

**United States Department of Energy  
Savannah River Site**

**Statement of Basis/Proposed Plan for the  
L-Area Oil & Chemical Basin  
and  
L-Area Acid/Caustic Basin (U)**

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**WSRC-RP-96-851  
Revision 1  
February 1997**

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Westinghouse Savannah River Company  
Savannah River Site  
Aiken, South Carolina 29808

PREPARED FOR THE US DEPARTMENT OF ENERGY UNDER CONTRACT DE-AC09-96-SR18500



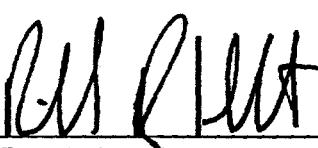
SAVANNAH RIVER SITE

## CERTIFICATION

### Statement of Basis/Proposed Plan for the L-Area Oil and Chemical Basin and L-Area Acid/Caustic Basin Rev. 1 (U)

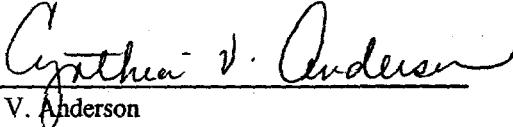
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Date: 21 Feb 97

Signature: 

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Vice President and General Manager  
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Co-operator for the U.S. Dept. of Energy  
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Date: Feb. 24, 1997

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U. S. Department of Energy  
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### Acronyms

ARAR	Applicable, or Relevant and Appropriate Requirement
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, 1980
CMS/FS	Corrective Measures Study/Feasibility Study
COC	Constituent of Concern
DOE	U. S. Department of Energy
EPA	U. S. Environmental Protection Agency
FFA	Federal Facility Agreement
HI	Hazard Index
LAACB	L-Area Acid/Caustic Basin
LAOCB	L-Area Oil & Chemical Basin
RAo	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act, 1976
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RGO	Remedial Goal Option
ROD	Record of Decision
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SDCF	Soil/Debris Consolidation Facility
SRS	Savannah River Site
S/S	Solidification/Stabilization
WSRC	Westinghouse Savannah River Company

## EXECUTIVE SUMMARY

This source unit Statement of Basis/Proposed Plan is being issued by the U. S. Department of Energy (DOE), which is the lead agency for remedial activities at the Savannah River Site (SRS), with concurrence by the U. S. Environmental Protection Agency (EPA) - Region IV and the South Carolina Department of Health and Environmental Control (SCDHEC).

The purpose of this source unit Statement of Basis/Proposed Plan is to describe the preferred alternative for addressing the L-Area Oil & Chemical Basin (LAOCB) and L-Area Acid/Caustic Basin (LAACB) source unit located at SRS, in southwestern Aiken County, South Carolina, and to provide an opportunity for public input into the remedial action selection process. R.61 -79.124 of the South Carolina Hazardous Waste Management Regulations (SCHWMR) and Section 1 17(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires advertisement of the draft RCRA permit modification and notice of proposed remedial actions (*i.e.*, the Statement of Basis/Proposed Plan).

The LAOCB and LAACB are located approximately 400 feet southeast of L-Area. Between 1961 and 1979, the LAOCB was operated as an unlined earthen basin for the purpose of disposing of small volumes of wastes that were not appropriate for discharge to local streams, regular seepage basins, or the waste management system. Liquid waste consisting of small volumes of radioactive oil and chemical wastewater were sent to the LAOCB from throughout the SRS, but came primarily from the reactor areas. The LAACB was operated from 1955 to 1968 as an unlined earthen basin for disposal of wastewater from the L-Area water treatment plant. The wastewater from this treatment plant consisted of dilute solutions of sulfuric acid and sodium hydroxide which had been used to regenerate ion exchange resins in the L-Area's power generation facility's water purification processes.

The RCRA Facility Investigation/Remedial Investigation (RFI/RI) and the Baseline Risk Assessment (BRA) indicate that:

- 1) LAOCB soils pose significant risk to human health,
- 2) LAOCB pipelines pose potential future risk to human health,
- 3) LAACB and associated pipeline do not pose significant risk and requires No Action, and
- 4) the extent of LAOCB groundwater contamination has not been completely defined and requires further characterization.

The LAOCB sludge/soil pose a potential threat to human health through exposure to sixteen primary ( $>1 \text{ E-04}$  risk) constituents of concern (COCs) and five secondary COCS ( $1 \text{ E-04}$  to  $1\text{E-06}$  risk). Significant risk related exposure pathways for the LAOCB soils include: 1) external radiation from basin soils, 2) ingestion of produce grown in basin soils, 3) inhalation of soil particulate, and 4) ingestion of basin soils. Two receptors are identified as having the potential for significant risk from both radiological and nonradiological (metals) contaminants: 1) the future on-unit resident and 2) the future on-unit worker. Radionuclides and metals represent 100 percent of the risk above  $1 \text{ E-06}$  for all applicable receptors, with greater than 99 percent of the total unit risk attributable to radionuclides that pose risk in excess of  $1 \text{ E-04}$ . The predominant risk drivers for these receptors are direct radiation from cobalt-60 and cesium-137 and ingestion of soils from chromium and lead. Both the future on-unit resident and the future on-unit worker have significant risk from exposure to radionuclides and nonradionuclides (metals).

The LAOCB pipeline soil poses minimal threat to human health through exposure to four primary COCS and two secondary COCS. Carcinogenic and non-carcinogenic risks posed by the pipeline soils are due to naturally occurring metals and radionuclides that are typical of SRS soils. Relatively high levels of radioactivity were detected in the LAOCB pipelines. Although this contamination does not currently represent a risk to human health and the environment, future deterioration of the steel walls of the pipeline could

potentially release contaminants to the environment and result in unacceptable risk.

This Statement of Basis/Proposed Plan (SB/PP) proposes:

- 1) remedial action for the LAOCB soils and LAOCB pipelines,
- 2) no action for the LAACB and associated pipelines, and
- 3) additional characterization for the LAOCB groundwater.

Since significant risk is associated with the waste remaining in the LAOCB, an evaluation of available remediation strategies was warranted. Because potential future risk is also associated with the LAOCB pipelines, remediation strategies applicable to the pipelines also warranted evaluation. Therefore, a corrective measures study/feasibility study (CMS/FS) was conducted for the LAOCB soil and the LAOCB pipelines. Since no significant risk is associated with the LAACB, no evaluation of remediation strategies was warranted and No Action is proposed. LAOCB groundwater remediation strategies will be evaluated following assessment of additional characterization efforts.

Radionuclides are unique contaminants with a very limited selection of remedial responses/technologies. The CMS/FS included detailed analyses of six alternatives for LAOCB soils and four alternatives for the LAOCB pipeline. The evaluated alternatives and estimated costs for LAOCB soils are:

S-1 No Action	\$280,000
S-2 Capping	\$1,430,000
S-3 Slurry Cut-Off Wall & Capping	\$3,430,000
S-4 In Situ Stabilization& Capping	\$3,580,000
S-5 Ex Situ Stabilization& Capping	\$4,370,000
S-6 Disposal Off Unit	\$9,100,000

The evaluated alternatives and estimated costs for the LAOCB pipeline are:

P-1 No Action	\$0
P-2 Capping	\$730,000
P-3 In Situ Stabilization and On Unit Disposal in the LAOCB	\$990,000

P-4 In Situ Stabilization and Off Unit Disposal at Nevada Test Site \$4,630,000

Since all of the risk at the LAOCB -is posed by radionuclides and metals with very similar physical and chemical properties, these technologies or any combination of them are applicable to the treatment of all COCS (primary and secondary).

The preferred alternative for remediating the LAOCB soil is alternative S-4: In Situ Stabilization and Capping which will eliminate direct radiation risk and reduce potential leaching of COCS to unit groundwater. The preferred alternative for remediating the LAOCB pipeline is alternative P-3: In Situ Stabilization and On Unit Disposal in the LAOCB which will eliminate direct radiation risk and mitigate potential leaching of GOCS to unit groundwater. No Action is appropriate for the LAACB and associated pipelines.

The LAOCB is located in an area which has been recommended for exclusive industrial use by the Citizens Advisory Board and the *Savannah River Site Future Use Project Report* (DOE, 1996). Under this land use scenario, alternatives S-4 and P-3 will be protective of human health and the environment and comply with applicable, or relevant and appropriate requirements (ARARs).

Implementation of the LAOCB soils alternative (S-4) will involve in situ solidification/stabilization (S/S) of the top 2 feet of the basin sediment (contamination extends to approximately 1.75 feet below the basin bottom). In addition, contaminated media located on the side walls of the LAOCB and in the staging area on the north end of the LAOCB will likely be placed in the bottom of the basin for in situ S/S. Following S/S, any remaining void will be backfilled to grade and a low-permeability engineered cap will be constructed over the basin.

Implementation of the LAOCB pipeline alternative (P-3) will first involve in situ S/S (grouting) of the pipelines to minimize the release of residual contaminants from inside the pipeline during excavation. The pipelines would then be excavated and cut into manageable segments. The pipeline segments would then be placed in the

LAOCB along with any contaminated soils along the pipelines. Pipeline soils and voids between pipeline sections would then be grouted inside the LAOCB to create a monolith that would further reduce the mobility of pipeline contaminants.

