United States Department of Energy

Savannah River Site

Record of Decision
Remedial Alternative Selection for the
P-Area Operable Unit (PAOU) (U)

CERCLIS Number: 94

SRNS-RP-2009-01368

Revision 1

April 2010

Prepared by:
Savannah River Nuclear Solutions, LLC
Savannah River Site
Aiken, SC 29808

Prepared for U.S. Department of Energy under Contract No. DE-AC09-08SR22470

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Prepared for
U.S. Department of Energy
and
Savannah River Nuclear Solutions, LLC
Aiken, South Carolina

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION (U)

P-Area Operable Unit Name (PAOU) (U)

CERCLIS Number: 94

SRNS-RP-2009-01368
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April 2010

Savannah River Site
Aiken, South Carolina

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Savannah River Operations Office
Aiken, South Carolina

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DECLARATION FOR THE RECORD OF DECISION

Unit Name and Location

P-Area Operable Unit (PAOU)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 94

Savannah River Site

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy

The PAOU is listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit /CERCLA unit in Appendix C of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS). This Record of Decision (ROD) document addresses the PAOU that is comprised of multiple subunits, some of which were previously selected for early remedial actions or non-time critical (NTC) removal actions.

The FFA is a legally binding agreement between regulatory agencies (United States Environmental Protection Agency [USEPA] and South Carolina Department of Health and Environmental Control [SCDHEC]) and regulated entities (United States Department of Energy [USDOE]) that establishes the responsibilities and schedules for the comprehensive remediation of SRS.

The media associated with the subunits discussed in this document include surface soil, vadose zone soil, rail bed materials, metal components, concrete, and sediment. Although portions of this document discuss the localized impacts to the groundwater from contaminant migration, the groundwater is not part of the PAOU; it will be addressed separately under the P-Area Reactor Groundwater Operable Unit (OU).

Statement of Basis and Purpose

This decision document presents the selected remedies for the PAOU subunits located at the SRS near Aiken, South Carolina. The PAOU is comprised of the following subunits:

- P-Reactor Building (105-P) Complex and its Ancillary Structures including Engine House (108-1P), Engine House (108-2P) with Standby Pumphouse (191-P);
- Disposition of Water in the P-Reactor Disassembly Basin;
- Potential Release from the P-Area Reactor Cooling Water System (186/190-P);
- Potential Release from the P-Area Disassembly Basin (no building number [NBN]);
- Process Sewer Lines as Abandoned (NBN) (PSLs); including the Spill on 03/15/79 of 5000 gallons of Contaminated Water; and various components of the PSLs including Process Water Storage Tank (106-P), Process Water Storage Basin (109-P), Cooling Water Effluent Sump (107-P/107-1P), outfalls, manholes, and miscellaneous weirs and boxes; sumps, etc.;
- P-Area Reactor Area Cask Car Railroad Tracks as Abandoned (NBN);
- All railroad tracks within the P-Area fence;
- High Contamination Area (HCA) associated with the P-Area Cask Car Railroad Tracks;
- P-Area Ash Basin (including Outfall P-007) (188-P);
- Slab Associated with Containment Tank within Emergency Cooling Water Retention Basin (904-86G);
- Slab Associated with Pipe Fabrication Shop Building (717-9P);
- Slab Associated with Radiological Zone Storage Building (710-P);
- Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P);

- Potential Source Area (PSA) 1 – Emergency Cooling Water Retention Basin (904-86G);
- PSA 2 – Area around the Cooling Water Effluent Sump (107-P/107-1P);
- PSA 3A – Area near the Northern end of the P-Reactor Building (105-P);
- PSA 3B – Area West of the Administrative/Maintenance Slab;
- PSA 4 – Area East of the P-Reactor Building (105-P);
- PSA 5 – Two localized areas in the Southwestern part of P Area; and
- Outfall P02.

The remedy was chosen in accordance with CERCLA, as amended by the Superfund Amendments Reauthorization Act, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the information contained in the Administrative Record File for this site.

The USEPA, SCDHEC and USDOE concur with the selected remedy.

Assessment of the Site

Regulatory decisions were previously made on select PAOU subunits. These decisions included early remedial actions documented in the Early Action Record of Decision (EAROD) and an Explanation of Significant Difference (ESD) to the EAROD that include the following subunits:

- P-Reactor Building (105-P) Complex and its Ancillary Structures including Engine House (108-1P), Engine House (108-2P) with Standby Pumphouse (191-P);
- HCA associated with the P-Area Cask Car Railroad Tracks;
- PSA 3A – Area near the Northern end of the P-Reactor Building (105-P);
- PSA 3B – Area West of the Administrative/Maintenance Slab; and

- Outfall P02.

NTC removal actions are documented in the three Removal Site Evaluation Reports (RSER)/Engineering Evaluation/Cost Analyses (EE/CAs) and include the following subunits:

- P-Area Ash Basin (including Outfall P-007) (188-P);
- PSLs; including the Spill on 03/15/79 of 5000 gallons of Contaminated Water; and various components of the PSLs including Process Water Storage Tank (106-P), Process Water Storage Basin (109-P), Cooling Water Effluent Sump (107-P/107-1P), outfalls, and manholes, miscellaneous weirs and boxes; sumps, etc.; and
- Disposition of Water in the P-Reactor Disassembly Basin.

The remaining subunits not selected for an early remedial action or a NTC removal action were presented in the *RCRA Facility Investigation/Remedial Investigation with Baseline Risk Assessment and Corrective Measures Study/Feasibility Study* (RFI/RI/BRA/CMS/FS) report.

Based on the results of the RFI/RI/BRA/CMS/FS, two subunits require No Further Action since it has been determined that these subunits pose no impact to human health or the environment based on an unrestricted land use scenario. These subunits include the Slab Associated with Containment Tank within the Emergency Cooling Water Retention Basin (904-86G) and the PSA 1 - Emergency Cooling Water Retention Basin (904-86G). In addition, a third subunit, Outfall P02, has also been determined to require No Further Action as documented in the Early Action Remedial Action Implementation Plan. These three subunits are located outside of the P Area fence line. The remaining PAOU subunits are located within the P Area fence line and will require land use controls (LUCs) as part of the selected remedy to prevent unrestricted land use.

There has been a release of hazardous and radioactive substances at the PAOU into the environment. Subsequent to the completion of the early actions and the NTC removal actions, hazardous and radioactive wastes will remain in place at some of the subunits. Therefore, the response action selected in this ROD is necessary to protect the public health or welfare or the

environment from actual or threatened releases of hazardous and radioactive substances into the environment.

Description of the Selected Remedy

The current land use for the PAOU is industrial with USDOE maintaining control of the land as long as necessary to keep the selected remedy fully protective of human health and the environment. The selected remedy for the PAOU is Alternative PAOU-2 – LUCs to maintain industrial land use. This remedy was selected because it meets the remedial action objectives and the threshold criteria, provides overall protection of human health and the environment, and complies with Applicable or Relevant and Appropriate Requirements. The remedy effectively balances short-term effectiveness, implementability, and cost criteria, while providing a high level of long term protection to radioactive and hazardous contaminants that remain.

The following LUC objectives are necessary to ensure protectiveness of the selected remedy:

- Restrict unauthorized worker access and prevent contact, removal or excavation of contaminated waste, pipelines, equipment, and buildings;
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds;
- Maintain the integrity of any current or future remedial or monitoring systems, such as soil vapor extraction systems, soil covers, or groundwater monitoring wells; and
- Prevent access or use of contaminated groundwater until cleanup levels are met;
- Prevent construction of inhabitable buildings without an evaluation of indoor air quality to address vapor intrusion.

As previously stated, early remedial actions and NTC removal actions were selected for some PAOU subunits. These decisions included early remedial actions documented in an EAROD and an ESD to the EAROD, and NTC removal actions documented in three RSER/EE/CAs. The

remaining subunits not selected for an early remedial action or a NTC removal action were presented in the RFI/RI/BRA/CMS/FS report.

Following successful completion of the early remedial actions and the NTC removal actions, residual hazardous substances will remain at the PAOU that pose a threat to human health. Therefore, LUCs are needed for the PAOU to prevent unrestricted land use. Implementation of this alternative would require both near- and long-term actions. It is important to note that a potential future use for the PAOU that could be considered is access by the United States Armed Forces for training purposes. This activity is consistent with industrial use and the LUCs selected in this ROD are protective of this potential land use scenario.

The RCRA permit will be revised to reflect selection of the final remedy using the procedures under 40 Code of Federal Regulations Part 270, and South Carolina Hazardous Waste Management Regulations R.61-79.264.101; 270.

Statutory Determinations

Early action regulatory decisions were made on select PAOU subunits as documented in an EAROD, an ESD to the EAROD, and in three Action Memoranda (removal actions). The remaining subunits not selected for an early remedial action or a NTC removal action were presented in the RFI/RI/BRA/CMS/FS report. Following successful completion of the early remedial actions and NTC removal actions, residual hazardous substances will remain at the PAOU that pose a threat to human health and the environment. Therefore, Alternative PAOU-2 – LUCs, has been selected as the remedy for the PAOU. As part of the selected remedy, the future land use of the PAOU will be industrial.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after the initiation of remedial action to ensure that the remedy is and will continue to be protective of human health and the environment.

The selected remedy for the PAOU (Alternative PAOU-2 - LUCs) is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action (unless justified by a waiver) and is cost-effective. This remedy for the PAOU does not satisfy the statutory preference for treatment as a principal element of the remedy because it does not reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment.

In the long-term, if the property is ever transferred to nonfederal ownership, the United States Government will take those actions necessary pursuant to Section 120(h) of CERCLA. Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The contract for sale and the deed will contain the notification required by CERCLA Section 120(h). The deed notification shall notify any potential purchaser that the property has been used for the management and disposal of waste. These requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

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 exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended ROD with USEPA and SCDHEC review and approval.

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

The selected remedy for the PAOU leaves hazardous substances in place that pose a potential future risk and will require land use restrictions for an indefinite period of time. As agreed on March 30, 2000, among the USDOE, USEPA, and SCDHEC, SRS is implementing a Land Use Control Assurance Plan (LUCAP) to ensure that the LUCs required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific Land Use

Control Implementation Plan (LUCIP) for the PAOU will provide details and specific measures required to implement and maintain the LUCs selected as part of this remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this ROD. Upon final approval, the PAOU LUCIP will be appended to the LUCAP and is considered incorporated by reference into the ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. The LUCIP will remain in effect unless and until modifications are approved by the USEPA and SCDHEC as needed to be protective of human health and the environment. LUCIP modification will only occur through another CERCLA document.

Data Certification Checklist

This ROD provides the following information:

- Constituents of Concern (COCs) and their respective concentrations (Section V);
- Baseline risk represented by the COCs (Section VII);
- Cleanup levels established for the COCs and the basis for the levels (Section VIII);
- Current and reasonably anticipated future land and groundwater use assumptions used in the BRA and ROD (Section VI);
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Section VI);
- Estimated capital, operation and maintenance, and total present worth cost; discount rate; and the number of years over which the remedy cost estimates are projected (Section IX);
- Key decision factor(s) that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria) (Section X); and

- How source materials constituting principal threats are addressed (Section VII, Section XI).

