA-053	90.0	605.13	607.85	80.0-90.0	Bedrock
RS2003	UPG	34° 37' 52.58"N	86° 38' 55.08"W	RSA-053	58.0	603.33	604.48	47.0-57.0	Overburden
RS2175	UPG	34° 37' 52.58"N	86° 38' 55.01"W	RSA-053	92.0	603.71	605.04	81.0-91.0	Bedrock
RSA-054/055									
RS038	EFF	34° 38' 30.46"N	86° 38' 28.93"W	RSA-054/055	52.5	625.69	628.56	37.5-47.5	Overburden
RS039	EFF	34° 38' 24.35"N	86° 38' 31.13"W	RSA-054/055	46.0	634.77	638.49	30.0-41.0	Overburden
RS165	EFF	34° 38' 41.58"N	86° 38' 29.24"W	RSA-054/055	44.0	609.28	611.99	21.0-41.0	Overburden
RS166	EFF	34° 38' 24.53"N	86° 38' 41.24"W	RSA-054/055	66.0	615.61	617.93	51.0-61.0	Overburden
RS200	EFF	34° 38' 44.88"N	86° 38' 33.19"W	RSA-054/055	41.0	604.26	607.00	26.0-37.0	Overburden
RS201	EFF	34° 38' 30.25"N	86° 38' 43.05"W	RSA-054/055	60.0	611.82	614.23	47.0-57.0	Overburden
RS223	EFF	34° 38' 36.33"N	86° 38' 29.49"W	RSA-054/055	44.0	614.13	616.86	29.0-39.0	Overburden
RS297	EFF	34° 38' 42.21"N	86° 38' 43.02"W	RSA-054/055	44.4	627.86	630.65	31.9-40.9	Overburden
RS384	EFF	34° 38' 25.94"N	86° 38' 43.36"W	RSA-054/055	42.0	614.74	617.69	27.0-42.0	Overburden
RS385	EFF	34° 38' 37.37"N	86° 38' 45.74"W	RSA-054/055	40.0	630.40	632.66	30.0-40.0	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RSA-056/139									
RS048	EFF	34° 38' 36.101"N	86° 38' 3.962"W	RSA-056/139	23.6	587.34	590.87	8.6-18.6	Overburden
RS517	POC	34° 38' 29.72"N	86° 38' 0.909"W	RSA-056/139	22.1	583.12	585.82	16.3-21.3	Overburden
RS518	EFF	34° 38' 34.317"N	86° 38' 1.093"W	RSA-056/139	28.1	586.36	587.96	22.6-27.6	Overburden
RS521	EFF	34° 38' 34.093"N	86° 38' 7.729"W	RSA-056/139	36.5	587.72	590.88	30.7-35.7	Overburden
RS630	EFF	34° 38' 32.798"N	86° 38' 4.85"W	RSA-056/139	24.0	589.69	592.19	9.0-23.8	Overburden
RS1255	EFF	34° 38' 36.243"N	86° 38' 9.776"W	RSA-056/139	27.0	589.38	591.46	17.0-27.0	Overburden
RS1257	EFF	34° 38' 36.041"N	86° 38' 8.098"W	RSA-056/139	25.0	586.68	588.91	15.0-25.0	Overburden
RS1259	EFF	34° 38' 34.513"N	86° 38' 8.435"W	RSA-056/139	27.0	586.89	586.67	17.0-27.0	Overburden
RS1261	EFF	34° 38' 35.495"N	86° 38' 9.956"W	RSA-056/139	28.0	589.63	591.72	18.0-28.0	Overburden
RS1267	EFF	34° 38' 32.508"N	86° 38' 0.51"W	RSA-056/139	23.0	585.09	587.08	13.0-23.0	Overburden
RS1273	EFF	34° 38' 30.591"N	86° 38' 5.545"W	RSA-056/139	28.0	584.27	586.04	18.0-28.0	Overburden
RS1275	EFF	34° 38' 32.203"N	86° 38' 7.181"W	RSA-056/139	34.5	587.85	589.94	24.5-34.5	Overburden
RSA-060									
RS020	EFF	34° 37' 31.66"N	86° 38' 22.77"W	RSA-060	26.0	556.36	570.56	10.0-21.0	Overburden
RS022	EFF	34° 37' 29.49"N	86° 38' 32.71"W	RSA-060	41.0	567.05	570.12	14.0-25.0	Overburden
RS197	EFF	34° 37' 36.97"N	86° 38' 36.23"W	RSA-060	52.2	574.78	576.50	39.0-49.0	Overburden
RS282	EFF	34° 37' 37.03"N	86° 38' 24.85"W	RSA-060	28.3	568.23	570.92	15.8-24.8	Overburden
RS285	BKG	34° 37' 44.14"N	86° 38' 34.66"W	RSA-060	43.5	572.87	575.25	31.0-40.0	Overburden
RS552	EFF	34° 37' 29.88"N	86° 38' 32.58"W	RSA-060	62.0	569.90	572.61	52.0-62.0	Bedrock
RS555	EFF	34° 37' 32.45"N	86° 38' 33.60"W	RSA-060	47.0	573.10	575.94	37.0-47.0	Overburden
RS556	EFF	34° 37' 25.615"N	86° 38' 31.30"W	RSA-060	35.5	563.50	566.31	25.5-35.5	Interface
RS2723	EFF	34° 37' 31.05"N	86° 38' 27.67"W	RSA-060	18.0	571.04	573.38	7.6-17.6	Overburden
RS2876	EFF	34° 37' 35.76"N							

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS2876	EFF	34° 37' 35.76"N	86° 38' 34.77"W	RSA-060	54.0	576.32	578.7	43.6-53.6	Overburden
RS2877	EFF	34° 37' 40.01"N	86° 38' 33.72"W	RSA-060	36.5	572.11	574.14	26.1-36.1	Overburden
RSA-083									
RS708	EFF	34° 37' 16.029"N	86° 37' 13.622"W	RSA-083	10.5	575.28	578.19	5.5-10.5	Overburden
RS709	EFF	34° 37' 14.649"N	86° 37' 11.879"W	RSA-083	14.0	569.58	572.10	4.0-14.0	Interface
RS710	EFF	34° 37' 15.931"N	86° 37' 10.863"W	RSA-083	15.0	571.81	574.75	5.0-15.0	Interface
RS808	EFF	34° 37' 12.068"N	86° 37' 14.784"W	RSA-083	8.0	569.71	571.80	3.0-8.0	Overburden
RS2545	EFF	34° 37' 14.766"N	86° 37' 15.682"W	RSA-083	19.3	572.47	574.875	8.9-18.9	Interface
RS2547	UPG	34° 37' 12.858"N	86° 37' 12.065"W	RSA-083	12.2	570.34	572.58	1.8-11.8	Interface
RS2548	EFF	34° 37' 17.798"N	86° 37' 10.897"W	RSA-083	15.3	570.24	574.10	4.9-14.9	Interface
RS2549	EFF	34° 37' 20.072"N	86° 37' 7.786"W	RSA-083	14.6	571.84	574.27	4.2-14.2	Interface
RS2550	EFF	34° 37' 18.138"N	86° 37' 6.179"W	RSA-083	21.4	573.58	576.11	11.0-21.0	Interface
RS2637	EFF	34° 37' 14.604"N	86° 37' 4.931"W	RSA-083	17.8	573.83	576.25	7.4-17.4	Interface
RS2638	UPG	34° 37' 12.522"N	86° 37' 8.214"W	RSA-083	17.5	572.50	574.86	7.0-17.1	Interface
RS2639	EFF	34° 37' 20.956"N	86° 37' 8.605"W	RSA-083	16.3	571.74	574.10	5.9-15.9	Interface
RS2640	EFF	34° 37' 20.336"N	86° 37' 4.782"W	RSA-083	19.5	573.16	575.62	9.1-19.1	Interface
RS2641	UPG	34° 37' 9.859"N	86° 37' 9.793"W	RSA-083	14.5	572.76	575.08	4.1-14.1	Interface
RS3054	EFF	34°37'14.471"N	86°37' 13.592"W	RSA-083	12.0	568.58	570.88	2.0-12.0	Overburden
RSA-204									
RS690	EFF	34° 37' 13.65"N	86° 36' 38.47"W	RSA-204	23.5	579.47	582.59	13.5-23.5	Overburden
RS691	EFF	34° 37' 17.50"N	86° 36' 35.04"W	RSA-204	22.0	577.53	580.64	12.0-22.0	Interface
RS1223	EFF	34° 37' 18.60"N	86° 36' 38.61"W	RSA-204	29.0	578.65	581.43	18.7-28.7	Interface