A bulk disposal option is being developed for radiologically contaminated soils/debris at the SRS as a "soil/debris consolidation facility (SDCF)." If built, the SDCF would be located at the SRS and would accommodate soil and debris from many waste units at the SRS. The feasibility of constructing a SDCF is currently being evaluated; therefore, it is unknown if disposal at the SDCF will be a viable option in the future. If, after the Record of Decision (ROD) has been issued, DOE, EPA, SCDHEC, and stakeholders decide the LAOCB soil or pipeline should be disposed of at the SDCF, the ROD would be revised at that time.

Community involvement in the remedial alternative selection process for the LAOCB/LAACB is strongly encouraged. All submitted comments will be reviewed and considered prior to final selection of an alternative. A responsiveness summary will be prepared to address significant comments raised during the public comment period and it will be made available in the ROD and final RCRA permit modification. The final RCRA permit and the ROD document the final decision for the unit.

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## SECTION I INTRODUCTION AND BACKGROUND

### Introduction

This source unit Statement of Basis/Proposed Plan is issued by DOE, which is the lead agency for SRS remedial activities, with concurrence by EPA and SCDHEC. The purpose of the source unit Statement of Basis/Proposed Plan is to describe the preferred alternative for addressing the LAOCB/LAACB source unit located in southwestern Aiken County, South Carolina and to provide for public involvement in the decision-making process.

SRS manages certain waste materials which are regulated under RCRA, a comprehensive law requiring responsible management of hazardous waste. RCRA 3004(u) requires that releases from solid waste management units be investigated and remediated as necessary. The LAOCB/LAACB are solid waste management units regulated under RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List. This inclusion created a need to integrate the established RCRA Facility Investigation 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) with EPA and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. The Federal Facility Agreement lists the LAOCB/LAACB (904-83G, 904-79G) as a RCRA/CERCLA unit, thus requiring further evaluation under an investigation/assessment process that integrates and combines the RCRA Facility Investigation process with the CERCLA Remedial Investigation to determine the actual or potential impact to human health and the environment.

Both RCRA and CERCLA require that the public be given the opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in SCHWMR R.61 -79.124

and Sections 113 and 117 of CERCLA. These requirements include establishment of an Administrative Record File that documents the selection of remedial alternatives and allows for review and comment by the public regarding those alternatives (see Section II). The Administrative Record File must be established "at or near the facility at issue." The SRS Public Involvement Plan (DOE, 1994) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. SCHWMR R.6 1-79.124 and Section 117(a) of CERCLA require advertisement of the draft permit modification and proposed remedial action and provide the public an opportunity to participate in the selection of a remedial action.

This source unit Statement of Basis/Proposed Plan is a summary of the "Administrative" Record File leading to selection of the preferred alternative. The source unit Statement of Basis/Proposed Plan presents the preferred alternative and the rationale for selecting that alternative. Community involvement in consideration of this evaluation of alternatives for the LAOCB/LAACB is strongly encouraged. SCHWMR R.61 -79.124 requires that a brief description and response to all significant comments be made available to the public as a part of the RCRA Administrative Record. All submitted comments will be reviewed and considered. Following the public comment period, a Responsiveness Summary will be prepared to address significant issues raised during the comment period. The Responsiveness Summary will be made available with the final RCRA permit and the ROD. In order to gain a better understanding of RCRA and CERCLA activities as they pertain to the LAOCB/LAACB, the public is encouraged to review the Administrative Record File for this unit. Refer to Section II of this document for information regarding availability of and access to the Administrative Record.

The final selection of the remedial alternative under RCRA will be in the form of a final permit modification decision which is made by SCDHEC. The remedial alternative, that will satisfy the FFA requirements, will be selected by DOE, in consultation with EPA and SCDHEC, only after the public comment period has ended and all

comments submitted have been reviewed and considered. It is important to note that the final action may be different from the preferred alternative discussed in this plan, depending on new information or public comments. The alternative chosen will be protective of human health and the environment and will comply with all Federal and South Carolina State environmental laws.

#### Background

SRS occupies approximately 310 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. SRS is located approximately 25 miles southeast of Augusta, Georgia and 20 miles south of Aiken, South Carolina. Figure 1 shows the location of the LAOCB/LAACB in relation to other facilities at SRS and Figure 2 shows the layout of the LAOCB/LAACB.

#### SECTION II COMMUNITY INVOLVEMENT

This Statement of Basis/Proposed Plan summarizes information from the documents listed in the REFERENCES Section of this Statement of Basis/Proposed Plan. These unabridged documents are part of the FFA Administrative Record File, which is available for review by the public 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

Similar information is available through the repositories listed below:

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

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

The RCRA Administrative Record File for SCDHEC is available for review by the public at the following locations:

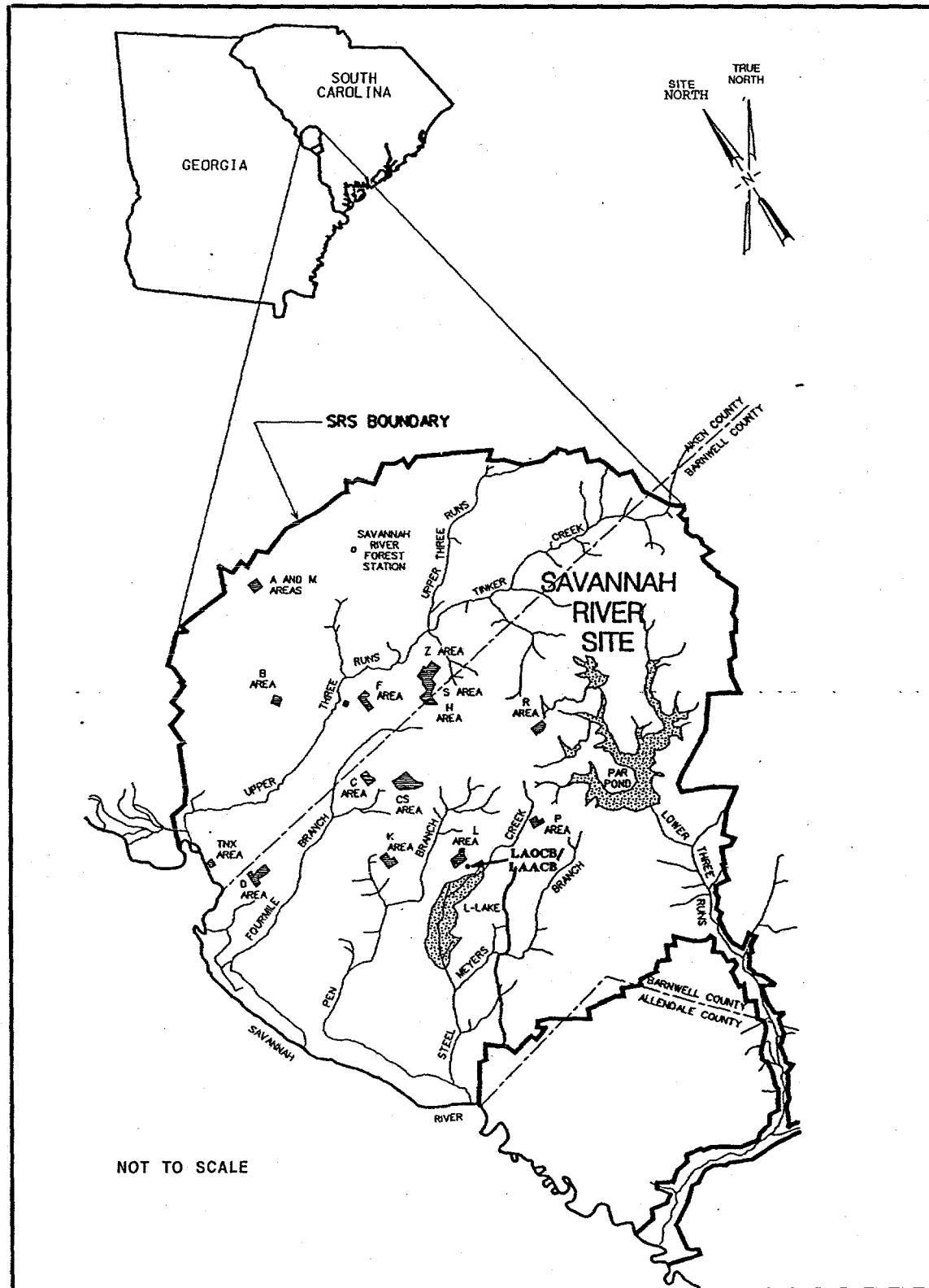
The South Carolina Department of Health and Environmental Control  
Bureau of Solid and Hazardous Waste Management  
8901 Farrow Road  
Columbia, South Carolina 29203  
(803) 896-4000

Lower Savannah District  
Environmental Quality Control Office  
215 Beaufort St., N. E.  
Aiken, South Carolina 29802  
(803) 641-7670

The public will be notified of a public comment period through mailing of the *SRS Environmental Bulletin*, a newsletter sent to approximately 3500 citizens in South Carolina and Georgia, and through the *Aiken Standard*, the *Allendale Citizen Leader*, the *Barnwell People Sentinel*, *The State*, and the *Augusta Chronicle* newspapers. The public comment period will also be announced on local radio stations.

