# SAVANNAH RIVER SITE
# FIVE-YEAR REVIEW OF RECORDS OF DECISION REPORT

**WSRC-RP-97-403**
**Revision.0**
**June 1997**

**Savannah River Site**
**Aiken, South Carolina**

**Prepared by**

**Westinghouse Savannah River Company**
**for the**
**U.S. Department of Energy Under Contract DE-AC09-96SR18500**
**Savannah River Operations Office**
**Aiken, South Carolina**

## DISCLAIMER



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Prepared for the
U.S. Department of Energy
and
Westinghouse Savannah River Company
Aiken, South Carolina

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Notes: * These RODs are on RCRA Corrective Actions. A detailed review of the Remedial/Corrective Action is not included in this document. The review for these units is covered under the SRS RCRA program.

** This ROD is a "No Action" ROD. Although the regulatory guidance does not require a Five-year review of no further actions to be performed, these units are included in the document for information purposes only and for completeness, with no review performed.

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## ACRONYM LIST

| | |
|---|---|
| ARAR | Applicable, Relevant and Appropriate Requirement |
| BGC | Burial Ground Complex |
| BRA | Baseline Risk Assessment |
| BRRP | Burma Road Rubble Pit |
| BRP6G | Central Shops Burning/Rubble Pit (631-6G) |
| CERCLA | Comprehensive Environmental Response Compensation and Liability Act |
| CVOC | Chlorinated Volatile Organic Compound |
| DBRP | D-Area Burning/Rubble Pits |
| DNAPL | Dense Non-Aqueous Phase Liquid |
| DOE | Department of Energy |
| DOE-SR | DOE-Savannah River |
| EPA | Environmental Protection Agency |
| FBRP | F-Area Burning Rubble Pits |
| FFA | Federal Facility Agreement |
| GPR | Ground Penetrating Radar |
| HGCA | Hybrid Groundwater Corrective Action |
| HWMF | Hazardous Waste Management Facility |
| msl | mean sea level |
| MWMF | Mixed Waste Management Facility |
| NCP | National Contingency Plan |
| NEPA | National Environmental Policy Act |
| NPDES | National Pollutant Discharge Elimination System |
| NRDC | Natural Resources Defense Council |
| OFASB | Old F-Area Seepage Basin |
| ORWBG | Old Radioactive Waste Burial Ground |
| OSWER | Office of Solid Waste and Emergency Response |
| OU | Operable Unit |
| PCB | polychlorinated biphenol |
| PCE | perchloroethylene (tetrachloroethylene) |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SDCF | Soil Debris Consolidation Facility |
| SRL | Savannah River Laboratory |
| SRTC | Savannah River Technology Center |
| SRS | Savannah River Site |
| SRWU | Silverton Road Waste Unit |
| SWMU | Solid Waste Management Unit |
| T&E | threatened and endangered |
| TBP | tributylphosphate |

| | |
|---|---|
| TCE | trichloroethylene |
| TRU | transuranic |
| VOC | Volatile Organic Compound |

## Introduction

### Authority Statement.

This report contains the five-year reviews of Records of Decision (RODs) being conducted pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c) and Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP). The purpose of a five-year review is to ensure that a remedial action selected for a waste unit continues to protect public health and the environment and is functioning as designed. A five-year review is required for all RODs which allow hazardous substances, pollutants, or contaminants to remain at a unit above levels that allow for unlimited use and unrestricted exposure. Executive Order 12580 delegates the responsibility for issuance of these reviews to the U.S. Department of Energy (DOE) at the Savannah River Site (SRS).

In accordance with Section 300.430(f)(5)(iii)(C), DOE-Savannah River (DOE-SR) will conduct a five-year review of a ROD if a remedial action is selected that results in hazardous substances remaining at the unit above levels that allow for unlimited use and unrestricted exposure

### Unit Characteristics.

The SRS occupies approximately 300 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell Counties of South Carolina. SRS is a secured U.S. Government facility with no permanent residents. The site is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina. According to 1990 census data, the average population densities (in people/square mile) for the surrounding South Carolina counties are 111 for Aiken County, 36 for Barnwell County, and 28 for Allendale County, and for the surrounding Georgia counties average population densities are 228 for Columbia County, 524 for Augusta-Richmond County, 25 for Burke County, and 21 for Screven County. The population within a 50-mile radius of SRS is 635,000.

SRS has historically produced tritium, plutonium, and other special nuclear materials for national defense. SRS has also provided nuclear materials for the space program and for medical, industrial, and research efforts. Chemical and radioactive wastes are byproducts of nuclear material production processes. Hazardous substances, as defined by CERCLA, are currently present in the environment at SRS.

On December 21, 1989, SRS was included on the National Priority List. In accordance with Section 120 of CERCLA, the U.S. DOE has negotiated a Federal Facility Agreement (FFA) with the U.S. Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) to coordinate cleanup activities at SRS. The FFA became effective on August 16, 1993.

**Next Five-Year Review.**

One comprehensive Five-Year Review Report of the SRS RODs will be issued every five years. The review will cover all RODs issued in the previous five years and those RODs issued in previous years that require a follow-up review.

If a unit affords unlimited use and unrestricted exposure, no five-year review is necessary. However, in an effort to maintain a comprehensive listing of all Records of Decision that have been issued for the Savannah River Site, units not requiring a five-year review (e.g., no further action Records of Decision) will be included in this report. In addition, units addressed under RCRA reviews will also be listed in this report. Their inclusion is not meant to indicate that a CERCLA five-year review has been performed.

## A/M Area Groundwater Operable Unit

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on June 29, 1992. An interim action involving groundwater recovery with treatment by air stripping is in progress. The five-year review for this unit is a statutory review. It is a type 1A as described in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-02A, because remedial action at the unit is not complete.

The A/M Area Groundwater OU is subject to the Resource Conservation and Recovery Act (RCRA). The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The A/M Area groundwater is a media-specific OU within the Upper Three Runs Watershed.

As a result of past waste disposal practices, the groundwater beneath A/M Area has been contaminated with organic solvents, primarily trichloroethylene (TCE) and tetrachloroethylene (perchloroethylene; PCE). Total plume size beneath the A/M Area, as currently defined, is approximately 1,200 acres. This plume has not migrated beyond the SRS boundaries. The contamination in the A/M Area groundwater and the overlying unsaturated zone (vadose zone) appears to be associated with releases from the following A/M Area source units: the A-014 Outfall, the M-Area Settling Basin/Lost Lake, the (M-Area Hazardous Waste Management Facility (HWMF)), the M-Area HWMF Process Sewer, and the Building 321-M Solvent Storage Area.

The groundwater beneath A/M Area has been contaminated with the organic solvents TCE and PCE in both the dissolved state and, in limited occurrences, as concentrated Dense Non-Aqueous Phase Liquids (DNAPLs). These DNAPLs consist of concentrated, undissolved accumulations of chlorinated solvents.

From 1952 to 1981, an estimated 13 million pounds of chlorinated solvents were used in the A/M Area. An estimated 50 to 90 percent of the solvents evaporated during use. The remaining solvents were discharged as waste to the process sewer system. Additionally, significant quantities of chlorinated solvents were inadvertently spilled during handling and storage.

The waste was piped, via a process sewer system, from the fuel tube processing facility to two primary locations: A-014 Outfall and the M-Area Settling Basin. As a result of this disposal practice and leakage within the process sewer line leading to the settling basin, four locations have been identified as potential sources for significant groundwater

contamination by TCE and PCE. The Metallurgical Laboratory Basin and Building 313-M, a solvent transfer station, both of which probably have impacted groundwater, also exist in A Area.

## II. Summary of Remedial Action Objectives

The goals of the remedial action are to (1) prevent further groundwater plume migration and initiate groundwater restoration while risk assessment activities are being planned and conducted, and (2) obtain further information about the response of the aquifer to remediation. The ultimate goal of remediation will be determined in a final remedial action for this OU.

Groundwater recovery with treatment by air stripping was implemented in 1985 as a Corrective Action Program. In the general M Area, the treatment system consists of 11 groundwater recovery wells and a full-scale production air stripper with an air blower, effluent pumps, instrument air system, and control building. The 11 recovery wells were installed from 1982 to 1985. A zero-leakage drainline constructed to transfer treated groundwater from the air stripper to the A-014 Outfall is also included. The A-014 Outfall is permitted by SCDHEC to receive this treated water.

In the northeastern sector of A/M Area, a groundwater recovery and air stripper system has been installed near the Savannah River Technology Center (SRTC). A zero-leakage drainline to carry treated liquid from the air stripper to a nearby permitted outfall is also part of the system.

Treated groundwater is discharged to permitted outfalls within SRS. Discharges of this type are regulated under the Clean Water Act and the South Carolina National Pollutant Discharge Elimination System (NPDES) Permit Regulations. Treated water must meet the discharge limits of the permitted outfall unless a permit modification is obtained. The systems are permitted through the SCDHEC Air Quality Control Program and the Clean Water Act (wastewater treatment discharge permit) rather than through RCRA.

SCDHEC has approved the existing A/M Area Groundwater Corrective Action Program as an intermediate step leading toward a complete RCRA corrective action program. The final action for this media-specific OU will be documented by modifications to the RCRA permit.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

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**Burma Road Rubble Pit (231-4F)**

## I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued July 8, 1996. Based on the results of the remedial investigation, no action was necessary at the Burma Road Rubble Pit (BRRP) source control OU soils to ensure the protection of human health and the environment. Since the BRRP unit soils posed minimal risk to human health and the environment, and no action was needed, the CERCLA Section 121 requirements are not applicable. This action is protective of human health and the environment and is the final action for the BRRP source control OU soils. It has been determined that a Five-Year Review of the ROD for the BRRP source control OU soils will not be performed. The remedial action selected for this unit (no action) results in no hazardous substances, pollutants, or contaminants remaining in the soils of the BRRP source control OU. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The BRRP (231-4F) was located approximately one-half mile southwest of F-Area Separations Facility and one-tenth mile southwest of C Road. The BRRP was between Upper Three Runs Creek (approximately 4,000 ft to the northwest) and Four Mile Creek (approximately one mile to the southwest). A westward trending tributary to Upper Three Runs Creek is located approximately 2,000 ft to the north. The BRRP ground surface elevation is approximately 290 ft above mean sea level (msl). Surface runoff is northwestward toward the tributary. The soil type that exists at the BRRP consists of Udorthents.

