

**CORRECTIVE MEASURES IMPLEMENTATION REPORT/
FINAL REMEDIATION REPORT FORMAT**

1.0 GENERAL DESCRIPTION

1.1 Purpose and Scope

This Corrective Measures Implementation Report/Final Remediation Report (CMIR/FRR) documents the completion of the remedial action (RA) for the closure of the *Operable Unit Name* operable unit (OU). The previously submitted Post-Construction Report (PCR) (WSRC 200X) summarized construction activities performed to implement the RA requirements in the Record of Decision (ROD) (WSRC XXXX) in accordance with the approved Corrective Measures Implementation/Remedial Action Implementation Report (CMI/RAIP) (WSRC XXXX). The *Operable Unit Name* (*acronym*) entered a period of long-term operation of the constructed equipment for treatment of contaminants in the source unit or in the groundwater. This operations period has ended and this CMIR/FRR reports on operations and documents the completion of all RA activities for this OU. [Note: Delete CMIR and CMI from this document if the OU is CERCLA only.]

This CMIR/FRR was completed after final inspection of operations and a determination that the RA is complete. The Savannah River Site (SRS) notified U.S. Environmental Protection Agency (USEPA) Region IV and South Carolina Department of Health and Environmental Control (SCDHEC) regarding completion of the aforementioned final operation and function determination. This CMIR/FRR is submitted to USEPA and SCDHEC for approval in accordance with Federal Facility Agreement (FFA) requirements.

This report includes the following items:

- A brief description of the OU background, including a brief statement on RA requirements and objectives in the ROD
- A chronology of completed events related to remediation of the OU
- A summary of reference to the PCR document which summarizes construction activities performed
- A summary of operations activities performed subsequent to the PCR
- Deviations from the original design of the approved CMI/RAIP (WSRC XXXX) or PCR (WSRC XXXX)
- Maps depicting source unit and groundwater COCs both before and after the RA completion
- Performance standards and quality control inspections, including a summary of (O&F) performance test results documenting verification of compliance with the acceptance criteria in the CMI/RAIP (WSRC XXXX) or PCR (WSRC XXXX)
- Final inspection and certification of OU Closure
- As-built drawings
- Land Use Controls
- Total Project costs includes total RA capital costs, total annual operations and maintenance (O&M) costs and total present worth (PW) costs from RA start date through completion

1.1.1 Document Format

[Typically addresses the document format used, including the basis for the format. This section should include specific details regarding any deviation from the generic description as well as the basis of the deviation.]

This report has been prepared in accordance with the requirements for submittal of regulatory documents as identified in the FFA (1993) and the latest format for the CMIR/FRR. This format was developed in accordance with the resolution of the USEPA comments on required contents for CMIR/FRR and USEPA latest guidelines (USEPA 2000). The *ERD Regulatory Handbook* (WSRC 2001) includes the approved format for the CMIR/FRR, which is the basis of the document's format.

The *Operable Unit Name* source OU required long-term RA (i.e., the final RA required long-term operation of the constructed equipment for treatment of contaminants in the source unit or in the groundwater). Therefore a PCR was submitted upon construction completion, on (date) (WSRC XXXX) and this CMIR/FRR is now being submitted upon completion of operation of the constructed equipment.

1.2 Operable Unit Background

The *Operable Unit Name* source OU is listed as a RCRA 3004(u) Solid Waste Management Unit/CERCLA unit in Appendix C of the FFA for SRS.

[Copy an abbreviated description of the waste unit from the ROD. Include only those components that are addressed by the RA. The description should include location, size, and the background operational history of the unit requirements including whether the OU is a RCRA and/or CERCLA unit. The section may also include a short paragraph identifying the predecessor documents related to the construction of the RA (e.g., PCR).

Provide figures showing RA location at SRS (Figure 1) and a pre-RA site layout (Figure 2).

Previous community involvement activities should be summarized. A very condensed presentation of information for this section since the same information has been covered in greater detail in previous documents required by the FFA process; however, this document is supposed to be a stand alone document presenting all aspects of the RA. Since earlier documents have provided the same information in detail, the CMIR/FRR provides a brief description of the OU with emphasis on RA. This section should also state whether the OU is a RCRA and/or CERCLA unit.] The contact person (title, address, and phone number) for the *Operable Unit Name* source OU is as follows:

Westinghouse Savannah River Company
Manager, Post-Closure Maintenance
Building 730-2B
Aiken, SC 29808
(803) 952-6882

Figure 1. *Operable Unit Name* Location on SRS Map

Figure 2. *Operable Unit Name* Pre-Remedial Action Site Plan

1.2.1 General Description and Location of Operable Unit Name

The *Operable Unit Name* (Figure 1) is located within the SRS, approximately TBD feet south of the (e.g., C, K, L, P, or R-Area Reactor) perimeter fence and XXXX feet north of