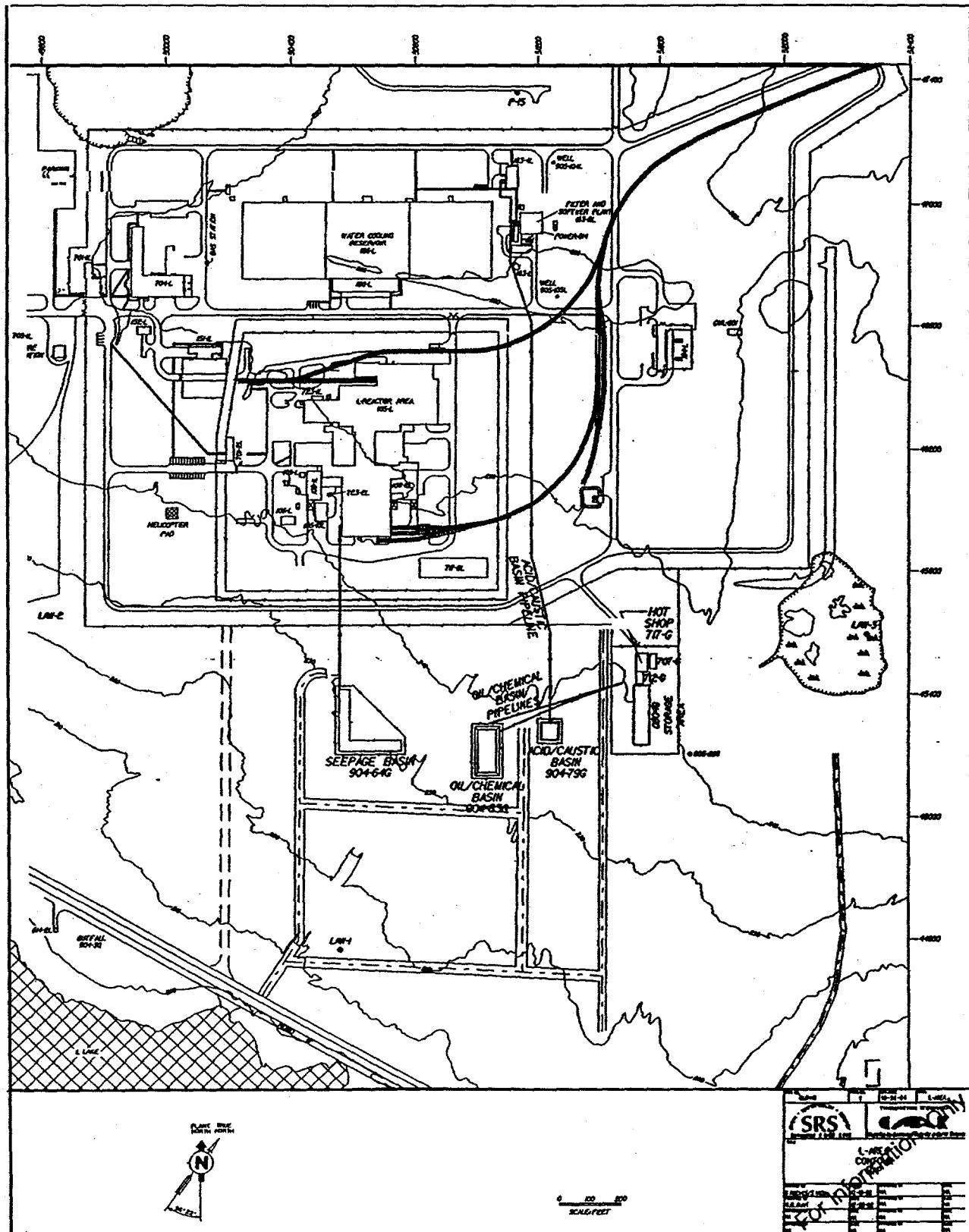
DOE will provide an opportunity for a public meeting during the public comment period if significant interest is expressed. The public will be notified of the date, time, and location. At the meeting, the proposed action will be discussed and questions about the action will be answered.

Figure 1 Location of the L-Area Oil & Chemical Basin and L-Area Acid/Caustic Basin in Relation to Major Savannah River Site Facilities



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Figure 2 L-Area Oil & Chemical Basin and L-Area Acid/Caustic Basin Layout



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To request a public meeting during the public comment period, to obtain more information concerning this Statement of Basis/Proposed Plan, or to submit written comments contact one of the following:

M. A. Flora  
Public Involvement  
Westinghouse Savannah River Company  
Savannah River Site  
Building 730-2B  
Aiken, South Carolina 29808  
(803) 952-6852

The South Carolina Department of Health and Environmental Control

"Attn.: G. Randall Thompson, P. E., Director  
Division of Hazardous and Infectious Waste  
Bureau of Solid and Hazardous Waste  
Management  
2600 Bull Street  
Columbia, South Carolina 29201  
(803) 896-4000

Following the public comment period, a ROD will be signed and a final decision for the RCRA permit will be issued. The ROD and RCRA permit will detail the remedial alternative chosen for the site and will include responses to oral and written comments received during the public comment period in the Responsiveness Summary.

### SECTION III SCOPE AND ROLE OF OPERABLE UNIT (RESPONSE ACTION) WITHIN THE SITE STRATEGY

The LAOCB/LAACB comprise a potential source control and groundwater operable unit, located within the Steel Creek Watershed. Source control and groundwater operable units within this watershed will be evaluated to determine impacts, if any, to associated streams and wetlands. SRS will manage all source control units to prevent impact to the Steel Creek Watershed. The proposed action for the LAOCB/LAACB source unit is intended as a final action. Upon disposition of all source control and groundwater operable units within this watershed, a final, comprehensive ROD for the watershed will be pursued.

Groundwater contamination has been documented during the LAOCB/LAACB groundwater monitoring program. Because the extent of groundwater contamination has not been completely defined, further downgradient characterization is required. Following characterization, remedial actions, if required, will be proposed in a final ROD.

### SECTION IV MEDIA SPECIFIC OPERABLE UNIT - THE LAOCB/LAACB

#### Section IV.A Unit Description, History, and Media Assessment

##### *Unit Description and Location*

The LAOCB/LAACB comprise a RCRA/CERCLA waste unit located within the SRS, approximately 400 feet southeast of L-Area Reactor. L Lake is located approximately 1,250 feet south of these basins. The local topography of the area is low to moderate relief with an elevation of about 235 feet above mean sea level and 45 feet above L Lake. The water table is 12 to 25 feet below ground surface in the area of the LAOCB/LAACB. Surface drainage is to the south toward L Lake.

The LAOCB covers an area of 0.5 acres (21,780 square feet) while the LAACB covers an area of 0.06 acres (250 square feet). The freeboard capacity of the LAOCB is approximately 5,500 cubic yards. Approximate dimensions of the LAOCB are 182 feet long by 108 feet wide by 12 feet deep. The dimensions of the LAACB are 50 feet long by 50 feet wide by 7 feet deep. The LAOCB pipelines are made of cast iron, measure 6 inches in diameter, total 900 feet in length, and are about 4 feet below land surface.

##### *History of the Unit*

Between 1961 and 1979, the LAOCB was operated as an unlined basin for the purpose of disposing of small volumes of wastes that were not appropriate for discharge to local streams, regular seepage basins, or the waste management system. Liquid waste consisting of small volumes of radioactive

oil and chemical wastewater were sent to the LAOCB from throughout the SRS, but came primarily from the reactor areas. Wastewater flowed into the LAOCB from a bermed concrete drainage pad that was located outside the LAOCB perimeter fence and from an underground pipeline originating at the maintenance Hot Shop. Wastes were transported to the drainage pad in tank trucks, metal drums, skid tanks, and other containers. The Hot Shop discharged decontamination wastewater containing radionuclides, detergents, and spent decreasing solvents through the pipeline to the LAOCB. Historical records indicate that wastes from all sources contributed 2.2 curies (Ci) of alpha emitters and 270 Ci of nonvolatile beta emitters including 0.1 Ci of strontium-90 and 0.4 Ci of cesium-137. Rainfall has resulted in the presence of some standing water in the LAOCB at most times.

The LAACB was operated from 1955 to 1968 as an unlined basin for disposal of wastewater from the L-Area water treatment plant. Wastewater from the treatment plant was discharged through an underground gravity flow pipeline to the LAACB. The wastewater consisted of dilute solutions of sulfuric acid and sodium hydroxide which had been used to regenerate ion exchange resins in the L-Area's power generation facility's water purification processes. The wastewater contained the cations and anions removed during the regeneration process. Other wastes discharged to the LAACB included water rinses from the ion exchange units both before and after regeneration, steam condensate from the heaters in the sodium hydroxide storage tanks and the water treatment building, and any rain that collected in the storage tank's spill containment enclosures. Rainfall has resulted in the presence of standing water in the LAACB during wet weather.

#### *Media Assessment*

The RFI/RI Report (WSRC, 1996c), BRA (WSRC, 1996a), and Corrective Measures Study/Feasibility Study (WSRC, 1996b) contain detailed analytical data for all of the environmental media samples taken in the characterization of the LAOCB/LAACB. These documents are available in the Administrative Record (See Section II).