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1550	EFF	34° 37' 21.73"N	86° 36' 35.61"W	RSA-204	26.0	575.04	575.28	16.0-26.0	Overburden
RS2027	EFF	34° 37' 21.09"N	86° 36' 40.47"W	RSA-204	34.7	580.94	583.40	24.3-34.3	Interface
RS2029	EFF	34° 37' 18.48"N	86° 36' 40.55"W	RSA-204	32.2	585.66	588.11	21.7-31.7	Interface
RS2030	EFF	34° 37' 13.79"N	86° 36' 36.26"W	RSA-204	24.2	581.54	584.12	13.8-23.8	Interface
RS2031	EFF	34° 37' 14.67"N	86° 36' 33.72"W	RSA-204	25.7	576.94	579.83	15.3-25.3	Interface
RS2032	EFF	34° 37' 18.92"N	86° 36' 35.04"W	RSA-204	32.5	577.66	576.91	22.1-32.1	Interface
RS2033	EFF	34° 37' 22.72"N	86° 36' 34.51"W	RSA-204	42.8	571.54	574.29	32.4-42.4	Interface
RS2034	EFF	34° 37' 22.84"N	86° 36' 37.54"W	RSA-204	24.6	576.73	579.13	14.2-24.2	Interface
RS2668	EFF	34° 37' 20.85"N	86° 36' 39.40"W	RSA-204	55	580.92	583.71	45-55	Bedrock
RS2669	EFF	34° 37' 19.34"N	86° 36' 37.09"W	RSA-204	60.0	576.91	579.33	50.0-60.0	Bedrock
RS2670	EFF	34° 37' 16.15"N	86° 36' 36.89"W	RSA-204	50	579.45	582.23	40-50	Bedrock
RS2671	EFF	34° 37' 14.91"N	86° 36' 35.67"W	RSA-204	65	581.01	580.78	55-65	Bedrock
RS2672	EFF	34° 37' 14.25"N	86° 36' 35.87"W	RSA-204	29.9	581.40	581.12	19.5-29.5	Interface
RS2673	EFF	34° 37' 15.16"N	86° 36' 36.59"W	RSA-204	27.2	582.14	582.05	16.8-26.8	Interface
RS2674	EFF	34° 37' 15.84"N	86° 36' 35.23"W	RSA-204	27.8	579.80	582.12	17.4-27.4	Interface
RS2675	EFF	34° 37' 16.24"N	86° 36' 36.60"W	RSA-204	30.3	579.17	581.99	19.9-29.9	Overburden
RS2676	EFF	34° 37' 17.46"N	86° 36' 37.23"W	RSA-204	20.5	578.89	581.06	10.1-20.1	Overburden
RS2677	EFF	34° 37' 19.12"N	86° 36' 38.21"W	RSA-204	29.5	578.31	580.75	19.1-29.1	Overburden
RS2678	EFF	34° 37' 20.02"N	86° 36' 37.65"W	RSA-204	28.4	578.348	580.788	18.0-28.0	Overburden
RS2683	EFF	34° 37' 21.49"N	86° 36' 39.73"W	RSA-204	28.8	579.491	581.813	18.4-28.4	Overburden
RS2791	EFF	34° 37' 15.38"N	86° 36' 35.74"W	RSA-204	28.5	582.65	580.26	18.2-28.2	Interface
RS2793	EFF	34° 37' 19.06"N	86° 36' 36.93"W	RSA-204	24.9	579.43	577.16	14.6-24.6	Interface
RSA-206									

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1653	UPG	34° 37' 38.86" N	86° 36' 42.87" W	RSA-206	22.2	565.5806	567.8339	11.8-21.8	Interface
RS1654	EFF	34° 37' 40.04" N	86° 36' 46.41" W	RSA-206	9.4	562.8104	565.1344	3.9-8.9	Overburden
RS1856	EFF	34° 37' 38.66" N	86° 36' 45.71" W	RSA-206	12.61	563.8169	566.3	7.2-12.11	Overburden
RS1896	EFF	34° 37' 40.02" N	86° 36' 43.93" W	RSA-206	27.8	570.4329	570.15	17.4-27.4	Overburden
RS2024	EFF	34° 37' 39.28" N	86° 36' 45.30" W	RSA-206	12.0	563.8913	566.1891	7.5-11.5	Overburden
RS2183	EFF	34° 37' 41.29" N	86° 36' 47.44" W	RSA-206	13.3	562.0188	564.3878	7.9-12.9	Overburden
RS2184	EFF	34° 37' 41.99" N	86° 36' 45.63" W	RSA-206	11.2	562.5338	564.9668	5.8-10.8	Overburden
RS2185	EFF	34° 37' 39.37" N	86° 36' 47.05" W	RSA-206	12.9	563.4178	565.6238	7.5-12.5	Overburden
RS2186	EFF	34° 37' 37.57" N	86° 36' 47.51" W	RSA-206	6.3	564.0738	566.2268	2.9-5.9	Overburden
RS2777	EFF	34° 37' 41.19" N	86° 36' 49.94" W	RSA-206	20.2	563.327	565.796	19.8-9.8	Interface
RS1215	EFF	34° 37' 39.02" N	86° 36' 44.73" W	RSA-206	20.0	566.31	568.68	9.25-19.25	Interface
RS2554	EFF	34° 37' 32.34" N	86° 36' 47.73" W	RSA-206	15.0	567.394	569.673	4.6-14.6	Interface
RS2555	EFF	34° 37' 33.75" N	86° 36' 45.88" W	RSA-206	13.3	565.821	568.127	2.9-12.9	Interface
RS2556	EFF	34° 37' 34.66" N	86° 36' 43.09" W	RSA-206	33.2	567.873	570.36	22.8-32.8	Overburden
RS1857	EFF	34° 37' 32.05" N	86° 36' 43.65" W	RSA-206	18.4	566.6845	568.8418	8.0-18.0	Overburden
RS1897	UPG	34° 37' 31.75" N	86° 36' 42.72" W	RSA-206	13.7	570.3458	571.9109	3.3-13.3	Overburden
RS2187	EFF	34° 37' 33.38" N	86° 36' 43.15" W	RSA-206	27.5	566.6268	568.9528	17.1-27.1	Overburden
RS2188	EFF	34° 37' 32.96" N	86° 36' 44.88" W	RSA-206	12.3	566.2948	568.5028	6.9-11.9	Overburden
RS2189	EFF	34° 37' 32.41" N	86° 36' 43.18" W	RSA-206	42.3	566.7158	569.1408	31.9-41.9	Overburden
RS2190	EFF	34° 37' 30.33" N	86° 36' 43.32" W	RSA-206	14.2	567.6438	569.6808	8.8-13.8	Overburden
RSA-209									

