005437

United States Department of Energy

Savannah River Site

Record of Decision
Remedial Alternative Selection for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U)

WSRC-RP-97-850
Revision 1
July 1998

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DIVISION OF SITE
ASSESSMENT & REMEDIATION

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

SAFETY • RESPONSIBILITY • SECURITY
SRS
SAVANNAH RIVER SITE

Prepared for the U. S. Department of Energy under Contract No. DE-AC09-96SR18500

005437

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

C-, F-, K-, and P-Area Coal Pile Runoff Basins
(189-C, 289-F, 189-K, and 189-P)

WSRC-RP-97-850
Revision 1
July 1998

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

DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P)
Savannah River Site
Aiken, South Carolina

The C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (C-, F-, K-, and P-CPRBs) waste units are listed as Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Units/Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) units in Appendix C of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS). The C-, F-, K-, and P-CPRBs comprise a single operable unit which was remediated under an early removal action during the summer of 1997.

Statement of Basis and Purpose

This decision document presents the selected remedial alternative for the C-, F-, K-, and P-CPRBs located at the SRS in Aiken, South Carolina. The selected alternative was developed in accordance with CERCLA, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record File for this specific RCRA/CERCLA operable unit.

Assessment of the Site

Slightly elevated levels of naturally occurring metals and radionuclides in the coal-laden sediments and shallow soils were confined to the 0-1 foot interval below the basin floor. These source materials were identified as low level threat wastes. Under the *Removal Site Evaluation Report/Wastewater Closure Plan for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U)* (WSRC 1997b), the coal-laden sediments and shallow soils were removed from each of the four basins during the summer of 1997. At least four feet of clean backfill was placed in each basin to restore the area to the surrounding grade. This removal action completely freed the four CPRBs of the source material for the constituents of concern and the sulfide minerals, which were reducing the pH of the infiltrate. Because the source material has been removed from the CPRBs, releases of hazardous substances will not occur from this operable unit and there is no imminent or substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The preferred alternative for the C-, F-, K-, and P-CPRBs operable unit is No Further Action with a five-year period of confirmatory groundwater monitoring at the K-CPRB.

Gross alpha and the sum of radium-226 and radium-228 have occasionally exceeded maximum contaminant levels (MCLs) in the water table aquifer at the K-CPRB. Based on the groundwater monitoring history, no significant groundwater contamination has originated from the C-, F-, and P-CPRBs. The probable condition for the groundwater at all of CPRBs is no significant groundwater contamination resulting from the operation of the CPRBs. As a result, no remedial action is deemed appropriate for the water table aquifer at the CPRBs. Confirmatory groundwater monitoring, as discussed in Section IX of the ROD, will be conducted for five years at the K-CPRB. Confirmatory monitoring should demonstrate that No Further Action is the appropriate remedy. In the event that the probable condition is no longer appropriate, DOE, SCDHEC, and EPA (the three parties to the Federal Facility Agreement) will evaluate the need for remedial action.

The South Carolina Department of Health and Environmental Control has modified the SRS RCRA permit (SC1 890 008 989) to incorporate the selected remedy.

Statutory Determinations

The *Removal Site Evaluation Report/Wastewater Closure Plan for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U)* (WSRC 1997b) was reviewed and approved by the EPA and SCDHEC's Division of Site Assessment and Remediation and the Industrial, Agricultural and Storm Water Permitting Division. Following the completion of the removal action, SCDHEC inspected the four CPRBs and approved the final closure of these basins.

Based on the *Post Removal Action/Remedial Investigation Report for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U)* (WSRC 1997d), all low level threat source material was removed. The operable unit poses no significant risk to human health or the environment. Therefore, a determination has been made that No Further Action is required at the C-, F-, K-, and P-CPRBs and that CERCLA Section 121 is not applicable to this No Further Action ROD.

The selected remedy is protective of human health and the environment, complies with Federal and State of South Carolina requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This No Further Action remedy is a permanent solution. Because this remedy does not result in hazardous substances remaining on-site above health-based levels, the five-year review will not apply to this action.

7/13/98
Date

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Assistant Manager for Environmental Quality
U. S. Department of Energy, Savannah River Operations Office

9/14/98
Date

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11/10/98
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South Carolina Department of Health and Environmental Control

005437

DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

C-, F-, K-, and P-Area Coal Pile Runoff Basins
(189-C, 289-F, 189-K, and 189-P)

WSRC-RP-97-850
Revision 1
July 1998

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

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LIST OF ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or relevant and appropriate requirements
BEHP	bis(2-Ethylhexyl)phthalate
BRA	Baseline Risk Assessment
C-CPRB	C-Area Coal Pile Runoff Basin
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
C-, F-, K-, and P-CPRBs	C-, F-, K-, and P-Area Coal Pile Runoff Basins
CMS	Corrective Measures Study
CMS/FS	Corrective Measures Study/Feasibility Study
COC	Constituent of Concern
COPC	Constituent of Potential Concern
CPRB	Coal Pile Runoff Basin
CrVI	Chromium VI
CSM	Conceptual site model
DOE	U.S. Department of Energy
DQO	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
F-CPRB	F-Area Coal Pile Runoff Basin
FFA	Federal Facility Agreement
FS	Feasibility Study
HI	Hazard index
HQ	Hazard quotient
K-CPRB	K-Area Coal Pile Runoff Basin
MCL	Maximum contaminant level
mg/kg	Milligrams per kilograms
NCP	National Oil and Hazardous Substances Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
OU	Operable unit
P-CPRB	P-Area Coal Pile Runoff Basin
PP	Proposed Plan
PRA/RIR	Post-Removal Action/Remedial Investigation Report
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RG	Remedial Goal
RI	CERCLA Remedial Investigation
ROD	Record of Decision
SB	Statement of Basis
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SRS	Savannah River Site
SWMU	Solid waste management unit
USC	Unit-specific constituent
WSRC	Westinghouse Savannah River Company

I. SAVANNAH RIVER SITE AND OPERABLE UNIT NAME, LOCATION, DESCRIPTION, AND PROCESS HISTORY

Savannah River Site Location, Description, and Process History

The Savannah River Site (SRS) occupies approximately 310 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of western South Carolina. SRS is a secured U.S. Government facility with no permanent residents. SRS is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina (Figure 1).

SRS is owned by the U.S. Department of Energy (DOE). Management and operating services are provided by Westinghouse Savannah River Company (WSRC). SRS has historically produced tritium, plutonium, and other special nuclear materials for national defense and the space program.

Operable Unit Name, Location, Description, and Process History

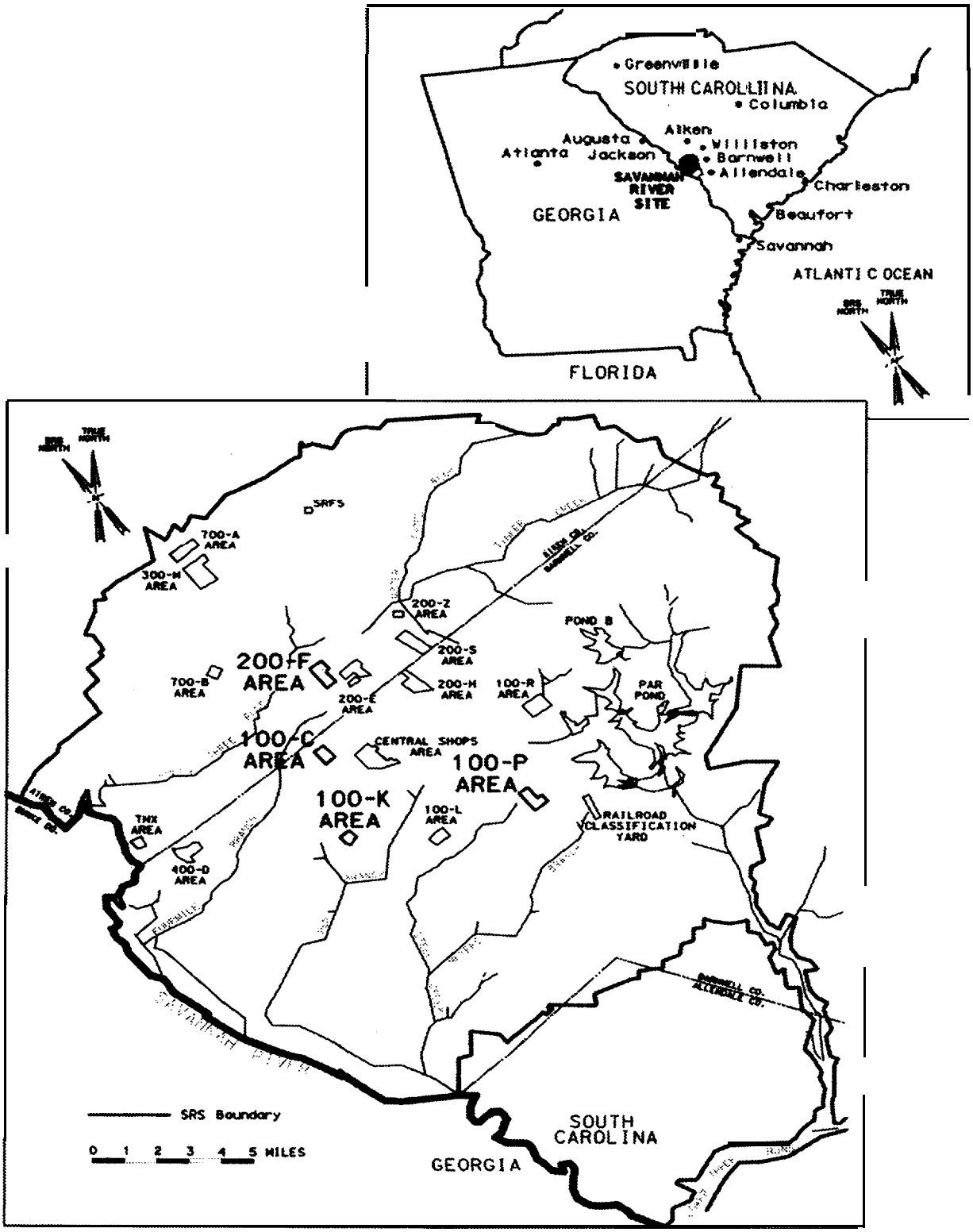
The operable unit (OU) comprises the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (C-, F-, K-, and P-CPRBs). The Federal Facility Agreement (FFA) lists the C-, F-, K-, and P-CPRBs as Resource Conservation and Recovery Act/Comprehensive Environmental Response, Compensation and Liability Act (RCRA/CERCLA) units requiring evaluation to determine the actual or potential impact to human health and the environment. Figures 2, 3, 4, and 5 show the location of each CPRB in relation to its host area and associated facilities. Table 1 summarizes the historical information and site-specific data for each CPRB.