The BRRP consisted of two unlined earthen pits dug into surficial soil and filled with various waste materials. The BRRP area consisted of two generally rectangular pits, each about 400 ft long, up to 50 ft wide, and 10 ft deep.

The BRRP was used from 1973 to 1983 for the disposal of dry inert rubble such as wood, trash, wire, bottles, plastic, rubble, foam, and concrete. No record of hazardous substance disposal at the BRRP has been found. In 1983, disposal at the BRRP ceased and it was backfilled with soil.

The BRRP RCRA Facility Investigation/Remedial Investigation (RFI/RI) was conducted from November 1993 to February 1994. The results of the RFI/RI indicate that the BRRP source control OU soils posed minimal risk to human health or the environment. The only soil contamination found at the BRRP source control OU was arsenic at a concentration of 1.74 mg/kg. This soil concentration led to a risk value of $1.9 \times 10^{6}$ for the future residential adult (i.e., there is a 1.9 in one million chance of developing cancer from the ingestion of arsenic) and a risk value of $2.8 \times 10^{6}$ for the future residential child (i.e., there is a 2.8 in one million chance of developing cancer from the ingestion of

arsenic). It was determined that the BRRP source control OU did not contribute contamination to the area groundwater or surrounding soils.

## II. Summary of Remedial Action Objectives

Based on the risk values from the results of the RFI/RI, no action was warranted at the BRRP source control OU soils. This is a final CERCLA action for the BRRP source unit soils only.

A notification identifying the presence of buried, inert debris has been placed in the Aiken County Courthouse Records Office; the notification includes a survey plat, prepared and certified by a professional land surveyor, of the area.

Groundwater contamination found beneath the BRRP is due to migration from upgradient sources such as the F-Area Inactive Process Sewer Lines, and thus was not addressed in the remedial action.

## III. Determination of Current and Projected Protectiveness of the Action

The results of the RFI/RI indicated that the BRRP source control unit soils posed minimal risk to human health or the environment. It was determined that the BRRP source control OU does not contribute contamination to the area groundwater or surrounding soils.

No wetlands or threatened and endangered (T&E) species were observed in the vicinity of the BRRP, and use of the site by T&E species was not expected. Ecological impacts from the BRRP source control OU are unlikely.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## Central Shops Burning/Rubble Pit (631-6G)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued June 19, 1997. Based on the results of the remedial investigation, no action was necessary at the Central Shops Burning/Rubble Pit (631-6G) (BRP6G) Solid Waste Management Unit (SWMU) to ensure the protection of human health and the environment. Since the BRP6G unit soils posed minimal risk to human health and the environment, and no action was needed, the CERCLA Section 121 requirements are not applicable. This action is protective of human health and the environment and is the final action for the BRP6G SWMU. The remedial action selected for this unit (no action) results in hazardous substances, pollutants, or contaminants remaining in the soils of the BRP6G SWMU, however, the selected remedy complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.**

The BRP6G is located in the Central Shops area near the center of SRS. The unit is south of and immediately adjacent to the construction laydown area, 300 ft southeast of the Ford Building Seepage Basin.

The BRP6G received waste materials for disposal and burning from 1951 through 1955. The unit measured 275 ft long by 30 ft wide by 10 ft deep. Ground penetrating radar surveys determined that while most of the soil at the unit was undisturbed, two areas of disturbed soil were present and are believed to be disposal sites.

Although no record of the types or volumes of waste materials were kept during operation, it is believed that the materials disposed in the unit included waste oils, rags, paper, cardboard, plastics, degreasers, wood, rubber, and drummed organic solvents. These materials were burned periodically. After disposal activities at the unit ceased in 1955, the area was covered with soil. Due to the potential presence of hazardous substances that could migrate into surrounding soil and/or groundwater, BRP6G was designated a SWMU and was hence subject to the RCRA/CERCLA process.

The BRP6G RCRA Facility Investigation/Remedial Investigation (RFI/RI) was completed in April 1996. The results of the RFI/RI indicate that the BRP6G soils posed minimal risk to human health or the environment. Constituents detected above the two times average background concentration include 21 metals, 16 semivolatile organics, 13 volatile organics, 4 pesticides, polychlorinated biphenyl (PCB) 1254, octachlorodibenzo-p-dioxin (OCDD), and radionuclide indicators. These detections occurred at locations distributed fairly evenly among borings both inside and outside the pit. Of these, seven constituents were identified as contaminants of potential concern

(COPCs) in surface soil (0-2 ft): 2-hexanone, anthracene, arsenic, benzo(*g,h,i*)perylene, iron, OCDD, and PCB-1254. These same constituents, as well as beryllium, were also identified as COPCs in the 0-5 ft interval. Constituents identified as groundwater COPCs were aluminum, arsenic, beryllium, iron, lead, manganese, and bis(2-ethylhexyl)phthalate. These COPCs led to a risk value of $2 \times 10^{-6}$ for inhalation of groundwater to current workers, and $1 \times 10^{-5}$ from ingestion of groundwater for the hypothetical future worker. The total carcinogenic risk for the hypothetical future resident adult is $8 \times 10^{-5}$, and that for the hypothetical future resident child is $3 \times 10^{-5}$.

## II. Summary of Remedial Action Objectives

Based on the risk values from the results of the RFI/RI, no action was warranted at the BRP6G SWMU. This is a final CERCLA action for the BRP6G.

A notification identifying the presence of buried, inert debris has been placed in the Aiken County Courthouse Records Office; the notification includes a survey plat, prepared and certified by a professional land surveyor, of the area.

## III. Determination of Current and Projected Protectiveness of the Action

The results of the RFI/RI indicated that the BRP6G SWMU posed minimal risk to human health or the environment. It was determined that the BRP6G SWMU does not contribute contamination to the area groundwater or surrounding soils.

No wetlands or threatened and endangered (T&E) species were observed in the vicinity of the BRRP, and use of the site by T&E species was not expected. Ecological impacts from the BRRP source control OU are unlikely.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## D-Area Burning/Rubble Pits (431-D and 431-1D)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued April 22, 1997. Based on the results of the remedial investigation, institutional control is appropriate at this unit. The five-year review for this unit is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A.

**Unit Characteristics.** The D-Area Burning/Rubble Pits (DBRPs) are located approximately 2,600 ft west of D Area in northwestern Barnwell County, South Carolina, about 2,600 ft east of the boundary of the SRS. The two contiguous waste pits are designated as 431-D and 431-1D and cover a total area of 0.54 acre. Between 1951 and 1973, the pits were used to burn paper, plastics, wood, rubber, rags, cardboard, oil, degreasers, and spent solvents. The chemical composition and volume of the disposed waste are unknown. After burning was discontinued in 1973, the pits were used to dispose of concrete rubble, bricks, tile, asphalt, plastic, metal, wood products and rubber. When the pits were filled to capacity in 1983, they were covered with compacted clay-rich native soil, and vegetation was established. The pit cover is raised above the surrounding terrain, which is essentially level, to enhance drainage.

The water table is approximately 10 ft below ground surface in the area of the DBRP. Surface drainage is to the west-southwest toward a nearby ephemeral tributary of the Savannah River.

Groundwater monitoring data indicate that no significant release of hazardous substances to groundwater from the DBRPs has occurred.

Interpretation of the ecological significance of the unit-related contamination at the DBRPs indicate that there is essentially no likelihood of any unit-related chemical causing significant impacts to the community of species in the vicinity of the unit.

### II. Summary of Remedial Action Objectives

The remedial action for the DBRPs is institutional controls. The DBRPs are located in an area that has been recommended for industrial use. Under this land use scenario, the risk from soil ingestion in the pits is $1 \times 10^{-6}$ to future industrial workers. The hazard index is 0.03.

Signs have been posted indicating that this area was used to manage hazardous materials. In addition, existing SRS access controls are being used to maintain this area for industrial use only.

In the long term, if the property is transferred to non-federal ownership, the U.S. Government will, in compliance with Section 120(h) of CERCLA, create a deed for the new property owner. The deed will include notification disclosing former waste management and disposal activities, results from groundwater monitoring, and remedial actions taken on the site. The deed notification will, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of non-hazardous, inert construction debris, and that wastes containing hazardous substances, such as degreasers and solvents, were also managed and burned on the site. The deed will also preclude residential use of the property. The need for deed restrictions may be reevaluated at the time of transfer in the event that contamination no longer poses an unacceptable risk under residential use.

A period of confirmatory annual groundwater monitoring will be conducted at the five wells located at the DBRPs. The samples will be analyzed for the following constituents, many of which have not been detected in the groundwater at the DBRPs since monitoring began in 1983:

- arsenic
- benzene
- benzo(*a*)anthracene
- benzo(*a*)pyrene
- benzo(*b*)fluoranthene
- benzo(*k*)fluoranthene
- chromium
- chrysene
- 1,2-dichloroethane
- dichloromethane
- endrin
- manganese
- octachlorodibenzo-p-dioxin
- PCB-1260
- total radium
- 1,1,2-trichloroethane
- tritium

The Corrective Measures Implementation/Remedial Action Report (CMI/RAR), submitted to the regulators four months after issuance of the ROD, will discuss the monitoring strategy in detail. The CMI/RAR will outline the monitoring report submittal schedule, as well as a description of the contents of the reports. For example, the monitoring reports will include data analysis, a summary of conclusions drawn from the data, and any recommendations for modifying the monitoring program.

The DBRPs are a source control OU, located within the Savannah River Floodplain Swamp Watershed. Several source control and groundwater OUs within this watershed will be evaluated to determine impacts, if any, to associated streams and wetlands. The action for the DBRP is a final action. Upon disposition of all source control and groundwater OUs within this watershed, a final, comprehensive ROD for the watershed will be pursued.

## III Determination of Current and Projected Protectiveness of the Action

Throughout the period of federal ownership, as well as for any future ownership, under institutional controls there will be no risk greater than $1 \times 10^{-6}$ or hazard index greater than 0.03 to future industrial workers. Furthermore, there will be no appreciable risk to the environment.