#### SOILS

Analytical data collected for the RFI/RI indicate that significant impact to the soil media associated with the LAOCB has occurred - from both radiological and nonradiological (metals) contaminants. Radiological contaminants approach background activity levels within approximately 2 feet below the bottom of the basin. Nonradiological contaminants are similarly limited to 2 feet below the basin bottom. Surficial soil contamination is isolated to the confines of the fenced basin and staging area on the north end of the basin. Major contaminants in the LAOCB soils are radionuclides (primarily americium-241, cesium-137, and cobalt-60) with a maximum detection of 13,098 pCi/g gross alpha and 22,625 pCi/g non-volatile beta. Metals (primarily chromium) are also major contaminants with the highest detection of chromium at 5250 milligrams per kilogram (mg/kg).

No significant impact to soils associated with the LAOCB pipeline, the LAACB, and the LAACB pipeline has occurred. However, the interior of the LAOCB pipeline has been found to contain relatively high levels of radioactivity and the possibility of future leaks in the pipeline could result in a future release to the environment.

#### GROUNDWATER

Groundwater contamination has been documented during the LAOCB/LAACB groundwater monitoring program. Because the extent of groundwater contamination has not been completely defined, further characterization is required downgradient of identified tritium and volatile organic plumes. In addition, the potential groundwater contamination associated with units proximal (L-Area Hot Shop, L-Area Reactor Seepage Basin) to the LAOCB/LAACB will be required prior to any final remedial activities associated with the groundwater in this area.

## Section IV.B Operable Unit Risks

### *Human Health Risk Assessment*

As part of the investigation and assessment process for the LAOCB/LAACB, a BRA was performed using data generated during the assessment phase. Detailed information regarding the development of constituents of potential concern, the fate and transport of contaminants, and the risk assessment can be found in the RFI/RI and BRA reports. The process of designating the constituents of concern was based on consideration of background concentrations, frequency of detection, the relative toxic potential of the constituents, and human nutrient requirements. Constituents of potential concern are the constituents that are potentially site-related and are reported at a sufficient data quality level for use in the risk assessment.

An exposure assessment was performed to provide an indication of the potential exposures which could occur based on the chemical concentrations detected during sampling activities. The only current exposure scenario identified for the LAOCB/LAACB was for on-site visitors. Conservative future exposure scenarios identified for the LAOCB/LAACB included future on-unit industrial workers and future on-unit resident adults and children. The reasonable maximum exposure concentration value was used as the exposure point concentration.

Carcinogenic risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of pathway-specific exposure to cancer-causing constituents. The risk to an individual resulting from exposure to non-radioactive chemical carcinogens is expressed as the increased probability of cancer occurring over the course of a 70 year lifetime. Cancer risks are related to the target risk range of one excess human cancer in a population often thousand ( $1 \times 10^{-4}$ ) to one in one million ( $1 \times 10^{-6}$ ) for incremental cancer risk at National Priorities List sites.

Non-carcinogenic effects are also evaluated to identify a level at which there may be concern for potential non-carcinogenic health effects. The hazard quotient, which is the ratio of the exposure

dose to the reference dose, is calculated for each constituent. Hazard quotients are summed for each exposure pathway to determine the specific hazard index for each exposure scenario. If the hazard index exceeds unity (1.0), there is concern that adverse health effects might occur.

### *Current Land Use - Noncarcinogenic Hazards*

The BRA shows that potential adverse noncarcinogenic health effects are not likely to occur for either the LAOCB and LAACB, because none of the hazard indices exceeds a value of one.

### *Current Land Use - Carcinogenic Risks*

Under the current land use scenario, human health risks were characterized for the current on-unit visitor. Media evaluated include soil inside the LAOCB and LAACB source units, soil adjacent to the LAOCB and LAACB source units, and LAOCB and LAACB pipelines. All nonradiological cancer risks were less than  $1 \times 10^{-6}$ .

The highest estimated radiological risk for each pathway was  $3 \times 10^{-6}$  from direct radiation exposure to soils (primarily cobalt-60) from the LAOCB bottom.

### *Future Industrial Land Use - Noncarcinogenic Hazards*

The hazard indices were less than one for all constituents by all exposure pathways.

### *Future Industrial Land Use - Carcinogenic Risks*

The risks for chemical (nonradiological) carcinogens were all within or below the target risk range except for inhalation of the LAOCB soil. This risk from soil inhalation was  $2 \times 10^{-4}$  driven by chromium.

Carcinogenic risk from radiological constituents exceeded the target risk range for LAOCB soil ingestion and direct radiation. The highest risk under this pathway was  $2 \times 10^{-2}$  for direct radiation

exposure to soil from the LAOCB soils. This risk was driven by cobalt-60 and cesium- 137.

#### *Future Residential Land Use - Noncarcinogenic Hazards*

The hazard indices (HI) for noncarcinogenic hazards under the future resident scenario exceeded 1.0 for the LAOCB soil and LAOCB pipeline. The highest risks under these pathways were ingestion of LAOCB soils (HI of 20, primarily from chromium and lead) and ingestion of LAOCB pipeline soils (HI of 9, primarily from thallium).

#### *Future Residential Land Use - Carcinogenic Risks*

Carcinogenic risks for nonradiological exposure exceeded the target risk range by inhalation of LAOCB soils only. This risk is estimated at  $4 \times 10^{-4}$ , driven by chromium.

Carcinogenic risks for radiological exposure exceeded the target risk range for only LAOCB soils. Risk pathways which exceeded the target risk range were exposure to LAOCB soils from direct radiation, ingestion, and ingestion of produce grown in LAOCB soils. Risks are estimated at  $2 \times 10^{-1}$  (primarily cobalt-60 and cesium- 137) for direct radiation exposure,  $5 \times 10^{-3}$  (primarily strontium-90 and cesium-137) for exposure from ingestion of produce grown in LAOCB soils, and  $6 \times 10^{-4}$  (primarily americium-241, strontium-90, and plutonium-239) for exposure from ingestion of LAOCB soils.

#### *Ecological Risk Assessment*

Based on characterization of the environmental setting and identification of potential receptor organisms, a conceptual site model was developed to determine the complete exposure pathways through which receptors could be exposed to constituents of potential concern.

Interpretation of the ecological significance of the unit-related contamination at the LAOCB/LAACB source unit concluded that there was no likelihood of unit-related radiological or nonradiological

constituents causing significant impacts to the community of species in the vicinity of the unit. No constituents of potential concern identified in the soil at the LAOCB or LAACB are estimated to pose significant ecological risk based on their toxicity at the concentration at which they are present.

#### *COCS and Human Health Risk-Based RGOS*

The LAOCB sludge/soil pose a potential threat to human health through exposure to sixteen primary COCS ( $>1 \times 10^{-4}$  risk) and five secondary COCS ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  risk), and the BRA indicated that LAOCB pipeline soil pose a potential threat to human health through exposure to four primary COCS and two secondary COCs. The primary and secondary COCS for the LAOCB sludge/soil and LAOCB pipeline soil are presented below.

Primary COCs (LAOCB Soils)		
Americium-241	(pCi/g)	2.60E+00
Antimony-125	(pCi/g)	6.30E-02
Cesium-137	(pCi/g)	3.70E-02
Cobalt-60	(pCi/g)	8.80E-03
Curium-244	(pCi/g)	4.90E+00
Europium-152	(pCi/g)	2.10E-02
Europium-154	(pCi/g)	1.90E-02
Plutonium-238	(pCi/g)	3.60E+00
Plutonium-239	(pCi/g)	3.40E+00
Potassium-40	(pCi/g)	1.20E-01
Strontium-90	(pCi/g)	3.90E-01
Uranium-238+D	(pCi/g)	1.40E+00
Uranium-234	(pCi/g)	2.50E+01
Uranium-235+D	(pCi/g)	3.10E-01
Aluminum	(mg/kg)	7.80E+04
Cadmium	(mg/kg)	1.20E+01
Chromium	(mg/kg)	3.40E+02
Lead	(mg/kg)	2.80E+01
Nickel	(mg/kg)	4.70E+02
Vanadium	(mg/kg)	5.40E+01

Secondary COCs (LAOCB Soils)		
Actinium-228	(mg/kg)	ND
Thallium-208	(mg/kg)	ND
13ismuth-214	(mg/kg)	ND
Potassium-40	(mg/kg)	ND
Beryllium	(mg/kg)	ND
Primary COCs (Pipeline Soils)		
Aluminum	mg/kg	7.80E+04
Arsenic	mg/kg	1.90E+01
Lead	mg/kg	2.80E+01
Thallium	mg/kg	6. 10E+00
Secondary COCS (Pipeline Soils)		
Beryllium	mg/kg	ND
Thallium-208	mg/kg	ND

ND - RGOS were not determined

Remedial Goal Options (RGOs) were developed for the primary COCS (primarily radionuclides) which represent greater than 99 percent of the total unit risk. RGOS 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 future resident scenario usually yields the most conservative RGO, future resident RGOS are presented above for the primary COCS for the LAOCB sludge/soil and LAOCB pipeline soil.