The C-CPRB is located approximately 700 feet southeast of the limited area fence surrounding C Area (Figure 2) in northwestern Barnwell County, South Carolina. Surface drainage in the area is southwest to an unnamed, intermittent tributary of Fourmile Branch. The water table at the C-CPRB is approximately 50 ft below surface, and the flow direction is to the southwest at a gradient of 1.3 ft per 100 ft.

The F-CPRB is located approximately 50 feet southeast of the limited area fence surrounding F Area (Figure 3) in southwestern Aiken County. Surface drainage in southeastern F Area is toward the southeast to an unnamed tributary of Fourmile Branch. The water table at the F-CPRB is approximately 80 ft below surface, and the flow direction is to the southeast at a gradient of 1.5 ft per 100 ft.

The K-CPRB is located approximately 500 feet west of the limited area fence surrounding K Area (Figure 4) in northwestern Barnwell County. Surface drainage is toward the west-southwest to an unnamed tributary of Indian Grave Branch. The water table is approximately 50 ft below surface, and the flow direction is to the west-southwest at a gradient of 0.6 ft per 100 ft.

Figure 1. Savannah River Site Map showing the Locations of C, F, K, and P Areas and Other Major SRS Facilities



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Esther Palmer
Administrative Record File Coordinator
November 2002

Table 1. Summary of Historical Information and Site-specific Data for C-, F-, K-, and P-Area Coal Pile Runoff Basins and Associated Facilities

Location	Period of Powerhouse Operation	Period of Operation of Coal Pile Runoff Basin	Date Coal was Removed from Coal Pile Storage Area	Coal Pile Runoff Basin Length x Width x Average Depth (ft) Surface Area (sq ft) Surface Area (acres) Capacity (gals)	Pipeline Length (ft) x Diameter (in) Depth of Burial (ft) Extension during Removal Action (ft)	Coal Pile Storage Area Dimensions (ft) Area (sq ft) Area (acres)	Typical Amount of Coal in Storage Area (tons)
C Area	1954-1984	1981-1985	1985	170' x 170' x 4' 28,900 sq ft 0.66 acres 864,000 gals	1300' x 18" 3-8' 148' added across basin	175' x 170' 30,000 sq ft 0.69 acres	3,600 (from 1983 to 1985 contained less than 1000 T)
F Area	1953-1984	1981-1985	1985	270' x 270' x 5' 72,900 sq ft 1.67 acres 2,727,000 gals	900' x 30" >2' No pipe added	400' x 275' 110,000 sq ft 2.53 acres	10,000
K Area	1954-1990	1981-1990	1997	290' x 300' x 4' 87,000 sq ft 2.00 acres 2,603,000 gals	1000' x 30" 3.5-6.5' 348' added across basin	480' x 250' 120,000 sq ft 2.75 acres	16,000 (from 1990 to 1997 contained less than 5000 T)
P Area	1953-1990	1981-1990	1997	290' x 290' x 4' 84,100 sq ft 1.93 acres 2,517,000 gals	530' x 36" >2' 284' added across basin	480' x 250' 120,000 sq ft 2.75 acres	16,000 (from 1990 to 1997 contained less than 2000 T)

The P-CPRB is located approximately 330 feet southeast of the limited area fence surrounding P Area (Figure 5) in northwestern Barnwell County. Surface drainage is toward the southeast to Meyers Branch. The water table is approximately 25 ft below surface, and the flow direction is to the southeast at a gradient of 1.88 ft per 100 ft.

Originally coal-fired power plants produced steam and electricity for Savannah River Site (SRS) activities. Stoking coal was stored in unsheltered stockpiles at each of the power plant locations. CPRBs were constructed in 1981 at C, F, K, and P Areas to protect surface water from coal pile contaminants such as suspended solids, sulfuric acid, metals, radionuclides, and semi-volatile organic compounds. The power plants at C, F, K, and P Areas have been inactive for several years.

II. SRS AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational History

The SRS was created in 1951 with the primary mission of producing tritium, plutonium, and other special nuclear materials for our nation's defense program. Production of nuclear materials for the defense program was discontinued in 1988. SRS has provided nuclear materials for the space program, as well as medical, industrial, and research efforts up to the present. Chemical and radioactive wastes are byproducts of nuclear material production processes. These wastes have been treated, stored, and in some cases, disposed at SRS. Past disposal practices have resulted in soil and groundwater contamination in some areas.

SRS Compliance History

Hazardous Waste handled at SRS is regulated under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities have required federal operating or post-closure permits under RCRA. The SRS 1995 RCRA Renewal Permit (SC1 890 008 989) was issued on September 5, 1995 by the South Carolina Department of Health and Environmental Control (SCDHEC). Section IV of this hazardous waste permit contains corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List (NPL). This inclusion created a need to integrate the established RCRA 3004(u) Program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA, DOE has negotiated a Federal Facility Agreement (FFA) (WSRC 1993a) with the U.S. Environmental Protection Agency (EPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements.

Operable Unit Compliance History and Removal Action

The C-, F-, K-, and P-CPRBs are listed in the FFA as RCRA/CERCLA units requiring evaluation to determine the actual or potential impact to human health and the environment. The C-, F-, K-, and P-CPRBs were combined in a single operable unit under the *Removal Site Evaluation Report/Wastewater Closure Plan for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U)* (WSRC 1997b) (RSER/WCP).

A RCRA Facility Investigation/CERCLA Remedial Investigation (RFI/RI) characterization was conducted for the K-CPRB in 1994 and 1995. The RFI/RI and Baseline Risk Assessment (BRA) conducted on the K-CPRB demonstrated that toxic metals, radionuclides, and semi-volatile compounds were largely confined to coal-laden sediments in the basin. These constituents, concentrated in the 0.0-1.0 ft interval of coal-laden sediments and soils within the basin, are naturally occurring constituents of coal. The results of the RFI/RI and Baseline Risk Assessment (BRA) were presented in the RFI/RI/BRA Report (WSRC 1997a). The report was submitted in accordance with the FFA and the approved implementation schedule approved by the EPA and SCDHEC in February 1997. In accordance with the FFA and the approved implementation schedule, the Corrective Measures Study/Feasibility Study (CMS/FS) (WSRC 1997c) for the K-CPRB was submitted by SRS and approved by EPA (June 13, 1997) and SCDHEC (August 7, 1997). A preliminary RFI/RI/BRA (WSRC 1996) was also conducted for the C-CPRB, the development of this document was discontinued after the RSER was approved with the K-CPRB as the lead site.

Because coal from the same sources was used in all four of these power plants and the CPRBs were all located in similar upland soils, the contaminant suite, the distribution of the contaminants, and the risks and hazards attributed to these contaminants are similar. The RFI/RI/BRA (WSRC 1997a) report for the K-CPRB and the preliminary RFI/RI/BRA for the C-CPRB (WSRC 1996) document the similarity of conditions in the two CPRBs. Thus it was not necessary to characterize the F- and P-CPRBs as rigorously as the C- and K-CPRBs, resulting in a considerable reduction in the time necessary to effect remediation of the four basins.

The coal-laden sediments and shallow soils were identified as low level threat source materials because the material represented relatively low risks to humans and the ecology, had a low to moderate potential for migration, and was easily contained or removed. Specifically, the risk assessment concluded that the contaminants found in the 0.0-1.0 foot interval of basin sediments and soils contributed to a carcinogenic risk of 6.0×10^{-5} to possible future on-unit residents via the shallow soil ingestion pathway at the K-CPRB. The carcinogenic risks to future on-unit residents from the contaminants in the coal-laden sediments via the groundwater ingestion pathway based on the unit soil and groundwater data were calculated to be 7.0×10^{-6}.