The alternative chosen is protective of human health and the environment.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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## D-Area Oil Seepage Basin (631-G)

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on March 6, 1995. This review is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete. The interim action chosen resulted in the removal of suspected drum contents and large debris within the waste unit. The interim action was completed August 13, 1996. Following completion of this interim action, further characterization, and a risk assessment, a final action(s) that addresses residual risk or contamination will be evaluated.

**Unit Characteristics.** The D-Area Oil Seepage Basin unit is located in the southwest portion of SRS between unimproved dirt Roads A-4.4 and A-4.5, approximately one mile north of the coal-fired D-Area Powerhouse and approximately 1.9 miles from the nearest SRS boundary. The D-Area Oil Seepage Basin remedial action resulted in the removal of suspected drum contents and large debris within the unit.

Construction of the D-Area Oil Seepage Basin trenches began in 1952. The basin was used in the disposal of waste oil originating from D-Area Powerhouse operations to dispose of nonburnable waste (drums, paint cans, metal objects, and rubber products), and for the routine burning of office and cafeteria waste. Unknown amounts and types of waste were disposed in the basin. No historical evidence of overflow of the basin exists. Records of the contents of the disposed drums do not exist. To date, there is no evidence to indicate the presence of radionuclides in the drums or the trenches. In 1975, the D-Area Oil Seepage Basin was removed from service and backfilled with soil. Approximately 1 ft of standing liquid, plus an unknown number of 55-gallon drums possibly containing waste oil, remained in the basin when it was backfilled.

The FFA lists the D-Area Oil Seepage Basin as a RCRA/CERCLA unit requiring further evaluation, using an investigation/assessment process that integrates and combines the RFI with the CERCLA RI to determine the actual or potential impact to human health and the environment. The basin is listed as a Solid Waste Management Unit (SWMU) under both state and federal RCRA permits. These permits required investigation and implementation of corrective measures, as necessary, for releases of hazardous constituents from SWMUs. The permits also provided for implementation of interim measures to stabilize SWMU releases.

### II. Summary of Remedial Action Objectives

The overall strategy for conducting the interim removal action at the D-Area Oil Seepage Basin waste unit was to:

- Perform the proposed interim remedial action.

- Further characterize the unit delineating the nature and extent of contamination and identifying the media of concern.

Groundwater and contaminated soil layers encountered during the interim action were beyond the scope of this interim action and will be addressed during the remedial investigation/feasibility study process.

The interim remedial action was completed August 13, 1996. During the interim remedial action, principle threat source material, subsurface hazardous liquids, drums, pumpable free products, debris and discernible layers of sludge were removed. Approximately 15,000 cubic yards of material was excavated, and 57 drums, and approximately 400 cubic yards of debris were removed. The trenches at the D-Area Oil Seepage Basin were divided into 245 quadrants measuring 10 ft by 20 ft. Each quadrant was excavated until no evidence of contamination, drums or debris was observed. As drums and debris were unearthed and removed, the soil from the excavation was placed back into the previous excavation. The excavation was backfilled until the soil was approximately 1 ft above existing average grade level.

Excavation activities from the interim remedial action have altered the equilibrium of the basin soils and changed the previously quantified baseline. Soils down to 8 ft below grade were excavated with an air bucket and sieved to remove debris. As the excavation process continued, the excavated soils were allowed to "breathe" for a period of time while exposed to the atmosphere. Warm temperatures and wind enhanced evaporation of volatile constituents in the excavated soil. This activity aerated, mixed and shifted basin soils, which likely caused significant changes in the physical and biological properties of the basin contaminants. Additional samples were taken to establish a new baseline.

## III. Determination of Current and Projected Protectiveness of the Action

This interim action is protective of human health and the environment. Since this action does not constitute the final remedy for the D-Area Oil Seepage Basin waste unit, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## F-Area Burning/Rubble Pits (231-F, 231-1F, 231-2F)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued April 22, 1997. Based on the results of the remedial investigation, institutional control is appropriate at this unit. This review is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A.

**Unit Characteristics.** The F-Area Burning/Rubble Pits (FBRP) are located about one-half mile west of F Area. Between 1951 and 1973, pits 231-F and 231-1F were used to burn paper, plastics, wood, rubber, rags, cardboard, oil, degreasers, and spent solvents. Combustible materials were burned monthly. Pit 231-2F was only used as a rubble pit. After burning was discontinued in 1973, pits 231-F and 231-1F were also converted to rubble pits and used to dispose of concrete rubble, bricks, tile, asphalt, plastic, metal, wood products, and rubber. When the pits were filled to capacity in 1978, they were covered with compacted clay-rich native soil, and vegetation was established.

Some of the waste materials (degreasers and solvents), which were not considered hazardous during use of the pits, are now considered to be hazardous based on ingestion or possible dermal contact. Pit 231-2F was used exclusively as a rubble pit. Large volumes of uncontaminated construction debris disposed in the pits may have included relatively small, nonhomogeneously distributed amounts of low-level contamination by cesium-137, strontium-90 and iodine-129. Traces of these radionuclides may also have entered the FBRP as fallout.

Burning of waste was discontinued by October 1973. A layer of soil was placed over the residue in the pits, and they were subsequently used as rubble pits. When the pits were filled to capacity in 1978, a layer of clayey soil was placed over the contents and the surface was compacted and mounded. Vegetation has been established to reduce erosion.

The RFI/RI Report determined that the majority of contaminants in the FBRPs are located in the interval from 4 ft below the surface to the bottom of pits 231-F and 231-1F, which is about 10 ft below the surface. Contaminant transport modeling demonstrates that these residual contaminants constitute little or no risk to groundwater. Modeling in the Baseline Risk Assessment (BRA) indicates that groundwater downgradient of the FBRPs represent a total risk of $1 \times 10^{-4}$ and a hazard index of 3.0 for all pathways and contaminants. Contaminants responsible for this risk were also found in wells upgradient of the FBRPs, possibly indicating an upgradient source for groundwater contamination. The source of this groundwater contamination has not been determined at this time.

DOE, EPA, and SCDHEC decided that additional groundwater monitoring and assessment, including sampling of several locations by cone penetrometer technology, will be conducted to delineate the source of the contamination. The Statement of

Basis/Proposed Plan will focus on mitigating the risks from soil contamination in the FBRP.

Under an industrial land use scenario, ingestion of soil in the top 2- ft layer of pits 231-F and 231-1F poses a risk of $5 \times 10^{-6}$ from a combination of arsenic, heptachlorodibenzo-p-dioxin, and benzo(*a*)pyrene. This risk represents the probability of one excess cancer in a human population of 200,000 and is well within the EPA's target risk range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$.

Ingestion of soil in the 0 to 2-ft interval from pit 231-2F yields a risk of $4 \times 10^{-6}$, predominantly from polychlorinated biphenyl-1254 (PCB-1254). The hazard index for ingestion of PCB-1254 contaminated soil in the 0 to 2-ft interval of pit 231-2F is 0.09 for future industrial workers, and 2.0 for possible future residents. The level of PCB-1254 contamination detected in the 0 to 2-ft interval (2.87 mg/kg) is below the Applicable, Relevant and Appropriate Requirements (ARARs) of 10 mg/kg established by the Toxic Substances Control Act and the EPA industrial to-be-considered guidance of 10 mg/kg. However, it exceeds the EPA residential to-be-considered guidance of 1 mg/kg.

## II. Summary of Remedial Action Objectives

The remedial action for the FBRP is institutional controls. The FBRPs are located in an area that has been recommended for exclusive industrial use by the SRS Citizens' Advisory Board. Signs have been posted indicating that this area was used to manage hazardous materials. In addition, existing SRS access controls are being used to maintain this site for industrial use only. In the longer term, if the property is ever transferred to non-federal ownership, the U.S. Government will, in compliance with Section 120(h) of CERCLA, create a deed for the new property owner which will include notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The deed will also include restrictions precluding residential use of the property.

The initial groundwater assessment did not definitively determine the source of groundwater contamination in the area; therefore further assessment of the situation was deemed necessary to determine if the contamination was caused by the FBRP source unit. The assessment was conducted under the groundwater assessment program addendum to the Work Plan, and the results are currently being studied. Depending on the outcome of the assessment, the three potential options being considered for addressing the groundwater contamination are as follows:

1) If no upgradient source is identified, the contribution of the FBRP source unit will be considered confirmed, and a ROD for the FBRP groundwater will be pursued.

2) If a previously unrecognized upgradient source is discovered, a new groundwater operable unit will be created that will undergo a Remedial Investigation/Feasibility Study assessment.

3) If an existing upgradient groundwater operable unit is determined to be the source of the contamination, the boundaries of the existing operable unit will be modified to include the groundwater contamination in the FBRP area.

## III. Determination of Current and Projected Protectiveness of the Action

The RFI/RI and BRA indicate that the FBRP source unit poses no significant risk to the environment and minimal risk to human health when reasonable exposure scenarios are assumed.

The institutional controls alternative is intended to be the final action for the FBRP source unit, pending the outcome of the latest groundwater assessment.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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## F-Area Groundwater Operable Unit

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on April 13, 1995. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete.

Closure of the F-Area HWMF was conducted under a RCRA closure plan approved by the SCDHEC. The RCRA permit for post-closure care required submittal of a Corrective Action Plan for the groundwater associated with the F-Area HWMF. The Corrective Action Plan was included in the RCRA permit renewal application submitted in October 1993. The corrective action of the groundwater OU associated with the F-Area HWMF and addressed under the SRS RCRA permit has been determined to be protective of human health and the environment under CERCLA. The CERCLA selected alternative is no further action beyond that required by the SRS RCRA permit.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The F-Area HWMF is regulated under RCRA. The basins comprising the F-Area HWMF were stabilized and closed in 1991. The F-Area Groundwater OU is the groundwater associated with the F-Area HWMF.

The F-Area HWMF was operated from 1955 until 1988. During that time, the facility received waste effluents from F-Area chemical separations facilities such as the nitric acid recovery unit, waste storage system evaporator overheads, and general purpose evaporator overheads. Significant amounts of nitrate and caustic were received. Tritium was the primary radionuclide released to the basins.

The maximum detected levels of several contaminants (e.g., tritium, cadmium, and lead) in the F-Area groundwater currently exceed the National Primary Drinking Water Standards, and applicable state standards. However, potential exposures to the general public are minimized by the distance from the OU to the site boundary, by natural attenuation and radionuclide decay, by institutional controls, and by dilution in receiving streams. In addition, all offsite contaminant concentrations are well below drinking water and other applicable standards. The remediation of the F-Area Groundwater OU will be designed to meet, as far as practicable, the Phase I groundwater protection standards outlined in the RCRA permit.