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6/8/10
Date

Karen C. Guevara
Assistant Manager for Closure Project
U. S. Department of Energy
Savannah River Operations Office

6/24/10
Date

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DECISION SUMMARY
REMEDIAL ALTERNATIVE SELECTION (U)

P-Area Operable Unit

CERCLIS Number: 94

SRNS-RP-2009-01368
Rev. 1

April 2010

Savannah River Site
Aiken, South Carolina

Prepared By:

Savannah River Nuclear Solutions, LLC
for the
U. S. Department of Energy under Contract DE-AC09-08SR22470
Savannah River Operations Office
Aiken, South Carolina

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LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM	Meaning
amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirement
BRA	Baseline Risk Assessment
C	Centigrade
CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulation
CM	contaminant migration
cm^2	centimeter square
CMS	Corrective Measures Study
COC	constituent of concern
CSM	conceptual site model
dpm	disintegrations per minute
EARAIP	Early Action Remedial Action Implementation Plan
EAROD	Early Action Record of Decision
EE/CA	Engineering Evaluation / Cost Analysis
ESD	Explanation of Significant Difference
F	Fahrenheit
FFA	Federal Facility Agreement
FS	Feasibility Study
ft	feet
ft^2	feet square
ft^3/s	cubic feet per second
gal	gallon
HCA	High Contamination Area
HI	hazard index
IOU	Integrator Operable Unit
ISD	*In situ* decommissioning
LLC	Limited Liability Company
LUC	Land Use Control
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
km	kilometer
km^2	kilometer square
L	liter
m	meter
m^2	meter square
m^3	cubic meter
m3/s	cubic meter per second
MCL	maximum contaminant limit

LIST OF ACRONYMS AND ABBREVIATIONS (*continued*)

ACRONYM	Meaning
mg/kg	milligram/kilogram
mi	mile
mi^2	mile square
NBN	no building number
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NTC	Non-Time Critical
O&M	Operations and Maintenance
OU	operable unit
PAOU	P-Area Operable Unit
PCE	tetrachloroethylene
pCi/g	picocuries per gram
pCi/mL	picocuries per milliliter
PRGW	P-Area Reactor Groundwater
PSA	potential source area
PSL	process sewer line
PTSM	principal threat source material
RAO	remedial action objective
RBC	P-Reactor Building (105-P) Complex
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RG	remedial goal
RI	Remedial Investigation
ROD	Record of Decision
RSER	Removal Site Evaluation Reports
SB/PP	Statement of Basis/Proposed Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulations
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SVE	soil vapor extraction
TCE	trichloroethylene
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds
WSRC	Washington Savannah River Company, LLC
WSRC	Westinghouse Savannah River Company LLC
yd3	cubic yards

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

Unit Name, Location, and Brief Description

P-Area Operable Unit

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU- 94

Savannah River Site

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy (USDOE)

Savannah River Site (SRS) occupies approximately 803 km^2 (310 mi^2) of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is located approximately 40.2 km (25 mi) southeast of Augusta, Georgia, and 32.2 km (20 mi) south of Aiken, South Carolina.

The USDOE owns the SRS, which historically produced tritium, plutonium, and other special nuclear materials for national defense and the space program. Chemical and radioactive wastes are by-products of nuclear material production processes. Hazardous substances, as defined by the CERCLA, are currently present in the environment at SRS.

The Federal Facility Agreement (FFA) (FFA 1993) for the SRS lists the P-Area Operable Unit (PAOU) as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/CERCLA unit in Appendix C of the FFA for the SRS.

The PAOU was evaluated through an investigation process that integrates and combines the RCRA corrective action process with the CERCLA remedial process to determine the actual or potential impact of releases of hazardous and radiological substances to human health and the environment.

II. SITE AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational and Compliance History

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

Hazardous waste materials handled at SRS are managed under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities require South Carolina Department of Health and Environmental Control (SCDHEC) operating or post-closure permits under RCRA. SRS received a RCRA hazardous waste permit from the SCDHEC, which was most recently renewed on September 30, 2003 (SC1 890 008 989). Module VIII of the Hazardous and Solid Waste Amendments portion of the RCRA permit mandates corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u).

On December 21, 1989, SRS was included on the National Priorities List. The inclusion created a need to integrate the established RCRA facility investigation (RFI) program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 United States Code Section 9620, USDOE has negotiated a FFA (FFA 1993) with United States Environmental Protection Agency (USEPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. USDOE functions as the lead agency for remedial activities at SRS, with concurrence by the USEPA - Region 4 and the SCDHEC.

Operable Unit Operational and Compliance History

The PAOU is located in south-central SRS approximately 4.0 km (2.5 mi) east-southeast of the geographical center of SRS and about 6.4 km (4 mi) west of the nearest site boundary (Figure 1). PAOU is approximately 50 hectares (126 acres) (including the P-Area Ash Basin and Outfall P-007) and is located in an upland area between Steel Creek and Lower Three Runs watersheds and has a flat to gently rolling topography. PAOU is approximately 96 m (315 ft) above mean sea level (amsl).

The PAOU is predominantly an industrialized area and does not provide significant ecological habitats. An ecological checklist for the PAOU was provided in the Work Plan (WSRC 2006). Portions of the PAOU are located in both Steel Creek and Lower Three Runs watersheds. Detailed descriptions of the floral and faunal species, biotic diversity, and hydrology of these watersheds are included in the Steel Creek Integrator Operable Unit (IOU) Work Plan (WSRC 2000) and the Lower Three Runs IOU Work Plan (WSRC 2002).

The soils in the immediate vicinity of P Area are classified as Udorthent (USDA 1990). Udorthent is a generic term that indicates that the natural soil weathering horizon has been disturbed or removed, usually by construction activity or erosion. Soil may be classified as Udorthent when either the top soil or disturbed soil is used for fill during grading for parking lots or to create level areas.

Additional information pertaining to PAOU soils can be found in the P-Area Reactor Groundwater (PRGW) Operable Unit (OU) Work Plan (WSRC 2005b) and the Steel Creek and the Lower Three Runs IOU Work Plans (WSRC 2000 and WSRC 2002, respectively) which summarize the pedological assemblages and the distribution of various soil types specific to P Area.

There is no surface water body associated with the PAOU. However, during P-Reactor operation, large quantities of cooling water (11.3 m^3/s [400 ft^3/s]) were heated up to 57 C (137 F) in heat exchangers and discharged to either Steel Creek or PAR Pond via the P-Area Discharge Canals. The combination of the heated water and high flow volume

caused extreme scouring and sterilization within Steel Creek. Steel Creek began receiving thermal effluents from both L- and P-Reactor Areas in 1954, and flow rates in Steel Creek were largely influenced by these effluent releases. By 1961, both reactors released a total of 22.6 m^3/s (800 ft^3/s) of thermal effluent into Steel Creek (Hayes 1982). In 1964, all effluents from P-Reactor were diverted to PAR Pond (Figure 2). To date, natural flow exists within Steel Creek and natural vegetation has repopulated the banks and stream bed.

P Area is higher in elevation (>100 m [330 ft] amsl) than the surrounding land (interfluvial zone). Surface drainage on the west side of the P-Reactor area is toward Steel Creek. The headwaters of Steel Creek, which originates near the P-Reactor, sit at an elevation of 85 m (280 ft) amsl and incises down to ~61 m (~200 ft) amsl at the southwest boundary near L Lake. Surface drainage on the east side of the Reactor Area drains to unnamed tributaries that drain to PAR Pond.

Beginning in November 1961, P-Reactor discharged into the middle arm of the reservoir through a series of canals and pre-cooler ponds, including Pond C. A pumphouse, on the south arm of PAR Pond, recirculated water from PAR Pond to P Area until 1988, when P-Reactor ceased operations. During PAR Pond's operation as a cooling pond, this recirculated water was pumped into P-Reactor Cooling Water Retention Basin (186-P) and mixed with makeup water pumped from the Savannah River.

Discussions pertaining to the groundwater associated with P Area are included in this document as it relates to the vadose zone source areas of contamination. However, the groundwater media is not considered within the scope of the PAOU; any groundwater contaminated media associated with the PAOU will be addressed as part of the PRGW OU.

Generally, groundwater flow direction in both the upper and the lower Upper Three Runs Aquifer diverge at P Area with flows toward Steel Creek to the northwest, PAR Pond to the northeast, and Meyers Branch to the southeast (Figure 2). In the Gordon Aquifer, groundwater flows to the southwest toward Meyers Branch. In area monitor wells, the

depth to the water in the upper Upper Three Runs Aquifer is approximately 15.2 m (50 ft). The P-Reactor Building (105-P) Complex and associated building slabs are positioned on the north-south trending watertable divide. The water table in P Area is the unconfined, upper part of the Upper Three Runs Aquifer.

In February 1954, P-Reactor began operations. It was taken off-line for maintenance and safety upgrades in 1987, placed in warm standby in 1988, and placed in shutdown status in 1991. In 1993, P-Reactor was placed in cold shutdown with no capability of restart. The primary sources of radioactive contamination in P Area are activation products, fission products, and tritium, the majority of which were the consequence of P-Reactor operations. Currently, P-Reactor Building (105-P) and other facilities within P Area are undergoing deactivation in preparation for in situ decommissioning (ISD) (SRNS 2009b).

The PAOU is comprised of the following subunits (Figure 3; Table 1):

- P-Reactor Building (105-P) Complex and its Ancillary Structures including Engine House (108-1P), Engine House (108-2P) with Standby Pumphouse 191-P;
- Disposition of Water in the P-Reactor Disassembly Basin (no building number [NBN];
- Potential Release from the P-Area Reactor Cooling Water System (186/190-P);
- Potential Release from the P-Area Disassembly Basin (105-P);
- Process Sewer Lines As Abandoned (NBN) (PSLs); including the Spill on 03/15/79 of 5000 gallons of Contaminated Water; and various components of the PSLs including Process Water Storage Tank (106-P), Process Water Storage Basin (109-P); Cooling Water Effluent Sump (107-P/107-1P); outfalls; manholes, miscellaneous weirs and boxes; sumps, etc.;
- P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN);
- All Railroad Tracks within the P-Area Fence;
- High Contamination Area (HCA) associated with the P-Area Cask Car Railroad Tracks;

- P-Area Ash Basin (including Outfall P-007) (188-P);
- Slab Associated with Containment Tank within Emergency Cooling Water Retention Basin (904-86G);
- Slab Associated with Pipe Fabrication Shop Building (717-9P);
- Slab Associated with Radiological Zone Storage Building (710-P);
- Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P);
- Potential Source Area (PSA) 1 – Emergency Cooling Water Retention Basin (904-86G);
- PSA 2 – Area around the Cooling Water Effluent Sump (107-P/107-1P);
- PSA 3A – Area near the Northern end of the Reactor Building (105-P);
- PSA 3B – Area West of the Administrative/ Maintenance Slab;
- PSA 4 – Area East of the Reactor Building (105-P);
- PSA 5 – Two localized areas in the Southwestern part of P Area; and
- Outfall P02.

Summary of Previous Regulatory Decisions

Regulatory decisions were previously made on select PAOU subunits. These decisions included early remedial actions documented in the Early Action Record of Decision (EAROD) (SRNS 2008a) and an Explanation of Significant Difference (ESD) to the EAROD (SRNS 2009b) and Non-Time Critical (NTC) removal actions documented in the three Removal Site Evaluation Reports (RSER)/Engineering Evaluation/Cost Analyses (EE/CAs) (SRNS 2009c and 2009d, USDOE 2008). The remaining subunits not selected for an early remedial action or a NTC removal action were presented in the RCRA Facility Investigation (RFI)/Remedial Investigation (RI) with Baseline Risk Assessment (BRA) and Corrective Measures Study (CMS)/Feasibility Study (FS) report (SRNS 2008b). Figure 3 and Table 1 present this information for each of the subunits.

Based on the results of the RFI/RI/BRA/CMS/FS (SRNS 2008b) two subunits require No Further Action since it has been determined that these subunits pose no impact to human health or the environment based on an unrestricted land use scenario. These subunits include the Slab Associated with Containment Tank within the Emergency Cooling Water Retention Basin (904-86G) and the PSA 1 - Emergency Cooling Water Retention Basin (904-86G). In addition, a third subunit, Outfall P02, has also been determined to require No Further Action as documented in the Early Action Remedial Action Implementation Plan (EARAIP) (SRNS 2009a). These three subunits are located outside of the P Area fence line. The remaining seventeen subunits, located within the P Area fence line, will require land use controls (LUCs) as part of the selected remedy to prevent unrestricted land use. All 20 subunits are discussed in more detail below and are categorized as either requiring no further action or requiring further action.

PAOU Subunits Requiring No Further Action

The following subunits have been determined to require no further action. These subunits are located outside the P-Area fence line and were evaluated using both the industrial and residential (i.e., unrestricted) land use scenario. It has been determined that these subunits pose no impact to human health (based on the more conservative residential land use) or the environment. LUCs required as part of any selected remedy for the PAOU to prevent unrestricted use are not needed for these subunits as discussed in further detail below.

Potential Source Area 1 – Emergency Cooling Water Retention Basin (904-86G)

PSA 1 is primarily associated with the Emergency Cooling Water Retention Basin (904-86G) (Figure 4). It is a 190 million L (50 million gal) earthen basin that was constructed during the 1960's as part of the emergency cooling water system. The basin was designed to contain contaminated water that would accumulate in the event of a loss-of-cooling or loss-of-circulation accident. The basin never received discharges from an emergency event.

Slab Associated with Containment Tank within the 904-86G (Emergency Cooling Water Retention Basin)

The Containment Tank was located inside of the Emergency Cooling Water Retention Basin (904-86G) (SRNS 2008b) (Figure 4). The tank was constructed in 1979 and had a capacity of 1,900,000 L (500,000 gal).