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS649	EFF	34° 36' 18.71" N	86° 35' 35.20" W	RSA-209	25.0	573.47	573.19	15.0-25.0	Interface
RS652	EFF	34° 36' 13.91" N	86° 35' 36.93" W	RSA-209	25.0	578.01	580.82	8.0-23.0	Overburden
RS654	EFF	34° 36' 16.75" N	86° 35' 41.18" W	RSA-209	40.0	587.06	586.88	28.0-38.0	Interface
RS662	EFF	34° 36' 14.85" N	86° 35' 42.74" W	RSA-209	32.0	585.03	587.56	17.0-32.0	Interface
RS1110	EFF	34° 36' 14.36" N	86° 35' 41.22" W	RSA-209	46.5	583.86	586.63	30.0-45.0	Interface
RS1748	EFF	34° 36' 16.14"N	86° 35' 34.00"W	RSA-209	19.6	571.84	571.58	9.6-19.2	Overburden
RS1753	EFF	34° 36' 12.52"N	86° 35' 38.18"W	RSA-209	25.2	576.47	578.69	14.8-24.8	Overburden
RS2019	EFF	34° 36' 17.79"N	86° 35' 40.12"W	RSA-209	36.3	585.55	587.67	25.9-35.9	Interface
RS2020	EFF	34° 36' 17.14"N	86° 35' 41.88"W	RSA-209	30.2	589.03	591.73	19.8-29.8	Interface
RS2021	EFF	34° 36' 16.14"N	86° 35' 40.49"W	RSA-209	25.4	584.47	586 5	15.0-25	Interface
RS2022	EFF	34° 36' 16.49"N	86° 35' 38.21"W	RSA-209	34.4	578.09	580.19	24.0-34.0	Overburden
RS2657	UPG	34° 36' 18.43"N	86° 35' 43.84"W	RSA-209	27.1	586.19	588.66	16.7-26.7	Interface
RS2658	UPG	34° 36' 19.43"N	86° 35' 42.12"W	RSA-209	29.1	588.63	591.17	18.7-28.7	Interface
RS2659	UPG	34° 36' 17.66"N	86° 35' 42.53"W	RSA-209	21.8	590.44	593.06	11.4-21.4	Interface
RS2660	EFF	34° 36' 17.03"N	86° 35' 43.23"W	RSA-209	41.2	590.80	593.13	30.8-40.8	Interface
RS2661	EFF	34° 36' 16.18"N	86° 35' 41.90"W	RSA-209	27.6	586.34	588.97	17.2-27.2	Interface
RS2665	UPG	34° 36' 18.66"N	86° 35' 40.08"W	RSA-209	31.6	586.67	588.89	21.2-31.2	Interface
RS2690	EFF	34° 36' 16.75"N	86° 35' 41.35"W	RSA-209	65	587.15	589.95	55.0-65.0	Bedrock
RS2766	EFF	34° 36' 16.85"N	86° 35' 41.28"W	RSA-209	119	587.49	589.53	98.6-118.6	Bedrock
RSA-225									
RS1899	EFF	34° 38' 28.49"N	86° 38' 19.08"W	RSA-225	43.8	609.92	609.80	33.0-43.0	Overburden
RS1900	EFF	34° 38' 26.51"N	86° 38' 15.74"W	RSA-225	40.0	600.57	602.64	29.1-39.1	Overburden
RS1901	EFF	34° 38' 25.26"N	86° 38' 16.80"W	RSA-225	34.6	604.42	602.21	23.8-33.8	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1902	EFF	34° 38' 24.26"N	86° 38' 14.84"W	RSA-225	42.6	602.33	599.90	31.9-41.9	Overburden
RS2043	UPG	34° 38' 29.35"N	86° 38' 19.13"W	RSA-225	41.5	609.10	607.96	31.1-41.1	Overburden
RS2044	EFF	34° 38' 28.42"N	86° 38' 17.54"W	RSA-225	29.5	605.31	608.01	19.1-29.1	Overburden
RS2471	EFF	34° 38' 22.24"N	86° 38' 15.63"W	RSA-225	35.6	610.74	613.19	20.2-35.2	Overburden
RSA-252									
RS349	EFF	34° 37' 56.82" N	86° 38' 52.43" W	RSA-252	62.0	603.88	506.45	52.0-62.0	Overburden
RS350	EFF	34° 37' 53.87" N	86° 38' 46.02" W	RSA-252	32.0	605.01	607.60	14.5-29.5	Overburden
RS1679	EFF	34° 38' 03.92" N	86° 38' 46.22" W	RSA-252	37.5	596.00	595.60	27.5-37.5	Overburden
RS1682	EFF	34° 37' 59.62" N	86° 38' 48.46" W	RSA-252	45.4	604.15	606.54	35.4-45.4	Overburden
RS1686	EFF	34° 37' 58.20" N	86° 38' 38.34" W	RSA-252	39.6	585.97	588.81	29-39	Overburden
RS1885	EFF	34° 38' 06.46" N	86° 38' 32.30" W	RSA-252	37.0	587.65	589.95	26.6-36.6	Overburden
RS1888	EFF	34° 37' 55.05" N	86° 38' 31.21" W	RSA-252	32.0	582.57	584.60	21.6-31.6	Overburden
RS1889	EFF	34° 37' 58.82" N	86° 38' 29.98" W	RSA-252	31.0	586.30	588.75	20.6-30.6	Overburden
RS1892	EFF	34° 38' 03.33" N	86° 38' 31.35" W	RSA-252	32.0	588.91	591.32	21.6-31.6	Overburden
RS1994	EFF	34° 38' 04.36" N	86° 38' 40.26" W	RSA-252	33.6	585.63	585.16	23.3-33.3	Overburden
RS2400	BKG	34° 38' 07.66" N	86° 38' 43.92" W	RSA-252	34.1	592.95	595.59	23.9-33.9	Overburden
RS2401	EFF	34° 38' 05.48" N	86° 38' 35.67" W	RSA-252	35.3	589.88	592.15	24.9-34.9	Overburden
RS2402	EFF	34° 38' 02.07" N	86° 38' 37.88" W	RSA-252	44.0	590.51	592.93	21-31	Overburden
RS2761	EFF	34° 38' 04.51" N	86° 38' 45.49" W	RSA-252	99.6	594.95	594.76	89.2-99.2	Bedrock
RS2767	EFF	34° 37' 55.73" N	86° 38' 37.40" W	RSA-252	34.1	589.69	591.93	23.7-33.7	Overburden
RS2845	BKG	34° 38' 12.70" N	86° 38' 39.49" W	RSA-252	48.8	592.68	594.76	38.4-48.4	Overburden
RS2846	BKG	34° 38' 12.47" N	86° 38' 43.02" W	RSA-252	38.4	593.13	595.67	28.0-38.0	Overburden

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS2847	BKG	34° 38' 10.30" N	86° 38' 37.92" W	RSA-252	36.8	589.28	589.01	26.6-38.4	Overburden
RS2934[4]	BKG	34° 38' 11.24" N	86°38' 45.26 " W	RSA-252	TBD	TBD	TBD	TBD	Overburden
RS2935[4]	BKG	34° 38' 06.66" N	86° 38' 48.97" W	RSA-252	TBD	TBD	TBD	TBD	Overburden
RS2936[4]	BKG	34° 38' 02.18" N	86° 38' 51.37" W	RSA-252	TBD	TBD	TBD	TBD	Overburden
RSA-269									
RS1622	EFF	34° 35' 48.13" N	86° 37' 58.79" W	RSA-269	26.9	575.66	577.95	6.5-26.5	Overburden
RS1623	EFF	34° 35' 48.11" N	86° 37' 59.20" W	RSA-269	25.5	573.06	575.51	5.1-25.1	Overburden
RS1625	UPG	34° 35' 48.00" N	86° 38' 0.16" W	RSA-269	25.5	570.42	570.17	5.1-25.1	Overburden
RSA-306									
RS2340	EFF	34°35' 55.715" N	86° 37' 15.519" W	RSA-306	17.2	584.56	584.10	6.8 - 16.8	Overburden
RS2341	EFF	34°35' 56.299" N	86° 37' 16.335" W	RSA-306	17.0	583.99	583.76	6.5 - 16.5	Overburden
RS2342	EFF	34°35' 56.011" N	86° 37' 16.553" W	RSA-306	16.4	583.90	583.56	6.0 - 16.0	Overburden
RS2343	EFF	34°35' 56.021" N	86° 37' 15.795" W	RSA-306	12.4	585.02	584.68	7.0 - 12.0	Overburden
RS2344	EFF	34°35' 56.018" N	86° 37' 15.491" W	RSA-306	9.8	584.72	584.38	4.4 - 9.4	Overburden
RS2346	EFF	34°35' 55.385" N	86° 37' 15.059" W	RSA-306	12.0	584.10	583.85	6.6 - 11.6	Overburden
RS2805	EFF	34°35' 54.810" N	86° 37' 16.176" W	RSA-306	17.3	582.95	585.44	6.9 - 16.9	Overburden
RS2806	EFF	34°35' 55.343" N	86° 37' 14.461" W	RSA-306	12.9	583.71	585.93	7.5 - 12.5	Overburden
RS2807	EFF	34°35' 56.788" N	86° 37' 14.672" W	RSA-306	15.5	584.44	586.70	5.1 - 15.1	Overburden
Facility-Wide									
RS065	BDY	34° 40' 58.86"N	86° 36' 41.71"W	Facility-Wide	58.0	596.85	597.98	43.0-58.0	Interface
RS066	BDY	34° 40' 02.80"N	86° 36' 38.08"W	Facility-Wide	47.0	583.98	583.98	32.0-47.0	Interface
RS070	BDY	34° 35' 46.53"N	86° 35' 12.39"W	Facility-Wide	48.0	571.12	572.27	33.0-48.0	Interface