1.2.2 Pre-Remedial Action Completion Nature and Extent of Contamination in Operable Unit Name Soils (Source Unit)

[Briefly identifies the source unit constituents of concern (COCs) and principal threat source materials (PTSMs) copied from the ROD (table may be used) that were considered for RA, and the associated risks, specific components of the unit requiring remediation and locations of COCs and PTSMs with respect to the zone of remediation (areas and depths). Because the information is covered in greater detail in previous FFA documents, a condensed presentation (synopsis or summary) is appropriate for this section. Provide or reference figures or maps for the design clarification of data already provided in the ROD to illustrate the nature and horizontal and vertical extent of COCs and PTSMs (Figure 3).]

1.2.3 Pre Remedial Action Completion Nature and Extent of Contamination in Operable Unit Name Groundwater

[Briefly identifies the groundwater source unit constituents of concern (COCs) and principal threat source materials (PTSMs) copied from the ROD (table may be used) that were considered for RA and the associated risks, specific components of the unit requiring remediation and locations of COCs and PTSMs with respect to the zone of remediation (areas and depths). Because the information is covered in greater detail in

Figure 3. Pre-Remedial Action Completion Nature and Horizontal and Vertical Extent of COCs in the Source Unit

previous FFA documents, a condensed presentation (synopsis or summary) is appropriate for this section. Provide or reference figures or maps for the design clarification of data already provided in the ROD to illustrate the nature and horizontal and vertical extent of COCs and PTSMs (Figure 4).]

1.3 Remedial Action Requirements and Objectives

1.3.1 Remedial Action Objectives

As detailed in the ROD, the remedial action objectives (RAOs) for the *Operable Unit Name* are as follows:

[Copy RAO text from the ROD for OU.]

Per the ROD, the RAOs for this RA would be achieved by implementing the below RA.

1.3.2 Selected Remedial Action

As stated in the ROD (WSRC XXXX), the selected RA for the *Operable Unit Name* source OU soils included the following key elements:

[Copy RA description text from the ROD for the OU. May include a schematic illustration of the selected remedy from the ROD or a reference to the Land Use Control Implementation Plan (LUCIP) figure number if the conceptual site model (CSM) is contained therein.]

Figure 4. Pre-Remedial Action Completion Nature and Horizontal and Vertical Extent of COCs in the Groundwater Source Unit

Figure 5. Conceptual Site Model

1.4 Chronology of Events

[Copy from the PCR, the tabular summary (reference Table 1) of activities performed during the construction phase in accordance with the approved CMI/RAIP. Reference the PCR. Add to the tabular summary (reference Table 1) the additional post PCR major milestones and dates related to the RA for the OU, PCR approval, major operations verification sampling and performance testing, inspections, identification and resolution of non-conformances (if any), demobilization and final inspection (regulatory walkdown) of completed operations.]

Table 1. Chronology of Events

<u>Description of Activity</u>	<u>Start Date</u>

2.0 OPERATION ACTIVITIES

[Provides a summary of operations activities performed during the operations phase in accordance with the approved PCR. The summary will be a brief narrative following the sequence of activities listed in Section 1.4. This section also briefly describes materials and equipment used, name and roles of the prime subcontractor(s), with description of any treatment process required to implement the RA, a description of operating permits, successes and problems encountered during operations and resolutions of problems (including innovative solutions, if any) and causes for any delay. This section also includes a brief discussion of unexpected conditions encountered in the field, particularly those that affected the scope or schedule of the operations phase of the RA.]

2.1 Performance Reports

[State (if applicable): The effectiveness of the action in meeting the performance criteria of the groundwater RAOs was assessed through periodic Effectiveness Monitoring Reports (EMRs), Corrective Action Plans (CAPs), etc. This section provides a brief description of all EMRs, CAPs, etc. Summaries should include discussions and graphs of operations durations, pounds of materials treated, pounds of COC removed, COC concentrations in groundwater, vadose and or source units, as well as discussions of significant downtimes and mass or concentration spikes or rebounds. Hydrogeological conditions throughout the plume and the impact of the RAs may also be included. Enhancement recommendations and implementation results along with system effectiveness in meeting the RAOs should also be highlighted.]

2.2 Equipment D&D

[Describe the treatment system waste (e.g., sludge, filters, purge water, etc.) Describe the decontamination and decommissioning (D&D) of all equipment (e.g., treatment systems) not permanently required for the RA and subsequently disposed.]

2.3 Secondary/Job Control Waste Disposal

[This section provides the specific details of the unit's waste management plan. Describe the waste type, waste volume, and method, consistent with SRS procedures, that were used for waste characterization (e.g., testing methods), disposal (include location such as onsite, offsite at SRS, off SRS at XYZ facility) and transportation (include contaminant limits) during operations, as applicable to the selected RA. An example follows.]