The tank received water from building drains, manholes, sump pumps, or storage tanks located within the P-Reactor Building (105-P). In the mid-1980's, the tank received process sewer back-up from P-Reactor Building (105-P) during a high rain event. The facility was demolished and removed to foundation and all interfacing utilities were isolated, disconnected, and plugged (WSRC 2007d). There are no spills associated with the tank and there are no instances where the tank overflowed onto the surrounding basin soils. The tank has been decommissioned and deactivated with only the slab remaining.

Outfall P02

Outfall P02 is a stormwater outfall located to the northeast of the PAOU and is a tributary to PAR Pond (Figure 4). It is approximately 0.07 hectares (0.16 acres) in area. Previous sampling suggested the presence of radionuclides in the upper section of Outfall P02, thus soil excavation/ removal was planned as an early action. In 2008, additional sampling conducted at Outfall P02 did not indicate the presence of radionuclides at levels that would prevent unrestricted land use (SRNS 2009a).

PAOU Subunits Requiring LUCs

The following discussions pertain to the PAOU subunits that will require further action:

P-Reactor Building (105-P) Complex including Engine House (108-1P), Engine House (108-2P) with Standby Pumphouse (191-P)

The P-Reactor Building (105-P) Complex (RBC), in its entirety, is subdivided into three components based on total curie inventory, risk, and future remedial action(s). For clarification, the RBC, as a whole, contains all three components which were integral to reactor operations (Figures 5 and 6). The three components are as follows:

- Reactor Vessel;
- Disassembly Basin; and
- P-Reactor Building (105-P) and its Ancillary Structures including the Engine House (108-1P), Engine House (108-2P) with Standby Pumphouse (191-P).

Similar to other SRS reactors, the reactor at P Area produced special nuclear materials (mainly plutonium and tritium) for defense purposes. The basic layout of the P-Reactor Building (105-P) is shown in Figures 5 and 6. The building consists of four main operating sections at ground level: the Assembly Area, the Process Room, the Purification Wing and the Disassembly Basin. The Engine Houses (108-1P and 108-2P), together with the Standby Pumphouse (191-P), provided backup for the reactor cooling systems and are included as part of the P-Reactor Building (105-P). The underground (108-1P and 108-2P) emergency diesel engine houses are concrete structures that are located below-grade and contiguous to the P-Reactor Building (105-P) at the minus 20 ft level. Each structure consists of a large concrete room that housed diesel generators, switch gear, day tanks for fuel and oil, and air compressors for the P-Reactor Building (105-P) air. Bulk storage for diesel fuel was located in storage tanks outside of the 108-1P/108-2P/105-P footprint. Physical evidence of a lead spill/stain was noted. The area has been cleaned with Biosolve®. Characterization data external to these engine houses confirms that fuel contamination is not present in soil or groundwater. The primary cooling circuit, which includes the heat exchangers, is located at the minus 20 ft level. The cooling water pumps, storage tanks, collection sumps and reactor instrument rooms are located at the minus 40 ft level. The minus 49.5 ft level represents the lowest point in the P-Reactor Building (105-P) and is the bottom of the two sumps. The reactor control and safety rod latches with the drive mechanisms are located in the actuator tower above the process room.

Prefabricated fuel and target materials were shipped from M Area and were received in the reactor assembly area where they were cleaned with solvents and prepared for charging into the reactor vessel. The reactor vessel is in the shape of a cylinder, is

approximately 5.5 m (18 ft) wide and 6.7 m (22 ft) deep, and is made of 304-grade stainless steel.

The fuel and target assemblies were irradiated in the reactor vessel and then transferred to the Disassembly Basin where they were stored for 6 months to allow cooling and the high activity isotopes to decay. They were then transported to F and H Areas via casks for further chemical processing.

To generate these special materials, the SRS reactors utilized a process of neutron irradiation of either uranium-238 or lithium-6 targets to produce plutonium-239 and tritium, respectively. The source of the neutrons came from the fission of uranium-235, which is an isotope present in the uranium reactor fuel. The fission of uranium-235 is a process whereby the uranium nucleus disintegrates to emit a great deal of energy in the form of heat and radiation, and also generated many extraneous radioactive fission isotopes that are the predominant radioactive waste products from the process. In the SRS reactor design, the fuel and target assemblies were clad with aluminum, which was intended to contain the fission products until chemical processing could be completed in the F and H canyons. However, a small amount of leakage occurred through ruptured aluminum cladding over the 35 years of operation, resulting in a gradual accumulation of low levels of radioactive fission products within the reactor process systems. The transfer of targets and spent fuel through the Disassembly Basin resulted in accumulation of the radioactive fission products within the basin itself. These fission products are predominantly tritium, cesium-137, and strontium-90 isotopes. When fuel and target assemblies were moved from the reactor to the Disassembly Basin, fission products on the surface of the assemblies were flushed into the basin. Fission products were also added to the basin when failed fuel and target assemblies were discharged to the Disassembly Basin. In the early years, the Disassembly Basin water was continuously purged into the process sewer. In the later years, the basin water was continuously filtered to remove silt and particles from the basin water. In addition, as a safety precaution to protect facility worker, the basin water was occasionally purged to the seepage basins when the tritium concentration in the basin approached 400,000 pCi/mL.

Radioactive byproducts were generated within the reactor process in other ways. The continual neutron bombardment of reactor components during operations activated their construction materials, mainly the stainless steel and concrete in and around the reactor vessel. Neutron bombardment of the heavy water moderator also produced unwanted tritium, mainly in the form of tritiated water and water vapor. The majority of this airborne tritium was removed by the building ventilation system, but some tritium accumulated in the Disassembly Basin water, and a very small amount was absorbed into the building structure and components.

Additional details pertaining to the components of the RBC can be found in the EAROD for the PAOU (SRNS 2008a).

A preliminary evaluation for a range of alternatives for ISD of the P-Reactor Building (105-P) Complex was conducted in the PAOU Early Action Proposed Plan (WSRC 2008) in order to establish a range of cost estimates for comparing alternatives applied to ISD. These alternatives were further evaluated against the CERCLA criteria in the RFI/RI/BRA/CMS/FS (SRNS 2008b) and to study the various stages of removal of the above-ground structures and the reactor vessel. As stated in the EAROD (SRNS 2008a), ISD was selected as the end-state decisions for the RBC.

In the subsequent submittal of the ESD to the EAROD (SRNS 2009a), Alternative R-2A (ISD with the Reactor Vessel grouted in place) was the selected remedial alternative for the P-Reactor Building (105-P) Complex (Figure 6). This early action alternative includes the Process, the Purification, and the Assembly Areas of the RBC as well as the actuator tower remaining in place. The stack would be removed to the plus 55 ft elevation. All the below-grade equipment including the reactor vessel would remain and be grouted in place. The below-grade contents of the Disassembly Basin will be grouted to stabilize the contaminants. The above-grade structure of the Disassembly Basin will be demolished to grade-level after forced evaporation of the Disassembly Basin water has been completed. A sloped concrete cover will then be placed over the grouted Disassembly Basin. Concrete and cementitious low-strength materials will be used to stabilize the contamination. The above-ground portions of the Engine Houses (108-1P

and 108-2P) and the Standby Pumphouse (191-P) would be removed, with the remaining below-ground structures being grouted. The remaining contaminated equipment in the above-grade structure of the RBC will be left in place.

Disposition of Water in the P-Reactor Disassembly Basin

The P-Area Disassembly Basin is a concrete-lined basin that ranges in depth from 5.2 m (17 ft) below-grade to 9.1 m (30 ft) below-grade. The full-pool capacity of the basin is 18.2 million L (4.82 million gal); currently, the basin is 85% full, containing approximately 15.5 million L (4.1 million gal) of water and miscellaneous contaminated scrap (chains, buckets, hangers, lights, plastic, hand tools, etc.) (WSRC 2005c).

The Disassembly Basin is divided into several discrete, but contiguous, areas that are used for different fuel handling processes, including storage, cooling, disassembly, and preparation for transport (WSRC 2005a). The tritium contamination in the Disassembly Basin water and sludge was from the small amounts of moderator that were transferred with the fuel, targets, and other components when discharged from the reactor. The other radionuclide contamination within the Disassembly Basin water and sludge is from the corrosion of the irradiated and activated components that were stored in the basin.

A NTC removal action was selected for this subunit as documented in the RSER/EE/CA (USDOE 2008). The selected removal action for the Disassembly Basin is Alternative 3 – Forced Evaporation. Additionally, 1.4 million L (380,000 gal) of water from the R-Reactor Disassembly Basin will need to be transported to the P-Reactor Disassembly Basin in order to achieve closure of the R-Reactor Disassembly Basin (USDOE 2009). The P-Reactor Disassembly Basin subunit is included as part of the ISD decision for the RBC, as documented in the ESD to the EAROD (SRNS 2009b).

Potential Release from the P-Reactor Disassembly Basin (105-P)

Investigations of the subsurface soils around the P-Area Disassembly Basin were evaluated for potential releases from the P-Area Disassembly Basin. Soil sampling determined the presence of inorganic and radionuclide constituents at naturally-occurring levels (SRNS 2008b).

Potential Release from Reactor Cooling Water System (186/190-P)

The P-Area Reactor Cooling Water System comprises the P-Area Reactor Cooling Water Reservoir (186-P) and the P-Area Cooling Water Pump House (190-P) (Figure 7). The P-Reactor Cooling Water Reservoir, commonly referred to as the concrete lakes or the cooling water basin, is a large, reinforced concrete basin. The footprint of the reservoir is 17,652 m^2 (190,000 ft^2) and, when full, the basin holds 94.6 million L (25 million gallons) total. The basin depth is approximately 9 m (30 ft), of which approximately 6 m (20 ft) is below grade.

When operational, the basin was filled with cooling water from PAR Pond or makeup water from the Savannah River. From the reservoir, the water was pumped to the non-contact heat exchangers in the P-Reactor Building (105-P). These heat exchangers sometimes leaked minute quantities of radioactively contaminated heavy water (deuterium oxide) to the cooling water. During normal operation and cold weather, some of the water was recycled back to the Cooling Water Reservoir (186-P) to maintain water temperature. The structure has been decommissioned and deactivated.

P-Area Process Sewer Lines As Abandoned (NBN)

The P-Area PSLs (NBN) consist of 4.7 km (2.9 mi) of underground lines of various sizes and configuration throughout the P Area (Figure 7). The process lines were constructed of carbon steel. These lines, in some cases, were joined to concrete stormwater lines. In addition, underground tanks (including 106-P and 109-P), outfalls, manholes, miscellaneous weirs and boxes associated with the PSLs are included with this subunit for closure (Figure 7).

Based on process knowledge and limited data, the PSLs were determined to potentially have principal threat source material (PTSM) present as part of their matrix. A NTC removal action was selected for this subunit as documented in a RSER/EE/CA (SRNS 2009d). The removal action selected for the PSLs was Alternative P-2 (Isolation Plugging of P-Reactor Building [105-P] PSLs and Drainage System; Grouting of Manholes, Diversion Boxes, and Process Tanks; Select Removal of Process Equipment

External to the P-Reactor Building [105-P]; Sealing/Plugging of Outfalls, and LUCs) (Table 1). An Action Memorandum presenting the selected removal action was completed in January 2010 (USDOE 2010).

P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN)

The P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN) is an area south of the Disassembly Basin that extends from the eastern reactor fence line back to the end of a railroad spur (Figure 7). Radiological material from the reactor was transferred into metal casks inside the P-Reactor Building (105-P). The casks were loaded onto railroad cars inside the building and were routinely parked in various P Area locations while awaiting transfer to the Separation Areas (F/H Areas). When the railroad cars were exposed to rain, radiological materials could have been washed from the outside of the casks onto the ground surface, thus possibly contaminating the railroad tracks with radiological constituents from reactor operations. Soil sampling confirmed that no inorganics or radionuclides were present above naturally-occurring levels (SRNS 2008b).

All P-Area Cask Car Railroad Tracks within the P-Area Fence

All remaining railroad tracks within P Area that are not included with the P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN) subunit are included with this subunit (Figure 7). As with the Cask Car Railroad Tracks subunit, there was the potential for the cask cars to leak radioactive material onto the railroad tracks. Investigation of the surface soil around these tracks determined no presence of man-made radionuclide constituents (SRNS 2008b).

High Contamination Area associated with the P-Area Cask Car Railroad Tracks

During reactor operations, the irradiated fuel and target assemblies were loaded underwater into lined casks in the Disassembly Basin. These casks were then transported by rail to the Separations Areas (F/H Areas) for chemical processing. Inevitably some leakage (water contaminated with radionuclides – mostly cesium-137) occurred, which resulted in a release of radioactive contaminants along one small section of the railroad tracks to the southeast of the P-Reactor Building (105-P) (Figure 7).