## II. Summary of Remedial Action Objectives

The goal of the remediation of the F-Area Groundwater OU is to reduce contaminant concentrations in the groundwater associated with the F-Area HWMF to levels specified in the RCRA permit and to minimize the discharge of contaminants to the adjacent stream.

The alternative provided in the 1992 RCRA permit provides three phases for the recovery of contaminated groundwater via extraction wells and treatment of hazardous constituents and radionuclides (except tritium and nitrates). The extraction wells would capture the plume as defined by the 10,000 picoCuries per milliliter tritium contour. The treated water would be injected into the shallow aquifer at the upgradient extent of the plume. Meeting treatment standards provided in the RCRA permit in the injected water is the remedial goal of Phase I.

Although tritium will not be removed from the groundwater, injection of the treated water will partially control the movement of tritium-contaminated water. Upgradient injection will lengthen the tritium flow path to the seep lines, allowing more time for tritium decay before the plume water discharges to the receiving stream. This will reduce tritium discharges to the onsite receiving surface stream.

The groundwater remediation is an interim measure pending an evaluation of its effectiveness in actual practice. The 1992 RCRA permit specifies that the overall corrective action will be implemented in phases and will be periodically reevaluated. The scope of the Phase I action coupled with possible future actions will serve to provide protection to human health and the environment.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

## F-Area Hazardous Waste Management Facility (904-41G, 904-42G, 904-43G)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued on September 23, 1993. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A because remedial action at the unit is not complete. Due to the RCRA preventive action, no further action under CERCLA is necessary for this source control OU. The RCRA preventive action is protective to human health and the environment and satisfies CERCLA requirements. Closure was begun in 1989 and completed in 1991. The closure was certified in February 1991 and accepted by SCDHEC as being in compliance with RCRA and state requirements. The closure is considered a final action under CERCLA.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The F-Area HWMF (904-41G, 904-42G, 904-43G) operated from 1955 until November 7, 1988. During that time, the facility received waste effluents from F-Area chemical separation facilities processes such as the nitric acid recovery unit, waste storage system evaporator overheads, and general purpose evaporator overheads. The facility consists of three basins with a combined maximum operating capacity of 20.5 million gallons of wastewater.

Significant amounts of nitrate and caustic were received in the basins. Radioactive releases were greater than 99 percent tritium. A 1984 soil coring study showed that approximately 90 percent of the radionuclides, cations, and anions were concentrated within the top 1 ft of basin soil.

These basins were closed by dewatering, physically and chemically stabilizing the remaining sludges, and placing a protective multi-layer cover system over them to reduce rainwater contact with basin bottoms. A RCRA Part B permit application for post-closure care was submitted in December 1990, and a hazardous waste permit was issued y effective November 1992.

As a condition of the RCRA hazardous waste permit, post-closure groundwater monitoring is required to verify that no unacceptable exposures to potential hazards are posed by conditions at the OU in the future. Routine inspections are required for a minimum of 30 years to verify the integrity of the cover system, fences, signs, etc. Any necessary repairs to the cap will be made as part of the maintenance program. In addition, access to the F-Area HWMF is restricted to authorized personnel with appropriate training on applicable requirements. The survey plat and records associated

with deed restricted use of the F-Area HWMF have been filed in the Aiken County Courthouse, South Carolina.

## II. Summary of Remedial Action Objectives

The objectives of the final action are to prevent physical exposure to contaminants and mitigate further migration of contaminants to the groundwater by minimizing a liquid medium pathway (rainwater percolation) for transport. The action has been determined to satisfy these objectives.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

## Grace Road Site (631-22G) Operable Unit

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued April 22, 1997. The Grace Road Site was listed as a RCRA 3004(u) SWMU/CERCLA unit in Appendix C of the FFA for the SRS. The results of the RCRA/CERCLA RI indicated that the Grace Road Site, posed no unacceptable risk to human health or the environment. Therefore, no action is needed at the Grace Road Site and CERCLA Section 121 requirements are not applicable. This final RCRA/CERCLA action for the Grace Road Site is a permanent solution, final action. No five-year remedy review is needed or will be performed. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The Grace Road Site is located 0.8 mi south of B Area and about 800 yds east of the intersection of Grace Road and SRS Road 2. The unit is roughly rectangular in shape and has a northwest-southeast orientation running parallel to Grace Road. The unit is approximately 1,300 ft by 320 ft. It covers an area of about 9.6 acres.

The Grace Road Site consisted of numerous drums and cans, concrete slabs, brick foundations (pre-SRS) and miscellaneous debris. Small mounds of concrete, bricks, shingles, car and truck parts, and large concrete blocks that appeared to be pieces of a bridge were also found at the unit. The unit also contained numerous drums and cans varying in size from one-half gallon cans to 55-gallon drums. Most of the debris was on the surface or partially buried in scattered locations across the unit. Markings on a few of the smaller drums and cans indicated that they once contained oil and grease. There is no evidence that any recent disposal activity has occurred or that the disposal activity was more widespread. Also, there is no evidence of any burning or excavation at this waste unit.

Prior to the establishment of SRS, Grace Road Site was part of a farm, of about 544 acres. About 230 acres were cultivated, and the remaining 314 acres were in woodlands and swamp lands. This land had been a farm since the late 1890's. After purchase by the U.S. Government, the area was utilized as a laydown yard for materials used in the construction of B Area. There are no records to indicate that this unit has been used for any other purpose since it was closed as a laydown yard in the mid-1950's.

Between February and May 1992, all the debris, drums and concrete slabs were removed from the Grace Road Site. No records of any type of waste management activity have been found for the Grace Road Site. Based on available information, no hazardous materials have been managed or disposed of at the Grace Road Site.

The FFA listed the Grace Road Site (631-22G) as a RCRA/CERCLA unit that required further evaluation. An investigation/assessment process that integrates and combines the

RCRA RFI with the CERCLA RI to determine the actual or potential impact to human health and the environment was performed.

## II. Summary of Remedial Action Objectives.

There was no action taken at this unit.

## III. Determination of Current and Projected Protectiveness of the Action

The results of the RCRA/CERCLA RI indicated that the Grace Road Site posed no unacceptable risk to human health or the environment. Therefore, no action was needed at the Grace Road Site, and CERCLA Section 121 requirements were not applicable. This is the final RCRA/CERCLA action for the Grace Road Site and is a permanent solution, final action.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## Gunsite 113 Access Road Unit (631-24G)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued April 22, 1997. The Gunsite 113 Access Road Unit was a RCRA/CERCLA unit. The results of the RCRA/CERCLA RI indicated that the Gunsite 113 Access Road Unit posed no threat to human health or the environment. DOE, EPA, and SCDHEC recommended that no remedial action be performed at this unit. There is no waste to treat and therefore, no institutional or engineering controls are required. The proposed no action is the final action. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The Gunsite 113 Access Road Unit is approximately 80 yds long and 50 yds wide, and is located on the boundary of SRS. The unit is a grassy area of weeds and small trees. It contains several small mounds of dirt and asphalt that are covered with a thick layer of pine straw, brush, and young trees.

From 1955 to 1960, the U.S. Army established various gunsites for anti-aircraft artillery gun emplacements to defend SRS in the event of an air attack. Gunsite 113 was one of those emplacements.

In the mid 1980s, sparse vegetation, dead trees, and small mounds of soil were discovered on a portion of the road leading to Gunsite 113. This area was used as a disposal area for spoil dirt and/or road construction debris. There is no documentation or record of any hazardous substance management, disposal, or any other type of waste disposal at this unit. There is no evidence that any burning, excavation, or recent disposal activities occurred in this area or that disposal activities were more widespread. There are no major drainage features nearby. The nearest surface water body is a small unnamed creek located approximately 0.8 mi southeast. The water table is approximately 60 ft below ground surface.

### II. Summary of Remedial Action Objectives

There was no action taken at this unit.

### III. Determination of Current and Projected Protectiveness of the Action

The results of the RCRA/CERCLA Remedial Investigation indicated that the Gunsite 113 Access Road Unit posed no unacceptable risk to human health or the environment. Therefore, no action is needed at the Gunsite 113 Access Road Unit.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## Gunsite 720 Rubble Pit Unit (631-16G)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued April 22, 1997. The results of the RCRA/CERCLA RFI/RI indicated that Gunsite 720 Rubble Pit Unit (631-16G) posed no threat to human health or the environment. Therefore, no remedial action was needed at this unit. The proposed no action is the final RCRA/CERCLA action. No five-year review is needed or will be performed. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The Gunsite 720 Rubble Pit Unit is located on the west side of SRS. It is approximately 1,000 ft west of South Carolina Highway 125, 550 ft north of SRS Road A-2, and 1.5 mi from the nearest SRS boundary. The unit consists of an open area of approximately 25,000 $ft^2$. It is relatively flat and is surrounded by native pine trees and shrubs. Two concrete slabs and an old water well are located on the east side of the open area.

During 1955 to 1960, the U.S. Army established a gunsite for anti-aircraft artillery gun emplacements at the Gunsite 720 Rubble Pit Unit to defend SRS in the event of an air attack. In the early to mid-1980s, nine empty, partially buried drums, labeled "duPont Freon 11" were found at Gunsite 720. As a result, Gunsite 720 became one of the original waste units specified in the SRS RCRA Facility Assessment. When SRS was included on the National Priorities List, Gunsite 720 became a RCRA/CERCLA unit, requiring further evaluation under an investigation/assessment process that integrates the two programs.

The nine drums were excavated in July 1987, and placed on a pallet at Gunsite 720. In October 1989, the drums were removed from the unit.

A review of SRS site plans and maps indicated the presence of an underground fuel storage tank. An above-ground tank was also noted on the map. However, there is no physical evidence indicating that either tank currently exists at the Gunsite 720 Rubble Pit Unit. Currently, the unit consists of two concrete slabs and an old water well.

The results of the RCRA/CERCLA RFI/RI indicate that the Gunsite 720 Rubble Pit Unit posed no threat to human health or the environment.

### II. Summary of Remedial Action Objectives

There was no action taken at this unit.