Since the coal-laden sediments at the K-CPRB were determined to be the source of gross alpha contamination to the shallow groundwater, and the coal-laden sediments at the other basins were determined to be potential sources of groundwater contamination, it was appropriate to remove these low level threat source materials. In addition to mitigating groundwater contamination, the removal reduced the risk associated with exposure to sediment and near surface soils and is consistent with the statutory preference for treatment and a desire to alleviate or minimize the need for engineering/institutional controls.

Working under the RSER/WCP, during the summer of 1997, SRS removed the coal-laden sediments and soils in the C-, F-, K-, and P-CPRBs. The basins were backfilled to grade with clean soil. The remaining coal was also removed from the K-Area Coal Stockpile under the RSER/WCP. Before the removal action began, the remaining coal at the P-Area Coal Stockpile was transported to an active SRS power plant as a separate activity. The coal was removed from the coal stockpile areas in C and F Areas in 1985 (Table 1) and the former storage areas were used for other purposes.

The 1997 removal action is summarized in Table 2. Figures 6 through 9 show photographs of the basins before, during, and after the removal action. The 13,100 tons of coal, coal-laden sediment, and soils were transported to Southeastern Soil Recovery, Inc. where the material was thermally treated. This facility was approved under the CERCLA Offsite Rule. The residual material is being used for road base.

The C-, F-, K-, and P-CPRBs were cleaned out to a planar surface at least four feet below the proposed final grade. All coal was removed from the C-, F-, K-, and P-CPRBs and the K-Area Coal Stockpile. This eliminated the source of potential exposure to shallow soils for future industrial workers and on-unit residents and the source of potential groundwater contamination at the C-, F-, and P-CPRBs. The groundwater at the K-CPRB exhibits elevated gross alpha attributed to the operation of the K-CPRB. In the case of the K-CPRB, the prior removal action should prevent further groundwater contamination. The action completely removed at least the 0-1 foot interval, which contained the highest concentrations of the constituents of concern (COCs) in the CPRBs. The basins were backfilled with a minimum of four feet of clean native soil, eliminating the potential for exposure of future workers and on-unit residents during future excavation activities. The backfill was graded to minimize ponding and to reduce infiltration and the potential for erosion; a vegetative cover was established to prevent erosion.

The buried, reinforced-concrete pipelines, which had conveyed stormwater runoff from the coal stockpiles to the CPRBs, were extended across the backfilled basins at the C-, K-, and P-CPRBs (Table 1) because these pipelines were still being used to manage stormwater runoff from the former coal stock piles and surrounding areas. After the coal was removed from the F-Area Coal Stockpile in early 1985, the upline end

Table 2. Summary of the Removal Actions at the C-, F-, K-, and P-Area Coal Pile Runoff Basins

Facility	Start Date	End Date	Coal-laden Sediments and Soil Removed (tons)	Fill Added (tons)
C-CPRB	May 20, 1997	August 1, 1997	673.0	3300
F-CPRB	May 13, 1997	July 18, 1997	1725.0	16,050
K-CPRB	May 20, 1997	September 3, 1997	2691.3	15,300
K-Coal Pile	May 26, 1997	August 8, 1997	4536.5	1800
P-CPRB	May 26, 1997	August 19, 1997	3471.0	22,425
Totals		1.5 tons per cubic yard	13,096.8 tons	58,875 tons

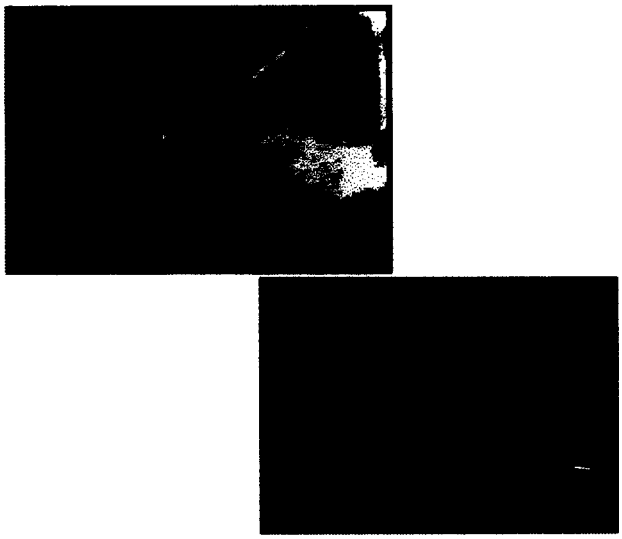
of the F-CPRB pipeline was plugged. During the removal action, the basin end of the line was plugged. The F-CPRB pipeline is buried and will remain in place.

EPA approved the RSER/WCP on March 13, 1997. The RSER/WCP was also reviewed and approved on April 25, 1997 by the Industrial, Agricultural and Storm Water Permitting Division of SCDHEC and by the Federal Facility Agreement Section of the Bureau of Land and Waste Management of SCDHEC. On October 6, 1997, the Lower Savannah Environmental Quality Control District of SCDHEC inspected the C-, F-, K-, and P-CPRBs and approved the closure of the basins. The *Statement of Basis/Proposed Plan for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U)* (WSRC 1997e) (SB/PP) was approved by EPA on January 21, 1998 and SCDHEC on January 26, 1998.

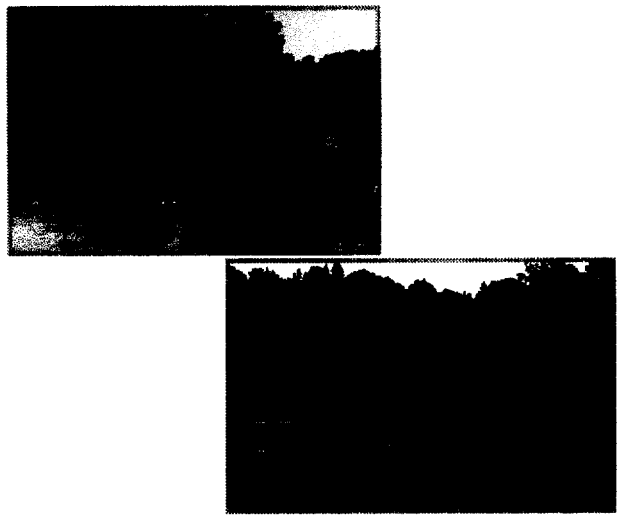
III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require the public be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA. These requirements include establishment of an Administrative Record File that documents the investigation and selection of the remedial alternatives for addressing the C-, F-, K-, and P-CPRBs soils and groundwater. The Administrative Record File must be established at or near the facility at issue. The SRS Public Involvement Plan (PIP) (DOE, 1994) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. The SRS PIP addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act, 1969 (NEPA). SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an

Figure 6. C-Area Coal Pile Basin Before, During, and After the Removal Action in 1997



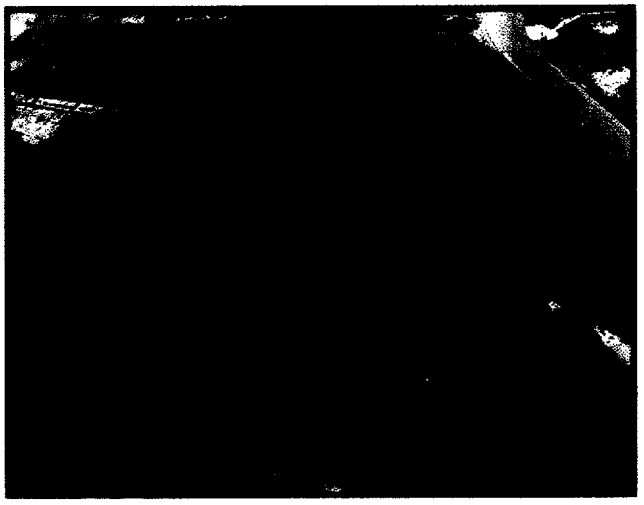
C Area Basin (CPRB) - before



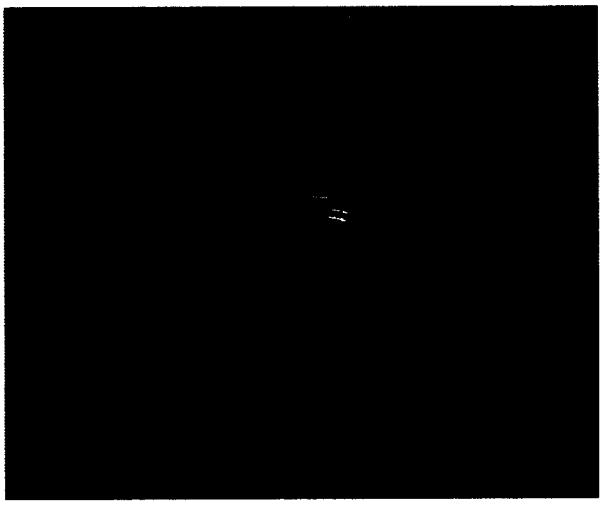
C Area Basin (CPRB) - during

C Area Basin (CPRB) - after

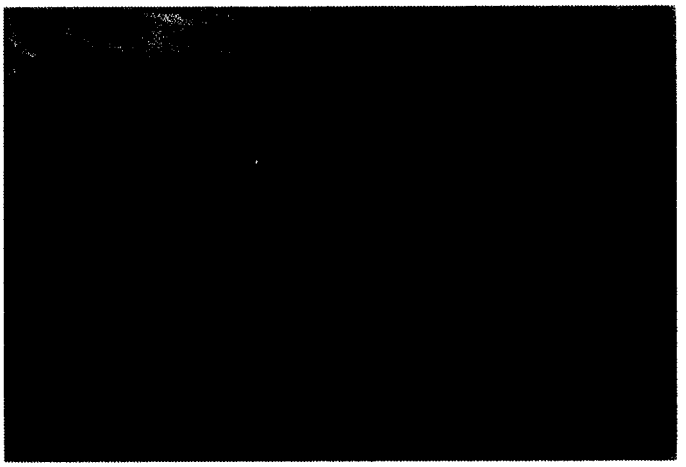
Figure 7. F-Area Coal Pile Basin Before, During, and After the Removal Action in 1997