In January 2009, an early remedial action was selected for the HCA associated with the P-Area Cask Car Railroad Tracks as documented in the EAROD (SRNS 2008a). Alternative AC-2 – Excavation and Removal with Confirmatory Sampling was selected as the remedial alternative to remove radioactive contaminants. The excavation will remove contaminated rails, railbed material, and soil to 1 pCi/g cesium-137. Following the removal action, contamination will remain at levels that prevent unrestricted use.

P-Area Ash Basin (including Outfall P-007) (188-P)

Each reactor at SRS utilized a coal-fired powerhouse to generate steam and electricity, with coal ash produced as a result of boiler operations. In P Area, this ash was disposed within the P-Area Ash Basin (188-P) via a sluice line. The ash basin is located outside the southeastern perimeter of P Area. The P-Area Ash Basin (188-P) is an unlined, earthen containment basin that received sluice from 1951 to 1991. During the years of 1973 to 1974, significant amounts of ash within the basin were removed and placed around the perimeter of the basin and to the north along the access road that led to the basin (Figure 7), including in the vicinity of Outfall P-007. Ash covers approximately 9.71 hectares (24 acres). An estimate of approximately 157,498 m^3 (206,000 yds^3) of ash is determined to be present both inside and outside of the basin. The P-Area Ash Basin (188-P) operated under Industrial Wastewater Permit #7292.

The Outfall P-007 is located north of the P-Area Ash Basin (188-P) (Figure 7). Gamma overflight data indicated a localized area of elevated gamma activities. Because the source of cesium-137 contamination in the Outfall P-007 is from process line discharges that originated from the P-Reactor Disassembly Basin, the Outfall P-007 was evaluated independent of the P-Area Ash Basin (188-P). Sampling performed in 2006 and 2008 confirmed the presence of elevated activities of cesium-137 and cobalt-60. Figure 7 shows the extent of the contamination at Outfall P-007 as it relates to the ash deposits from the P-Area Ash Basin (188-P). Including the extent of ash present, Outfall P-007 is approximately 2.83 hectares (7 acres) in size. Removal alternatives for the P-Area Ash Basin and the Outfall P-007 were evaluated in a RSER/EE/CA (SRNS 2009c).

A NTC removal action was selected for the P-Area Ash Basin (including Outfall P-007) (188-P) as documented in a RSER/EE/CA (SRNS 2009c). The selected removal action was Alternative P-3 (Removal and Disposal of Cesium-137; Consolidate as Needed; Soil Cover; LUCs). Under the removal action, cesium-137 will be removed to 10 pCi/g. The residual cesium-137 contaminated soil at Outfall P-007 and the ash associated with the P-Area Ash Basin will be placed under a minimum 0.61 m (2 ft) thick soil cover.

Slab Associated with 717-9P Pipe Fabrication Shop Building

The Pipe Fabrication Shop Building (717-9P) was located southwest of P-Reactor Building (105-P) (Figure 7). It was constructed in 1987 to support the renovation of systems within the P-Reactor Building (105-P), including storing construction materials and industrial products. It was constructed of a wooden frame on a concrete slab with corrugated aluminum siding and roof. The building footprint was approximately 177 m^2 (1,263 ft^2).

The building was decommissioned and demolished to the foundation slab (WSRC 2007a). An evaluation of the building identified both an oil stain and a radiological hot spot on the slab. The oil stain on the building foundation slab was cleaned with Biosolve® and the hot spot was scabbled twice. Final verification sampling confirmed only naturally-occurring radionuclides remained (WSRC 2007b).

Slab Associated with 710-P Radiological Zone Storage Building

Radiological Zone Storage Building (710-P) was an 11.9 m^2 (128 ft^2), single-story structure. The building was a steel-framed structure with corrugated asbestos panels as siding and roofing. It was constructed on a concrete slab with no floor drains, sumps, or secondary containment structures. The building served as a storage area for contaminated laundry and waste bags.

An evaluation of the building noted areas of spilled paint and an area, in the approximate center of the structure's slab, as having internal/fixed contamination. The facility was decommissioned and demolished to the foundation slab. Final verification sampling

confirmed no contamination remained at levels that exceeded industrial land use (WSRC 2007b).

Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P)

The No. 2&5 Basin Deionizers Pad (105-1P), located next to P-Reactor Building (105-P), began operating in 1963 as a 186 m^2 (2,000 ft^2) curbed concrete slab with electrical and piping connections for connecting portable filtration/deionization trailers to the Disassembly Basin Cooling and Filtration System for periodic decontamination of the basin water (Figure 7).

Two sumps were operated during Building 105-1P's operation history. The slab was sloped to a process drain which was approximately three inches below grade. In 1984, the "collection sump" was filled in with grout and a new sump and pump were installed. During deactivation in the late 1990's, the sump pump was removed, and a metal cover was placed over the new sump and covered with two inches of concrete.

The concrete foundation was radiologically contaminated due to disassembly basin water leaks from trailers and piping connections.

The facility was decommissioned and demolished to the concrete slab. Fixative coatings applied during the initial deactivation in the late 1990's were removed to allow surveys and decontamination of the foundation concrete. Several long thin cracks that were previously covered by a fixative coating were visible. During decommissioning of the slab, the slab was scabbled and the cracks were heavily scabbled to the extent that the cracks are no longer open. The new sump was uncovered and all remaining equipment (float valve and electrical connection), sludge, and water were removed from the bottom of the sump. No cracks or holes were present in the sump bottom following visual inspection. The new sump was grouted to surface. Investigation of the concrete pad determined the presence of inorganic and radionuclide constituents (SRNS 2008b), but at naturally-occurring levels (WSRC 2007c).

Potential Source Area 2 – Area around the Cooling Water Effluent Sumps (107-P/ 107-1P)

PSA 2 is located in the area around the Cooling Water Effluent Sumps (107-P/107-1P) which received cooling water effluent discharges from the P-Reactor Building (105-P) (Figure 7). PSA 2 was identified due to the presence of elevated gross alpha and nonvolatile beta activities in the groundwater from previous groundwater investigations. However, sampling results indicated that there was no release of material to subsurface soils or groundwater from the Cooling Water Effluent Sumps (SRNS 2008b).

Potential Source Area 3A – Area near the Northern End of the P-Reactor Building (105-P)

PSA 3A is located north of the P-Reactor Building (105-P) (Figure 7). The highest volatile organic compound (VOC) concentrations (trichloroethylene [TCE]) are exhibited in an area outside the northern end of the P-Reactor Building (105-P). Releases within PSA 3A have resulted in subsurface soil contamination and are contributing to the existing VOC groundwater plume.

In January 2009, an EAROD was issued that documents the selected early remedial action for PSA 3A (Soil Vapor Extraction [SVE] with Soil Fracturing and Chemical Oxidation Injection) (SRNS 2008a) (Figure 3; Table 1), to remediate TCE soil concentrations to the remedial goal (RG) of 0.53 mg/kg in the vadose zone.

Potential Source Area 3B – Area West of the Administrative/Maintenance Slab

PSA 3B is located west of the Administrative/ Maintenance slab (704-P) (Figure 7). The highest VOC concentrations (tetrachloroethylene [PCE]) are exhibited in an area west of the Administrative/ Maintenance slab. Releases from PSA 3B have resulted in subsurface soil contamination which is contributing to the existing VOC groundwater plume.

In January 2009, an EAROD was issued that documents the selected early remedial action for PSA 3B (SVE) (SRNS 2008a) (Figure 3; Table 1), to remediate PCE soil concentrations to the RG of 0.53 mg/kg in the vadose zone.

Potential Source Area 4 – Area East of the P-Reactor Building (105-P)

PSA 4 is located in an area on the eastern side of the P-Reactor Building (105-P) (Figure 7). PSA 4 was identified due to the presence of elevated TCE/tritium in the groundwater from previous groundwater investigations. Sampling results taken as part of the PAOU characterization at the PSA 4 did not indicate a source(s) of VOCs or tritium in the subsurface (SRNS 2008b).

Potential Source Area 5 – Two Localized Areas in the Southwestern Part of P Area

PSA 5 focuses on two small areas in the southwestern part of P Area (Figure 7). Previous groundwater investigation had identified potential VOC contamination in the groundwater of these two localized areas, but the source of the contamination, if any, had not been identified. Based on process knowledge and historical data, there is no indication of surficial release of VOCs in this area. Sampling results taken as part of the PAOU characterization at the PSA 5 did not indicate a source(s) of VOCs in the subsurface (SRNS 2008b).

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require the public to be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124 and Sections 113 and 117 of CERCLA (42 United States Code Sections 9613 and 9617). These requirements include establishment of an Administrative Record File that documents the investigation and selection of the remedial alternatives for addressing the PAOU. The Administrative Record File must be established at or near the facility at issue.

The SRS FFA Community Involvement Plan (WSRC 1996) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. The SRS FFA Community Involvement Plan addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act, 1969. SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require

the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action. The *Statement of Basis/Proposed Plan for the P-Area Operable Unit (PAOU)* (SB/PP) (SRNS 2009e), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred actions for addressing the PAOU.

The FFA Administrative Record File, which contains the information pertaining to the selection of the response action, is available at the following locations:

US 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

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 Land and Waste Management
8911 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

The South Carolina Department of Health and Environmental Control – Region 5
Aiken Environmental Quality Control Office
206 Beaufort Street, Northeast
Aiken, South Carolina 29801
(803) 641-7670

The Statement of Basis/Proposed Plan (SB/PP) 45-day public comment period began on February 12, 2010 and ended of March 29, 2010. No comments were received from the public.

The Facilities Disposition and Site Remediation Committee of the SRS Citizens Advisory Board (CAB) has met and reviewed the strategy for closure of P Area. This resulted in the CAB adopting recommendation #233 on May 23, 2006, which supported public involvement in the process to determine the P-Reactor Building (105-P) Complex end state at the PAOU. At their subsequent July 23-24, 2006 meeting, the CAB formally

issued recommendation #248, which requested DOE to hold public workshops to discuss selection of the P-Reactor Building (105-P) end state. In response to this request, USDOE held two workshops for the Aiken, SC area: the first on October 16, 2007 and the second on February 28, 2008. A third workshop was held on May 19, 2008 in Savannah, GA. These workshops were well publicized and included representatives from the USEPA-Region 4 and SCDHEC. These workshops discussed ISD as the agreed to end state for the P-Reactor Building (105-P) Complex as documented in the EAROD (SRNS 2009a). Responses to public comments received during the public workshops were included in the EAROD.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT

The USDOE developed a new completion strategy in 2003 for environmental restoration at SRS including an area-by-area remediation strategy. Through the coordinated sequencing of environmental restoration and decommissioning activities, environmental cleanup can be completed for the entire areas of SRS. In addressing whole areas, individual units will be consolidated to form an Area OU to take advantage of characterization data, risk assessments, decommissioning documents and integrated remedy strategies to affect economies of scale and reduce administrative requirements. In 2005, the Core Team (representatives from USDOE, USEPA and SCDHEC) convened and agreed that using the Area OU strategy to manage the facilities in the former P-Area industrial area (including the P-Area Ash Basin [188-P]) as a single OU was appropriate. The current land use for the PAOU is industrial with USDOE maintaining control of the land as long as necessary to keep the selected remedy fully protective of human health and the environment. The future land use of the PAOU is assumed to remain industrial.

Groundwater contamination in P Area will be addressed separately as part of the PRGW OU.

In 2008, the Core Team convened and agreed to accelerate clean up of certain PAOU subunits (the PSA 3A, the PSA 3B, and the HCA associated with the P-Area Cask Car

Railroad Tracks) using an early remedial action approach (SRNS 2008a). The end-state decision to use ISD for the RBC was also agreed to by the Core Team.

In 2009, the USDOE decided to proceed with removal actions to support accelerated remediation of the remainder of the PAOU under the American Recovery and Reinvestment Act of 2009. These removal actions included the details of the ISD for the RBC, as described in the ESD to the EAROD (SRNS 2009b), and the NTC removal actions for the P-Area PSLs (SRNS 2009d) and the P-Area Ash Basin (including Outfall P-007) (188-P) (SRNS 2009c).