## III. Determination of Current and Projected Protectiveness of the Action.

No further action is needed.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## H-Area Groundwater Operable Unit

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on April 13, 1995. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete. Closure of the H-Area HWMF was conducted under a RCRA closure plan approved by SCDHEC. The RCRA permit for post-closure care required submittal of a Corrective Action Plan for the groundwater associated with the H-Area HWMF. The Corrective Action Plan was included in the RCRA permit renewal application.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The H-Area HWMF is a RCRA-regulated unit. As an OU, the basins comprising the H-Area HWMF were stabilized and closed in 1991. The H-Area Groundwater OU is the groundwater associated with the H-Area HWMF.

The H-Area HWMF consists of a series of three hydraulically connected unlined basins (H-1, H-2, and H-4). Basins H-1, H-2 and H-3 were constructed in 1955. Basin H-4 was built in 1962 to replace basin H-3. Wastewater flow to the basins was terminated on November 7, 1988, in accordance with the requirements of RCRA. H-Area HWMF received waste effluents from H-Area chemical separations facilities such as the nitric acid recovery unit, waste storage system evaporator overheads, and general purpose overheads. The waste stream contained hazardous constituents and low levels of radionuclides. Radioactivity released to these basins was due primarily to tritium.

The maximum detected levels of several contaminants (e.g., tritium, cadmium, and lead) in the H-Area groundwater currently exceed the National Primary Drinking Water Standards, and applicable state standards. However, potential exposures to the general public are minimized by the distance from the OU to the site boundary, by natural attenuation and radionuclide decay, by institutional controls, and by dilution in receiving streams. In addition, all offsite contaminant concentrations are well below drinking water and other applicable standards. This corrective action will address the potential ecological impacts at the seeplines along Fourmile Branch, and will also serve to address the ambient water quality standards in Fourmile Branch by remediating this OU. The remediation of the H-Area Groundwater OU will be designed to meet, as far as practicable, the Phase I groundwater protection standards outlined in the RCRA permit.

## II. Summary of Remedial Action Objectives

The goal of remediation of the H-Area Groundwater OU is to reduce contaminant concentrations in the groundwater associated with the H-Area HWMF to levels specified in the RCRA permit and to minimize the discharge of contaminants to the adjacent stream.

The alternative provided in the 1992 RCRA permit provides three phases for the recovery of contaminated groundwater via extraction wells and treatment of hazardous constituents and radionuclides (except tritium and nitrates). The extraction wells would capture the plume as defined by the 10,000 picoCuries per milliliter tritium contour. The treated water would be injected into the shallow aquifer at the upgradient extent of the plume. Meeting treatment standards provided in the RCRA permit in the injected water is the remedial goal of Phase I.

Although tritium will not be removed from the groundwater, injection of the treated water will partially control the movement of tritium-contaminated water. Upgradient injection will lengthen the tritium flow path to the seep lines, allowing more time for tritium decay before the plume water discharges to the receiving stream. This will reduce tritium discharges to the onsite receiving surface stream.

The groundwater remediation is an interim measure pending an evaluation of its effectiveness in actual practice. The 1992 RCRA permit specifies that the overall corrective action will be implemented in phases and will be periodically reevaluated. The scope of the Phase I action, coupled with possible future actions, will serve to provide protection to human health and the environment.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

**H-Area Hazardous Waste Management Facility**
**(904-44G, 904-45G, 904-46G, 904-56G)**

## I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued on September 23, 1995. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete. Due to RCRA preventive action, no further action under CERCLA is necessary for this unit. The RCRA preventive action is protective to human health and the environment and satisfies CERCLA requirements.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The H-Area HWMF operated from 1955 until November 7, 1988. The original H-Area HWMF consisted of basins 904-44G, 904-45G and 904-46G and operated from 1955 to 1962. In 1962, 904-46G was replaced by 904-56G. At the time of closure, the H-Area HWMF (904-44G, 904-45G, and 904-56G) had a combined maximum operating capacity of 26.5 million gallons of wastewater.

The H-Area HWMF received waste effluents from H-Area chemical separation facilities such as the nitric acid recovery unit, waste storage system evaporator overheads, and general purpose evaporator overheads.

Significant amounts of nitrate and caustic were received in the basins. Radioactive releases were greater than 99 percent tritium. A 1984 soil coring study showed that approximately 90 percent of the radionuclides, cations, and anions were concentrated within the top 1 ft of basin soil.

The four basins were closed by dewatering; physically and chemically stabilizing the remaining sludges with a layer of granite, limestone, and blast furnace slag; and placing a protective multi-layer cover system over them to reduce rainwater contact with basin bottoms. The remedy prevents physical exposure to contaminants and mitigates further migration of contaminants from the H-Area HWMF to groundwater by minimizing a liquid medium pathway (rainwater percolation) for transport.

Closure of the unit was begun in 1989 and completed in May 1991. The H-Area HWMF was certified closed in July 1991. In October 1991, the closure certification was accepted by SCDHEC as being in compliance with RCRA requirements. A RCRA Part B permit application for post-closure care was submitted in December 1990, and a hazardous waste permit was issued effective November 1992.

As a condition of the RCRA hazardous waste permit, post-closure groundwater monitoring is required to verify that no unacceptable exposures to potential hazards are posed by conditions at the OU in the future. Routine inspections are required for a minimum of 30 years to verify the integrity of the cover system, fences, signs, etc. Any necessary repairs to the cap will be made as part of the maintenance program. In addition, access to the H-Area HWMF is restricted to authorized personnel with appropriate training on applicable requirements. The survey plat and records associated with deed restricted use of the H-Area HWMF have been filed with Aiken County Courthouse, South Carolina.

## II. Summary of Remedial Action Objectives

The objectives of the final action are to prevent physical exposure to contaminants and mitigate further migration of contaminants to the groundwater by minimizing a liquid medium pathway (rainwater percolation) for transport. It has been determined that the actions taken satisfy these objectives.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

**M-Area Hazardous Waste Management Facility Operable Unit (904-51G, 904-112G)**

## I. Introduction

**Authority Statement/Level of Review.** An interim ROD for this unit was issued on June 29, 1992. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete.

Remedial actions were started at the M-Area HWMF under RCRA. A RCRA closure plan was approved in 1987. Also in 1987, DOE received a hazardous waste permit (SCI-890-008-984) for container storage areas and post-closure care of the M-Area HWMF.

Closure of the M-Area HWMF was begun in 1988 and completed in 1990.. The closure was certified in 1991 by SCDHEC as being in compliance with RCRA and state requirements. The closure is currently considered an interim action under CERCLA.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The M-Area HWMF is a source-specific OU within the Upper Three Runs Watershed. The M-Area HWMF includes an unlined surface impoundment (settling basin), a portion of an inactive process sewer line, drainage and seepage areas, and a Carolina bay known as Lost Lake. The nearest plant boundary is approximately 5,800 ft northwest of the M-Area HWMF.

The M-Area HWMF was a settling basin constructed in 1958. The basin was used to settle out metals (primarily uranium, nickel, lead and aluminum) discharged from M-Area manufacturing operations. The manufacturing processes consisted of aluminum forming and metal finishing processes that produced fuel and targets for SRS reactors. Waste effluents from these processes were discharged from three production buildings and two support laboratories to the settling basin through a process sewer line. The waste effluents generally contained hydroxides; precipitates of aluminum, uranium, nickel, lead and other metals; solvents (1,1,1-trichloroethane, TCE, and PCE); acids; and caustics. Very low concentrations (<50 ppm) of PCBs were detected in the early 1980s in soils in an isolated portion of the drainage ditch downstream of the basin. No PCBs are known to have been detected in the basin. Cracks in the sewer pipeline allowed some effluent to leak into the ground, contaminating underlying soils. The pipeline was slip-lined after cracks and misalignments were discovered in 1983, and an inactive portion was excavated in 1989 as part of the settling basin closure. Contamination was detected in

groundwater, surface water, soil, sediments, and air prior to closure of the M-Area HWMF.

The basin dimensions were approximately 330 ft by 280 ft (surface dimensions) by 17 ft (depth) with a volumetric capacity of approximately eight million gallons. Overflow from the settling basin was directed to a natural seepage area and ultimately to Lost Lake. In July 1985, a permitted wastewater treatment facility was placed in operation, and discharges to the settling basin were discontinued.

## II. Summary of Remedial Action Objectives

The focus of the interim action is to prevent physical exposure to contaminants and mitigate further migration of contaminants from the settling basin to groundwater by minimizing a liquid medium pathway (rainwater percolation) for transport.

The alternative selected involves pumping and treating any standing water remaining in the basin; excavating, dewatering, and stabilizing the basin sludge with Portland cement; placing, consolidating and compacting the stabilized sludge into the basin; discharging the effluent to the NPDES permitted M-004 Outfall; consolidating waste volume by excavating and placing contaminated soils associated with the seepage area, a portion of the sewer line, and Lost Lake into the basin; and installing a low permeability cap over the settling basin.

The alternative achieves overall protection by minimizing potential exposure to contaminated media and minimizes the transport of chemical residuals to groundwater. This alternative was selected within the RCRA closure process in 1988. Closure of the M-Area HWMF was begun in 1988 and completed in 1990. The closure was certified in 1991 by SCDHEC as being in compliance with RCRA and state requirements. The closure is currently considered an interim action under CERCLA. However, upon completion of the risk evaluation, SRS will submit appropriate documentation to EPA, SCDHEC, and the public requesting that the alternative be designated a final action.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

## M-Area West Unit (631-21G)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued on September 29, 1995. The results of the RCRA/CERCLA RI indicate that the M-Area West Unit poses no unacceptable risk to human health or the environment. Therefore, no action was needed at the M-Area West Unit. This is the final RCRA/CERCLA action for the M-Area West Unit. CERCLA Section 121 requirements are not applicable, and no five-year remedy review is needed or will be performed. This unit has been included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The M-Area West Unit was located west of the M-Area production facility on a dirt road approximately 1.1 miles north of Silverton Road. No structures of any type are located at or near M-Area West. The only nearby man-made feature is a dirt access road located approximately 30 to 40 ft west of the waste areas. The topography of the unit is relatively flat with an elevation of approximately 350 ft above msl. The nearest surface water body is approximately 1,000 ft away.