[Example: Waste management (handling, disposal, and transportation of operations-generated wastes) and de-watering met the requirements of applicable SRS manuals and procedures (e.g., WSRC 3Q Manual, *Environmental Compliance Manual*; WSRC 1S

Manual, *Waste Acceptance Criteria*; WSRC C1 Manual, *Environmental Restoration Administrative Procedures*). Primary remediation waste was stabilized by in situ stabilization/solidification (S/S). Aqueous secondary remediation waste, which includes decontamination rinsates and the excess water from de-watering was..... Excess (unused) rainwater was sampled, analyzed, and compared to the *Investigation-Derived Waste Management Plan*, Rev 2, Appendix A (WSRC 1994) limits. The contamination in the water was below those limits, and water was discharged on the ground.]

3.0 DEVIATIONS FROM ORIGINAL DESIGN

[Identifies design changes required during operations as well as the technical basis for those changes. The discussion includes all changes made during operation, regardless of whether those changes were previously communicated to SCDHEC and USEPA.]

Several design and construction changes were needed during operations to resolve problems. The project team reviewed all changes prior to implementation to ensure compliance with regulatory requirements in the ROD, CMI/RAIP and the PCR. Consistent with the PCR, notifications were made to USEPA and SCDHEC prior to implementation, as appropriate. Table 2 provides a summary of all such changes.

The basis and resolution of deviations from the original design are detailed below. Where applicable, a statement is provided on whether the deviation still meets a performance criterion.

Table 2. Summary of Design Changes

Item	Change	Reason
1		
2		
3		

4.0 VERIFICATION SAMPLING, TESTING, ANALYSIS, PERFORMANCE STANDARDS, AND OPERATIONS QUALITY CONTROL

4.1 Performance Requirements/Standards

[For each RA component verified in the PCR (e.g., cover, soil treatment, soil disposal, etc.), copy a summary of the PCR verification. For all remaining components (e.g., long-term operating equipment), subsections of Section 4.0 will cite appropriate references to the performance requirements (acceptance criteria) as required per the PCR and/or CMI/RAIP for the RA and the operation quality control requirements. Provide a brief discussion and table of test samples, and a comparison of test results with PCR and/or CMI/RAIP acceptance criteria performance requirement and/or process control parameters broken down by type of media evaluated (groundwater, vadose, air emission, etc.) Copy from the PCR and/or the CMI/RAIP. Include a description of how those criteria were met but with allowances for deviations outlined in Section 3.0. It also provides discussion on other non-conforming conditions identified during the quality control inspection and how those non-conformances were resolved to meet the specified performance criteria.]

A summary table is suggested which lists the specific attributes required and the specific tests or monitoring for each attribute. If numerous tests or monitoring is conducted, a minimum, maximum, average summary is suggested along with footnotes for entries not meeting RAOs, shutdown criteria, or other compliance points. Summarize cover inspection and maintenance actions.]

4.2 Operations Quality Control

[Provides a summary of operations quality assurance (QA) and quality control procedures that were implemented to ensure successful implementation of the RA. It also includes any special or unit-specific strategy applicable to the RA.]

5.0 CERTIFICATION OF REMEDIAL ACTION COMPLETION AND FINAL INSPECTION

[Note: If the waste unit is being released for unrestricted land use (e.g., no institutional controls), use the term "OU Closure" instead of "Remedial Action Completion" in the title. Provides the text stating that:]

(1) As detailed in Section 4.0, the operations activities required for the RA have met the acceptance criteria established in the approved CMI/RAIP and/or PCR, but with allowances for deviations outlined in Section 3.0. (2) As detailed in Section 5.1, the RA is certified as complete and that operations were in accordance with the ROD RAOs. Section 5.1's certification is typically based upon the result of performance tests and quality control inspections provided in the verification of Section 4.0. (3) As outlined in Section 5.2, the final walkdown inspection with participation of USEPA and SCDHEC (as applicable) has been performed and issues have been closed out.

[Note: For each RA component inspected and certified as complete in the PCR (e.g., typically all non-operation components like the cover, soil treatment, disposal, etc.), summarize Section 5.0 of the PCR (Certification of Construction Completion and Final Inspection.)]

5.1 Certification of Remedial Action Completion

[List the primary RA components and include a certification statement on which and how each applicable RAO was met. Each RAO should be copied from the ROD. Provide assurance that the implemented remedy (or no action decision) achieves the degree of cleanup or protection specified in the ROD(s) for all pathways of exposure described in the CSM and that no further RCRA/CERCLA response is needed to protect human health and the environment.]