Following successful completion of the early remedial actions and NTC removal actions, residual hazardous substances will remain at the PAOU that require LUCs to prevent unrestricted use. The scope that will be addressed by the selected remedial action for the PAOU include:

- LUCs after completion of the NTC removal action for the P-Area PSLs;
- LUCs after completion of the NTC removal action for the P-Area Ash Basin (including Outfall P-007) (188-P) to meet RGs;
- LUCs after completion of the early remedial action for the P-Reactor Building (105-P) Complex and the NTC removal action for the Disposition of the P-Reactor Disassembly Basin Water;
- LUCs after completion of the early remedial actions at the PSA 3A, PSA 3B, and the HCA associated with the P-Area Cask Car Railroad Tracks to meet RGs;
- LUCs for the entire PAOU will include the ten subunits designated in Table 1 that were not included in the early remedial actions or removal actions decisions but are located within the P-Area fence line;
- Document that no further actions are required for the three subunits that have been determined to pose no threat to human health (residential and industrial) or the environment (Table 1). Due to their location outside of the P-Area fence line, LUCs are not warranted.

V. OPERABLE UNIT CHARACTERISTICS

This section presents the conceptual site model (CSM), provides an overview of the characterization activities, and presents the characterization results and constituents of concern (COCs).

Conceptual Site Model for the PAOU

The CSM identified and evaluated suspected sources of contamination, contaminant release mechanisms, potentially affected media (secondary sources of contamination), potential exposure pathways, and potential human and ecological receptors (Figure 8).

The primary sources of contamination at the PAOU are due to the P-Reactor Facility and other P-Area operations. Spills, leaks, accidental releases, or simply the operation itself resulted in releases of hazardous and/or radioactive substances. If the primary source were to contact other media, secondary sources of contamination could be created through several release mechanisms. Typically, the potential secondary release mechanisms include release of volatile constituents from the soil (volatilization), generation of contaminated fugitive dust by wind or other surface soil disturbance, biotic uptake, radiation emissions, bioturbation between surface and subsurface soils, and infiltration/percolation/leaching to groundwater. Contact with contaminated environmental media created potential pathways for both human and ecological receptors. The future industrial worker was chosen as the baseline risk assessment exposure scenario for quantitative evaluation of human receptors at this site. However, for PSA 1 –Emergency Cooling Water Retention Basin (904-86G), the Slab Associated with Containment Tank within the Emergency Cooling Water Retention Basin (904-86G), and Outfall P02, the residential land use scenario was also considered because the subunits were outside the P-Area fence line. Detailed CSMs for each of the PAOU subunits are presented in the RFI/RI/BRA/CMS/FS (SRNS 2008b). Soil data was evaluated against residential risk criteria to determine if PSA 1 and Outfall P02 subunits could be identified as unrestricted release. Radiological data from the Slab associated with the Containment Tank within the Emergency Cooling Water Retention Basin (904-86G) was evaluated using radiological release criteria. For the remaining subunits that a

quantitative evaluation of the future resident scenario was not performed, it was qualitatively assessed by recognizing that residential use of the area will be restricted by implementing land use restrictions to ensure long-term protectiveness.

The exposure pathways for evaluation relative to the future industrial worker included:

- Exposure to surface (0 to 0.3 m [0 to 1 ft]) soil, ash, or gravel via incidental ingestion, dermal contact, inhalation of windblown dust, inhalation of VOCs, and external exposure to radionuclides. In addition, sediment media was evaluated using the same pathways as soil media.
- Exposure to concrete surface media via the incidental ingestion and external radiation pathways. In addition, metal media was evaluated using the same pathways as concrete media.

The majority of the PAOU subunits were determined not to require a quantitative ecological risk evaluation due to lack of habitat (industrial setting) and/or conceptual model considerations (e.g., contamination at depth). However, the risk potential for ecological receptors was evaluated for the subunits outside the P-Area fence line in the surface (0 to 0.3 m [0 to 1 ft]) and subsurface (0.3 to 1.2 m [1 to 4 ft]) soil intervals via the incidental ingestion, dermal contact, inhalation of windblown dust (surface only), biotic uptake, and external exposure to radionuclides pathways. The ecological risk assessment considered an evaluation of terrestrial receptors which included soil invertebrates, herbivorous mammals, insectivorous mammals, omnivorous mammals, insectivorous birds and carnivorous birds.

Surface soil and building features, as well as subsurface soils and building features (i.e., sumps, trenches, pipelines, etc.), that are below grade (i.e., > 0.3 m [1 ft]) of concrete slab, gravel, or soil offer a potential exposure pathway for a future industrial worker under an excavation scenario. This pathway was evaluated in the PTSM analysis.

Leaching of contaminants from the contaminated media (concrete, pipeline, soil) to groundwater constitutes a secondary contaminant release mechanism. The potential to leach to groundwater was evaluated in the contaminant migration analysis.

Ingestion of groundwater offers a potentially complete pathway for human receptors. However, the groundwater media is not considered within the scope of the PAOU; any groundwater contaminated by the PAOU will be addressed as part of the PRGW OU.

Media Assessment

The RFI/RI/BRA/CMS/FS (SRNS 2008b) contains detailed information and analytical data for all the characterization investigations conducted and samples taken in the media assessment of the PAOU. It is available in the Administrative Record File (see Section III of this document). Media assessment results are focused on PAOU characterization activities for those subunits that did not have an early action or removal action conducted.

Characterization Investigation

Soil-gas, soil, ash, and gravel samples were collected, evaluated, and screened against appropriate regulatory thresholds and protocols to identify COCs that would warrant further remedial action at the PAOU.

Soil-gas sampling was conducted as an initial screen in detecting the presence of VOCs in the subsurface. Soil-gas data were used as a screening tool to assist in delineating areas that indicate elevated levels of VOCs and if necessary, direct depth-discrete VOC soil sampling to delineate the extent of contamination within the vadose zone.

Soil samples collected were evaluated against a trigger level of 20 and 50 pCi/g for gross alpha and nonvolatile beta, respectively. If a sample exceeded either of these trigger levels, the sample was speciated for a range of radionuclides according to the appropriate analyses for that radionuclide indicator.

For the field investigation, radiological instruments were used as a precursor to determining a gross-level of radioactivity in PAOU surface units prior to the sampling

events. This field activity included the use of sodium iodide detectors and other radiological handheld surveying instruments. The detectors/instruments were used at the Outfall P02.

Contaminant fate and transport analyses were performed to select contaminant migration (CM) COCs on the basis of leaching by infiltrating water and subsequent transport to groundwater. These analyses were also used to predict the rate of CM and to project contaminant concentration at receptor locations via various transport media. The overall objective of these analyses is to evaluate potential future impact to human health and the environment.

Groundwater Investigation

Although groundwater is not included as part of the PAOU, shallow groundwater samples were collected at all subunits to support conclusions concerning further impact from the vadose zone into the groundwater system and direct future groundwater characterization efforts. The groundwater will be addressed by the PRGW OU.

Media Assessment Results

In summary, the PAOU was investigated to determine the nature and extent of contamination, the risks to an industrial worker and the environment, the presence of PTSM, and if there is any contaminant migration concerns. Soil-gas, soil, ash, gravel, concrete, Disassembly Basin sludge and water, and groundwater samples were collected, evaluated, and screened against appropriate regulatory thresholds and protocols to identify COCs that would warrant further remedial action. For the P-Reactor Disassembly Basin water, the RBC, PSA 3A, PSA 3B, the HCA associated with the P-Area Cask Car Railroad Tracks, the PSLs, and the P-Area Ash Basin (including Outfall P-007) (188-P), the results identified problems warranting action. For each of these subunits, an early action or a NTC removal action was conducted and the summary of the media assessment and risk assessment are presented in the appropriate regulatory document (SRNS 2008a, SRNS 2009b, SRNS 2009c, SRNS 2009d, USDOE 2008). The

following sections summarize the sampling results for the No Further Actions or LUCs-only subunits.

PAOU Subunits Requiring No Further Action

The following subunits have been determined to require no further action. These subunits are located outside the P-Area fence line and were evaluated using both the industrial and residential land use scenario. It has been determined that these subunits pose no impact to human health (based on the more conservative residential land use) or the environment. The LUCs selected for the entire PAOU are not needed for these subunits as discussed in further detail below.

Potential Source Area 1 – Emergency Cooling Water Retention Basin (904-86G)

Surface (0 to 0.3m [0 to 1 ft]) and subsurface (0.3 to 1.2m [1 to 4 ft]) soil samples were collected from seven locations and analyzed for target analyte list inorganics, gross alpha, and non-volatile beta. Evaluation of the data indicates the presence of naturally-occurring inorganic and radionuclide constituents with no risk to the human health or the environment (SRNS 2008b).

Slab Associated with Containment Tank within the 904-86G (Emergency Cooling Water Retention Basin)

Radiological samples taken in support of decommissioning activities indicated that the tank met the unconditional release criteria (removal surface contamination is less than 20 dpm/100 cm^2 alpha, 200 dpm/100 cm^2 beta/gamma, and 10,000 dpm/100 cm^2 tritium) (WSRC 2007d). Additionally, the concrete slab was surveyed as a best practice. The survey demonstrated that the concrete slab also met the unconditional release criteria.

Outfall P02

Two radionuclides (cesium-137 and cobalt-60) were identified as contaminants in the soil during IOU characterization activities. PAOU sampling activities (2006) focused on the location in which gamma overflight (1991) and Lower Three Runs IOU soil data (2001) had previously identified elevated levels. To confirm the presence of radionuclide contamination, the same location that had indicated elevated levels of cesium-137 and

cobalt-60 was sampled in 2006. Results did not indicate the presence of radionuclides. The location was re-sampled later in 2006. Again, the results did not indicate the presence of radionuclides.

In 2008, 43 soil samples were collected from 22 sampling locations and analyzed for gross alpha, nonvolatile beta, cesium-137 and cobalt-60 at surface (0 to 0.3m [0 to 1 ft]) and subsurface (0.3 to 1.2m [1 to 4 ft]) depths to confirm that the contamination had not spread. Results of the sampling showed detected activities of cesium-137 were below the established RG of 1 pCi/g; cobalt-60 was not detected. In most sampling results, cesium-137 was not detected.

Additional information pertaining to the results at the Outfall P02 can be found in the EARAIP for the PAOU (SRNS 2009a).

PAOU Subunits Requiring LUCs

The following discussions pertain to the PAOU subunits that will require further action:

Potential Release from Reactor Cooling Water System (186/190-P)

Investigation of surface and subsurface soil around the Reactor Cooling Water System (186/190-P) determined the presence of inorganic and radionuclide constituents (SRNS 2008b), but at naturally-occurring levels. The presence of VOCs and tritium in the groundwater is not attributed to the Cooling Water Reservoir System (186/190-P), but rather to upgradient sources (PSA 3A/PSA 3B). The groundwater will be addressed as part of the PRGW OU.

Potential Release from the P-Area Disassembly Basin (105-P)

Soil sampling was conducted to discern the nature and extent of metal and radionuclide constituents from potential contamination releases at the P-Area Disassembly Basin (SRNS 2008b). Analysis of the data indicates that inorganics and radionuclides that were detected in subsurface soils are naturally-occurring. Radionuclides, which were typical of reactor operations, were not detected in the subsurface soils around the P-Area Disassembly Basin.

P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN)

Soil sampling was conducted to discern the nature and extent of metal and radionuclide contamination at the P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (SRNS 2008b). Analysis of the data indicates that at the Cask Car Railroad Tracks inorganics and radionuclides that were detected are naturally-occurring.

All P-Area Cask Car Railroad Tracks within the P-Area Fence

All remaining railroad tracks within P Area not included with the P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN) subunit are included with this subunit. As with the Cask Cark Railroad Tracks subunit, there was a potential for the cask cars to leak radioactive material onto the railroad tracks. Investigation of the surface soil around these tracks determined no presence of man-made radionuclide constituents (SRNS 2008b).

Slab Associated with 717-9P Pipe Fabrication Shop Building

Final verification sampling was performed on the building slab to identify residual contamination. Only naturally-occurring radionuclides (lead-212, lead-214, potassium-40, and thallium-208) were detected in the concrete samples collected. No unit-related radionuclides were detected (WSRC 2007a).

Slab Associated with 710-P Radiological Zone Storage Building

The slab was scabbled to address the painted areas and radiological hot spot. Radiological survey performed after scabbling did not indicate the presence of radioactivity (WSRC 2007b).

Samples were collected as part of final verification. Tritium and lead-212 were the only radionuclides detected. However, lead-212 is present in the natural material used in making concrete and is not considered to be unit-related.

Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P)

Subsequent to scabbling the slab, radiological surveys were conducted and did not indicate the presence of radiological contamination on the slab (WSRC 2007c).

Two sumps are present in the slab. The original sump had been grouted up previously as part of operations when the newer sump was installed. Sampling was performed on the original sump by drilling through the grout fill to the bottom of the sump. Analysis indicates two unit-related radionuclides (cesium-137 and tritium) and two metals (barium and chromium) were detected in the sample. Upon completion of the sampling, the drill hole was regrouted.