The unit consisted of two small areas. The southern debris area covers 20 ft x 20 ft and the northern debris area (located 220 ft to the north of the southern area) covers 10 ft x 10 ft. Several drums and other small, innocuous debris were found on the land surface adjacent to a dirt road approximately 3,300 ft west of the M-Area production facility. The total waste at the unit consisted of six empty 55-gallon drums, four 1-gallon cans and a 1-gallon glass jar. The cans and the jar were originally contained in one of the larger drums. With the exception of a crushed drum and small amounts of metal debris, all other materials were removed from the site in 1992 with concurrence from EPA and SCDHEC. The remaining crushed drum and debris were removed from the unit as a maintenance action following the ROD approval.

There is no documented information available regarding past hazardous or non-hazardous waste disposal activities at the M-Area West Unit. Markings on the drums found at the unit suggest that they once contained oil and that they are approximately 37 years old. There is no evidence that any recent disposal activity has occurred or that the disposal activity was more widespread. Also, there is no evidence of any burning or excavation at this waste unit.

It has been determined through several studies that the M-Area West Unit did not contribute contamination to the area groundwater or surrounding soils.

### II. Summary of Remedial Action Objectives

There was no action taken at this unit.

## III. Determination of Current and Projected Protectiveness of the Action

The results of the RCRA/CERCLA RFI/RI indicate that the M-Area West Unit poses no unacceptable risk to human health or the environment.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

## Metallurgical Laboratory Hazardous Waste Management Facility Operable Unit (904-110G)

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on June 29, 1992. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete. The Metallurgical Laboratory HWMF and associated Carolina bay are subject to RCRA. The basin and sewer line portions of the Metallurgical Laboratory HWMF are being closed under interim status regulations and will be permitted as an HWMF by a post-closure care, part B permit.

An interim action has been selected that prevents physical exposure to contaminants by use of containment and institutional controls and mitigates further migration of contaminants to the groundwater by minimizing a liquid medium pathway (rainwater percolation) for transport. The ultimate goal of remediation will be determined in a final remedial action for this OU.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The Metallurgical Laboratory HWMF includes an abandoned portion of a process sewer line, a seepage basin, a drainage outfall, and a Carolina bay. The nearest plant boundary is located approximately three-fourths of a mile to the northwest of this OU.

The Metallurgical Laboratory HWMF has been designated as a source-specific OU within the Upper Three Runs Watershed.

The Metallurgical Laboratory HWMF began receiving effluent from the Savannah River Laboratory Equipment Engineering Division Metallurgical Laboratory (Building 723-A) in 1956. The effluent consisted primarily of noncontact cooling water (water that did not contact process operations) and small quantities of laboratory rinse water containing hazardous substances. Discharges to the basin during the period from 1983 to November 8, 1985, consisted of non-hazardous effluent. All flow to the Metallurgical Laboratory Basin was terminated on November 8, 1985, when the process sewer line was plugged.

### II. Summary of Remedial Action Objectives

The goal of the interim remedial action is to minimize migration to groundwater of the Metallurgical Laboratory Basin sediment contaminants associated with the process sewer

line while risk assessment activities for the Carolina bay are being planned and conducted. The ultimate goal of remediation will be determined during the final remedial action selection for this OU.

The interim action selected includes excavation of the process sewer line and associated contaminated sediments, basin closure with a low permeability soil cap, and evaluation of the Carolina bay. Waste was not removed from the basin prior to closure. Upon completion of the Carolina bay risk assessment, this interim action may be incorporated into the design of the OU remedy specified in the final action ROD.

A RCRA closure plan for the basin and sewer line portions of the Metallurgical Laboratory HWMF was submitted to, and approved by, SCDHEC in June 1991. The intent of the closure plan is to ensure the basin and sewer line portions of the Metallurgical Laboratory HWMF will be closed in a manner that controls, minimizes, or eliminates post-closure migration of hazardous constituents and decomposition products to the vadose zone, groundwater, surface waters, or atmosphere.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

## Mixed Waste Management Facility (643-28E)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued on September 23, 1993. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete. The Mixed Waste Management Facility (MWMF) is subject to RCRA. A closure plan was approved by SCDHEC in 1987. Closure of the MWMF began in 1988 and was completed in December 1990. The MWMF was certified closed in 1991. In April 1991, the closure certification was accepted by SCDHEC as being in compliance with RCRA requirements. A RCRA Part B permit application for post-closure care was submitted in November 1992.

Because of the action taken at the MWMF under a RCRA closure plan approved by the state of South Carolina, no further remedial action is necessary under CERCLA.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The MWMF is a source-specific OU in the Upper Three Runs Watershed. The MWMF consists of 118 slit trenches, 1 engineered low level trench, and a naval core barrel mound. It is located in the center of SRS, between F and H Areas.

The MWMF operated from 1969 until March 11, 1986. During that time this facility, which comprises approximately 58 acres, received low-level radioactive waste materials produced at the SRS. Some of these materials are classified under RCRA as mixed waste containing both hazardous and radioactive components.

Waste from SRS disposed in the form of job control waste such as rags, gloves and coveralls, soil, construction debris, failed equipment, spent air filters, spent lithium-aluminum targets, irradiated scrap metal, naval reactor hardware, lead shielding, waste oil, scintillation fluids, cadmium, and silver-coated beryl saddles, were sent to the MWMF. The primary constituents of concern are tritium, lead, TCE and uranium.

### II. Summary of Remedial Action Objectives

The objective of the correction action was to prevent physical exposure to contaminants and mitigate further migration of contaminants to the groundwater by minimizing a liquid medium pathway (rainwater percolation) for transport.

The RCRA preventive action involved the precompaction and placement of all contaminated materials under a low permeability cap.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

## Old F-Area Seepage Basin (904-49G)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued June 19, 1997. The five-year review for this unit is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A because remedial action at the unit is not complete.

**Unit Characteristics.** The OFASB covers a total area of 1.3 acres. An earthen berm in the interior divides the basin into two areas. The basin is open, with growing vegetation, and is a wet weather pond. The unit also includes one effluent ditchline adjacent to the basin that leads toward Upper Three Runs Creek, and one process sewer line, that fed the basin. Groundwater in the area is also included in the unit assessment.

Between November 1954 and mid-May 1955, 9 to 14 million gallons of wastewater were discharged to the basin. OFASB is an unlined seepage basin that was used to reduce radioactive substance concentrations.

After 1955, the OFASB received occasional discharges of cooling water and rainfall runoff. During a three-month period in 1969, spent nitric acid solutions used to etch depleted uranium were discharged to the basin. Wastewater disposal was discontinued after the 1969 discharge. An estimated 1.8 curies of radioactive releases occurred during use of the basin. Due to natural radioactive decay, an estimated inventory of less than 0.8 curies remains. Various nonradioactive chemicals were also discharged to the basin.

The inactive basin is currently fenced, open, and contains mature trees, shrubs, and grasses. Standing water is present during wet seasons.

The RFI/RI and the BRA indicate that the OFASB poses a significant risk to human health. Significant impact to the soil media associated with the OFASB has occurred from both radiological and nonradiological contaminants. Radiological contaminants cesium-137 and cobalt-60 approach background at about 25 ft below the bottom of the basin. Nonradiological mercury is bound to the top 2 ft of the basin soils. Surficial soil contamination is isolated to the confines of the fenced basin and effluent ditchline areas.

Groundwater monitoring data indicate that release of radiological substances to the groundwater has occurred. Both tritium and uranium-238 in the uppermost groundwater aquifer have migrated beyond the surface boundaries of OFASB by more than 200 ft. Migration is toward Upper Three Runs Creek, which is more than 2,500 ft to the north of OFASB.

## II. Summary of Remedial Action Objectives

The remedial action for the OFASB soils and vegetation is in situ grouting of soils to 2 ft, and either incinerating vegetation at a consolidated incinerator facility or disposing of vegetation at the SRS. The effluent ditchline soils will be consolidated with the OFASB soils, then the top 2 ft of the OFASB (4,500 cubic yards) and effluent ditchline soils (167 cubic yards) will be grouted in situ. Upon completion of in situ grouting, the OFASB will be backfilled and compacted to grade, and an engineered cap will be constructed over the OFASB to minimize surface infiltration and reduce the potential for contaminant migration. The vegetation will be removed and chipped, then transported to the SRS Burial Grounds to trenches that are permitted to accept debris. Following remediation, the unit will be maintained for a minimum of 30 years.

The remedial action for the OFASB groundwater is groundwater controls using an Alternate Concentration Limit/Mixing Zone to ensure that existing contaminated groundwater does not impact potential receptors. Following development of acceptable action levels based on environmental modeling, and design of a monitoring well network and sampling strategy, this alternative would involve the installation of the designed monitoring well network between the basin and the down gradient stream, and initiation of periodic monitoring to ensure that appropriate contaminant levels are not exceeded in the groundwater. This monitoring will prevent future impacts to receptors by identifying when active remedial action needs to be initiated to prevent contaminant impacts to previously identified sensitive receptors. Modeling, designing the monitoring well network, and sampling design will be performed as part of the remedial design. These efforts will support a request for approval of an Alternate Concentration Limit/Mixing Zone from SCDHEC.

The OFASB is located in an area which has been recommended for industrial use and so designated by the U.S. DOE.

Several source control and groundwater OUs within this watershed will be evaluated to determine impacts, if any, to associated streams and wetlands. The OFASB is a final action. Upon disposition of all source and groundwater OUs within this watershed, a final, comprehensive ROD for the watershed will be pursued.

## III. Determination of Current and Projected Protectiveness of the Action

The soil remedial action eliminates direct radiation risk and potential future impacts to the groundwater. The groundwater remedial action ensures that existing contaminated groundwater does not impact potential receptors. Current and future institutional controls, including access controls, ensure that residential use is prohibited. Under this policy, the preferred alternatives are protective of human health and the environment.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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## Old Radioactive Waste Burial Ground

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on June 18, 1996. The interim action was chosen to mitigate further contamination of the soil and groundwater. A final remedial action will be evaluated and conducted in the future according to requirements of the FFA. The five-year review for this unit is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete.

**Unit Characteristics.** The Burial Ground Complex (BGC) is an area which occupies approximately 195 acres in the central part of SRS between F- and H-Separation Areas, on a nearly flat divide between Upper Three Runs Creek to the north and Four Mile Creek to the south. The BGC includes the Old Radioactive Waste Burial Ground (ORWBG) and other OUs.