F Area Basin (CPRB) - before



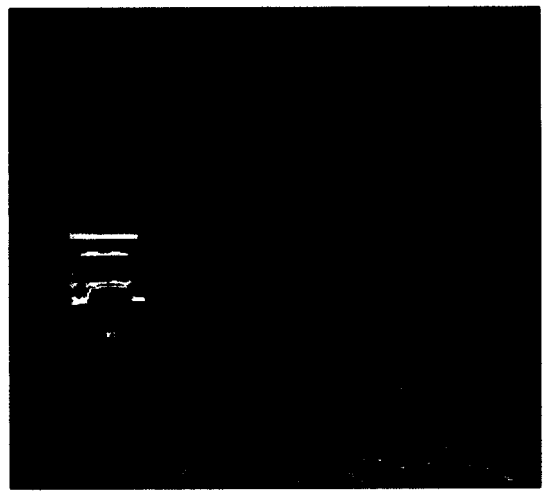
F Area Basin (CPRB) - during



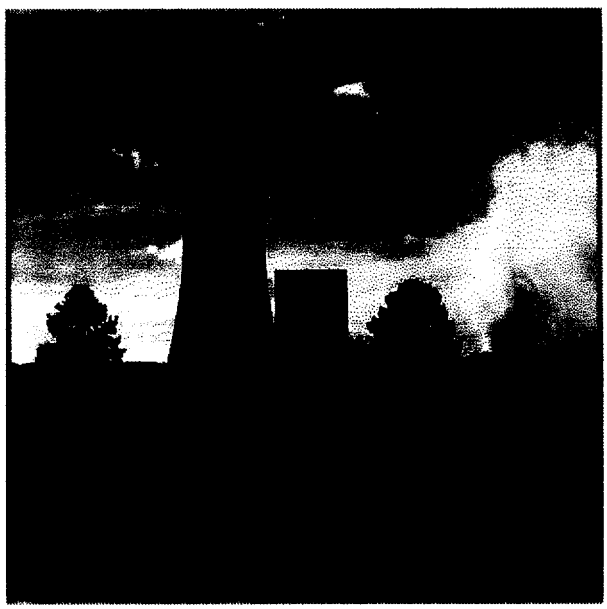
F Area Basin (CPRB) - after

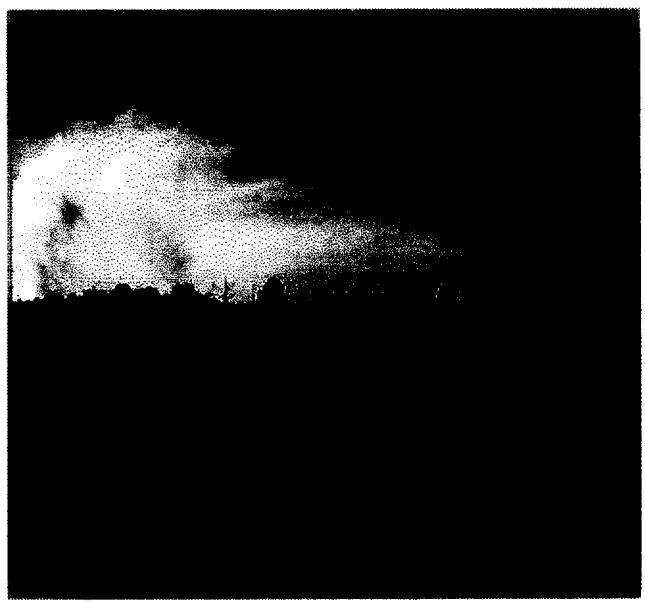
Figure 8. K-Area Coal Pile Basin Before, During, and After the Removal Action in 1997

K Area Basin (CPRB) before



K Area Basin (CPRB) - during





K Area Basin (CPRB) - after

opportunity to participate in the selection of the remedial action. The SB/PP, a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the C-, F-, K-, and P-CPRBs.

The FFA Administrative Record File, which contains the information pertaining to the selection of the response action, is available at the EPA Region IV office in Atlanta, Georgia, and at the following locations:

U. S. Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina-Aiken
171 University Parkway
Aiken, South Carolina 29801
(803) 641-3465

Thomas Cooper Library
Government Documents Department
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

Reese Library
Augusta State University
2500 Walton Way
Augusta, Georgia 30910
(706) 737-1744

Asa H. Gordon Library
Savannah State University
Tompkins Road
Savannah, Georgia 31404
(912) 356-2183

The public was notified of the public comment period on the SB/PP through the *SRS Environmental Bulletin*, a newsletter sent to approximately 3,500 citizens in South Carolina and Georgia. Notices were also published in the *Aiken Standard*, the *Allendale Citizen Leader*, the *Augusta Chronicle*, the *Barnwell People-Sentinel*, and *The State* newspapers. The public comment period was also announced on local radio stations.

The 45-day public comment period began on February 12, 1998 and ended on March 28, 1998. No comments were submitted on the SB/PP. A Responsiveness Summary, prepared to address public comments, is usually provided in Appendix A of the ROD and in the final RCRA Permit; as no comments were received on the SB/PP, Appendix A has been omitted from this ROD.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT WITHIN THE SITE STRATEGY

The removal action at the C-, F-, K-, and P-CPRBs eliminated the potential for exposure of human and ecological receptors to low level threat waste in shallow soils and removed the source of potential groundwater contamination. Local groundwater at the C-, F-, K-, and P-CPRBs is not currently used as a drinking water source. Based on the groundwater monitoring history at the C-, F-, and P-CPRBs, no significant groundwater contamination has originated from these units. Gross alpha and the sum of radium-226 and radium-228 have occasionally exceeded maximum contaminant levels (MCLs) in the water table aquifer at the K-CPRB. These levels have shown a historical decline and with the source removed, the

expectation is that the sporadic exceedances will end. The No Further Action Alternative with confirmatory groundwater monitoring at the K-CPRB (EPA 1991) is appropriate because the confirmation sampling will address any remaining concerns.

The No Further Action Alternative means that no further remedial action will be performed on the CPRBs. The waste has been removed and the Remedial Goals (RGs) have been met. The excavation has been covered with at least four feet of clean soil backfill. The CPRBs are located in areas which have been recommended for industrial use by the Citizens Advisory Board and the *Savannah River Site Future Use Project Report* (DOE 1996).

V. OPERABLE UNIT CHARACTERISTICS

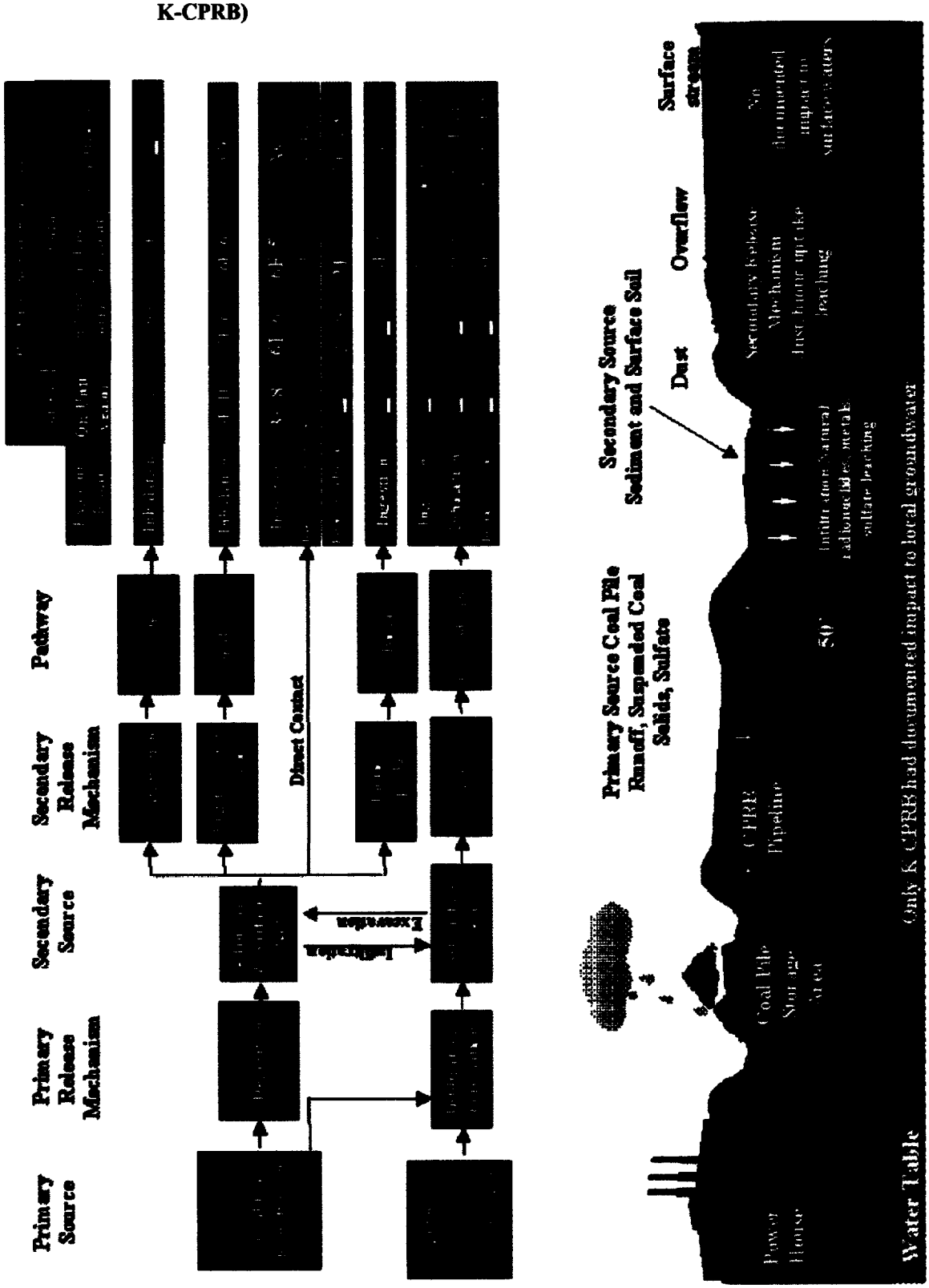
A conceptual site model (CSM) was developed for the K-CPRB to identify the primary sources, primary contaminated media, migration pathways, exposure pathways, and potential receptors for the K-CPRB. The K-CPRB CSM, modified for a typical CPRB, is presented in Figure 10. The RFI/RI/BRA Reports for the C- (WSRC 1996) and K-CPRB (WSRC 1997a), RSER/WCP (WSRC 1997b), and PRA/RIR (WSRC 1997d) contain analytical data for all of the environmental media samples taken in the characterization of the C- and K-CPRBs. The PRA/RIR documents the confirmatory data obtained during the removal action at the F- and P-CPRBs. These documents are available in the Administrative Record (See Section III).