Radiological survey of the other sump indicated radioactive contamination (WSRC 2007c). Three radionuclides (cesium-137, cobalt-60, and tritium) and three metals (arsenic, barium, and chromium) were detected in the new sump. Upon completion of the sampling, the new sump was grouted to surface.

Potential Source Area 2 – Area around the Cooling Water Effluent Sumps (107-P/ 107-1P)

Sampling results taken as part of PAOU characterization at the PSA 2 indicate that there was no release of material to subsurface soils or the groundwater from the Cooling Water Effluent Sumps (SRNS 2008b).

Potential Source Area 4 – Area East of the P-Reactor Building (105-P)

Sampling results taken as part of PAOU characterization at the PSA 4 did not indicate a source(s) of VOCs in the subsurface (SRNS 2008b).

Potential Source Area 5 – Two Localized Areas in the Southwestern Part of P Area

Sampling results taken as part of PAOU characterization at the PSA 5 did not indicate a source(s) of VOCs in the subsurface (SRNS 2008b).

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Uses

According to the Savannah River Site Future Use Project Report (USDOE 1996), residential uses of SRS land should be prohibited. The *Land Use Control Assurance Plan for the Savannah River Site* (WSRC 1999) designates the PAOU as being within an industrial area. The future land use is reasonably anticipated to remain industrial with USDOE maintaining control of the land.

It is important to note that a potential future use for the PAOU is access by the U.S. Armed Forces for training purposes. This activity is consistent with industrial use and the LUCs selected in this ROD are protective of this potential land use scenario.

Groundwater Uses/Surface Water Uses

P Area shallow groundwater has been impacted by previous reactor operations in the area and will be evaluated under CERCLA for future remedial action. Although there is no anticipated current or future use of the groundwater, SRS procedures, in conjunction with South Carolina regulations will prevent use of the groundwater without prior approval. These administrative controls will remain in effect until LUCs are established as part of the final CERCLA remedial action for the PRGW OU.

VII. SUMMARY OF OPERABLE UNIT RISKS

Baseline Risk Assessment

As a component of the RFI/RI process, a BRA was performed to evaluate risks associated with the PAOU (SRNS 2008b). The BRA estimates what risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BRA includes human health and ecological risk assessments. Risks associated with the potential for contaminant migration to groundwater and PTSM are also summarized. This section of the ROD summarizes the results of the BRA for the PAOU subunits.

Summary of Human Health Risk Assessment

A summary of the risks for each subunit is provided below, including the expected residual risk after the early remedial actions or removal actions are completed. An area is considered to pose adverse health effects if the cumulative risk from all COCs exceeds a carcinogenic risk threshold greater than 1E-06 or a noncarcinogenic Hazard Index (HI) greater than 1.

The results of the human health risk assessment for the PAOU subunits are shown in Table 2. Subunits for which refined constituents of concern (RCOCs) were determined for the human health risk assessment are: HCA associated with the P-Area Cask Car Railroad Tracks, P-Reactor Building (105-P) Complex, and P-Area Ash Basin (including Outfall P-007) (188-P). Additionally, COCs were qualitatively identified for the P-Area PSLs based on the potential for fixed contamination within the lines. Each of these subunits, and the PSLs, were addressed by early remedial actions or NTC removal actions and are briefly discussed below. Risks associated with the P-Reactor Disassembly Basin water were previously described in the EE/CA for the disposition of water in the 105-P Disassembly Basin (WSRC 2007e).

Due to human health risk at the HCA associated with the P-Area Cask Car Railroad Tracks (Table 2), an early remedial action will be conducted to eliminate exposure to radionuclide contaminants (total cumulative risk = 5.6E-03). Following the early remedial action (soil removal to 1 pCi/g cesium-137), the HCA associated with the P-Area Cask Car Railroad Tracks subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Because of the below-grade contamination and the above-grade contaminated equipment remaining in place at the RBC, an early remedial action will be conducted to eliminate exposure to radionuclide contaminants (total cumulative risk = 1.3E+03). Following the early remedial action, radioactive contaminants will be left in place. LUCs will be required to prevent exposure to contaminants located within the RBC. Therefore, LUCs

will be required for as long as necessary to keep the selected remedy fully protective of human health and the environment.

Based on radioactive and hazardous contaminants being left in place under a soil cover for the P-Area Ash Basin (including Outfall P-007) (188-P), a removal action will be conducted to prevent disturbance of the cover and potential exposure to the contaminants (total cumulative risk = 5.9E-04). Following the removal action, LUCs will be required to prevent disturbance of the cover and potential exposure to the contaminants.

Based on the likelihood for human health risks to exceed 1E-03 in the P-Area PSLs, a removal action will be conducted to eliminate exposure to access points in the lines and prevent water flow through the lines. Following the removal action, radioactive contaminants will be left in place. LUCs will be required to prevent exposure if the PSLs are physically breached and exposed at the surface.

The remaining PAOU subunits fall into two categories: 1) those requiring no further action, and 2) those requiring LUCs.

PAOU Subunits Requiring No Further Action

Potential Source Area 1 – Emergency Cooling Water Retention Basin (904-86G)

Based on the results of the human health risk assessment (SRNS 2008b), there are no human health RCOCs in the surface soils for a future industrial worker or a future resident at the PSA 1 Emergency Cooling Water Retention Basin. Therefore, No Further Action was determined for this subunit (Table 1).

Slab Associated with Containment Tank within the 904-86G (Emergency Cooling Water Retention Basin)

Because the surveys of the slab met unconditional release criteria and the human health risk assessment for PSA 1 resulted in no human health RCOCs in the surface soils for a future industrial worker or a future resident, No Further Action was determined for this subunit (SRNS 2008b) (Table 1).

Outfall P02

Using the results of the 2008 confirmatory sampling, a supplemental risk assessment was performed for Outfall P02 to evaluate exposure risk to a residential receptor (SRNS 2009a). Based on this evaluation, it was determined that no exposure risk exists for the residential scenario. Both the confirmatory sampling and No Further Action determination occurred prior to commencing the planned early action excavation activities. Therefore, no remedial action is required for the Outfall P02 (Table 1).

PAOU Subunits Requiring LUCs

Potential Release from Reactor Cooling Water System (186/190-P)

As determined in the RFI/RI/BRA/CMS/FS (SRNS 2008b), the Potential Release from Reactor Cooling Water System (186/190-P) was determined to have no problems warranting action under the industrial land use scenario (Tables 1 and 2). However, the Potential Release from Reactor Cooling Water System (186/190-P) subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Potential Release from the P-Area Disassembly Basin (105-P)

As discussed in the RFI/RI/BRA/CMS/FS (SRNS 2008b), the Potential Release from the P-Area Disassembly Basin (105-P) was determined to have no problems warranting action under the industrial land use scenario (Tables 1 and 2). However, the Potential Release from the P-Area Disassembly Basin (105-P) subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN)

As discussed in the RFI/RI/BRA/CMS/FS, the P-Area Reactor Area Cask Car Railroad Tracks As Abandoned was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The P-Area Reactor Area Cask Car Railroad Tracks As Abandoned subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

All P-Area Cask Car Railroad Tracks within the P-Area Fence

As an outcome of the survey, no radiological contamination was found on or near the P-Area Cask Car Rail Road Tracks within the P-Area fence (except for the HCA associated with the P-Area Cask Car Railroad Tracks, which was discussed earlier in the Summary of Human Health Risk Assessment). However, because of its location within the P Area fence, the Cask Car Railroad Tracks will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Slab Associated with 717-9P Pipe Fabrication Shop Building

As discussed in the RFI/RI/BRA/CMS/FS, the Slab Associated with 717-9P Pipe Fabrication Shop Building was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The Slab Associated with 717-9P Pipe Fabrication Shop Building subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Slab Associated with 710-P Radiological Zone Storage Building

As discussed in the RFI/RI/BRA/CMS/FS, the Slab Associated with 710-P Radiological Zone Storage Building was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The Slab Associated with 710-P Radiological Zone Storage Building subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P)

As discussed in the RFI/RI/BRA/CMS/FS, the Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P) was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P) subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Potential Source Area 2 – Area around the Cooling Water Effluent Sumps (107-P/ 107-1P)

As discussed in the RFI/RI/BRA/CMS/FS, the PSA 2 was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The PSA 2 subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Potential Source Area 3A – Area near the Northern End of the P-Reactor Building (105-P)

No surficial exposure pathway exists to human health receptors from the PSA 3A. Following the early remedial action, the PSA 3A subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Potential Source Area 3B – Area West of the Administrative/Maintenance Slab

No surficial exposure pathway exists to human health receptors from the PSA 3B. Following the early remedial action, the PSA 3B subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Potential Source Area 4 – Area East of the P-Reactor Building (105-P)

As discussed in the RFI/RI/BRA/CMS/FS, the PSA 4 was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The PSA 4 subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Potential Source Area 5 – Two Localized Areas in the Southwestern Part of P Area

As discussed in the RFI/RI/BRA/CMS/FS, the PSA 5 was determined to have no problems warranting action under the industrial land use scenario (SRNS 2008b) (Tables 1 and 2). The PSA 5 subunit will be managed with the LUCs selected for the entire PAOU to prevent unrestricted use.

Summary of Ecological Risk Assessment

Ecological risk is associated with the potential for harmful effects to ecological systems resulting from exposure to an environmental stressor. A stressor is any physical, chemical, or biological entity that can induce an adverse response. Stressors may adversely affect specific natural resources or entire ecosystems, including plants and animals, as well as the environment with which they interact.

An ecological risk assessment was conducted on the P-Area Ash Basin (188-P), the Outfall P-007, the Outfall P02, the Potential Release from P-Reactor Cooling Water System (186/190-P), and the PSA 1 – Emergency Cooling Water Retention Basin (904-86G). The remaining PAOU subunits were determined not to require a quantitative ecological risk evaluation due to lack of habitat (industrial setting) and/or conceptual model considerations (e.g., contamination at depth).

The results of the ecological risk assessment for the PAOU subunits are shown in Table 2. There were no ecological COCs identified for any of the PAOU subunits.

Summary of the Contaminant Fate and Transport Analysis

A contaminant migration analysis was performed to identify CM COCs. The constituents are identified as a CM COC if leachability modeling predicts the constituent will leach to the groundwater and exceed maximum contaminant levels (MCLs) or preliminary remedial goals within 1000 years.

The results of the CM evaluation for the PAOU subunits are shown in Table 2. Subunits for which COCs were determined for the CM evaluation are: P-Reactor Building (105-P) Complex, PSA 3A, and PSA 3B. Early remedial actions have been developed (SRNS 2008a, SRNS 2009a) that will address the CM COCs in these subunits.

Discussion of Principal Threat Source Material (PTSM)

Source materials are those materials that include or contain hazardous substances, pollutants, or contaminants that act as a reservoir for migration to groundwater, surface

water, or air, or that act as a source for direct exposure. PTSM is defined as those source materials that have a high toxicity or mobility and cannot be reliable contained or present a significant risk to human health or the environment (USEPA 1991). Treatment alternatives should be considered for source materials with a toxicity of 1E-03 or greater for carcinogens or cumulative HI of 10 or greater for noncarcinogens.

At SRS, source material is considered to be PTSM if the cumulative risk exceeds one of the following threshold criteria:

- Carcinogens – greater than 1E-03 industrial worker risk; or
- Non-carcinogens – industrial worker HI greater than 10.

The results of the PTSM evaluation for the PAOU subunits are shown in Table 2. Subunits for which RCOCs were determined for the PTSM evaluation are: HCA associated with the P-Area Cask Car Railroad Tracks and P-Reactor Building (105-P) Complex. Early remedial actions have been developed (SRNS 2008a, SRNS 2009a) that will address the PTSM in these subunits.

Conclusions

Following successful completion of the ongoing early remedial or removal actions to meet industrial level RGs, residual contamination will remain at the PAOU that may present a risk to human health and the environment. LUCs for the entire PAOU are needed to prevent unrestricted use.

A conceptual site model that identifies how the final remedial action will eliminate the primary exposure pathway(s) for the contaminants and media of concern for each PAOU subunit is presented in Figure 8.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

The goals of remedial actions are to protect human health and the environment and to mitigate the effects of contamination. Remedial action objectives (RAOs) are media- or OU-specific objectives for protecting human health and ecological receptors from

exposure to unit-related contamination. RGs represent media-specific cleanup goals and serve as a standard by which to measure whether a selected remedial action has met its RAO.