Exposure to direct radiation from radiological constituents in soils/sediments at the LAOCB posed an estimated carcinogenic risk to the hypothetical future resident greater than all other evaluated exposure pathways. The primary contributors to the risk are cobalt-60 and cesium-137.

The greatest risk to the hypothetical future resident at the LAOCB pipelines was estimated to be by the incidental ingestion of contaminated soils adjacent to the LAOCB pipelines. However, these risks are attributed to metals that occur naturally or from farming activities in SRS soils typically at concentrations above risk based concentrations.

#### *Site-Specific Considerations*

Site-specific considerations, based on the conclusions of the BRA and RFI/RI, which

indicate significant risk to the future on-unit worker and future on-unit resident include:

- 1) LAOCB soils represent the greatest risk at the unit. Specifically, radionuclides with risk exceeding 1 E-04 represent greater than 99 percent of the total unit risk. Direct radiation exposure is the primary risk pathway and results in a  $2 \times 10^{-2}$  (i.e., 2 in 100 people would develop cancer due to exposure in a residential setting) risk for a hypothetical future worker and  $2 \times 10^{-1}$  (1 in 5 people would develop cancer due to exposure in a residential setting) risk for a hypothetical future resident. Cesium-137 (12 %) and cobalt-60 (83 %) are the primary risk drivers for the direct radiation pathway. The half-lives of cobalt-60 and cesium- 137 are 5.2 years and 30.2 years, respectively.
- 2) Carcinogenic and noncarcinogenic risks posed by the pipeline soils are due to naturally occurring metals and radionuclides that are typical of SRS soils.
- 3) Radioactive contamination of the internal surface of the LAOCB pipeline has been documented to be approximately 300,000 dpm. Although this contamination does not currently represent a risk to human health and the environment future deterioration of the steel walls of the pipeline could potentially release contaminants to the environment and result in unacceptable risk.
- 4) The LAACB, LAACB pipeline, and the area adjacent to the LAOCB are estimated to contribute low to nonexistent risk; therefore, No Action for these components of this operable unit is appropriate.
- 5) The LAOCB is underlain with a compact layer of dense clay which has limited migration of contaminants to within approximately 2 feet below the LAOCB bottom.
- 5) The extent of groundwater contamination has not been completely defined; therefore, further characterization is required downgradient of identified tritium and volatile organic plumes.

6) The LAOCB and LAACB are in a remote area which has been recommended as an industrial zone by the Citizens Advisory Board and the *Savannah River Site Future Use Project Report* (DOE, 1996), precluding future residential use.

#### **Remedial Action Objectives**

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 Report and the 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.

The unit specific contaminants and media of concern are the primary and secondary COCS for the LAOCB sludge/soil and LAOCB pipeline soil presented above. Since, primary and secondary COCs for the LAOCB sludge/soil and LAOCB pipeline soil are radionuclides and metals with very similar physical and chemical properties, the remedial alternatives presented in the CMS/FS are applicable to all unit primary and secondary COCs.

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. Three types of ARARs; action-, chemical-, and location-specific; have been developed to simplify identification and compliance with environmental requirements. Action-specific requirements set controls on the design, performance, and other aspects of implementation of specific remedial activities.

Chemical-specific requirements are media-specific and health-based concentration limits developed for site-specific levels of constituents in specific media. Location-specific ARARs must consider Federal, State, and local requirements that reflect the physiographical and environmental characteristics of the unit or the immediate area.

There were no action-specific, location-specific, or chemical-specific ARARs relevant to establishing remedial action objectives for the LAOCB/LAACB source unit.

Remedial action objectives for the LAOCB soil are as follows:

- 1) to reduce risks to human health and the environment associated with:
  - a) external exposure to radiological constituents,
  - b) inhalation of radiological constituents,
  - c) ingestion of soil or produce grown in soil with radiological constituents, and
- d) prevent or mitigate the leaching of COCS to unit groundwater.

- 2) Achieve RGOS established for unit soils

## **SECTION V ALTERNATIVE ANALYSIS**

### **Section V.A Summary of Alternatives**

The RFI/RI and BRA indicate that the LAOCB source unit poses significant risk ( $2 \times 10^{-4}$ ) to human health and no significant risk to ecological receptors. These reports also indicate that No Action is warranted at the LAACB, and that under reasonable scenarios, only limited risk is associated with the LAOCB pipeline soils ( $2 \times 10^{-5}$ ) and soils outside the LAOCB fence ( $1 \times 10^{-5}$ ). However, due to radioactivity detected inside the LAOCB pipelines, there is a potential for increased future risks. Based on these conclusions, the Corrective Measures Study/Feasibility Study was conducted to consider possible actions which could reduce the risks at the LAOCB soils and LAOCB pipeline.

Since a No Action is appropriate for the LAACB, no evaluation of alternatives in the CMS/FS was warranted for the LAACB.

The Corrective Measures Study/Feasibility Study included detailed analyses for six LAOCB soils alternatives and four LAOCB pipeline alternatives which are described below. These alternatives do not include discussion of the soil/debris consolidation facility (SDCF), a bulk disposal option currently under evaluation for the disposal of radiologically contaminated soils/debris at the SRS. If built, the SDCF would be located at the SRS and would accommodate soil and debris from many waste units at the SRS. The feasibility of constructing a SDCF is currently being evaluated and it is unknown if disposal at the SDCF will be a viable option in the future. Therefore, this disposal option was not considered during the CMS/FS. If, after the ROD has been issued, DOE, EPA, SCDHEC, and stakeholders decide the LAOCB soil or pipeline should be disposed of at the SDCF, the ROD would be revised at that time.

#### LAOCB Basin Soil Alternatives

##### *Alternative S-1. No Action*

Under this alternative, no action would be taken at the LAOCB soils. EPA policy and regulations require consideration of a no action alternative to serve as a basis against which other alternatives can be compared. Because no action would be taken and the LAOCB soils would remain in their present condition, there are minimal costs related to normal SRS maintenance activities. The only reduction of risks resulting from the No Action alternative would be due to natural decay. Natural decay of Cobalt-60 and cesium- 137, which pose 95% of the risk in the primary risk pathway (external radiation to hypothetical future resident), would reduce the external radiation risk by 100% and 88%, respectively, over 90 years. Since five year reviews of the remedy are required, the total present value estimate for these reviews for the next 30 years is \$280,000.

##### *Alternative S-2. Backfill and Cap the LAOCB*

This alternative involves the placement of clean backfill in the LAOCB followed by construction of a cap over the LAOCB. Initially, the waste unit would be prepared by abandoning the existing monitoring wells around the basin and clearing any vegetation, fencing, and other physical obstructions immediately surrounding the LAOCB area. In addition, the contaminated soils, vegetation, and debris on the walls of the basin and the staging area on the north end of the basin would be pulled into the bottom of the basin. The basin would then be backfilled and compacted to grade. After sufficient compaction, an engineered cap would be constructed over the LAOCB to minimize surface infiltration and thereby reduce the potential for contaminant migration. A low permeability engineered soil cap would be sufficient to minimize infiltration, intrusion, and surface erosion. The cover design would be approved by the EPA and SCDHEC prior to construction. The cap would cover an area of approximately 0.5 acres (21,780 square feet). Existing SRS institutional controls would remain in effect and the capped area would be maintained for 100 years. Based on the known half-lives of the predominant radiological risk drivers (i.e., cobalt-60 and cesium- 137), cobalt-60 will have gone through approximately 20 half-lives and cesium-137 will have gone through approximately 3.5 half-lives over the 100 year duration of SRS institutional controls.

A properly engineered cap would function as a physical barrier to prevent direct human exposure to soil-borne contamination and thus be protective of human health and the environment. Capping is a performance based engineering approach since it does not reduce the total mass of COCS and cannot achieve RGOs. However, only three feet of soil cover is required to reduce the annual effective dose associated with continuous exposure to the <sup>137</sup>Cs and <sup>60</sup>Co in the Basin by over 99 percent and within regulatory and DOE limits. In addition, a properly maintained cap would minimize infiltration and subsequent leaching of contamination from unsaturated soil to the groundwater. Under this remedial alternative, remedial action objectives would be satisfied by: 1)

limiting infiltration into the area and thereby reducing the leaching of primary and secondary COCS to unit groundwater, and 2) preventing human or ecological access and thereby reducing risks to human health and the environment. The total present value estimate for this alternative is \$1,430,000.

*Alternative S-3. Backfill, Install Slurry Cut-Off Walls around the LAOCB, and Cap*

This alternative involves the placement of clean backfill in the LAOCB followed by installation of a vertical cut-off wall around the LAOCB cap area and construction of a cap over the LAOCB. Initially, the waste unit would be prepared by abandoning the existing monitoring wells around the basin and clearing any vegetation, fencing, and other physical obstructions immediately surrounding the LAOCB area. In addition, the contaminated soils, vegetation, and debris on the walls of the basin and the staging area on the north end of the basin would be pulled into the bottom of the basin. The basin would then be backfilled and compacted to grade. After sufficient compaction, a vertical cut-off wall (slurry wall) would be installed by excavating a trench around the LAOCB down to the hardpan clay layer located just below the bottom of the LAOCB, and filling with a low permeability soil-bentonite or cement-bentonite slurry. An engineered cap would be constructed over the LAOCB to minimize surface infiltration and reduce the potential for contaminant migration. Coupled with the hardpan clay layer located just below the bottom of the LAOCB, this slurry wall/cap would form a complete low-permeability containment unit.