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS961	BDY	34° 37' 37.52"N	86° 35' 22.155"W	Facility-Wide	45.5	566.46	568.92	35.5-45.5	Interface
RS1111	BDY	34° 41' 46.97"N	86° 41' 58.25"W	Facility-Wide	25.0	605.75	608.36	15.0-25.0	Overburden
RS1114	BDY	34° 41' 00.30"N	86° 42' 52.73"W	Facility-Wide	61.0	598.59	601.27	50.6-60.6	Overburden
RS1121	BDY	34° 39' 42.59"N	86° 42' 50.81"W	Facility-Wide	16.0	584.49	587.36	5.6-15.6	Overburden
RS1153 EP3- 3	BDY	34° 34' 17.14"N	86° 40' 20.69"W	Facility-Wide	45.0	564.95	567.61	34.6-44.6	Interface
RS1159 EP3- 5	BDY	34° 35' 3.22"N	86° 36' 8.30"W	Facility-Wide	40.6	565.21	567.69	25.0-40.0	Interface
RS1353	BDY	34° 38' 43.58"N	86° 42' 35.94"W	Facility-Wide	36.0	581.39	584.01	25.8-35.8	Overburden
RS1414	BDY	34° 41' 27.246"N	86° 42' 44.679"W	Facility-Wide	85.0	643.30	645.47	75.0-85.0	Interface
RS1419	BDY	34° 41' 0.625"N	86° 37' 18.301"W	Facility-Wide	25.0	578.34	580.56	10.0-25.0	Overburden
RS1523	BDY	34° 37' 02.71"N	86° 35' 12.16"W	Facility-Wide	22.0	568.09	571.10	11.8-21.8	Interface
RS1527 (off site)	BDY	34° 36' 38.96"N	86° 35' 14.10"W	Facility-Wide	21.0	567.38	570.80	11.0-21.0	Interface
RS1711	BDY	34° 36' 9.326"N	86°35' 15.345"W	Facility-Wide	54.0	565.72	568.23	44.0-54.0	Interface
RS2109	BDY	34° 35' 46.53"N	86° 35' 12.39"W	Facility-Wide	30.8	571.12	572.27	20.4-30.4	Overburden
RS2801	BDY	34° 36' 27.28"N	86° 35' 21.67"W	Facility-Wide	16.3	568.88	571.27	5.9-15.9	Overburden
RS2802	BDY	34° 36' 17.77"N	86° 35' 20.66"W	Facility-Wide	18.5	568.53	571.02	8.1-18.1	Overburden
RS2803	BDY	34° 36' 10.52"N	86° 35' 19.40"W	Facility-Wide	30.3	566.23	568.74	19.9-29.9	Overburden
RS2804	BDY	34° 36' 01.56"N	86° 35' 18.59"W	Facility-Wide	50.0	568.71	570.34	39.6-49.6	Overburden
MSW13	BDY	34° 41' 48.127"N	86°41' 56.881"W	Facility-Wide	0.0	NA	NA	NA	Surface water
MSW14	BDY	34° 42' 32.59"N	86° 38' 21.466"W	Facility-Wide	0.0	NA	NA	NA	Surface water
MSW16	BDY	34° 39' 40.587"N	86° 36' 17.672"W	Facility-Wide	0.0	NA	NA	NA	Surface water
MSW18a	BDY	34° 37' 18.974"N	86° 35' 15.024"W	Facility-Wide	0.0	NA	NA	NA	Surface water
INCRK-01	BDY	34° 34' 54.971"N	86° 43' 47.586"W	Facility-Wide	0.0	556.00	NA	NA	Surface water

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
OFF-SW27 (off site)	BDY	34° 35' 48.045"N	86° 35' 9.743"W	Facility-Wide	0.0	NA	NA	NA	Surface water
P-SW11	BDY	34° 34' 21.525"N	86° 40' 20.909"W	Facility-Wide	0.0	556.00	NA	NA	Surface water
RS065A	BDY	34° 40' 46.52"N	86° 36' 37.19"W	Facility-Wide Bedrock	142.0	585.89	588.89	57.0-77.0 127.0-142.0	Bedrock
RS643	BDY	34° 37' 29.87"N	86° 35' 21.23"W	Facility-Wide Bedrock	56.0	577.66	580.11	44.7-55.1	Bedrock
RS1148 EP3- 1	BDY	34° 35' 21.629"N	86° 41' 28.22"W	Facility-Wide Bedrock	194.0	565.09	568.07	182.3-192.3	Bedrock
RS1149 EP3- 1	BDY	34° 35' 21.65"N	86° 41' 28.31"W	Facility-Wide Bedrock	274.4	565.23	567.80	259.4-274.4	Bedrock
RS1151 EP3- 2	BDY	34° 35' 00.22"N	86° 40' 39.41"W	Facility-Wide Bedrock	235.5	560.22	565.00	225.0-235.0	Bedrock
RS1152 EP3- 2	BDY	34° 35' 00.11"N	86° 40' 39.24"W	Facility-Wide Bedrock	300.3	560.16	564.79	270.0-285.0	Bedrock
RS1154 EP3- 3	BDY	34° 34' 17.042"N	86°40' 20.77"W	Facility-Wide Bedrock	191.0	565.06	567.73	176.0-191.0	Bedrock
RS1157 EP3- 4	BDY	34° 34' 41.19"N	86° 37' 00.55"W	Facility-Wide Bedrock	200.3	562.99	565.43	190.0-200.0	Bedrock
RS1158 EP3- 4	BDY	34° 34' 41.30"N	86° 37' 00.48"W	Facility-Wide Bedrock	327.8	562.81	565.34	316.0-326.0	Bedrock
RS1160 EP3- 5	BDY	34° 35' 03.17"N	86° 36' 08.41"W	Facility-Wide Bedrock	205.5	565.24	567.85	195.5-205.5	Bedrock
RS1164 EP3- 6	BDY	34° 35' 7.55"N	86° 35' 16.45"W	Facility-Wide Bedrock	278.8	563.31	566.47	268.8-278.8	Bedrock
RS1167	BDY	34° 38' 15.09"N	86° 36' 08.57"W	Facility-Wide Bedrock	198.0	566.36	568.28	182.2-192.2	Bedrock
RS1294 EP4- 6	BDY	34° 35' 07.73"N	86° 35' 16.61"W	Facility-Wide Bedrock	119.5	563.29	565.85	109.0-119.0	Bedrock
RS1413S	BDY	34° 41' 47.371"N	86° 41' 54.903"W	Facility-Wide Bedrock	175.0	609.56	612.28	90.0-120.0	Nested Bedrock
RS1413D	BDY	34° 41' 47.371"N	86° 41 '54.903"W	Facility-Wide Bedrock	175.0	609.56	612.28	155.0-175.0	Nested Bedrock
RS1416	BDY	34° 42' 33.373"N	86° 39' 3.342"W	Facility-Wide Bedrock	56.0	683.69	685.69	36.0-56.0	Bedrock
RS1418	BDY	34° 42' 32.778"N	86° 38' 25.385"W	Facility-Wide Bedrock	92.0	629.14	631.32	82.0-92.0	Bedrock
RS1483	BDY	34° 41' 27.095"N	86° 42' 44.787"W	Facility-Wide Bedrock	101.0	642.52	644.76	91.0-101.0	Bedrock
RS1486c	BDY	34° 42' 33.373"N	86° 39' 3.342"W	Facility-Wide Bedrock	258.0	683.30	685.65	144.0-154.5	CMT Bedrock

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1488e	BDY	34° 42' 32.817"N	86° 38' 25.297"W	Facility-Wide Bedrock	125.0	628.99	631.63	121.5-124.5	CMT Bedrock
RS1489e	BDY	34° 41' 0.625"N	86° 37' 18.301"W	Facility-Wide Bedrock	200.0	578.75	581.18	184.5-197.0	CMT Bedrock
RS1514S	BDY	34° 37' 16.10"N	86° 35' 30.17"W	Facility-Wide Bedrock	150.0	569.55	572.07	121.0-126.0	Nested Bedrock
RS1514D	BDY	34° 37' 16.10"N	86° 35' 30.17"W	Facility-Wide Bedrock	150.0	569.55	572.07	144.0-149.0	Nested Bedrock
RS1518a	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	55.5-61.0	FLUTe Bedrock
RS1518b	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	83.0-89.0	FLUTe Bedrock
RS1518c	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	100.0-110.0	FLUTe Bedrock
RS1518d	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	152.0-163.0	FLUTe Bedrock
RS1518e	BDY	34° 37' 02.71"N	86° 35' 12.12"W	Facility-Wide Bedrock	240.0	567.67	570.15	213.0-229.0	FLUTe Bedrock
RS1520a	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	67.0-75.0	FLUTe Bedrock
RS1520b	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	99.0-113.0	FLUTe Bedrock
RS1520c	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	130.0-143.0	FLUTe Bedrock
RS1520d	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	164.0-175.0	FLUTe Bedrock
RS1520e	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	210.0-214.0	FLUTe Bedrock
RS1520f	BDY	34° 36' 22.62"N	86° 35' 16.66"W	Facility-Wide Bedrock	260.0	569.09	571.76	230.5-244.5	FLUTe Bedrock
RS1522S (off site)	BDY	34° 36' 39.14"N	86° 35' 14.43"W	Facility-Wide Bedrock	182.0	567.56	570.06	100.0-110.0	Nested Bedrock
RS1522D (off site)	BDY	34° 36' 39.14"N	86° 35' 14.43"W	Facility-Wide Bedrock	182.0	567.56	570.06	172.0-182.0	Nested Bedrock
RS1534a	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	99.5-103.5	FLUTe Bedrock
RS1534b	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	127.3-134.3	FLUTe Bedrock
RS1534c	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	182.2-186.2	FLUTe Bedrock
RS1534d	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	218.6-225.9	FLUTe Bedrock
RS1534e	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	235.0-235.9	FLUTe Bedrock