USEPA has established a structured process to identify and evaluate technologies for remedial applications. This process involves developing and screening a range of appropriate remedial options and selecting the most suitable approach(es) for corrective measures and remedial actions.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) specifies six criteria for developing this range of remedial technologies [40 Code of Federal Regulation (CFR) Part 300.430 (a)(1)(iii)(A)-(F)]:

- Whenever practical, use treatment to address principal threats posed by the unit;
- Use engineering controls for waste that poses a relatively low long-term risk or when treatment is impractical;
- Combine methods (for example, treatment plus engineering controls) to protect human health and the environment;
- Supplement engineering controls with institutional controls to prevent or limit exposure;
- Whenever practical, use innovative technologies; and
- Return usable groundwater to beneficial uses or prevent further degradation.

Remedial Action Objectives

RAOs usually specify potential receptors and exposure pathways, and are identified during scoping once the CSM is understood. RAOs describe what the cleanup must accomplish and are used as a framework for developing remedial alternative. The RAOs are based on the nature and extent of contamination, threatened resources, and the potential for human and environmental exposure. The following RAOs are identified for the PAOU subunits warranting final action and are protective of the industrial worker:

- Eliminate or control all routes of exposure to residual radioactive or chemical contamination posing risks exceeding 1E-06 to the industrial worker or the resident in media or structures associated with the RBC including the water in the P-Reactor Disassembly Basin, the HCA associated with the P-Area Cask Car Railroad Tracks, the P-Area PSLs, the PSA 3A, the PSA 3B, and the P-Area Ash Basin (including Outfall P-007) (188-P); and
- Prevent exposure of potential contamination in media or structures to a residential receptor associated with the following subunits:
  - Potential Release from the Reactor Cooling Water System (186/190-P);
  - Potential Release from the P-Reactor Disassembly Basin (105-P);
  - P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN);
  - All Railroad Tracks within the P-Area Fence;
  - Slab Associated with Pipe Fabrication Shop Building (717-9P);
  - Slab Associated with Radiological Zone Storage Building (710-P);
  - Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P);
  - PSA 2 – Area around the Cooling Water Effluent Sump (107-P/107-1P);
  - PSA 4 – Area East of the P-Reactor Building (105-P); and
  - PSA 5 – Two localized areas in the Southwestern part of P Area.

Remedial Goals

RGs can be qualitative statements or numerical values often expressed as concentrations in soils and groundwater, or actions (installation of engineered barriers, placement of caps and covers, etc.) that achieve the RAO. Final RGs will be monitored to determine when the remedial action is complete.

The RGs identified in the early remedial action and removal action decision documents (SRNS 2008a, SRNS 2009a, SRNS 2009c, and SRNS 2009d) will be met as the actions are completed. Specific RGs are not developed for the final action since the preferred

alternative (LUCs) will break the exposure pathway to any contamination left in place following completion of the early remedial actions or removal actions.

Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs) are 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. Section 121(d) of CERCLA, as amended by the Superfund Amendments Reauthorization Act, requires that remedial actions comply with requirements and standards set forth under federal and state environmental laws.

Three categories of ARARs were defined to clarify how to identify and comply with environmental requirements. They include action-specific, location-specific, and chemical-specific requirements:

- Action-specific ARARs control or restrict the design, performance, and other aspects of implementation of specific remedial activities.
- Location-specific ARARs reflect the physiographic and environmental characteristics of the unit or the immediate area, and may restrict or preclude remedial actions depending on the location or the characteristics of the unit.
- Chemical-specific ARARs are media-specific concentration limits promulgated under federal or state law. The NCP requires the development of health-based, site-specific levels for chemicals where such limits do not exist and where there is a concern with their potential health or environmental effects.

ARARs for the early remedial actions and the NTC removal actions were previously identified in the EAROD, the ESD to the EAROD, or the RSER/EE/CA documents. The chemical- and action-specific ARARs identified for the alternatives evaluated in the SB/PP for the PAOU are shown in Table 3. Groundwater monitoring will not be required

for the P-Area Ash Basin (including the Outfall P-007) (188-P) as the contaminant fate and transport analysis indicated that there is no potential for impact to the groundwater.

IX. DESCRIPTION OF ALTERNATIVES

This section presents and summarizes the remedial alternatives for the final remedy for PAOU. Under CERCLA, it is desirable when practical to offer a range of diverse alternatives to compare during the detailed analysis to arrive at the most effective cost-efficient remedial action. The range of alternatives includes options that (1) immobilize chemicals, (2) reduce the contaminant volume, or (3) reduce the need for long-term, onsite management. For PAOU, these alternatives were previously evaluated in the early remedial actions or removal action decision documents (SRNS 2008a, SRNS 2008b, SRNS 2009a, SRNS 2009b, SRNS 2009c, SRNS 2009d, USDOE 2008). For the final action at PAOU, the LUC alternative was developed that involves no treatment yet provides protection to human health and the environment by preventing or controlling exposure to the contaminants through LUCs. As required by the NCP, the No Action alternative is provided as a baseline for comparison.

Remedy Components, Common Elements, and Distinguishing Features of Each Alternative

For each of the alternatives below, a discount rate of 2.7% was used to estimate the present-worth. The present-worth costs include the five-year remedy reviews, if included as part of the alternative. Detailed breakdowns of these cost summaries are included in Tables 4 and 5. Present-worth costs for these items are based on an estimated time frame of 200 years. ARARs for the PAOU subunits are provided in Section X.

Two remedial alternatives were developed for the PAOU and are discussed below. These alternatives are based on the site conditions that remain following successful completion of the removal/remedial actions to meet RGs.

Alternative PAOU-1 – No Action

Total Present Worth Cost *$0*

The No Action alternative is required by the NCP to serve as a baseline for comparison with other remediation alternatives. Under this alternative, no efforts would be made to control access, limit exposure, or reduce contaminant toxicity, mobility, or volume at the PAOU. This alternative would leave the PAOU in its current condition with no additional controls. This alternative does not include five-year remedy reviews.

Alternative PAOU-2: Land Use Controls

Total Present Worth Cost *$1,580,323*

Under this alternative, LUCs would be implemented after completion of the removal/remedial actions. The PAOU LUC boundary is depicted in Figure 9. No additional active remedial action is needed after completion of the early remedial actions and removal actions. Implementation of this alternative would require both near- and long-term actions.

For the near-term, signs would be posted to indicate that the area was used for disposal of waste material or that contaminated structures exist. In addition, existing SRS access controls would be used to maintain the use of the PAOU consistent with its intended use. A perimeter fence will not be constructed around the PAOU because removal/remedial actions and land use restrictions are sufficient to isolate the contaminants from human exposure. Surface soils will not pose a potential threat to a current on-unit worker at the PAOU once removal/remedial actions have been completed to meet RGs.

Periodic inspections would be conducted and maintenance would be performed to help ensure that the removal/remedial actions are in satisfactory condition. Maintenance, as needed, would consist primarily of mowing, cap and roof repair, subsidence repairs, etc. Minor drainage modification may be conducted as needed to prevent ponding and to promote surface water runoff. Although groundwater is not part of the PAOU, periodic (every five years) groundwater monitoring would be conducted to confirm that contaminants associated with the RBC are not reaching the groundwater.

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

The NCP [40 CFR 300.430(e)(9)] requires that potential remedial alternatives undergo detailed analysis using relevant evaluation criteria that will be used by decision makers to select a final remedy. The results of the detailed analysis are then examined to compare alternatives and identify key tradeoffs among alternatives. Potential alternatives that address the PAOU are individually evaluated in detail against CERCLA requirements. A comparative analysis is then conducted for the corrective measure/remedial alternatives.

In this section, the alternatives formulated and retained are evaluated in detail against CERCLA requirements. The statutory requirements that guide the evaluation of remedial alternatives in a CERCLA FS state that a remedial action must:

- Be protective of human health and the environment;
- Attain ARARs or define criteria for invoking a waiver;
- Be cost effective; and
- Use permanent solutions to the maximum extent.

USEPA has established nine evaluation criteria to address these statutory requirements under CERCLA. The criteria fall into the categories of threshold criteria, primary balancing criteria, and modifying criteria. Evaluation criteria categories and the nine evaluation criteria are listed and explained below.

Threshold Criteria

Threshold criteria are requirements that each alternative must achieve to be eligible for selection as a permanent remedy under CERCLA. The threshold criteria are:

- Overall protection of human health and the environment.
- Compliance with ARARs.

Primary Balancing Criteria

Primary balancing criteria are factors that identify key tradeoffs among alternatives. The primary balancing criteria are:

- Long-term effectiveness and permanence.
- Reduction of mobility, toxicity, or volume through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.

Modifying Criteria

Modifying criteria (i.e., state or support agency acceptance, community acceptance) are also considered during remedy selection. Community acceptance is formally assessed after the public review and comment period on the SB/PP. The modifying criteria are:

- State or support agency acceptance.
- Community acceptance.

Comparative Analysis of the P-Area Operable Unit Alternatives

A comparative analysis summary and ranking of the PAOU alternatives is shown in Table 6. The following two alternatives were developed for consideration:

- Alternative PAOU-1 - No Action; and
- Alternative PAOU-2 - Land Use Controls.

1. Overall Protection of Human Health and the Environment - Alternative PAOU-2 is protective of human health (industrial workers and residents) by preventing the exposure to contaminated soils and structures through LUCs; Alternative PAOU-1 is not protective of human health since no controls are in place to prevent the potential exposure to contaminated soils and structures. Alternative PAOU-2 would achieve RAOs.

2. Compliance with ARARs – ARARs are associated with this proposed action (Table 4). Alternative PAOU-1 does not meet the chemical-specific ARARs since there are no controls in place to prevent the potential exposure to contaminated soils and structures; PAOU-2 meets both chemical-specific and action-specific ARARs.

3. Long-Term Effectiveness and Permanence – The remedial alternatives are assessed based on their ability to maintain reliable protection of human health and the environment after implementation. Alternative PAOU-2 is protective and provides long-term effectiveness and permanence as long as LUCs criteria are met. Alternative PAOU-1 does not provide long-term effectiveness and permanence since there are no controls in place to prevent the potential exposure to contaminated soils and structures.

4. Reduction of Toxicity, Mobility, or Volume through Treatment – Both Alternatives PAOU-1 and PAOU-2 do not provide a reduction in the toxicity, mobility, or volume of contaminants. This criteria was addressed by the early remedial/removal actions for the specific subunits, as described in the EAROD (SRNS 2008a), the ESD to the EAROD (SRNS 2009b), the EARAIP (SRNS 2009a), the RSER/EE/CA for the PSLs (SRNS 2009d), and the RSER/EE/CA for the P-Area Ash Basin (including Outfall P-007) (188-P) (SRNS 2009c).

5. Short-Term Effectiveness – The remedial alternatives are assessed considering factors relevant to implementation of the remedial action, including risks to the community during implementation, impacts on workers, potential environmental impacts and the time until protection is achieved. Alternative PAOU-2 achieves RAOs in a short period of time with essentially no risk to workers and the public. Alternative PAOU-1 does not provide short-term effectiveness since there are no controls in place to prevent the potential exposure to contaminated soils and structures.

6. Implementability – The remedial alternatives are assessed by considering the difficulty of implementing the alternative, including technical feasibility, constructability, reliability of technology, ease of undertaking additional remedial actions (if required), monitoring considerations, administrative feasibility (regulatory requirements), and

availability of services and materials. Both Alternative PAOU-1 and PAOU-2 are easily implementable.

7. Cost – Alternative PAOU-1 is less expensive ($0) than Alternative PAOU-2 ($1,580,323). Detailed alternative costs are provided in Tables 4 and 5. Five-year remedy reviews for 200 years are included for Alternative PAOU-2. At 200 years, greater than 99.5% of the total cost is captured based on the current discount rate used.

8. State Acceptance – State acceptance criteria were evaluated based on scoping meetings held between USDOE, USEPA, and SCDHEC, and based on comments received on the final SB/PP. Alternative PAOU-2 is the preferred remedy for SCDHEC.

9. Community Acceptance – The community acceptance of the preferred alternative is assessed by giving the public an opportunity to comment on the remedy selection process. A public comment period was held from February 12, 2010 through March 29, 2010. No comments were received from the public, indicating that the preferred remedy is acceptable.

XI. THE SELECTED REMEDY

Detailed Description of the Selected Remedy

The preferred alternative for the PAOU is described below.

P-Area Operable Unit

The preferred remedial action for the PAOU is Alternative PAOU-2 - Land Use Controls. This remedy meets the RAOs and the threshold criteria, provides overall protection of human health and the environment, and complies with ARARs. The remedy is effective in the long-term based on preventing human exposure to radioactive and hazardous contaminants that remain. Present worth cost estimates for Alternative PAOU-2 is $1,580,323.