The ORWBG served as a disposal area for solid radioactive waste produced at the SRS, as well as shipments from other DOE and U.S. Department of Defense facilities. The ORWBG, occupies approximately 76 acres. The ORWBG has contributed to localized shallow aquifer groundwater contamination. The plume of groundwater contamination from the ORWBG seeps into the Old F-Area effluent stream, which flows into Four Mile Creek which in turn flows into the Savannah River.

The ORWBG began receiving waste in 1952 and was filled in 1972. The ORWBG was divided into sections to accommodate disposal of various levels/types of radioactive waste materials. These materials include transuranic (TRU) waste, low-level waste, and intermediate-level waste generated at SRS, as well as waste generated elsewhere.

Beginning in 1962, records were kept of the contents, radiation level, and approximate storage location of each shipment of waste. Until 1965, TRU waste contained within plastic bags and cardboard was buried in unlined trenches designated specifically for this waste. Between 1965 and 1972, TRU waste was segregated according to content. Waste that did not fit into the prefabricated concrete containers was encapsulated in-place in concrete.

One trench approximately 100 ft long in the east-central part of the ORWBG was used for disposal of an unknown quantity of empty oil drums. From 1953 through 1968, organic solvents were incinerated in open, shallow, unlined trenches located in the north-central part of the ORWBG.

Various solvents including napthalene, n-paraffin, toluene, tributylphosphate (TBP), TBP-kerosene, trimethylbenzene, ultrasene, and xylene were stored in 22 underground

storage tanks at the ORWBG. However, the interim action did not address cleanup of these tanks.

A risk assessment has not yet been conducted. The risks, in general, are the contaminants in the buried waste. These contaminants have been released to the soil and groundwater due to infiltration and percolation. Once appropriate characterization data is available and a risk analysis has been performed, a final remedial action for the ORWBG will be implemented.

Groundwater associated with the entire BGC is being addressed under the RCRA permit for the MWMF in accordance with the second amendment to Settlement Agreement 87-52-SW. Revision 3 to the RCRA Part B permit includes a characterization of the plume that originates from the ORWBG. It also prepares a strategy and schedule for characterization, development of cleanup levels, and preparation of remediation plans for each of the separate plumes of contamination associated with the BGC.

## II. Summary of Remedial Action Objectives

Objectives of the interim action are to:

- Decrease the stormwater infiltration rate and contaminant migration to the groundwater.
- Provide increased radiation shielding from buried waste at the ground surface.
- Provide a cover that can be easily repaired should destruction of portions of the cover occur.
- Provide versatility for future characterization and removal activities.

The interim action is to place a low-permeability soil cover over the ORWBG unit. Topsoil with a vegetative cover will also be a part of the interim action. The soil cover will be sloped to promote surface runoff, minimize surface erosion, and control the leaching of hazardous substances from the source material.

Existing institutional controls, environmental monitoring, and site maintenance would also be components of this alternative. Visual inspection of the soil cover will be performed by trained individuals at regular intervals and after significant rainstorms. Any observed damage, erosion, or subsidence will be repaired to conform with the original soil cover contours.

The implementation of this action is scheduled for July 1996 through February 1998.

## III. Determination of Current and Projected Protectiveness of the Action

This interim remedial action will decrease leachate production and will reduce contaminant transport to the groundwater and a reduction in mobility of contaminants will occur. Protection of workers will be required during cover installation. This alternative is protective of human health and the environment.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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## Par Pond Unit (685-G)

### I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on February 16, 1995. This review is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete. The interim action addresses only the remediation of approximately 1,340 acres of sediments on the periphery of the Par Pond reservoir that were exposed as a result of reservoir drawdown. The final interim action was to refill the pond to full pool and then allow it to fluctuate naturally. The Par Pond interim action was declared complete March 15, 1995.

**Unit Characteristics.** Par Pond was built to augment the cooling water requirements of both P and R Reactors, which began operations in 1953 and 1954, respectively.

Releases in the form of process leaks, purges and makeup cooling water have contaminated Par Pond with cesium-137 and other radioactive and nonradioactive contaminants. Between 1954 and 1964, approximately 222 curies of cesium-137 were released from R Reactor into Par Pond or Lower Three Runs Creek (before the creation of the reservoir in 1958). All radioactive isotope releases ceased following the shutdown of R Reactor in 1964. No measurable cesium-137 was released into Par Pond from P Reactor. Since most of the radionuclide releases to Par Pond (direct or indirect) occurred during the 1950 to 1960 era, and the half-life of cesium-137 is approximately 30 years, more than half of this radionuclide has decayed. The current estimated inventory of cesium-137 associated with all sediments within the Par Pond reservoir is approximately 43 curies, of which 9 curies are present in the 1,340 acres of exposed sediments. The remaining 68 curies of cesium-137 inventory in the Par Pond system is located in the sediments of the pre-cooler canal/pond system and Lower Three Runs Creek.

Mercury has been detected in fish from the Savannah River and SRS water bodies since analyses began in 1971, with comparable concentrations measured in onsite and offsite fish. Much of the mercury has been assumed to be present in Savannah River water, which originated from industrial releases upriver from SRS. Since 1989, concentrations of mercury in fish collected at all locations onsite have been higher than in fish collected from the Savannah River. Therefore, concentrations of mercury may not be totally attributable to offsite sources. SRS is currently investigating possible causes for these increased concentrations.

During an inspection of the Par Pond Dam in March 1991, a small surface depression was noted on the downstream face. Based on the inspection report, DOE ordered a detailed structural investigation into the cause of the depression and simultaneously initiated a precautionary drawdown of the reservoir. From June through September 1991, the level of Par Pond was lowered from 200 ± 1 ft to 181 ft msl. The 181-ft level was chosen to

reduce the risk and consequences, in the unlikely even of a dam failure, of potential flooding in downstream communities.

Lowering the surface water level elevation of Par Pond resulted in a reduction of the reservoir's surface area and volume by approximately 50 and 65 percent, respectively. The drawdown had two major repercussions: (1) the elimination of the previous littoral (shore) zone and its interrelated communities, and (2) the exposure of sediments contaminated with mercury and radioactive cesium.

As of July 1, 1994, the Par Pond Dam has been repaired and is considered safe to maintain the reservoir at pre-drawdown water levels.

## II. Summary of Remedial Action Objectives

The interim action addressed only the remediation of approximately 1340 acres of sediments on the periphery of the Par Pond reservoir that were exposed as a result of reservoir drawdown. The overall strategy of remediating the Par Pond waste unit, consisting of the Par Pond reservoir, the series of pre-cooling ponds and canals, and Lower Three Runs Creek, was to:

- Perform the proposed interim action.
- Further characterize the waste unit, delineating the nature and extent of contamination and identifying the media of concern.
- Perform a quantitative BRA to evaluate media of concern, chemicals of concern, exposure pathways and characterize potential risks.
- Evaluate and perform a final action to remediate the identified media of concern.

The ROD was to refill the pond to full pool and allow it to fluctuate naturally, thus submerging the exposed sediments. The wetland and aquatic habitats of the Par Pond ecosystem would eventually recover to essentially pre-drawdown conditions. Because access to SRS is controlled, the only temporary exposure pathway would be to workers at the Par Pond Unit who were directly exposed to the sediment. External exposure to radionuclides, ingestion of and dermal contact with sediments, and inhalation of airborne sediments would cease with the refilling of the pond.

This action fulfills the interim remedial goals by providing timely reduction of risk to human health and the environment through the submergence of the sediments. Following completion of the interim action, further characterization, and the performance of a risk assessment, the final remedial action will be selected to address the entire Par Pond OU.

## III. Determination of Current and Projected Protectiveness of the Action

The water layer will provide a reduction in risk due to attentuation of radiation and will preclude contaminated sediments from becoming airborne.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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## Silverton Road Waste Unit (731-3A)

### I. Introduction

**Authority Statement/Level of Review.** A final ROD for this unit was issued April 22, 1997. This review is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete.

**Unit Characteristics.** The Silverton Road Waste Unit (SRWU) was first used before construction of the SRS. Although there is no written record of when disposal began at the SRWU, or what materials were accepted, it is believed that the unit was originally a borrow pit used as an "open dump" by the local municipalities, including Old Ellenton, before the land was acquired by the federal government. Municipal, agricultural, and commercial trash, rubbish, garbage, debris, and refuse probably constituted the waste stream until the early 1950's. The waste material at the dump was probably burned periodically, as was the practice at that time, for volume reduction. This practice would have eliminated many of the combustible organic materials while creating combustion by-products.

After procurement by the federal government, the SRS continued to use the SRWU land as an open dump. Aerial photographs show large piles of metal shavings (possibly aluminum), 55-gallon drums, cardboard drums, tires, lumber, wooden pallets, cardboard, construction debris, tanks, possibly asbestos, and other unidentified metal and wood objects. No records of waste disposal were kept. In 1974, the disposal of waste at the SRWU ceased, and the area was bulldozed, graded, covered with soil, and planted with grasses.

The SRWU is located on the southwestern flank of an interstream divide between Upper Three Runs Creek and the floodplains of the Savannah River. Surface drainage is southwestward, along a series of dry-wash tributaries, into the floodplain of the Savannah River. The water table ranges from about 40 ft below ground level to the southwest to about 130 ft below ground level to the northeast.

The SRWU is located within the Savannah River Floodplain Swamp Watershed. Several source control and groundwater OUs within this watershed will be evaluated to determine impacts, if any, to associated streams and wetlands. SRS will manage all source control and groundwater OUs to minimize impact to the watershed. Based on characterization and risk assessment information, the SRWU does not impact the watershed. The SRWU investigation considered all unit specific groundwater OUs, the M-Area groundwater aquifer and the Lost Lake groundwater aquifer. The contamination in the M-Area aquifer is apparently attributable to the SRWU wastes. The contamination in the Lost Lake aquifer is attributable to upgradient sources. The proposed action for the SRWU soils and M-Area groundwater aquifer is a final action.

As part of the investigation process for SRWU, a BRA was performed. The BRA shows that the total noncarcinogenic hazard index did not exceed unity for the environmental researcher evaluated in the current land use scenario. This indicates that potential adverse health effects are not likely to occur. The total carcinogenic risk from exposure to chemicals or radionuclides in soils did not exceed a risk level of $1 \times 10^{-4}$.