As previously stated in Section IV, the highest potential risk is primarily restricted to the coal-laden sediments and shallow soils within the CPRB. The RSER/WCP summarized the groundwater monitoring history at each of the four CPRBs and concluded that impacts on local groundwater had not exceeded Primary Drinking Water Standards at any of the CPRBs except the K- CPRB. Confirmatory groundwater monitoring and reporting for gross alpha and radium at the K-CPRB has been initiated with the scheduling of second quarter 1998 sampling at the KCB monitoring wells.

CPRB Primary Sources and Release Mechanisms

The primary source of potential contamination was coal-laden stormwater runoff discharged to the CPRBs from the coal storage areas via the gravity flow, reinforced-concrete CPRB pipelines (see Figure 12). After the power houses became inactive, no new coal was delivered to the coal storage areas and the available coal fines, which could be transported by stormwater runoff, were depleted from any remaining coal in the storage area. Because of the large volumes of runoff that passed through the pipelines after the C-, K-, and P-CPRBs became inactive, it is unlikely that any residual coal remains in the pipelines.

Figure 10. Flow Chart and Graphical Depiction of the Conceptual Site Model for a Typical CPRB Showing Maximum Risk and Principal Driver for Potential Human Receptors (Risks from K-CPRB)



The primary release mechanisms are deposition inside the basin, deposition outside the basin from overflow, deposition on the pipeline interior surfaces, and leakage of the pipeline (see Figure 12). The most significant of these mechanisms is the release of unit contaminants as solid particles to the sediments and surface soil in the basin bottom.

CPRB Secondary Sources and Release Mechanisms

Secondary sources include the following media impacted by the coal-laden stormwater runoff: sediment and shallow (0- 1 ft) soil in the CPRBs, surface water in the basin that accumulates from precipitation and runoff, surface and subsurface soil around the basin, and subsurface soil along the pipeline (see Figure 9). The maximum concentrations of the major risk drivers such as arsenic and beryllium in the soils along the C- and K-CPRB pipelines are generally less than half the maximum concentrations found in the basin soils. The highest risk to future residents from the soil along the K-CPRB pipeline is 1×10^{-5} due to ingestion of excavated subsoil; the risk via all other exposure pathways is less than 1×10^{-6}. The highest hazard index for the K-CPRB pipeline is 1.0 to the child-resident by subsoil ingestion. During the RFI/RI at the K-CPRB, no carcinogenic or radiological constituents of concern (COCs) were recognized in the soils of the overflow area; only aluminum, antimony, and iron were identified as non-carcinogenic COCs. The hazard indices to future workers and possible residents were less than 1.0. All constituents detected in the soils of the C-CPRB overflow area were less than two times background or residential risk-based concentrations. No action is warranted for the pipelines or overflow areas.

During the RFI/RIs conducted at the C- and K-CPRBs in 1994 and 1995, a total of five soil borings was performed in each basin. The BRA determined that the constituents of concern (before the removal action) for the K-CPRB soils were

- aldrin (via groundwater ingestion),
- antimony,
- arsenic,
- beryllium,
- bis(2-ethylhexyl)phthalate (via groundwater ingestion),
- chromium VI
- radium-226, and
- radium-228.

The COCs identified for the basin soils in the K-CPRB (antimony, arsenic, beryllium, chromium, radium-226, and radium-228) are all natural trace element constituents of coal. The maximum concentrations of the constituents of concern were confined to the 0-1 ft interval (removed under the RSER/WCP) with the exception of radium-226 and radium-228. In the K-CPRB, the maximum values for radium-226 (0.97 pCi/g) and radium-228 (2.23 pCi/g) were found in the 1-3 ft interval and the 3-5 ft interval, respectively; 2 x average background values for radium-226 and radium-228 in the deep (>5 ft) soils near the K-CPRB were 1.32 pCi/g and 2.4 pCi/g. Radium-226 is a daughter product of naturally occurring uranium-238, and

radium-228 is a daughter product of naturally occurring thorium-232. Both uranium-238 and thorium-232 are natural constituents of soils developed on the Coastal Plain sediments.

During the removal action, samples were collected from the 0-2 ft and 2-4 ft intervals below the cleanout elevation in the F- and P-CPRBs. The maximum values for the COCs (WSRC 1997d) are all less the maximum values reported from the 0-1 ft interval in the K-CPRB. The cleanout surface at each basin was covered with at least four feet of clean backfill, eliminating all potential for exposure to the soil under the future on-unit resident scenarios.

Secondary release mechanisms associated with these sources include direct contact, fugitive dust generation from exposed surface soil, biotic uptake, and leaching to groundwater. The most significant of these secondary release mechanisms are direct contact and leaching to unit groundwater. The quantified risks associated with these and other exposure routes are summarized in Section VI.

At the K-CPRB, gross alpha has exceeded its MCL (15.0 pCi/L) in nine groundwater samples out of a total of 18 analyzed for gross alpha from downgradient well KCB 3 since the first quarter of 1988. The maximum value for gross alpha was 52.8 pCi/L in the third quarter of 1988; the most recent gross alpha value was 17.5 pCi/L in the first quarter of 1996. The occurrence of elevated gross alpha is sporadic and the levels appear to be declining (WSRC 1997b). Gross alpha has not exceeded its MCL in the other downgradient wells (KCB 5 and 6). Many of the metals found in coal are in sulfide minerals; these minerals weather to produce sulfuric acid. The sulfuric acid may accelerate the leaching of contaminants from the coal-laden sediments or may leach contaminants from the Coastal Plain sediments, which are the parent material of all the local soils. The alpha emitters (including radium-226) dissolved in the groundwater may be from the coal or may have been leached from the Coastal Plain sediments by the acidic coal pile leachate; in either case, removing the coal and sulfide minerals and reducing infiltration will reduce the levels of alpha activity in the local groundwater.

Summary of CPRB Primary and Secondary Sources

The characterization of the primary and secondary sources associated with the CPRBs indicates that the principal human health risk drivers (arsenic and beryllium) are concentrated in the coal-laden sediments and soil in the 0-1 ft interval restricted to the basins. Radium-226 and radium-228, which are the only radiological risk drivers, are below the 2 x mean background screening criteria and are natural constituents of both the coal-laden sediments and the underlying soils. No man-made radionuclides, organic compounds, or metals were consistently identified in unit soils at concentrations above screening levels that would indicate contamination from unit operations.

VI. SUMMARY OF OPERABLE UNIT RISKS

As part of the investigation/assessment process for the K-CPRB, the lead site for the C-, F-, K-, and P-CPRB operable unit, a BRA was performed using data generated during the assessment phase. Detailed information regarding the development of COPCs, the fate and transport of contaminants, and the risk assessment can be found in the RFI/RI/BRA (WSRC 1997a). The risk assessment is based on conditions that existed in the K-CPRB before the removal action. During the removal action, SRS completely removed the 0-1 ft interval, containing the highest concentrations of the COPCs and covered the remaining sub-basin soils with a minimum of four feet of clean backfill, eliminating the future residential exposure to excavated soil scenario.