The low permeability engineered cap would have the same characteristics as identified in Alternative S-2. Existing SRS institutional controls would remain in effect and the capped area would be maintained for 100 years.

Under this alternative, remedial action objectives would be satisfied by: 1) limiting infiltration into the area and thereby preventing the migration of primary and secondary COCS to groundwater, and 2) preventing human or ecological access and

thereby reducing risks to human health and the environment. This alternative, assuming an approximate backfill/cap thickness of 4 feet, is estimated to reduce the radioactive dose (direct radiation exposure) received from cesium-137 and cobalt-60 at the LAOCB by 100 percent. The total present value estimate for this alternative is \$3,430,000.

*Alternative S-4. In Situ Stabilize, Backfill, and Cap*

This alternative involves the in situ S/S of the top 2 feet of sludge/soil in the bottom of the LAOCB, placement of clean backfill in the LAOCB to grade, followed by construction of a cap over the LAOCB. Initially, the waste unit would be prepared by abandoning the existing monitoring wells around the basin and clearing any vegetation, fencing, and other physical obstructions immediately surrounding the LAOCB area. In addition, the contaminated soils, vegetation, and debris on the walls of the basin and the staging area on the north end of the basin would be pulled into the bottom of the basin. The sludge/soil and debris would then be solidified/stabilized to a depth of approximately two feet below the current basin bottom. In situ S/S would involve mixing the S/S reagents into the waste by some mechanical means such as a long-reach backhoe fitted with a rotary tine or a jet-grouting system. A treatability study has been conducted on LAOCB soils to identify S/S reagents that effectively immobilize unit-specific contaminants. A mixture of Portland Cement, bentonite, and sodium silicate was found to effectively immobilize LAOCB contaminants of concern and would be used to in situ S/S LAOCB soils. Following S/S, the remaining depression would be backfilled to grade and a low permeability engineered cap sufficient to minimize infiltration, intrusion, and surface erosion would be constructed over the basin. The cover design would be approved by the EPA and SCDHEC prior to construction. Existing SRS institutional controls would remain in effect and the capped area would be maintained for 100 years.

In-situ S/S does not reduce the total mass of COCS and cannot in itself achieve RGOS, it is a proven performance based engineering approach that

reduces the mobility of primary and secondary COCs. Based on results of a literature search and a treatability study performed on LAOCB soils, the in-situ S/S reagents are considered effective at reducing the leachability of contaminants. Specifically the various S/S reagent samples (with LAOCB soil) were subjected to toxicity characteristic leaching procedure (TCLP) and the intended American National Standard (ANS) 16.1 procedure to simulate leaching of contaminants over time. Analysis of leaching test performed on LAOCB soil samples amended with S/S reagents demonstrated that all of the samples leached 0.41 % and 1.61 % or less of gross alpha and gross beta, respectively (WSRC, 1996c).

Under this alternative, contamination in the basin would be immobilized and covered with clean soil and a cap. These actions would meet remedial action objectives by: 1) preventing infiltration into the area through capping and immobilizing contaminant present in the basin via in-situ S/S, and thereby preventing migration of primary and secondary COCs to groundwater, and 2) preventing human or ecological access and thereby reducing risks to human health and the environment. In addition, assuming an approximate backfill/cap thickness of 4 feet, this alternative is estimated to reduce the radioactive dose (direct radiation exposure) received from cesium- 137 and cobalt-60 at the LAOCB by 100 percent. The total present value estimate for this alternative is \$3,580,000.

#### *Alternative S-5. Ex Situ Stabilize, Backfill, & Cap*

This alternative involves the ex situ S/S of the top 2 feet of sludge/soil in the bottom of the LAOCB, placement back in the LAOCB, placement of clean backfill in the remaining void space, followed by construction of a cap over the LAOCB. Initially, the waste unit would be prepared by abandoning the existing monitoring wells around the basin and clearing any vegetation, fencing, and other physical obstructions immediately surrounding the LAOCB area. Due to radiological control concerns with the excavation of the radioactive contamination in the basin, the sludge/soil would be stabilized prior to excavation for ex situ stabilization. The sludge/soil would be solidified/stabilized to a depth of approximately

two feet below the current basin bottom as described for alternative S-4. The top 2 feet of soil in the bottom of the basin would then be excavated and ex situ solidified/stabilized. Following placement of the treated basin soil back in the LAOCB, contaminated soils, vegetation, and debris on the walls of the basin and the staging area on the north end of the basin would be pulled into the bottom of the basin on top of the stabilized sludge/soil. The basin would be backfilled with clean soil and compacted to original grade. After sufficient compaction, an engineered cap would be constructed over the LAOCB. The treated soil and the engineered cap would minimize surface infiltration and reduce the potential for contaminant migration.

The low permeability engineered cap would have the same characteristics as identified in Alternative S-2. Existing SRS institutional controls would remain in effect and the capped area would be maintained for 100 years.

Under this alternative, contamination in the basin would be excavated, immobilized, replaced in the LAOCB, and a cap constructed.

As discussed under Alternative S-4, this alternative does not reduce the total mass of COCS and cannot in itself achieve RGOS; however, it is a proven performance based engineering approach that reduces the mobility of primary and secondary COCs. Also as discussed under Alternative S-4 results of a literature search and a treatability study performed on LAOCB soils, S/S reagents are considered effective at reducing the mobility of primary and secondary COCs. Under this alternative, contamination in the basin would be excavated, immobilized, replaced in the LAOCB, and a cap constructed.

This alternative would meet remedial action objectives by: 1) preventing infiltration into the area through capping and immobilizing contamination present in the basin though ex-situ S/S, thereby preventing migration of primary and secondary COCS to groundwater, and 2) preventing human or ecological access and thereby reducing risks to human health and the environment. In addition, assuming an approximate backfill/cap

thickness of 4 feet, this alternative is estimated to reduce the radioactive dose (direct radiation exposure) received from cesium- 137 and cobalt-60 at the LAOCB by 100 percent. The total present value estimate for this alternative is \$4,370,000.

***Alternative S-6. Excavation & Off-Unit Disposal***

This alternative involves the excavation and off unit disposal of the top 2 feet of sludge/soil from the bottom of the LAOCB, and contaminated soils, vegetation, and debris on the walls of the basin and the staging area on the north end of the basin. Treatment (i.e., stabilization) of the LAOCB soils would first be conducted to ensure optimal waste handling characteristics. Following pretreatment, a backhoe or trackhoe would be used to excavate contaminated material in the LAOCB to a depth of approximately 2 feet below the current basin bottom. Confirmation soil samples would be collected and analyzed periodically during excavation to verify that all soil exceeding concentration-based remediation goals was recovered. Following excavation, the soil may require further treatment for waste handling purposes and packaging and disposal requirements. The contaminated material would then be placed directly into lined haul trucks for transport from the waste unit to the disposal facility (Nevada Test Site near Mercury, Nevada). Upon completion of contaminated material removal, the LAOCB would be backfilled with clean soil and compacted to grade.

By removing the source of contamination, this alternative would eliminate all risks associated with the LAOCB sludge/soils and meet the remedial action objectives by eliminating any risk of contaminant migration to groundwater and risk to human health and the environment. The total present value estimate for this alternative is \$9,100,000.

**LAOCB Pipeline Alternatives**

***Alternative P-1. No Action***

Under this alternative, no action would be taken at the LAOCB pipeline. EPA policy and regulations require consideration of a no action alternative to

serve as a basis against which other alternatives can be compared. Because no action would be taken and the LAOCB pipeline would remain in its present condition, there are minimal costs related to normal SRS maintenance activities. Under the No Action alternative, there would be no reduction or mitigation of current or future risks associated with the pipelines. Since five year reviews of the remedy would be in conjunction with the LAOCB sludge/soil, the estimated cost for these reviews for the next 100 years is \$0. The total present value estimate for this alternative is \$0.

***Alternative P-2. Capping***

This alternative involves the construction of a low permeability cap over the LAOCB pipeline area. Initially, the waste unit would be prepared by clearing any vegetation, fencing, and other physical obstructions immediately surrounding the LAOCB pipeline area. After the area is prepared, an engineered cap would be constructed over the LAOCB pipeline to minimize surface infiltration and thereby reduce the potential for contaminant migration. The low permeability engineered cap would be designed to minimize infiltration, intrusion, and surface erosion. The cover design would be approved by the EPA and SCDHEC prior to construction. The cap would cover an area of approximately 0.5 acres (21,780 square feet). Existing SRS institutional controls would remain in effect and the capped area would be maintained for 100 years.

This alternative would meet the remedial action objectives by: 1) minimizing infiltration into the pipeline area, thereby preventing migration of contaminants to groundwater, and 2) preventing intrusion to the pipeline area, thereby reducing risk to human health and the environment. Since five year reviews of the remedy would be in conjunction with the LAOCB sludge/soil, the additional estimated present value for these reviews for the next 100 years is \$0. The total present value estimate for this alternative is \$730,000.