Table E-2

Description of Wells in RSA's Groundwater Monitoring Programs
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Test Location	Type[1]	Latitude	Longitude	Unit(s) Monitored	Depth (ft)	Ground Elevation (ft MSL)	Top of Riser Elevation (ft MSL)	Screened Interval (ft bgs)	Monitored Zone[2]
RS1534f	BDY	34° 35' 50.22"N	86° 35' 24.43"W	Facility-Wide Bedrock	260.0	574.68	577.36	252.0-257.0	FLUTe Bedrock
RS1673a	BDY	34° 40' 59.57"N	86° 37' 37.65"W	Facility-Wide Bedrock	125.0	595.82	597.48	72.9-77.9	Bedrock
RS1675S	BDY	34° 39' 27.698"N	86°36' 41.371"W	Facility-Wide Bedrock	171.0	567.42	569.77	102.0-117.0	Nested Bedrock
RS1675D	BDY	34° 39' 27.698"N	86°36' 41.371"W	Facility-Wide Bedrock	171.0	567.42	569.77	161.0-171.0	Nested Bedrock
RS1779	BDY	34° 41' 00.44"N	86° 42' 52.97"W	Facility-Wide Bedrock	121.0	600.69	603.19	116.0-121.0	Bedrock
RS1783S	BDY	34° 38' 08.09"N	86° 42' 32.72"W	Facility-Wide Bedrock	122.0	584.20	586.61	44.0-54.0	Nested Bedrock
RS1783D	BDY	34° 38' 08.09"N	86° 42' 32.72"W	Facility-Wide Bedrock	122.0	584.20	586.61	117.0-122.0	Nested Bedrock
RS1785S	BDY	34° 36' 36.12"N	86° 42' 31.56"W	Facility-Wide Bedrock	120.0	560.86	563.31	38.5-48.5	Nested Bedrock
RS1785D	BDY	34° 36' 36.12"N	86° 42' 31.56"W	Facility-Wide Bedrock	120.0	560.86	563.31	110.0-120.0	Nested Bedrock
RS1786S	BDY	34° 35' 46.68"N	86° 43' 14.14"W	Facility-Wide Bedrock	190.0	571.66	574.26	38.0-48.0	Nested Bedrock
RS1786D	BDY	34° 35' 46.68"N	86° 43' 14.14"W	Facility-Wide Bedrock	190.0	571.66	574.26	178.0-188.0	Nested Bedrock
RS1806a	BDY	34° 33' 20.19"N	86° 39' 07.77"W	Facility-Wide Bedrock	257.0	567.86	570.15	51.0-64.0	FLUTe Bedrock
RS1806b	BDY	34° 33' 20.19"N	86° 39' 07.77"W	Facility-Wide Bedrock	257.0	567.86	570.15	96.0-101.0	FLUTe Bedrock
RS1806c	BDY	34° 33' 20.19"N	86° 39' 07.77"W	Facility-Wide Bedrock	257.0	567.86	570.15	248.0-257.0	FLUTe Bedrock

[1] Well Type:
POC – Point of Compliance Well.
EFF – Effectiveness Monitoring Well.
BDY – Boundary Well.
BKG – Background Well.
UPG – Upgradient Well.

[2] Monitored Zone:
Interface – Well screened across the overburden and bedrock.
CMT – Continuous Multichannel Tubing, multi-screened well in a single borehole.
FLUTe – Flexible Liner Underground Technologies, multi-screened well in a single borehole.
Nested – Two separate wells in a single borehole.
EP – Exit Pathway Well Clusters along southern boundary.
ft – Feet.
bgs - Below ground surface.
MSL - Above mean sea level.
NA – Not applicable.
[3] Proposed new long-term monitoring well. The proposed location coordinates, depth, and screened interval are shown in table.

Table E-5

Summary of Groundwater Results for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Analytes	Range of Concentrations Above Cleanup Goal[1,2] (µg/L)	Cleanup Goal[1] (µg/L)
RSA-049		
Metals		
Arsenic	27.6	Background
Volatile Organic Compounds		
Carbon tetrachloride	6.53 – 22	Background
Trichloroethene	5.69 – 30	Background
RSA-053		
Pesticides		
4,4'-DDD	0.535 – 1.38	0.28
4,4'-DDE	0.446 – 0.532	0.20
4,4'-DDT	0.732	0.20
Aldrin	0.00105 – 0.169	0.00021
alpha-BHC	0.00692 – 0.0552	0.0062
beta-BHC	0.0258 – 0.342	0.022
Dieldrin	0.00183 – 0.0457	0.0015
Volatile Organic Compounds		
Benzene	20 – 28	5
Chlorobenzene	110 – 25,000	100
RSA-054/055		
Metals		
Cobalt	8.72	0.6
Manganese	878 – 2,200	43
Nickel	51.4	39
Explosives		
2-Nitrotoluene	0.536 – 0.598	0.31
3-Nitrotoluene	0.366 – 0.544	0.17
Nitrobenzene	0.572 - 3.37	0.14
Nitroglycerin	0.531	0.2
RDX	0.986	0.97
Pesticides		
4,4'-DDD	0.0344	0.0063
Kepone	0.00438 - 0.0106	0.0035
Semivolatile Organic Compounds		
Benzo(a)anthracene	0.0344 – 0.0865	0.03
bis(2-Chloroethyl)ether	0.536 – 0.915	0.014
Dibenz(a,h)anthracene	0.0167 - 0.0707	0.0029

Table E-5

Summary of Groundwater Results for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Analytes	Range of Concentrations Above Cleanup Goal[1,2] (µg/L)	Cleanup Goal[1] (µg/L)
Volatile Organic Compounds		
Chlorobenzene	198 - 360	100
Trichloroethene	7.08	5
Miscellaneous		
Formaldehyde	32	0.43
RSA-060		
Metals		
Arsenic	11.2	10
Iron	1,190 – 34,500	1,100
Manganese	37.6 – 7,260	32
Pesticides		
Aldrin	0.0044	0.004
alpha-BHC	0.00693 – 0.008	0.0062
beta-BHC	0.045	0.022
Dieldrin	0.00185 - 0.00939	0.0015
Volatile Organic Compounds		
1,1-Dichloroethene	33.5 - 87	7
Chlorobenzene	467 – 1,800	100
cis-1,2-Dichloroethene	250 – 1,000	70
Trichloroethene	49 - 338	5
Vinyl chloride	2.59 – 110	2
RSA-204		
Volatile Organic Compounds[3]		
Trichloroethene	6.66	5
Miscellaneous		
Perchlorate	17.4 – 37,300	15
RSA-209		
Perchlorate	36.9 - 6.04	15
Trichloroethene	6.04	5
Tetrachloroethene	5.74 - 8.59	5
2- Nitrotoluene	10.3	0.31
RDX	1.62	4.3
RSA-306		
1-Methylnaphthalene	4.87 – 6.16	11
Benzene	5.79 – 9.9	5
Iron	5,100 – 30,100	Background
Facility-Wide		

Table E-5

Summary of Groundwater Results for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Analytes	Range of Concentrations Above Cleanup Goal[1,2] (µg/L)	Cleanup Goal[1] (µg/L)
Metals		
Aluminum	2,130 – 17,100	2,000
Arsenic	11.4 - 30	10
Barium	2,080	2,000
Iron	1,870 – 20,300	1,400
Lead	27.2 – 35.3	15
Manganese	355 – 4,140	43
Vanadium	11.4 – 30.4	8.6
Explosives		
1,3-Dinitrobenzene	0.227 – 0.708	0.2
2,4-Dinitrotoluene	0.373 – 1.34	0.24
2,6-Dinitrotoluene	0.0915 – 1.53	0.049
2-Amino-4,6-dinitrotoluene	3.98	3.9
2-Nitrotoluene	0.322 - 24	0.31
3-Nitrotoluene	0.176 – 1.22	0.17
Nitrobenzene	0.146 - 11	0.14
Nitroglycerin	0.244 – 1.41	0.2
p-Nitrotoluene	7.69	4.3
RDX	2.07	0.97
Pesticides		
4,4'-DDD	0.00642 – 0.0413	0.0063
Aldrin	0.00243 – 0.00461	0.00092
alpha-BHC	0.00796	0.0072
Dieldrin	0.00226 – 0.00709	0.0018
Kepone	0.00426 – 0.0175	0.0035
Volatile Organic Compounds		
1,1,2,2-Tetrachloroethane	0.157	0.076
1,1-Dichloroethene	7.75 – 13.1	7
1,2,4-Trimethylbenzene	5.96 – 6.39	5.6
Acetone	1,410 – 60,600	1,400
Benzene	12.5 – 13.4	5
cis-1,2-Dichloroethene	73.2 - 109	70
Trichloroethene	5.04 - 229	5
Vinyl chloride	2.09 – 97.6	2
Semivolatile Organic Compounds		