[In accordance with the guidance from USEPA Region IV office regarding the intent of "certification" terminology, a Professional Engineer's certification is not required. Instead, this section provides the verification that RAOs established in the ROD have been met through field implementation of the RA per the approved CMI/RAIP (WSRC 1999).] The certification is based on the Section 5.2 walkdown and successful achievement of the RAOs per discussion above. It is concluded that the *Operable Unit Name* closure has been completed satisfactorily and the RA is complete in accordance with the requirements of the *Operable Unit Name* ROD. The results of any analytical sampling and testing have been documented and the records are on file at SRS SGCP Document Control in the project file. In accordance with the ROD, applicable post-closure activities (e.g., land use control, 5-year remedy reviews, etc.) will be performed as described in Section 7.0 of this CMIR/FRR. [Also include a summary of and reference for the PCR verification section for RA components not verified herein.]

5.2 Final Inspection for Acceptance of *Operable Unit Name* Closure

A final joint walkdown was performed on month/day/year by the *Operable Unit Name* closure Project Team, SCDHEC and USEPA. No further outstanding issues resulted from the walkdown. A summary and participants of the USEPA/SCDHEC inspection are provided in Appendix A. [Also include a summary of and reference for the PCR inspection section.]

6.0 AS-BUILT DOCUMENTATION

6.1 As-Built Drawings

[This section provides as-built drawings, which are updated PCR construction drawings and as-built operations drawings for the completed project and are included in Attachment A of this CMIR/FRR. Drawings should reflect the RA completion configuration. RA components no longer needed (e.g., operating equipment) should be

deleted or shown as abandoned in place. Post-CMIR/FRR RA components needed (e.g., cover, fencing, etc. needed per the LUCIP) should also be as-built.]

6.2 Well Modifications

[This section provides a summary or attaches a report of any well modifications (e.g., well abandonment, well extension or protection).]

7.0 POST-CMIR/FRR ACTIVITIES AND LAND USE CONTROL

[For post-CMIR/FRR activities, see the OU specific LUCIP required for the RA. Maintenance and institutional controls per the LUCIP (if applicable) will be reported during the five-year review of the remedy. [Provide assurance that a LUCIP is in place and is sufficient to maintain the protectiveness of the remedy. The LUCIP for this section should describe redevelopment potential at the site or any planned or ongoing redevelopment work. State whether a five-year review is appropriate, and if so, the type of review (statutory or policy) and the schedule for the review. Provide a summary of any five-year reviews already completed.]

8.0 PROJECT COSTS

[Provides in a table format (reference Table 3) a cost comparison of the final costs for the RA to the original ROD cost estimate. Cost deviations, beyond -30% and +50%, from the ROD cost estimate are discussed. The cost breakdown is limited to that which was presented in the ROD (e.g., limited to the soil cover total capital and total O&M costs and the soil vapor extraction (SVE)/Air Sparging (AS) total capital and total 5-year O&M costs.) As an example, the combined RA comparative capital costs and O&M costs for a soil cover and a SVE/AS system are as follows:]

Table 3. Project Cost Comparison

Project Cost Comparison (Example)			
	ROD Cost (\$K)	Incurred Cost (\$K)	Delta Cost (%)
Soil Cover Capital	175	157	(10%)
AS/SVE Capital	800	690	(14%)
Soil Cover O&M	20	25	+25%
AS/SVE O&M	1200	2735*	+228%**

[If applicable, separate costs into equipment, non-equipment and O&M categories.]

9.0 REFERENCES

[Provides a list of documents referenced in the body of the CMIR/FRR document.]

FFA, 1993. *Federal Facility Agreement for the Savannah River Site*, Administrative Docket No. 89-05-FF (Effective Date: August 16, 1993)

USEPA, 2000. *Closeout Procedures for National Priorities List Sites*, #EPA-540-R-98-016, January 2000

WSRC, 1994. *Investigation-Derived Waste Management Plan (U)* WSRC-RP-94-1227, Rev. 2, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 1997a. *Record of Decision, Remedial Alternative Selection for the Operable Unit Name*

WSRC, 1999. *Corrective Measures Implementation Plan/Post Construction Report for the Operable Unit Name*

WSRC, 1994a. WSRC E7 Manual, *Conduct of Engineering and Technical Support (U)*, Rev. 7, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 1994b. WRSC Procedure Manual 1Q, *Quality Assurance (U)*, Rev. 0, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2001. *ERD Regulatory Handbook*, ERD-AG-003, Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

10.0 APPENDICES

[Provides a list of reports or other stand-alone documents referenced in the body of the CMIR/FRR.]

Appendix A Significant Reference Documents

11.0 ATTACHMENTS

[Provides documents developed specifically for this project (e.g., as-built drawings).]

Attachment A As-Built Drawings

**Appendix A
Significant Reference Documents**

[Examples: RA Start Notification Letter, Fact Sheet, USEPA/SCDHEC Walkdown Memo, Well Abandonment Reports]

Attachment A
As-Built Drawings