***Alternative P-3. In Situ Stabilization and Disposal  
in the LA OCB***

This alternative involves the in situ S/S, excavation, and on-unit disposal of the LAOCB pipeline and associated soils in the LAOCB. The pipelines would first be grouted by in situ S/S to minimize the potential release of residual contaminants from inside the pipelines during excavation. A backhoe or trackhoe would then be used to excavate the LAOCB pipeline. The pipelines would be cut into manageable sections for the purpose of moving and minimizing required disposal space. Confirmation soil samples would be collected and analyzed periodically during excavation to verify that all soil exceeding concentration-based remediation goals was recovered. The pipeline sections and associated soils would be placed directly into the LAOCB and subsequently solidified/stabilized to create a monolith and further reduce the mobility of pipeline contaminants. When pipeline and soil removal and disposal are completed, the LAOCB pipeline area would be backfilled with clean soil and compacted to grade.

Because the source of contamination would be removed under this alternative, remedial action objectives would be met by eliminating any risk to groundwater, human health, or the environment caused by the LAOCB pipeline area. Since five year reviews of the remedy would be in conjunction with the LAOCB soil, the additional estimated present value for these reviews for the next 100 years is \$0. The total present value estimate for this alternative is \$990,000.

***Alternative P-4. In Situ Stabilization and Disposal  
at the Nevada Test Site***

This alternative involves the in situ S/S, excavation, and off unit disposal of the LAOCB pipeline and associated soils. The pipelines would first be grouted by in situ S/S to minimize the potential release of residual contaminants from inside the pipelines during excavation. A backhoe or trackhoe would be used to excavate the LAOCB pipeline. The pipeline sections would then be cut into manageable sections for the purpose of moving and minimizing required disposal space.

Confirmation soil samples would be collected and analyzed periodically during excavation to verify that all soil exceeding concentration-based remediation goals was recovered. The pipelines and associated soil would then be placed directly into lined haul trucks for transport from the waste unit to the disposal facility (Nevada Test Site near Mercury, Nevada). Upon the completion of the excavation of contaminated pipeline and soil, the LAOCB pipeline area would be backfilled with clean soil and compacted to grade.

Because the source of contamination would be removed under this alternative, remedial action objectives would be met by eliminating any risk to groundwater, human health, or the environment caused by the LAOCB pipeline area. Since five year reviews of the remedy would be in conjunction with the LAOCB soil, the additional estimated present value for these reviews for the next 100 years is \$0. The total present value estimate for this alternative is \$4,630,000.

**Section V.B Preferred Alternatives**

Based on the risks identified in Section IV.B, the LAOCB soil poses a significant risk to human health. Significant carcinogenic risks to the potential future worker or resident are driven by exposure from direct radiation, ingestion, and ingestion of produce grown in the LAOCB soils contaminated with radionuclides (primarily cobalt-60 and cesium-137) to a depth of less than 2 feet. In addition, significant noncarcinogenic risks are driven by ingestion of basin soils contaminated with chromium and lead. Based on characterization and risk evaluations, the preferred alternative for remediating the LAOCB sludge/soil is Alternative S-4: In Situ Stabilization and Capping. This alternative will meet remedial action objectives by eliminating ingestion of soils and produce grown in soils, and reduce/minimize direct radiation and potential future impacts to groundwater.

Implementation of the preferred LAOCB alternative (S-4) will involve in situ stabilization of the top 2 feet of sludge/soil in the bottom of the LAOCB, the placement of clean soil in the LAOCB, followed by construction of a cap over

the LAOCB. Initially, the waste unit would be prepared by abandoning the existing monitoring wells around the basin and clearing any vegetation, fencing, and other physical obstructions immediately surrounding the LAOCB area. In addition, the contaminated soils, vegetation, and debris on the walls of the basin and the staging area on the north end of the basin will be pulled into the bottom of the basin. The sludge/soil and debris will then be solidified/stabilized to a depth of approximately two feet below the current basin bottom. Following S/S, any remaining void will be backfilled to grade. After sufficient compaction, an engineered cap will be constructed that will minimize infiltration, intrusion, and surface erosion. The treated soil and the engineered cap will minimize surface infiltration and reduce the potential for leaching of COCs to unit groundwater. The design of the engineered cap will be approved by the EPA and SCDHEC prior to construction. The cap will cover an area of approximately 0.5 acres (21,780 square feet). Existing SRS institutional controls will remain in effect and the capped area will be maintained for 100 years.

Carcinogenic and noncarcinogenic risks posed by the pipeline soils are due to naturally occurring metals and radionuclides that are typical of SRS soils. Relatively high levels of radioactivity were detected in the LAOCB pipelines; however, specific radioisotopes were not identified. Although this contamination does not currently represent a risk to human health and the environment, future deterioration of the steel walls of the pipeline could potentially release contaminants to the environment and result in unacceptable risk. Therefore, the preferred alternative for remediating the LAOCB pipeline is Alternative P-3: In Situ Stabilization and Disposal in the LAOCB. This alternative would meet remedial action objectives by reducing risk to human health associated with direct radiation and reducing risk to groundwater by treating and removing the contaminant source.

Implementation of the LAOCB pipeline alternative (P-3) will first involve in situ S/S (grouting) of the pipelines to minimize the release of residual contaminants from inside the pipeline during

excavation. The pipelines would then be excavated and cut into manageable sections. The pipeline sections would then be placed in the LAOCB along with any contaminated soils associated with the pipelines. After being placed in the LAOCB, pipeline soil and voids between pipeline sections would be grouted to create a monolith that would further reduce the mobility of pipeline contaminants. As described in Alternative S-4 for LAOCB soils, any remaining void space in the basin would then be backfilled, compacted, and an engineered cap constructed.

Based on characterization and risk evaluations of the LAACB and soils surrounding the LAOCB, No Action is the preferred response.

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 as well as 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 radioactive oil and chemical wastewater.

The deed shall also include deed restrictions precluding residential use of the property. However, the need for these deed restrictions may be reevaluated at the time of transfer in the event that contamination no longer poses an unacceptable risk under residential use.

In addition, if the site is ever transferred to non-federal ownership, a survey plat of the area will be prepared, certified by a professional land surveyor, and recorded with the appropriate county recording agency.

These preferred alternatives and the No Action are intended to be the final action for the LAOCB/LAACB source unit. The solution is intended to be permanent and effective in both the long and short terms. Further assessment of the groundwater contamination will be conducted to define the extent of groundwater contaminant plumes. This assessment will provide the data

necessary to conduct a risk assessment, Feasibility Study, Proposed Plan, and ROD for groundwater in the vicinity of the unit.

This proposal is consistent with EPA guidance and the National Contingency Plan for sites that have relatively large volumes of waste with low levels of contamination and is an effective use of risk management principles. This source unit Statement of Basis/Proposed Plan provides for involvement of the community through a document review process and a public comment period. Public input will be documented in the Responsiveness Summary of the Record of Decision and RCRA permit modification, as previously discussed. To submit written or oral comments, please refer to Section II.

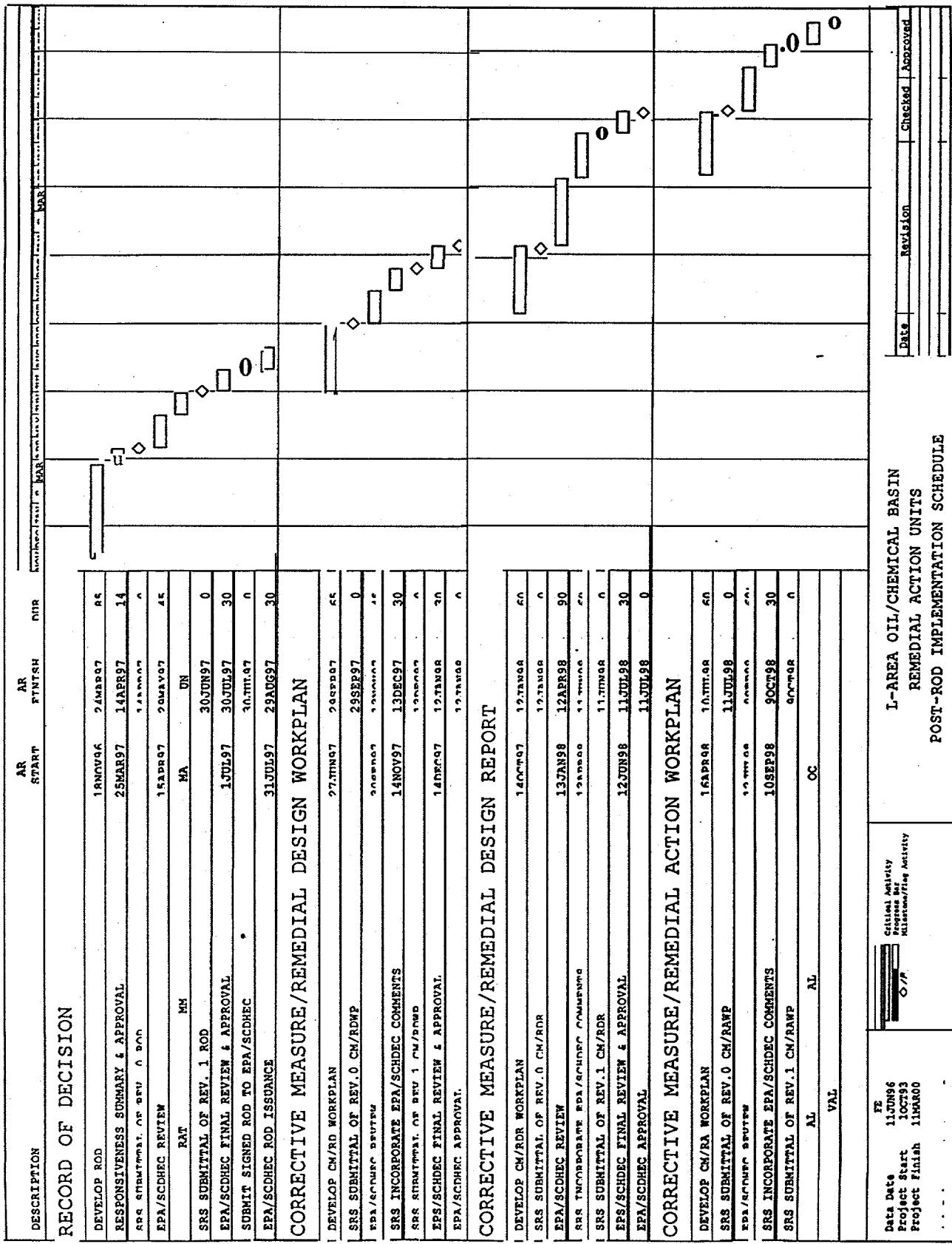
#### SECTION VI. POST-ROD DOCUMENT SCHEDULE