Table E-5

Summary of Groundwater Results for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Analytes	Range of Concentrations Above Cleanup Goal[1,2] (µg/L)	Cleanup Goal[1] (µg/L)
Benzo(a)anthracene	0.031 – 0.257	0.03
Dibenz(a,h)anthracene	0.026 – 0.0734	0.025
Methanol	18,000 – 21,000	2,000
Naphthalene	0.358 – 0.767	0.12
Miscellaneous		
Perchlorate	15.8 – 37.4	15
Formaldehyde	15 – 59	0.39
Monochloroacetic acid	86 - 320	60

Notes:
Only the chemicals present in groundwater at concentrations above the cleanup goals are shown.

Most recent available data used. Data evaluated was obtained from the following sources:

RSA-049: Annual monitoring data for 2018
RSA-053: Annual monitoring data for 2016-2017
RSA-054/055: Annual monitoring data for 2016-2017
RSA-060: Monitoring data for May and August 2018
RSA-204: Baseline groundwater sampling event in June 2018 (pre-injection)
Facility-Wide: Annual monitoring data for 2017

Background values are the calculated site-specific background concentrations in accordance with ADEM Admin. Code R.335-14-5-Appendix IV.

1 Cleanup goals for groundwater based on the following hierarchy:

a) MCL (EPA, 2018, 2018 Edition of the Drinking Water Standards and Health Advisories, EPA 822-F-18-001, Office of Water, Washington, DC, March).

b) Tap water regional screening levels (RSL); values are the lower of either the cancer-based RSL or the noncancer RSL adjusted to reflect a hazard index of 0.1 (EPA, 2020, Regional Screening Levels for Chemical Contaminants at Superfund Sites, May).

2 Groundwater monitoring results are not available for sites added to RSA's permit in Modification 14.

3 Trichloroethene breakdown products (cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride) were detected at concentrations below RSLs.

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-003	2-Nitrotoluene 1,1-Dichloroethene 1,2-Dichloroethane cis-1,2-Dichloroethene Trichloroethene Vinyl Chloride Benzo(a)anthracene 3-Nitrotoluene 1,1-Dichloroethane trans-1,2-Dichloroethene Methylene Chloride
RSA-009	Benzo(a)anthracene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
RSA-045	1,1-Dichloroethene Carbon Tetrachloride cis-1,2- Dichloroethene Trichloroethene Trans-1,2-Dichloroethene Vinyl Chloride 2-Nitrotoluene Benzo(a)anthracene Nitrobenzene
RSA-049	Arsenic Mercury Trichloroethene Carbon tetrachloride

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-053	Chlorobenzene Benzene 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin Alpha-BHC Alpha-Chlordane Beta-BHC Delta-BHC Dieldrin Endosulfan Endosulfan II Endosulfan Sulfate Endrin Endrin Aldehyde Endrin Ketone Gamma-BHC (Lindane) Gamma-Chlordane Heptachlor Heptachlor Epoxide Methoxychlor Toxaphene

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-054/055*	Aluminum Cadmium Cobalt Iron Magnesium Nickel Thallium Chlorpyrifos 2,4-Dinitrotoluene 2,6-Dinitrotoluene 2-Amino-4,6-dinitrotoluene 2-Nitrotoluene 3-Nitrotoluene Nitrobenzene Nitroglycerin RDX Acetaldehyde Formaldehyde 4,4'-DDD Aldrin alpha-BHC Chlorobenzilate delta-BHC Dieldrin Kepone 1,2-Diphenylhydrazine 2,4,6-Trichlorophenol 2,6-Dimethylphenol 3,3'-Dichlorobenzidine 4,6-Dinitro-2-methylphenol 4-Chloroaniline 4-Nitroaniline Azobenzene Benzidine

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-054/055 (Continued)	Benzo(a)anthracene (PAH) Bibenzene bis(2-Chloroethyl)ether bis(2-Ethylhexyl)phthalate Diallate Dibenz(a,h)anthracene (PAH) Disulfoton Hexachlorobutadiene Hexachloroethane Methanol Methyl parathion Naphthalene n-Nitrosodimethylamine n-Nitroso-di-n-propylamine Pentachlorobenzene Pentachlorophenol Phorate Sulfotepp 1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane 1,2-Dibromo-3-chloropropane 1,2-Dibromoethane Acrolein Acrylonitrile Allyl chloride Bromomethane Chlorobenzene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Trichloroethene Vinyl chloride
RSA-056/139	Arsenic

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-060	Arsenic Cadmium Iron Manganese 1,4,6-Trinitrotoluene 2-Nitrotoluene 4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin Alpha-BHC Beta-BHC Dieldrin 4-Chloroaniline 1,1,2,2-Tetrachloroethane 1,1-Dichloroethene cis-1,2-Dichloroethene Benzene Chlorobenzene Tetrachloroethene Trichloroethene Vinyl Chloride
RSA-083	Trichloroethene cis-1,2-Dichloroethene Vinyl Chloride Chlorobenzene 1,1-Dichloroethene 2,4-Dinitrotoluene
RSA-204	Perchlorate 1,3-Dinitrobenzene 2,6-Dinitrotoluene 2-Amino-4,6-dinitrotoluene 2-Nitrotoluene 3-Nitrotoluene HMX Nitrobenzene RDX Trichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl Chloride

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-209	Perchlorate Trichloroethene Tetrachloroethene 2- Nitrotoluene RDX cis-1,2- Dichloroethane trans-1,2- Dichloroethane Vinyl Chloride
RSA-225	2,4Dinitrotoluene 2,6Dinitrotoluene 2-Nitrotoluene RDX Benzo(a)anthracene Benzo(b)fluoranthene 1,1,2,2- Tetrachloroethane Tetrachloroethene Trichloroethene
RSA-252	AlphaBHC Beta-BHC Dieldrin Heptachlor Epoxide Toxaphene 1,1,2,2-Tetrachloroethane Trichloroethene 4,4-DDD 4,4-DDE 4,4-DDT Aldrin

Table E-6

Recommended List of Chemicals of Concern for Corrective Action Monitoring Sites RSA AHWMMA Permit Renewal Application Redstone Arsenal, Madison County, Alabama

Solid Waste Management Unit Number	Known or Suspected Contaminants
RSA-269	Trichloroethene 1,2Dichloroethene cis-1,2 Dichloroethene trans-1,2 Dichloroethene Vinyl chloride
RSA-306	1-Methylnaphthalene Benzene Iron

*ADEM did not accept the recommendation to reduce the analyte list for RSA -054/055 in the Final Permit as presented in this table.

Table E-8

Groundwater Protection Standards for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Unit[1]	Hazardous Constituent	Maximum Concentration Limit (µg/L)[2]
RSA-003	2-Nitrotoluene	2.7
	1,1-Dichloroethene	7
	1,2-Dichloroethane	5
	cis-1,2-Dichloroethene	70
	Trichloroethene	5
	Vinyl Chloride	2
	Benzo(a)anthracene	0.03
	3-Nitrotoluene	0.17
	1,1-Dichloroethane	2.8
	trans-1,2-Dichloroethene	100
	Methylene Chloride	5
RSA-009	Benzo(a)anthracene	EPA RSLs[2]
	Benzo(b)fluoranthene	EPA RSLs[2]
	Dibenz(a,h)anthracene	EPA RSLs[2]
	Indeno(1,2,3-cd)pyrene	EPA RSLs[2]
RSA-045	1,1-Dichloroethene	7
	Carbon tetrachloride	5
	cis-1, 2-Dichloroethene	70
	Trichloroethene	5
	trans-1, 2-Dichloroethene	100
	Vinyl Chloride	2
	2-Nitrotoluene	0.31[3]
	Benzo(a)anthracene	0.03[3]
	Nitrobenzene	0.14[3]
RSA-049	Arsenic	Background
	Mercury	Background
	Carbon Tetrachloride	Background
	Trichloroethene (TCE)	Background
RSA-053	Chlorobenzene	100
	Benzene	5
	4,4'-DDD	0.28
	4,4'-DDE	0.20
	4,4'-DDT	0.20
	Aldrin	0.00021
	Alpha-BHC	0.0062
	Alpha-Chlordane	2
	Beta-BHC	0.022