The future case residential scenarios showed total hazard and risk levels which exceeded the U.S. EPA criterion values relative to the M-Area groundwater aquifer pathway.

No wetlands or threatened and endangered (T&E) species were observed in the vicinity of the SRWU and use of the site by T&E is not expected. There is little or no risk of adverse ecological effects.

## II. Summary of Remedial Action Objectives

Due to the presence of buried waste material and future groundwater monitoring, the remedial action is institutional controls. Signs have been posted which indicate that this area was used for disposal of waste material and contains buried waste will be posted at the waste unit. Existing SRS access controls are being used to maintain this site for industrial use only.

In the long term, if the property is ever transferred to non-federal ownership, the U.S. Government will, in compliance with Section 120(h) of CERCLA, create a deed for the new property owner. The deed shall include notification disclosing former waste management and disposal activities, results from groundwater monitoring, and remedial actions taken on the site. The deed notification shall, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of non-hazardous, inert construction debris, and that wastes containing hazardous substances, such as degreasers and solvents, were also managed and burned on the site. The deed will also preclude residential use of the property. The need for deed restrictions may be reevaluated at the time of transfer in the event that contamination no longer poses an unacceptable risk under residential use.

Additional background monitoring well(s) will be installed, since one of the original wells for the M-Area groundwater OU went dry and was never monitored. The background well(s) will be used to further evaluate the upgradient concentrations of the contaminants in the M-Area groundwater OU. The existing background well and six existing M-Area wells will also be monitored to evaluate trends in groundwater contamination.

The Corrective Measures Implementation/Remedial Action Report (CMI/RAR) for the SRWU will include the number and location of the new background well(s), a list of the existing wells to be monitored, the monitoring frequency, and the data submittal frequency.

## III. Determination of Current and Projected Protectiveness of the Action

This alternative is protective of human health. Future residential use of the area would be prevented. There are no significant ecological risks for the unit. The short-term effectiveness will prevent exposure to workers associated with remedial activities. The surrounding community is protected from short-term risk because site access is restricted. This alternative will provide long-term effectiveness and permanence as long as the deed notifications are enforced.

The groundwater monitoring data will be evaluated at the next five-year ROD review to determine if any changes in the groundwater remedy are necessary or appropriate.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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## Tank 105-C Hazardous Waste Management Facility

### I. Introduction

**Authority Statement/Level of Review.** A final ROD was issued for this unit on September 23, 1994. The five-year review for this unit is a statutory review. It is a type 1A as described in OSWER Directive 9355.7-02A. Tank 105-C HWMF is subject to RCRA. Previous action taken was under a RCRA closure plan approved by the State of South Carolina, and is protective of human health and the environment. Therefore, no further action is necessary under CERCLA. In October 1990, the RCRA closure plan was submitted to the SCDHEC. Closure of the Tank 105-C HWMF began in May 1991 and was completed in September 1991. The tank was certified closed in November 1991. In December 1991, closure certification was accepted by SCDHEC as being in compliance with RCRA requirements.

The review for this unit is conducted under the SRS RCRA program. The CERCLA review requirements are met by the RCRA program, therefore a separate review is not duplicated here. This unit is included in this Five-Year Review of RODs Report for information only.

**Unit Characteristics.** The Tank 105-C HWMF consisted of one 8,400-gallon capacity underground storage tank and ancillary piping located in C Area, east of C Reactor (Building 105-C) and approximately 6 miles from the nearest site boundary.

The Tank 105-C HWMF was installed in 1961 as part of an off-line heat exchanger repair program and was used as a temporary holding tank for liquid solutions. Sumps from the heat exchanger cleaning area drained into Tank 105-C. Oil in the tank is probably attributable to oil leaks into these sumps. The reacted or spent oxalic acid solution that resulted from the rinsing process was pumped into an above-ground neutralization tank in the stack area of the reactor building. Potassium hydroxide was then added and mixed to raise the solution pH to 8.0 or above. After neutralization, the waste was transferred to the underground storage tank for temporary storage. It was common for the neutralization process to require additional pH adjustment inside Tank 105-C, accomplished by circulating the waste in the tank with a pump and adding more potassium hydroxide to fine-tune the pH. A permanent pump was set up to pump the waste into a waste trailer for transportation to a storage/disposal facility. The pump and circulation lines were disassembled in 1983.

Prior to the RCRA closure, chemicals of concern at the Tank 105-C HWMF included tritium and other radionuclides in a characteristic hazardous waste with a pH of 13.2. Post-closure chemicals of concern are residual minimal quantities of radionuclides solidified with concrete, with a pH of less than 12.5. Since the waste was neutralized, the solidified waste remaining in the tank is radioactive waste that has been immobilized.

## II. Summary of Remedial Action Objectives

The goal of the action was to prevent physical exposure to contaminants (radionuclides) and mitigate potential migration of contaminants to the groundwater by stabilizing the liquid medium and minimizing the pathway for transport.

The Tank 105-C HWMF was closed by neutralization of waste to a pH of less than 12.5, removal of as much waste as reasonably possible, and shipment of removed waste to an onsite storage/disposal facility. Any remaining waste and the tank void were stabilized with concrete. Additional contaminated soils adjacent to the ancillary piping were removed and shipped to an onsite storage/disposal facility. The ancillary piping was removed and capped, and the surface was restored by backfilling piping and tank excavations, and paving backfilled areas with asphalt.

## III. Determination of Current and Projected Protectiveness of the Action

This section is covered by the SRS RCRA program.

## IV. Areas of Noncompliance

This section is covered by the SRS RCRA program.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

This section is covered by the SRS RCRA program.

**TNX Area Groundwater Operable Unit**

## I. Introduction

**Authority Statement/Level of Review.** An interim action ROD for this unit was issued on November 16, 1994. This review is a statutory review. It is a type IA as described in OSWER Directive 9355.7-02A, because remedial action at the unit is not complete.

The TNX Area Groundwater and the source areas contributing to the contamination of the groundwater are in various stages of the CERCLA investigation and remedy selection process. An interim action has been chosen to mitigate further migration of the groundwater plume hotspot while also removing contaminants from the groundwater. Following investigation and remedy selection for the source units in the TNX Area, the groundwater unit will be reassessed and appropriate final remedial alternatives will be developed.

**Unit Characteristics.** The TNX Area is a pilot scale test facility for the SRTC. The pilot scale facilities are used to provide technical support to various SRS production areas. From 1953 to August 1988, wastewater generated by research performed in the TNX Area was disposed of in seepage basins (Old TNX Seepage Basin, New TNX Seepage Basin and TNX Burying Ground). In August 1988, wastewater was rerouted to the TNX Effluent Treatment Facility.

Operations associated with these units, as well as leakage from process sewers and leachate from other site activities, contributed to the groundwater contamination.

TNX is underlain by two aquifer systems: a deep aquifer system and a shallow aquifer system. Groundwater contamination at TNX was detected only in the water table aquifer in the shallow aquifer system. The shallow aquifer system is composed of a water table aquifer and a semi-confined aquifer. Depth to the water table varies from zero to 50 ft in the area of groundwater contamination. Groundwater flow in the shallow aquifer system is toward the Savannah River. The water table aquifer crops out in the seam between the Savannah River and the TNX Area.

Groundwater sampling data indicates that seepage from the unlined basins, leakage from the process sewers, and leachate from other activities in the area resulted in soil and groundwater contamination throughout the TNX Area. Analysis of surface water samples collected from the swamp adjacent to the Savannah River indicates that groundwater contaminated with Chlorinated Volatile Organic Compounds (CVOCs) is outcropping in the swamp before it reaches the river. No contaminants from the plume were detected in the Savannah River. Actual or threatened releases from this unit, if not addressed by implementing the response action selected in this ROD, could present an endangerment to human health, or the environment.

The contaminant responsible for the largest portion of the risk to the onsite worker is TCE, through contact with contaminated soil and water at the groundwater outcrop in the swamp during sampling. Under current conditions, the onsite worker is not exposed to contaminants at concentrations that will produce an unacceptable risk to human health.

While the contaminants in the groundwater system exceed Safe Drinking Water Standards, the contaminated groundwater is not being used, nor is it planned to be used while the site is controlled by DOE. Use of this groundwater as a drinking water source would present unacceptable risk levels.

## II. Summary of Remedial Action Objectives

Contaminated media at the TNX Area include groundwater, surface water, and the soil above the water table. The focus of the interim action is the contaminated groundwater.

The performance objectives of the interim action are to:

- Stabilize the OU and prevent the further degradation of the groundwater system by containing the portion of the plume with >500 ug/L TCE. This concentration level was selected based upon calculations performed associated with the Interim Risk Evaluation and technical considerations for well placement and system performance. Controlling the portion of the plume with >500 ug/L TCE will also control and treat the area with the highest concentrations of other CVOCs and nitrates.
- Maintain risks associated with potential exposure pathways within acceptable limits.
- Implement an action that will be consistent with and facilitate potential future cleanup efforts.

The selected alternative to achieve the interim action goals is the Hybrid Groundwater Corrective Action (HGCA). The HGCA includes one recirculation well and a series of groundwater extraction wells with an air stripper. The extraction wells and air stripper would be used to remove and treat the groundwater exceeding the cleanup goal in the TNX Area Groundwater OU. A recirculation well installed upgradient of the extraction wells would provide in situ treatment of contaminated groundwater and may stimulate the natural soil bacteria to degrade some of the contamination while in the aquifer.

Air emissions from the air stripper and recirculation well will be treated as necessary to comply with SCDHEC air pollution regulations. Mercury, gross alpha, and nitrate in the effluent from the treatment system will be monitored to ensure that they do not exceed discharge limits. If they begin to exceed discharge limits, the well causing the exceedance will be identified through sampling, and discharges from that well will be treated using methods similar to ion exchange or reverse osmosis.

## III. Determination of Current and Projected Protectiveness of the Action

Air stripping removes the contaminants from the recovered groundwater, reducing its toxicity. Volume of groundwater that may pose a risk to onsite workers will be reduced through reduction of contaminant mass in the portion of the plume exceeding the interim goal.

## IV. Areas of Noncompliance

None.

## V. Recommendations for Future Response Actions and/or Modifications to the ROD

None.

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