An exposure assessment was performed to provide an indication of the potential exposures that might occur based on the chemical concentrations detected during unit-specific sampling activities. The current land use scenario is an inactive industrial site. The only current exposure scenario identified for the K-CPRB was for on-unit visitors, who may perform environmental research such as groundwater sampling on a limited and intermittent basis at the K-CPRB. Conservative future exposure scenarios identified for the K-CPRB included future on-unit industrial workers and future on-unit resident adults and children. The future residential scenario includes homegrown produce as an exposure point, which is not considered under the current on-unit visitor or future industrial worker scenarios. Risks and hazards from exposures under the two land use scenarios at K-CPRB are presented in Figure 10 and Table 3. All risks and hazards to current on-unit visitors were less than 1×10^{-6} and 1.0, respectively (Figure 10).

The media evaluated in the BRA include soil inside the K-CPRB, soil along the K-CPRB pipeline, and soil in the K-CPRB overflow area. Aluminum, antimony, and iron were the only human health COPCs recognized for the overflow area; these are all naturally occurring metals. Slope factors are not available for these constituents. The overflow area does not represent significant risk or hazard to potential human or ecological receptors, and no action is warranted for the overflow area. The calculated risks for the shallow (0-1 foot) basin soils are evaluated under current and future land use scenarios in the following paragraphs.

<u>Current Land Use - Carcinogenic Risks (K-CPRB)</u>

Under the current land use scenario, human health risks were characterized for the current on-unit visitor (see Figure 10). The highest estimated radiological cancer risk for any pathway was 3×10^{-8} from ingestion of shallow (0-1 ft) basin soils, including the coal-laden sediments. This risk level is below the EPA point of departure 1×10^{-6} and the risk range for NPL sites. Radiological cancer risks were not evaluated for current on-unit visitors because no radionuclides were identified as COPCs.

Table 3. Human Health Risk Summary for the K-CPRB - Future Exposures

	Basin Surface Soil (0-1 ft)	Basin Deep Soil (0-5 ft)	Pipeline Surface Soil (0-1 ft)	Pipeline Deep Soil (0-5 ft)	Overflow Area Surface Soil	Overflow Area Deep Soil	Groundwater Basin Soil (0-1 ft)	Ingestion of Produce Basin Soil (0-1 ft)	Air (Particulate Inhalation Basin)
Nonradiological Carcinogenic Risk									
Future On-Unit Worker	6×10^{-6} (ingested) As 91%	4×10^{-6} (ingested) As 88%	6×10^{-7} (ingested) Be 100%	1×10^{-6} (ingested) As 70% Be 30%	NC	NC	2×10^{-6} (ingested) Aldrin 49% BEHP 42%	NA	2×10^{-6} (excavated) Cr 88%
Future On-Unit Resident	6×10^{-5} (ingested) As 91%	3×10^{-5} (ingested) As 88%	5×10^{-6} (ingested) Be 100%	1×10^{-5} (ingested) As 70% Be 30%	NC	NC	5×10^{-6} Chloroform (inhalation of VOCs) 7×10^{-6} (ingestion) Aldrin 49, BEHP 42%	3×10^{-5} Fruit, Leafy, Tuberous As 98%	6×10^{-6} (excavated) Cr 88%
Radiological Carcinogenic Risk									
Future On-Unit Worker	NE	2×10^{-5} (external) Ra-228	NE	NE	NE	NE	2×10^{-5} (ingested) Ra-226 81%	NA	1×10^{-12} (excavated) Ra-228
Future On-Unit Resident	NE	2×10^{-5} (external) Ra-228	NE	NE	NE	NE	4×10^{-5} (ingested) Ra-226 83% Ra-228 17%	2×10^{-5} Total Ra-228	1×10^{-12} (excavated) Ra-228
Noncarcinogenic Hazard									
Future On-Unit Worker	0.09 (ingestion) Fe 48% As 38%	0.07 (ingestion) Fe 49% As 29%	0.05 (ingestion) Fe 86%	0.05 (ingestion) Fe 68% Al 14%	0.05 (ingestion) Fe 90%	0.05 (ingestion) Fe 89%	2.0 (ingestion) Nitrate 51% Mn 40%	NA	0.01 (excavated) Mn 100%
Future On-Unit Resident	0.7 0.5 Soil ingestion by Adult 2.0 2.0 Soil ingestion by Child Fe 49% Fe 49% As 38% As 38%		0.3 Adult 1.0 Child Fe 86% Al 14%	0.3 Adult 1.0 Child Fe 68% Al 14% As 10% Sb 8%	0.4 Adult 1.0 Child Fe 90% Al 10%	0.4 Adult 1.0 Child Fe 89% Sb 11%	6.0 (Adult/ingestion) 10.0 (Child/ingestion) Nitrate 51% Mn 40%	0.2 Adult 0.3 Child Total As 80% Fe 16%	0.02 Adult 0.07 Child (excavated) Mn 100%

NA - Pathway not applicable for receptor. NC - No risk calculated because slope factors are not available for COPCs NE - Pathway not evaluated for receptor.

Note: The number following the COPC indicates its contribution to the risk or hazard by percent

Current Land Use - Noncarcinogenic Hazards (K-CPRB)

Under the current land use scenario, noncarcinogenic hazards were characterized for the current on-unit visitor. The RFI/RI/BRA (WSRC 1997a) shows that potential adverse noncarcinogenic health effects are not likely to occur, because none of the hazard indices exceed a value of 1.0.

Future Land Use - Carcinogenic Risks (K-CPRB)

For the future on-unit worker, cancer risk from radiological constituents (naturally occurring radium-228) exceeded the 1×10^{-6} risk level for external radiation. The highest risk was 2×10^{-5} for direct radiation from excavated (0-5 ft) soils in the K-CPRB (see Table 3). Ingestion of radium-226 in groundwater drove a risk of 2×10^{-5} for future on-unit workers. Cancer risks for nonradiological carcinogens were all between 1×10^{-6} and 1×10^{-4}. The highest risk for future on-unit workers was 6×10^{-6} from ingestion of soil from the 0-1 ft interval. The risk from particulate inhalation of excavated (0-5 ft) soil was 2×10^{-6}, primarily driven by chromium-VI (CrVI). The risk for ingestion of groundwater by future on-unit workers was estimated at 2×10^{-6} driven by aldrin and bis(2-ethylhexyl)phthalate (BEHP). Aldrin was detected one time (J0.0164 ug/L in well KCB3). The "J" qualifier indicates that the analytical result is an estimated value; BEHP is a constituent of vacuum pump oil and may be a laboratory contaminant.

For the future on-unit resident, cancer risks from exposure to external radiation exceeded the point of departure (1×10^{-6}) for K-CPRB excavated soils. Risks are estimated at approximately 2×10^{-5} (primarily radium-228) for external radiation exposure. Radium-226 was the dominant contributor to a radiological groundwater ingestion risk of 4×10^{-5}. Cancer risks for nonradiological carcinogens exceeded 1×10^{-6}. The risk to future residents from the ingestion of shallow soil was estimated at 6×10^{-5} driven by arsenic. The risk of 6×10^{-6} from inhalation of excavated K-CPRB soils is due primarily to CrVI. Groundwater ingestion produced a risk of 7×10^{-6} driven by aldrin and BEHP.

Future Land Use - Noncarcinogenic Hazards (K-CPRB)

For the future on-unit worker, the hazard indices (HIs) were less than 1.0 for all constituents and exposure pathways except groundwater ingestion (2.0) driven by nitrate and manganese. For the future on-unit resident, the HIs were less than 1.0 for adult residents for all constituents and exposure pathways except for groundwater ingestion (6.0) driven by nitrate and manganese. The HI for future resident children was 10.0 for groundwater ingestion, also driven by nitrate and manganese. Shallow-soil ingestion by future resident children results in an HI of 2.0 driven by iron and arsenic.

Ecological Risk Assessment Results for the K-CPRB

The ecological risk assessment evaluated the likelihood of adverse ecological effects from exposure to chemicals associated with the K-CPRB. The ecological setting of the unit is not unique. There are no

known endangered, threatened, or special concern species on the unit, nor are the species that inhabit the unit rare in the region or considered to be of special societal value. The area of the unit is small and the habitat is low in diversity and productivity.

Based on characterization of the environmental setting and identification of potential receptor organisms, a CSM for the K-CPRB (available in the BRA) was developed to determine the complete exposure pathways through which ecological receptors could be exposed to COPCs. The focused evaluation addressed small mammals inhabiting the unit (represented by the oldfield mouse).

Interpretation of the ecological significance of the unit-related contamination at the K-CPRB indicated that there was no likelihood of unit-related radiological or nonradiological constituents causing significant impacts to biotic communities in the vicinity of the unit. No ecological COCs were identified for the K-CPRB.

COCs and Human Health Risk-Based Remedial Goals

Primary COCs in the human health risk assessment are defined as constituents that either individually produce or significantly contribute to risk estimates that exceed a 1×10^{-4} risk or an HI of 3 by selecting individual COCs exceeding a risk of 1×10^{-6} or a hazard quotient (HQ) of 0.1 in any pathway. Secondary COCs which have a chemical-specific carcinogenic risk of at least 1×10^{-6} risk and a noncarcinogenic hazard of 0.1 that contributes to a pathway hazard of 1.0 or greater. The K-CPRB soil poses a potential threat to human health through exposure to five secondary COCs and the groundwater poses a potential human health threat through exposure to two primary and 13 secondary COCs. The primary and secondary COCs for the K-CPRB soil and groundwater are presented in Table 4.