Table E-8

Groundwater Protection Standards for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Unit[1]	Hazardous Constituent	Maximum Concentration Limit (µg/L)[2]
	Delta-BHC	0.27
	Dieldrin	0.0015
	Endosulfan I	7.8
	Endosulfan II	7.8
	Endosulfan Sulfate	7.8
	Endrin	2
	Endrin Aldehyde	0.17
	Endrin Ketone	0.17
	Gamma-BHC (Lindane)	0.2
	Gamma-Chlordane	2
	Heptachlor	0.4
	Heptachlor Epoxide	0.2
	Methoxychlor	40
	Toxaphene	3
RSA-054/055	Aluminum	EPA RSLs[2]
	Cadmium	EPA RSLs[2]
	Cobalt	EPA RSLs[2]
	Iron	EPA RSLs[2]
	Manganese	EPA RSLs[2]
	Nickel	EPA RSLs[2]
	Thallium	EPA RSLs[2]
	Chlorpyrifos	EPA RSLs[2]
	2,4-Dinitrotoluene	EPA RSLs[2]
	2,6-Dinitrotoluene	EPA RSLs[2]
	2-Amino-4,6-dinitrotoluene	EPA RSLs[2]
	2-Nitrotoluene	EPA RSLs[2]
	3-Nitrotoluene	EPA RSLs[2]
	Nitrobenzene	EPA RSLs[2]
	Nitroglycerin	EPA RSLs[2]
	RDX	EPA RSLs[2]
	Acetaldehyde	EPA RSLs[2]
	Formaldehyde	EPA RSLs[2]
	4,4'-DDD	EPA RSLs[2]
	Aldrin	EPA RSLs[2]
	alpha-BHC	EPA RSLs[2]
	Chlorobenzilate	EPA RSLs[2]
	delta-BHC	EPA RSLs[2]

Table E-8

Groundwater Protection Standards for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Unit[1]	Hazardous Constituent	Maximum Concentration Limit (µg/L)[2]
	Dieldrin	EPA RSLs[2]
	Kepone	EPA RSLs[2]
	1,2-Diphenylhydrazine	EPA RSLs[2]
	2,4,6-Trichlorophenol	EPA RSLs[2]
	2,6-Dimethylphenol	EPA RSLs[2]
	3,3'-Dichlorobenzidine	EPA RSLs[2]
	4,6-Dinitro-2-methylphenol	EPA RSLs[2]
	4-Chloroaniline	EPA RSLs[2]
	4-Nitroaniline	EPA RSLs[2]
	Azobenzene	EPA RSLs[2]
	Benzidine	EPA RSLs[2]
	Benzo(a)anthracene (PAH)	EPA RSLs[2]
	Bibenzene	EPA RSLs[2]
	bis(2-Chloroethyl)ether	EPA RSLs[2]
	bis(2-Ethylhexyl)phthalate	EPA RSLs[2]
	Diallate	EPA RSLs[2]
	Dibenz(a,h)anthracene (PAH)	EPA RSLs[2]
	Dibenzofuran	EPA RSLs[2]
	Disulfoton	EPA RSLs[2]
	Hexachlorobutadiene	EPA RSLs[2]
	Hexachloroethane	EPA RSLs[2]
	Methanol	EPA RSLs[2]
	Methyl parathion	EPA RSLs[2]
	Naphthalene	EPA RSLs[2]
	n-Nitrosodimethylamine	EPA RSLs[2]
	n-Nitroso-di-n-propylamine	EPA RSLs[2]
	Pentachlorobenzene	EPA RSLs[2]
	Pentachlorophenol	EPA RSLs[2]
	Phorate	EPA RSLs[2]
	Sulfotepp	EPA RSLs[2]
	1,1,2,2-Tetrachloroethane	EPA RSLs[2]
	1,2,3-Trichloropropane	EPA RSLs[2]
	1,2-Dibromo-3-chloropropane	EPA RSLs[2]
	1,2-Dibromoethane	EPA RSLs[2]
	Acrolein	EPA RSLs[2]
	Acrylonitrile	EPA RSLs[2]
	Allyl chloride	EPA RSLs[2]

Table E-8

Groundwater Protection Standards for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Unit[1]	Hazardous Constituent	Maximum Concentration Limit (µg/L)[2]
	Bromomethane	EPA RSLs[2]
	Chlorobenzene	EPA RSLs[2]
	cis-1,2-Dichloroethene	EPA RSLs[2]
	trans-1,2-Dichloroethene	EPA RSLs[2]
	Trichloroethene	EPA RSLs[2]
	Vinyl chloride	EPA RSLs[2]
RSA-056/139	Arsenic	10
RSA-060	Arsenic	10
	Cadmium	5
	Iron	1100
	Manganese	32
	2,4,6-Trinitrotoluene	0.76
	2-Nitrotoluene	0.27
	4,4'-DDD	0.28
	4,4'-DDE	0.20
	4,4'-DDT	0.20
	Aldrin	0.004
	Alpha-BHC	0.0062
	Beta-BHC	0.022
	Dieldrin	0.0015
	4-Chloroaniline	0.32
	1,1,2,2-Tetrachloroethane	0.066
	1,1-dichloroethene	7
	cis 1,2-Dichloroethene	70
	Benzene	5
	Chlorobenzene	100
	Tetrachloroethene	5
	Trichloroethene	5
	Vinyl Chloride	2
RSA-083	Trichloroethene	5
	cis-1,2-Dichloroethene	70
	Vinyl Chloride	2
	Chlorobenzene	100
	1,1-Dichloroethene	7
	2,4-Dinitrotoluene	1.08
RSA-204	Trichloroethene	5
	cis-DCE	EPA RSLs[2]

Table E-8

Groundwater Protection Standards for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Unit[1]	Hazardous Constituent	Maximum Concentration Limit (µg/L)[2]
	trans-DCE	EPA RSLs[2]
	Vinyl Chloride	EPA RSLs[2]
	Perchlorate	15
	1,3-Dinitrobenzene	EPA RSLs[2]
	2,6-Dinitrotoluene	0.1
	2-Amino-4,6-dinitrotoluene	EPA RSLs[2]
	2-Nitrotoluene	0.7
	3-Nitrotoluene	EPA RSLs[2]
	HMX	EPA RSLs[2]
	Nitrobenzene	EPA RSLs[2]
	RDX	0.5
RSA-206	cis-1,2-Dichloroethene	70
	1,1-Dichloroethene	7
	Trichloroethene	5
	Tetrachloroethene	5
	Vinyl Chloride	2
	Carbon Tetrachloride	5
	Perchlorate	15
	2-Nitrotoluene	2.5
	RDX	1.4
	1,3-Dinitrobenzene	0.2[3]
	Nitrobenzene	0.14[3]
	trans-1,2-Dichloroethene	100[3]
RSA-209	Perchlorate	See Note 3
	Trichloroethene	5
	Tetrachloroethene	5
	2- Nitrotoluene	1.35
	RDX	1.35
	cis- 1, 2- Dichloroethene	70
	trans- 1, 2- Dichloroethene	100
	Vinyl Chloride	2
RSA-225	2,4-Dinitrotoluene	0.11
	2,6-Dinitrotoluene	0.05
	2-Nitrotoluene	0.31
	RDX	0.71
	Benzo(a)anthracene	0.020
	Benzo(b)fluoranthene	0.012

Table E-8

Groundwater Protection Standards for Corrective Action Monitoring Sites
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Unit[1]	Hazardous Constituent	Maximum Concentration Limit (µg/L)[2]
	1,1,2,2-Tetrachloroethane	0.38
	Tetrachloroethene	5
	Trichloroethene	5
RSA-252	4,4'-DDD	0.042
	4,4'-DDE	0.23
	4,4'-DDT	0.23
	Aldrin	0.0046
	alpha-BHC	0.0085
	beta-BHC	0.093
	Dieldrin	0.0029
	Heptachlor epoxide	0.2
	Toxaphene	3
	1,1,2,2-Tetrachloroethane	0.37
	Trichloroethene	5
RSA-269	Trichloroethene	5
	1,2-Dichloroethene	EPA RSLs[2]
	cis-1,2-Dichloroethene	70
	trans-1,2-Dichlorothene	100
	Vinyl chloride	2
RSA-306	1-Methylnaphthalene	11
	Benzene	5
	Iron	Background

Notes:

1. Identifies the unit(s) at which the given constituent must be monitored. Note that ADEM did not accept the Army's recommendations for a reduced constituent monitoring list presented in this table for RSA- 054/055.
2. Includes:
    a. Drinking Water Standards and Health Advisories, U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (latest edition). Background values are the calculated site-specific background concentration in accordance with Alabama Department of Environmental Management (ADEM) Admin. Code R.335-14-5-Appendix IV.
    b. EPA tap water regional screening levels (RSL); values are the lower of either the cancer-based RSL or the noncancer RSL adjusted to reflect a hazard index of 0.1.
    c. Method detection limit must not exceed established Maximum Concentration Limit regulatory levels. Where background values do not exist, the values listed in the most recent EPA RSL Table, using a hazard quotient (HQ) of 0.1, shall be referenced.
3. Perchlorate is not listed as a hazardous constituent in Appendix IX; however, it is a constituent of concern for Redstone Arsenal and shall be included in the groundwater protection standards. A

background level for perchlorate does not exist; therefore, the standard listed in the most recent EPA RSL Table, using a HQ of 0.1 shall be referenced.