The post-ROD document and implementation schedule is listed below and is illustrated in Figure 3:

1. Corrective Measures Implementation/Remedial Design Work Plan (CMI/RDWP) (Rev. 1) will be submitted 4 months after issuance of ROD.
2. The CMI/Remedial Design Report (RDR) (Rev. 1) will be submitted 10 months after issuance of ROD.
3. The CMI/Remedial Action Work Plan (RAWP) (Rev. 1) will be submitted 13 months after issuance of ROD.
4. Document preparation will proceed before final regulatory approval of the previous document to meet 15 month statutory requirement.
5. Regulatory review, SRS revision, and regulatory approval cycles for CMI/RDWP, CMI/RDR, and CMI/RAWP will require approximately 14 months.

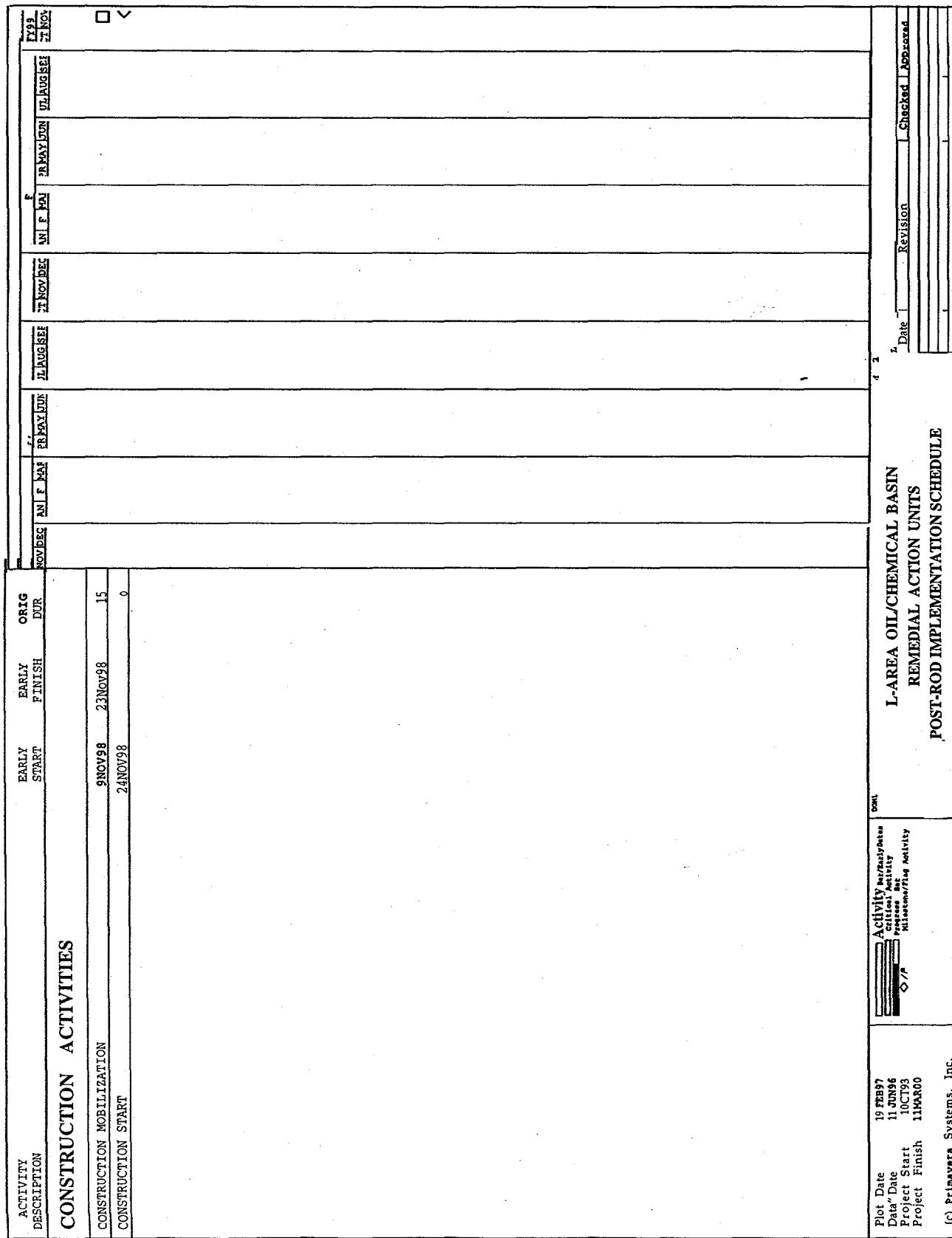
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Figure 3 L-Area Oil & Chemical Basin Remedial Action Units - Post ROD Schedule



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**Figure 3 (cont'd) L-Area Oil & Chemical Basin Remedial Action Units - Post ROD Schedule**



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## GLOSSARY

**Administrative Record File:** A file that is maintained and contains all information used to make a decision on the selection of a response action under the Comprehensive Environmental Response, Compensation & Liability Act. This file is to be available for public review, and a copy is to be established at or near the Site, usually at one of the information repositories. Also a duplicate file is held in a central location, such as a regional or state office.

**ARARs:** Applicable, or Relevant and Appropriate Requirements: Refers to the federal and state requirements that a selected remedy will attain. These requirements may vary from site to site.

**Baseline Risk Assessment:** Analysis of the potential adverse health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

**Characterization:** The compilation of all available data about the waste units to determine the rate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that maybe present.

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 1980:** A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The Acts created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

**Corrective Action:** An EPA requirement to conduct remedial procedures under RCRA 3998(h) at a facility when there has been a release of hazardous waste or constituents into the environment. Corrective action may be required beyond the facility boundary and can be required regardless of when the waste was placed at the facility.

**Exposure:** Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract, etc.) and available for absorption.

**Federal Facility Agreement (FFA):** The legally binding agreement between regulatory agencies (EPA and SCDHEC) and regulated entities (DOE) that sets the standards and schedules for the comprehensive remediation of the SRS.

**Media:** A pathway through which contaminants are transferred. Five media by which contaminants may be transferred are groundwater, soil, surface water, sediments, and air.

**National Priorities List (NPL):** EPA's formal list of the nation's most serious uncontrolled or abandoned waste sites, identified for possible long-term remedial response, as established by CERCLA.

**Operable Unit (OU):** A discrete action taken as one part of an overall site cleanup. The term is also used in EPA guidance documents to refer to distinct geographic areas or media-specific units within a site. A number of operable units can be used in the course of a cleanup.

**Operation and Maintenance (O&M):** Activities conducted at a site after a response action occurs to ensure that the cleanup and/or systems are functioning properly.

**Overall Protection of Human Health and the Environment:** The assessment - against this criterion describes how the alternative, as a whole, achieves and maintains protection of human health and the environment.

**Record Of Decision (ROD):** A legal document that explains to the public which alternative will be used at a site/operable unit. The record of decision is based on information and technical analysis generated during the remedial investigation/feasibility study and consideration of public comments and community concerns.

**Resource Conservation and Recovery Act (RCRA), 1976:** A Federal law that established a regulatory system to track hazardous substances from their generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

**Responsiveness Summary:** A summary of oral and/or written comments received during the proposed plan comment period and includes responses to those comments. The responsiveness summary is a key part of the ROD, highlighting community concerns.

**Statement of Basis/Proposed Plan (SB/PP):** A legal document that provides a brief analysis of remedial alternatives under consideration for the site/operable unit and proposes the preferred alternative. This integrated RCRA/CERCLA document actively solicits public review and comment on all alternatives under consideration.

**Superfund:** The common name used for CERCLA; also referred to as the Trust Fund. The Superfund program was established to help fund cleanup of hazardous waste sites. It also allows for legal action to force those responsible for the sites to clean them up.