Remedial Goals (RGs) are human health risk-based calculations performed on COCs which are primary contributors of potential risk and/or adverse effects for the future resident scenario. Because the hypothetical future scenarios usually yield the most conservative RG, future resident and on-unit worker RGs are presented in Table 4 for the primary and secondary COCs identified for the K-CPRB soil and groundwater.

Contaminant Threat Review

A review of the contamination present in the sediments and shallow soils within the CPRBs indicates that these source materials are low level threat wastes. The sediments and shallow soils in the 0-1 foot interval contained low concentrations of naturally occurring metals and radionuclides, which contributed to human

Table 4. K-CPRB COCs and Risk/Based Remedial Goals

COC	Units	RGs to Achieve 1×10^{-6} Risk and 1.0 HI Future Resident Adult and Child	RGs to Achieve 1×10^{-6} Risk and 1.0 HI Future On-unit Worker	Maximum Detected Concentration
Primary Groundwater COCs				
Manganese	mg/L	0.075	0.51	1.76
Nitrate/Nitrite	mg/L	24.76	163.31	148
Secondary G'water COCs				
Aldrin	mg/L	3.9E-6	ND	0.000016
Aluminum	mg/L	15.53	102.13	62.3
Arsenic	mg/L	4.5E-5	0.03	0.012
Barium	mg/L	1.062	ND	0.46
Beryllium	mg/L	1.5E-5	ND	0.003
Bis(2ethylhexyl)phthalate	mg/L	4.5E-3	ND	0.033
Chloroform	mg/L	8.3E-4	ND	0.0042
Chromium (hexavalent)	mg/L	0.068	0.51	0.127
Iron	mg/L	4.64	30.66	74.1
Lead	mg/L	ND	ND	0.181
Nickel	mg/L	0.31		0.086
Vanadium	mg/L	0.108	0.72	0.173
Zinc	mg/L	4.67	ND	3
Secondary Soil COCs				
Aluminum	mg/kg	77649.4	ND	18000
Antimony	mg/kg	30.53	ND	9.71
Arsenic	mg/kg	18.64	ND	22.1
Iron	mg/kg	22421.4	ND	28500
Vanadium	mg/kg	542.6	ND	121

ND Not determined

health risks well below 1 X 10-3. These low level threat wastes have been completely removed from the CPRBs and the basins have been backfilled to grade with clean soil.

Site-Specific Considerations

The RFI/RI/BRA was developed based on conditions that existed at the K-CPRB before the removal action. The findings of the K-CPRB investigation indicated that a remedial action was apropriate to protect human health and the environment. Site-specific considerations, based on the conclusions of the RFI/RI/BRA and the PRA/RIR for the C-, F-, K-, and P-CPRBs, which indicate that risk to human health and the environment has been effectively mitigated include:

1) The shallow basin soils (0-1ft) represented the greatest risk at the K-CPRB. Arsenic contributed 91 % of the greatest risk via soil ingestion, 6×10^{-5} for future on-unit residents (1 in 17,000 people would

develop cancer due to exposure in a residential setting). Arsenic is a natural constituent of coal, occurring in coal ash at an average of 500 parts per million (Mason 1966) or about 45.8 mg/kg in coal. The average concentration of arsenic in the earth's crust is about 2 mg/kg. Arsenic was also widely used as a pesticide by pre-SRS farmers. Beryllium, which contributed 9% of the soil ingestion risk to future residents, is also enriched in coal: crustal abundance is 2.6 mg/kg, abundance in coal is 4.1 mg/kg. External radiation exposure, predominantly radium-228, resulted in a 2×10^{-5} risk for a hypothetical future worker (i.e., 1 in 50,000 people would develop cancer due to exposure in an industrial setting) and 2×10^{-5} risk for a hypothetical future resident. Radium-228 is a daughter of naturally occurring uranium-238. The removal action conducted at the C-, F-, K-, and P-CPRBs during the summer of 1997 removed the 0-1 ft interval, which contained the highest concentrations of the COCs, and added four feet of clean fill above the remaining sub-basin soil. No Further Action is necessary to protect human health or the environment.

2) The K-CPRB pipeline is buried beneath 3.5 to 6.5 feet of soil; thus soil contamination from pipeline leaks is unlikely to be excavated under a residential setting. Carcinogenic and noncarcinogenic risks posed by the pipeline soils are due to naturally occurring metals such as aluminum, antimony, arsenic, beryllium and iron that are typical of coal and SRS soils. The shallow soils along the pipelines are estimated to contribute low to nonexistent risk, 5×10^{-6} via ingestion to future residents and below 1×10^{-6} and 1.0, respectively for future industrial workers. No Action is warranted at the K-CPRB pipeline.

3) The only COPCs for the surface soils in the K-CPRB overflow area were aluminum and iron. Carcinogenic risks for these constituents cannot be calculated because slope factors are not available. The hazard index for future residents is 0.38. No Action is appropriate for the CPRB overflow areas.

4) The gross alpha groundwater contamination at the K-CPRB appears to be declining as discussed in Section V. The coal-laden sediments were a source of sulfuric acid, radium-226, and other naturally occurring alpha emitters. The coal-laden sediments have been completely removed, so the gross alpha contamination in the groundwater should decline to below MCLs due to natural attenuation in the aquifer. A five-year program of confirmatory groundwater monitoring at the K-CPRB will be implemented with this ROD.

5) The C-, F- K-, and P-CPRBs are in areas which have been recommended as industrial in the *Savannah River Site Future Use Project Report* (DOE, 1996), precluding future residential use.

6) The similarity of conditions at the C-, F-, and P-CPRBs to those at the K-CPRB facilitated the consolidation of the C-, F-, K-, and P-CPRBs into a single operable unit with the K-CPRB as the lead

site. No Further Action is the appropriate remedial action for the C-, F-, K-, and P-CPRBs. No Action is appropriate for the pipelines and overflow areas.

VII. REMEDIAL ACTION OBJECTIVES FOR THE C-, F-, K-, AND P-CPRB OPERABLE UNIT

Remedial action objectives specify unit-specific contaminants, media of concern, potential exposure pathways, and remediation goals. The remedial action objectives are based on the nature and extent of contamination, threatened resources, and the potential for human and environmental exposure. Initially, preliminary remediation goals are developed based upon ARARs or other information from the RFI/RI/BRA. These goals should be modified, as necessary, as more information concerning the unit and potential remedial technologies becomes available. Final remediation goals will be determined when the remedy is selected and shall establish acceptable exposure levels that are protective of human health and the environment.

ARARs are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal, state, or local environmental law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. The only ARARs associated with the C-, F-, K-, and P-CPRBs are MCLs for gross alpha, total radium, and BEHP established under the Safe Drinking Water Act.

Threatened, endangered, or sensitive species are not found at the C-, F-, K-, and P-CPRBs and the unit does not offer attractive or unique cover or forage opportunities for wildlife. Thus, ecological receptors are not at significant risk from the C-, F-, K-, and P-CPRBs.

Soil COCs were identified in the RFI/RI/BRA for the K-CPRB, which was the lead site for the removal action. Table 5 compares the residual concentrations for the soil COCs after the removal action at each of the CPRBs to the RGs and 2 x mean background screening values derived at the K-CPRB. The average remaining concentrations of iron exceed the K-CPRB RGs in the F- and P-CPRBs; this may be due to localized variations in the mineralogy of the subsoils. Iron is a natural constituent of subsoil minerals such as plinthite. None of the maximum values for iron exceed the risk-based concentration for iron (610,000 mg/kg) for soil ingestion in an industrial setting. The maximum observed value for arsenic (J21.8 mg/kg) at the P-CPRB slightly exceeds the RG (18.64 mg/kg), the "J" qualifier indicates that this is an estimated value. This anomalous sample is from the 2-4 ft interval below clean out elevation and is now at least six feet below restored surface. The removal action has met the RGs established for the unit COCs and No Further Action is appropriate for the C-, F-, K-, and P-CPRBs.

Table 5. Comparison of Average and Maximum Concentrations for the Soil COCs Below Clean Out Elevation to RGs and 2 X Mean Background Screening Levels

Secondary Soil COCs by CPRB	Units	RGs to Achieve 1 x 10^{-6} Risk and 1.0 HI Future Resident Adult and Child	2 x Mean Background Concentration	Average Concentration Below 1 ft Nondetects @ 0.5 Detection	Maximum Detected Concentration Below 1 ft
C-CPRB					
Aluminum	mg/kg	77649.4	14050	15890	24200
Antimony	mg/kg	30.53	2.04	3.024	6.31*
Arsenic	mg/kg	18.64	1.64	8.12	8.46
Iron	mg/kg	22421.4	21390	14829	21400
Vanadium	mg/kg	542.6	41.78	34.42	49.8
F-CPRB					
Aluminum	mg/kg	77649.4	14050	22050	35400
Antimony	mg/kg	30.53	2.04	2.92	ND
Arsenic	mg/kg	18.64	1.64	8.74	ND
Iron	mg/kg	22421.4	21390	23316	30300
Vanadium	mg/kg	542.6	41.78	52.4	71.5
K-CPRB					
Aluminum	mg/kg	77649.4	14050	7916	18300
Antimony	mg/kg	30.53	2.04	1.34	3.91*
Arsenic	mg/kg	18.64	1.64	1.23	4.58*
Iron	mg/kg	22421.4	21390	10927	41300
Vanadium	mg/kg	542.6	41.78	28.01	121.0
P-CPRB					
Aluminum	mg/kg	77649.4	14050	26838	75200
Antimony	mg/kg	30.53	2.04	3.62	7.68
Arsenic	mg/kg	18.64	1.64	9.96	21.8
Iron	mg/kg	22421.4	21390	23883	34000
Vanadium	mg/kg	542.6	41.78	53.47	74.9

* Only value above detection limit.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF THE ALTERNATIVES

After the removal of the source term, the only remaining viable alternative for remediating the C-, F-, K-, and P-Area Coal Pile Runoff Basins is No Further Action. The components of the removal action are the same as the most conservative alternative developed in the K-CPRB CMS/FS.