Table E-10

Documents Incorporated by Reference
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Applicable SWMU/AOC	*CMS/CMI/ROD/LUC RD	Approval Date
Open Burning/Open Detonation Area	Revision 1, CMI Work Plan, dated August 17, 2017	01/08/2018
RSA-003, In-Ground Oil/Water Separator, Building 3617	Revision 1 CMI Work Plan for Groundwater, dated September 24, 2018	8/20/2019
RSA-009, Inactive Sewage Treatment Plant #3, OU-23	Revision 1 CMI Work Plan for Surface Media and Groundwater, dated August 8, 2018	8/20/2019
RSA-030, Former Central Oil/Water Separator, OU-24	Revision 0 CMI Work Plan, RSA-030/031, dated October 8, 2019	05/29/2020
RSA-031, Former Central Oil/Water Separator Storage Tanks, OU-24	Revision 0 CMI Work Plan, RSA-030/031, dated October 8, 2019	05/29/2020
RSA-045, Former Smoke Munitions Filling Plant 3, OU-2	Revision 1 CMI Work Plan for RSA-045, dated September 25, 2020	7/19/2020
RSA-049, Capped Arsenic Waste Ponds – West, OU-5	Final LUC RD for Surface Media at RSA-049, dated June 1, 2009	07/02/2009
RSA-053, Inactive Sanitary and Industrial Landfill, OU-7	CMI for Surface Media and Groundwater at RSA-053, dated September 10, 2012	04/16/2013
RSA-054/RSA-055, Inactive Sanitary and Industrial Landfill, OU-1	Revision 2, CMI Work Plan for Surface Media and Groundwater, dated December 10, 2012	04/16/2013
RSA-056, Closed Arsenic Waste Ponds (South) Area U,	Revision 0 CMI Work Plan, RSA-056 and RSA-139 for Surface Media and Groundwater, dated June 26, 2018 and March 13, 2019	8/20/2019
RSA-058, Inactive Rubble Fill/Waste Pile	Revision 2 CMI Work Plan, RSA-058, dated November 14, 2014	05/15/2015
RSA-060, Inactive Sanitary and Industrial Landfill, OU-7	Revision 1 CMI Work Plan, RSA-060, latest slip sheets dated September 20, 2017	01/08/2018
RSA-072-R-01 (RSA-282), Former Mortar Test Site (Not in Range), OU-15	Revision 0 CMI Work Plan, RSA-072-R-01, dated July 26, 2019	10/08/2019
RSA-083, Paint Spray Booth Sump, Building 7344, OU-09	Revision 1 CMI Work Plan, RSA-083, dated April 11, 2019	05/13/2019
RSA-101, DDT Contaminated Area DD	Consent Decree and *Joint Technical Proposal to Implement Remedial Activities Pursuant to Consent Decree* (Reference Civil Action No. CV80-PT-5300-NE)	Filed 05/31/1983

Table E-10

Documents Incorporated by Reference
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Applicable SWMU/AOC	*CMS/CMI/ROD/LUC RD	Approval Date
RSA-139, Closed Arsenic Waste Pond (North) Area U	Revision 0 CMI Work Plan, RSA-139 for Surface Media and Groundwater, dated June 26, 2018 and March 13, 2019	8/20/2019
RSA-140, Inactive Disposal Area Near T/S Tower, OU-12	CMI Work Plan, RSA-140, dated June 26, 2018	08/20/2019
RSA-142, TCE Spill by Thiokol Degreasing Process, OU-9	Revision 1 CMI WP for Surface Media, RSA-095 and RSA-142, dated September 6, 2013, Revised May 18, 2016	06/03/2016
RSA-142, TCE Spill by Thiokol Degreasing Process, OU-9	Revision 1 Addendum to the Revision 1 CMI Work Plan for Surface Media, RSA-095 and RSA-142, dated October 24, 2018	8/20/2019
RSA-201, Research Laboratory, Building 7632;	Revision 0 CMI Work Plan for Surface Media, RSA-201, RSA-242, and RSA-247, dated December 17, 2018	8/20/2019
RSA-204, Oxidizer Facility, Bldg 7691	Revision 2 CMI Work Plan for Surface Media and Groundwater at RSA-204, dated September 23, 2016	02/15/2017
RSA-206, Propellant Mixing Facility #2 and Casting Facility, Building 7339/7340, OU-9	Revision 1 CMI Work Plan for RSA-206, dated November 19, 2020	07/19/2021
RSA-209, Propellant Crushing/Grinding and Fuse Production	Revision 1 CMI Work Plan for RSA-209, dated April 22, 2020	06/30/2020
RSA-225, Former Fuze Modification Line No. 7, OU-2	Revision 1 CMI Work Plan for RSA-225, dated October 21, 2020	7/19/2021
RSA-242, Hazardous Waste Storage Igloo, Building 7314	Revision 0 CMI Work Plan for Surface Media, RSA-201, RSA-242, and RSA-247, dated December 17, 2018	8/20/2019
RSA-247, Steel Fabrication/Maintenance Facility, Building 7644	Revision 0 CMI Work Plan for Surface Media, RSA-201, RSA-242, and RSA-247, dated December 17, 2018	8/20/2019
RSA-250, Former Storage Warehouse, Building 778/5678, OU-3	Revision 1 CMI Work Plan for Surface Media at RSA-250, dated July 20, 2016	9/29/2016
RSA-252, Incendiary Facility Plant 2 Area, Building 5681	Revision 2 CMI Work Plan for RSA-252, dated November 10, 2020	7/19/2021
RSA-255, Former Manganese Ore Storage Area, OU-8	Revision 2 CMI Work Plan for RSA-255, dated December 12, 2017	04/09/2018
RSA-269, Former UST, Bldg 7852	CMI Work Plan, RSA-269, dated December 8, 2020	7/19/2021

Table E-10

Documents Incorporated by Reference
RSA AHWMMA Permit Renewal Application
Redstone Arsenal, Madison County, Alabama

Applicable SWMU/AOC	*CMS/CMI/ROD/LUC RD	Approval Date
RSA-275, Film Processing Laboratory, Former Building S-7173, OU-09	Revision 1 CMI Work Plan for RSA-275, dated October 15, 2019	02/18/2020
RSA-280-R-01, Skunk Hollow Small Arms Range	Revision 1 CMI Work Plan for RSA-280-R-01, Slip Sheets dated May 29, 2020	06/30/2020
RSA-294-R-01, Field Training Exercise Area E, South of Martin Road, OU-15	Revision 0 CMI Work Plan for RSA-294-R-01, dated June 20, 2019	07/22/2019
MSFC-027, Inactive Waste Accumulation Area, OU-18	CMI Work Plan for MSFC-027, dated April 26, 2016	02/15/2017
RSA-306, Steam Heating Plant, Building 7291, OU-24	Revision 1 CMI Work Plan for RSA-306, dated April 27, 2023	05/25/2023
RSA-315, Abandoned Drum Area Near the Golf Course	Revision 1 CMI Work Plan for RSA- 315, dated July 30, 2020	7/19/2021
MSFC-033A, Surface Soils East of Building 4816 Adjacent to MSFC-033	Revision 0 CMI Work Plan for Surface Media, dated May 30, 2018	8/20/2019
Installation-Wide Groundwater Interim Record of Decision (IROD)	Interim ROD, Interim Remedial Action for Installation-Wide Groundwater, dated September 2007	09/21/2007
	Installation-Wide Groundwater LUC RD, dated June 1, 2009	08/18/2009

*Note: RODs, LUC RD and/or RA WP documents serve as the CMI Plan for some SWMUs/AOCs pursuant to this Permit and are subject to the same Permit requirements.