IX. THE SELECTED REMEDY

The selected remedy is identical to the preferred alternative in the SB/PP (Section V, paragraph 3, WSRC 1997). After the removal action, the selected remedy for the C-, F-, K-, and P-CPRBs is No Further Action with confirmatory groundwater monitoring at the K-CPRB (EPA 1991). The No Further Action Alternative

means that no further remedial action will be performed on the CPRBs. The waste has been removed, the RGs have been met, and the excavation has been covered with at least four feet of clean soil backfill. The No Action alternative is appropriate for the CPRB pipelines and overflow areas.

The probable condition for the groundwater at all of CPRBs is no significant groundwater contamination resulting from the operation of the CPRBs. As a result, no remedial action is deemed appropriate for the water table aquifer at the CPRBs. However, annual confirmatory groundwater monitoring will be conducted at the K-CPRB for a period of five years to ensure that No Further Action with confirmatory groundwater monitoring at the K-CPRB is the appropriate remedy. SRS will notify SCDHEC and EPA within 30 days of the second consecutive exceedance of MCL by any of the analytes. In the event that the probable condition is no longer appropriate, DOE, SCDHEC, and EPA (the three parties to the FFA) will evaluate the need for remedial action. There are no groundwater RAOs to be met for the water table aquifer at the K-CPRB since the selected remedy for the aquifer is no remedial action with confirmatory groundwater monitoring.

The K-CPRB is the only basin where impacts on local groundwater quality due to the operation of the CPRB have exceeded MCLs. Gross alpha and the sum of radium-226 and radium-228 have occasionally exceeded maximum contaminant levels; bis(2-ethylhexyl) phthalate exceeded its maximum contaminant level one time in a side gradient well. When the source material was removed from the basin, several of the analytes (such as arsenic and vanadium) listed in the CMS/FS were reduced to near background levels and were no longer a potential threat to groundwater quality. The following list of analytes will be monitored in wells KCB 1, 3, 5, and 6 during the second calendar quarter of each year, beginning in the year (1998) following completion of the removal action:

- beryllium
- bis(2-ethylhexyl) phthalate
- chromium VI
- gross alpha
- radium-226
- radium-228
- pH

A summary report, including the data and interpretation, will be submitted to SCDHEC and EPA during the first calendar quarter of the year following each monitoring event (the first report is due in January 1999). If none of these constituents exceeds its MCL during five consecutive monitoring and reporting cycles, SRS will request SCDHEC and EPA concurrence with suspending the monitoring program and decommissioning the wells or dispositioning them to other programs. The cost of this groundwater monitoring and reporting program will be approximately $60,200. No other costs will be incurred under the No Further Action Alternative.

The No Further Action remedy for the C-, F-, K-, and P-CPRBs and the No Action remedy for the pipelines and overflow areas are intended to be the final action for the C-, F-, K-, and P-CPRB operable unit. The SCDHEC has modified the SRS RCRA permit to incorporate the selected remedy.

X. STATUTORY DETERMINATIONS

Based on the PRA/RIR for the C-, F-, K-, and P-CPRBs (WSRC 1997d), the OU no longer poses significant risk to human health. Therefore, a determination has been made that the No Further Action alternative for the CPRBs and the No Action alternative for the pipelines and overflow areas are protective of human health and the environment, effective in both the long and short terms, comply with Federal and State of South Carolina requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost-effective. Because no remedial action has been selected under this ROD, CERCLA Section 121 statutory requirements are not appropriate.

Section 300.430 (f)(4)(ii) of the NCP requires that a five-year review of the ROD be performed if hazardous substances, pollutants, or contaminants remain in the waste unit. The three Parties, DOE, SCDHEC, and EPA, have determined that five-year reviews of the ROD for the C-, F-, K-, and P-CPRBs operable unit will not be necessary to ensure continued protection of human health and the environment.

XI. EXPLANATION OF SIGNIFICANT CHANGES

The SB/PP and the draft RCRA permit modification provided for involvement with the community through a document review process and a public comment period (February 12, 1998 through March 28, 1998). No comments were received during the 45-day public comment period, thus there were no significant changes to the selected remedy as a result of public comments.

XII. RESPONSIVENESS SUMMARY

No comments were submitted during the public comment period.

XIII. POST-ROD DOCUMENT SCHEDULE

This is a No Further Action ROD; thus post-ROD documentation is not necessary for this operable unit. A summary report, including the groundwater data for the KCB monitoring well network and interpretation of the data, will be submitted to SCDHEC and EPA during the first calendar quarter of the year following the monitoring event.

XIV. REFERENCES

DOE (U. S. Department of Energy) 1994. *Public Involvement, A Plan for Savannah River Site.* Savannah River Operations Office, Aiken, South Carolina (1994).

DOE 1996. *Savannah River Site Future Use Project Report, Stakeholder Recommendations for SRS Land and Facilities (U).* Savannah River Operations Office, Aiken, South Carolina (January 1996).

EPA 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.* EPA/540/G-89-004, U.S. Environmental Protection Agency, Washington, DC.

EPA 1991. Guide to Developing Superfund No Action, Interim Action, and Contingency Remedy RODs. EPA Publication: 9355.3-02FS-3, U.S. Environmental Protection Agency, Washington, DC.

Mason, B 1966. *Principles of Geochemistry.* Third Edition. John Wiley & Sons, Inc. New York.

WSRC 1992. *RCRA Facility Investigation/ Remedial Investigation Work Plan for the A-, C-, D-, F-, H-, K-, and P-Area Coal Pile Runoff Basins.* WSRC-RP-90-585, Revision 1. Westinghouse Savannah River Company, Aiken, South Carolina (January).

WSRC 1993a. *Federal Facility Agreement for the Savannah River Site.* Appendix C. Docket No. 89-05-FF, WSRC-RP-94-42, Westinghouse Savannah River Company, Aiken, South Carolina (Effective Date: August 16, 1993).

WSRC 1993b. *RCRA Facility Investigation/RI Program Plan.* WSRC-RP-89-994, Revision 1. Westinghouse Savannah River Company, Aiken, South Carolina.

WSRC 1994a. *Overall Strategy for the RCRA Facility Investigation/Remedial Investigation Work Plan for the A-, C-, D-, F-, H-, K-, and P-Area Coal Pile Runoff Basins.* WSRC-RP-94-968, Revision 1. Westinghouse Savannah River Company, Aiken, South Carolina (October).

WSRC 1994b. *Phase I RFI/RI Work Plan for the K-Area Coal Pile Runoff Basin.* WSRC-RP-94-969, Revision 0. Westinghouse Savannah River Company, Aiken, South Carolina.

WSRC 1995. *Phase I RCRA Facility Investigation/Remedial Investigation for the C-Area Coal Pile Runoff Basin (189-C).* WSRC-RP-95-222, Revision 1. Westinghouse Savannah River Company, Aiken, South Carolina.

WSRC 1996. *RCRA Facility Investigation/Remedial Investigation and Baseline Risk Assessment for the C-Area Coal Pile Runoff Basin (189-C) (U).* WSRC-RP-96-1 55, Revision 1. Westinghouse Savannah River Company, Aiken, South Carolina (December).

WSRC 1997a. *RCRA Facility Investigation/ Remedial Investigation Report with the Baseline Risk Assessment for K-Area Coal Pile Runoff Basin (189-K) (U).* WSRC-RP-96-125, Revision 1.3. Westinghouse Savannah River Company, Aiken, South Carolina (February).

WSRC 1997b. *Removal Site Evaluation Report/ Wastewater Closure Plan for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U).* WSRC-RP-96-897, Revision 1. Westinghouse Savannah River Company; Aiken, South Carolina (April).

WSRC 1997c. *Corrective Measures Study/Feasibility Study for the K-Area Coal Pile Runoff Basin (189-K) (U).* WSRC-RP-96-869, Revision 1.1. Westinghouse Savannah River Company; Aiken, South Carolina (July).

WSRC 1997d. *Post Removal Action/Remedial Investigation Report for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U).* WSRC-RP-97-931, Revision 0. Westinghouse Savannah River Company; Aiken, South Carolina (November).

WSRC 1997e. *Statement of Basis/Proposed Plan for the C-, F-, K-, and P-Area Coal Pile Runoff Basins (189-C, 289-F, 189-K, and 189-P) (U).* WSRC-RP-97-436, Revision 0. Westinghouse Savannah River Company; Aiken, South Carolina (November).