The LUC objectives necessary to ensure the protectiveness of the selected remedy for the PAOU are:

- Restrict unauthorized worker access and prevent contact, removal, or excavation of contaminated waste, pipelines, equipment, and buildings;
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds;
- Maintain the integrity of any current or future remedial or monitoring system, such as SVE systems, soil covers, or groundwater monitoring wells;
- Prevent access or use of contaminated groundwater until cleanup levels are met;
- Prevent construction of inhabitable buildings without an evaluation of indoor air quality to address vapor intrusion.

Under Alternative PAOU-2, LUCs would be implemented after successful completion of the removal/remedial actions. No additional active remedial action is needed after completion of the early remedial actions and removal actions. Implementation of this alternative would require both near- and long-term actions.

For the near-term, signs would be posted to indicate the area that is subject to LUCs. Placement of signs is expected to be completed by the end of 2011. The language used on the signs will be detailed in the Land Use Control Implementation Plan (LUCIP). In addition, existing SRS access controls would be used to maintain the use of the PAOU consistent with its intended use. A perimeter fence will not be constructed around the PAOU because removal/remedial actions and land use restrictions are sufficient to isolate the contaminants from human exposure. Surface soils will not pose a potential threat to a current on-unit worker at the PAOU once removal/remedial actions have been completed to meet RGs.

LUCs for PAOU will be implemented by (Table 7) (Figure 9):

- Providing access controls for on-site workers via the Site Use Program, Site Clearance Program, work control, worker training, worker briefing of health and safety requirements and identification signs located at the waste unit boundaries.
- Providing access controls against trespassers as described in the 2000 RCRA Part B Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary.

In the long-term, if the property is ever transferred to nonfederal ownership, the US Government will take those actions necessary pursuant to Section 120(h) of CERCLA. Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The contract for sale and the deed will contain the notification required by CERCLA Section 120(h). The deed notification shall notify any potential purchaser that the property has been used for the management and disposal of waste. These requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

The deed shall also include deed restrictions precluding residential use of the property. The deed shall expressly prohibit activities inconsistent with the remedial goals and objectives in the ROD upon any and all transfers. However, the need for these deed restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended ROD with USEPA and SCDHEC review and approval.

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

The selected remedy for the PAOU leaves hazardous substances in place that pose a potential future risk and will require land use restrictions as long as necessary to keep the

selected remedy fully protective of human health and the environment. As agreed on March 30, 2000, among the USDOE, the USEPA, and the SCDHEC, SRS is implementing a land use control assurance plan (LUCAP) to ensure that LUCs required by numerous remedial decisions at SRS are properly maintained and periodically verified. The unit-specific land use control implementation plan (LUCIP) referenced in this ROD will provide details and specific measures to implement and maintain the LUCs selected as part of this remedy. The USDOE is responsible for implementing, maintaining, monitoring, reporting upon, and enforcing the LUCs selected under this ROD. The LUCIP, developed as part of this action, will be submitted for review and approval by USEPA and SCDHEC. Upon final approval, the LUCIP will be appended to the LUCAP and is considered incorporated by reference into the ROD, establishing LUC implementation and maintenance requirements enforceable under CERCLA and the SRS Federal Facility Agreement (FFA 1993). The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the PAOU. The LUCIP will remain in effect unless and until modifications are approved as needed to be protective of human health and the environment. The deed shall expressly prohibit activities inconsistent with the remedial goals and objectives in this ROD upon any and all transfers. The LUCs shall be maintained until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use. Approval by USEPA and SCDHEC is required for any modification or termination of the LUCs.

USDOE has recommended that residential use of SRS land be controlled; therefore, future residential use and potential residential water usage will be restricted to ensure long-term protectiveness. LUCs, including institutional controls, will restrict the PAOU to future industrial use and will prohibit residential use of the area. Unauthorized excavation will also be prohibited and the waste unit will remain undisturbed. LUCs selected as part of this action will be maintained for as long as necessary to keep the selected remedy fully protective of human health and the environment and termination of any LUCs will be subject to CERCLA requirements for documenting changes in remedial actions.

Periodic inspections would be conducted and maintenance would be performed to help ensure that the removal/remedial actions are in satisfactory condition. Maintenance, as needed, would consist primarily of mowing, cap and roof repair, subsidence repairs, etc. Minor drainage modification may be conducted as needed to prevent ponding and to promote surface water runoff. Although groundwater is not part of the PAOU, periodic (every five years) groundwater monitoring would be conducted to confirm that contaminants associated with the RBC are not reaching the groundwater.

Because the final remedial action will consist of LUCs only (i.e., no design or construction activities), a Corrective Measures Implementation / Remedial Action Implementation Plan will not be submitted for the PAOU. Approval of the PAOU LUCIP would constitute remedial action start.

Cost Estimate for the Selected Remedy

The detailed cost estimate for Alternative PAOU-2 – LUCs is presented in Table 5. Capital costs including posting of warning signs, preparing the LUCIP, and developing deed restrictions should property transfer occur. Direct Operations & Maintenance (O&M) costs are considered for 200 years and include annual inspections and maintenance, well monitoring, and five year remedy reviews.

The information in these cost estimate summary tables are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record File, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost.

P-Area Operable Unit

Summary of Costs

Capital:	$51,282
O&M:	$1,529,041

Present-worth: $1,580,323

Estimated costs associated with the selected remedy on the 2.7% discount rate over a 200-year period are summarized above.

Estimated Outcomes of Selected Remedy

LUCs will be maintained for protection of human health and the environment at the PAOU by restricting the land use to industrial use only. It is expected that portions of the PAOU will be available for industrial use by 2012. Although groundwater is not included as part of this OU, the use of groundwater will continue to be restricted until the final ROD for the PRGW OU is completed.

The selected remedy for the PAOU will meet RAOs through the following means:

- Eliminating or controlling all routes of exposure to residual radioactive or chemical contamination posing risks exceeding 1E-06 to the industrial worker or the resident in media or structures associated with the RBC including the water in the P-Reactor Disassembly Basin, the HCA associated with the P-Area Cask Car Railroad Tracks, the PSA 3A, the PSA 3B, the P-Area PSLs, the P-Area Ash Basin (including Outfall P-007); and
- Preventing exposure of potential contamination in media or structures to a residential receptor associated with the following subunits:
  - Potential Release from the Reactor Cooling Water System (186/190-P);
  - Potential Release from the P-Reactor Disassembly Basin (105-P);
  - P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN);
  - All Railroad Tracks within the P-Area Fence;
  - Slab Associated with Pipe Fabrication Shop Building (717-9P);
  - Slab Associated with Radiological Zone Storage Building (710-P);
  - Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P);
  - PSA 2 – Area around the Cooling Water Effluent Sump (107-P/107-1P);

- PSA 4 – Area East of the P-Reactor Building (105-P); and
- PSA 5 – Two localized areas in the Southwestern part of P Area.

XII. STATUTORY DETERMINATIONS

Regulatory decisions were made on select PAOU subunits. These decisions included early remedial actions documented in an EAROD and an ESD to the EAROD, and NTC removal actions documented in three RSER/EE/CAs. The remaining subunits not selected for an early remedial action or a NTC removal action were presented in the RFI/RI/BRA/CMS/FS report (SRNS 2008b). Following successful completion of the early remedial actions and NTC removal actions, residual hazardous substances will remain at the PAOU that pose a threat to human health and the environment. Therefore, Alternative PAOU-2 – LUCs, has been selected as the final remedy for the PAOU. The future land use of the PAOU is assumed to be industrial land use.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, and will continue to be, protective of human health and the environment.

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action (unless justified by a waiver) and is cost-effective. This remedy does not satisfy the statutory preference for treatment as a principal element of the remedy since the remedy does not reduce toxicity, mobility, or volume of materials comprising principal treats through treatment.

XIII. EXPLANATION OF SIGNIFICANT CHANGES

The remedy selected in this ROD for the PAOU does not contain any significant changes from the preferred alternative presented in the SB/PP.

XIV. RESPONSIVENESS SUMMARY

The Responsiveness Summary is included as Appendix A of this document. No comments were received from the public.

XV. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

A detailed schedule for the Post-ROD activities is shown in Figure 10. The forecast schedule for the post-ROD documentation is provided below:

- SRS submittal of the Revision 0 LUCIP is scheduled for June 4, 2010;
- USEPA and SCDHEC will receive 90 calendar days for review of the Revision 0 LUCIP;
- The SRS revision of the LUCIP will be completed 60 calendar days after receipt of all regulatory comments on the LUCIP;
- USEPA and SCDHEC will receive 30 calendar days for final review and approval of the LUCIP; and
- The projected Remedial Action start date is March 15, 2011.

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Figure 1. Location of the P Area within the Savannah River Site

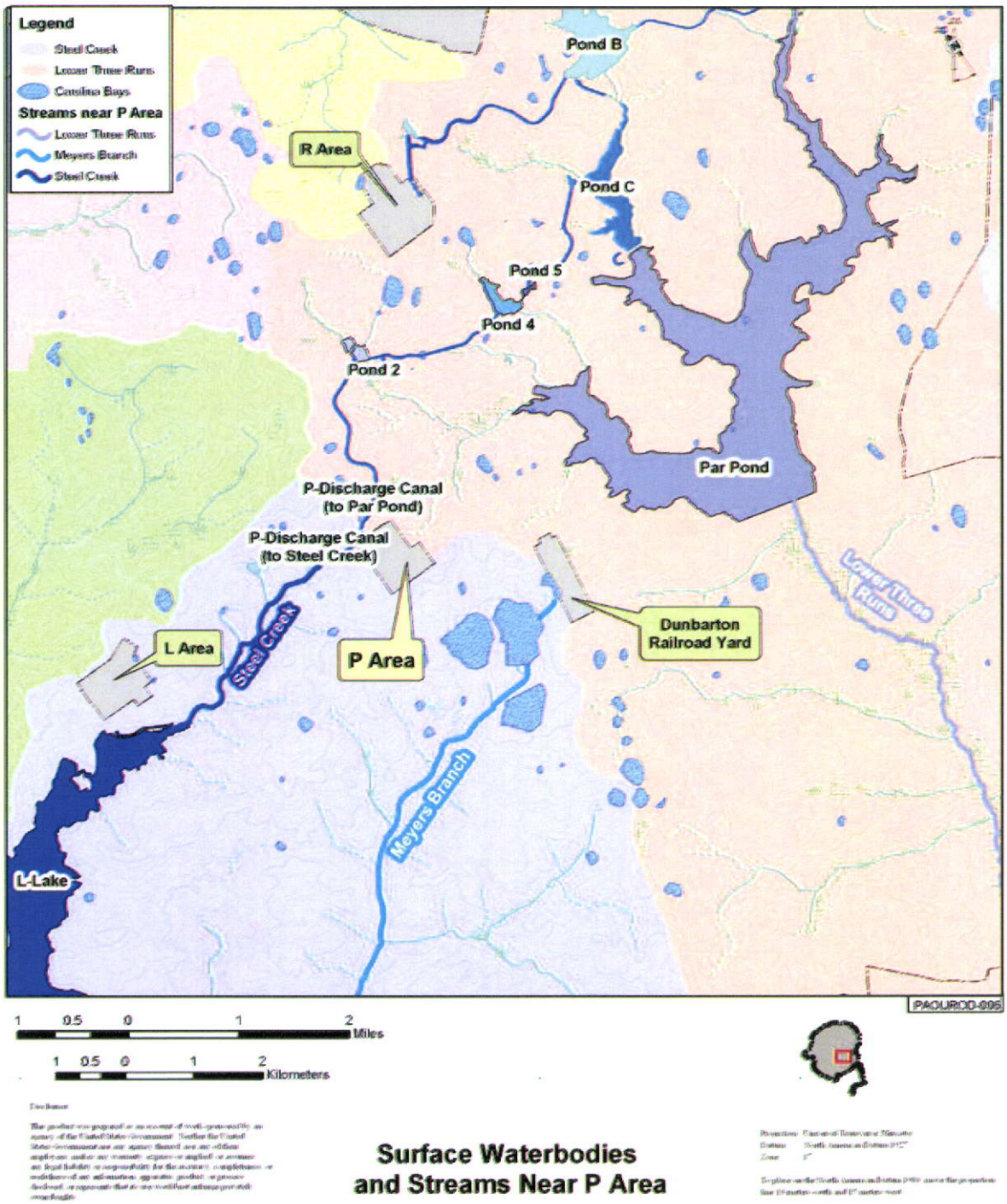


Figure 2. Location of the P Area within the Savannah River Site

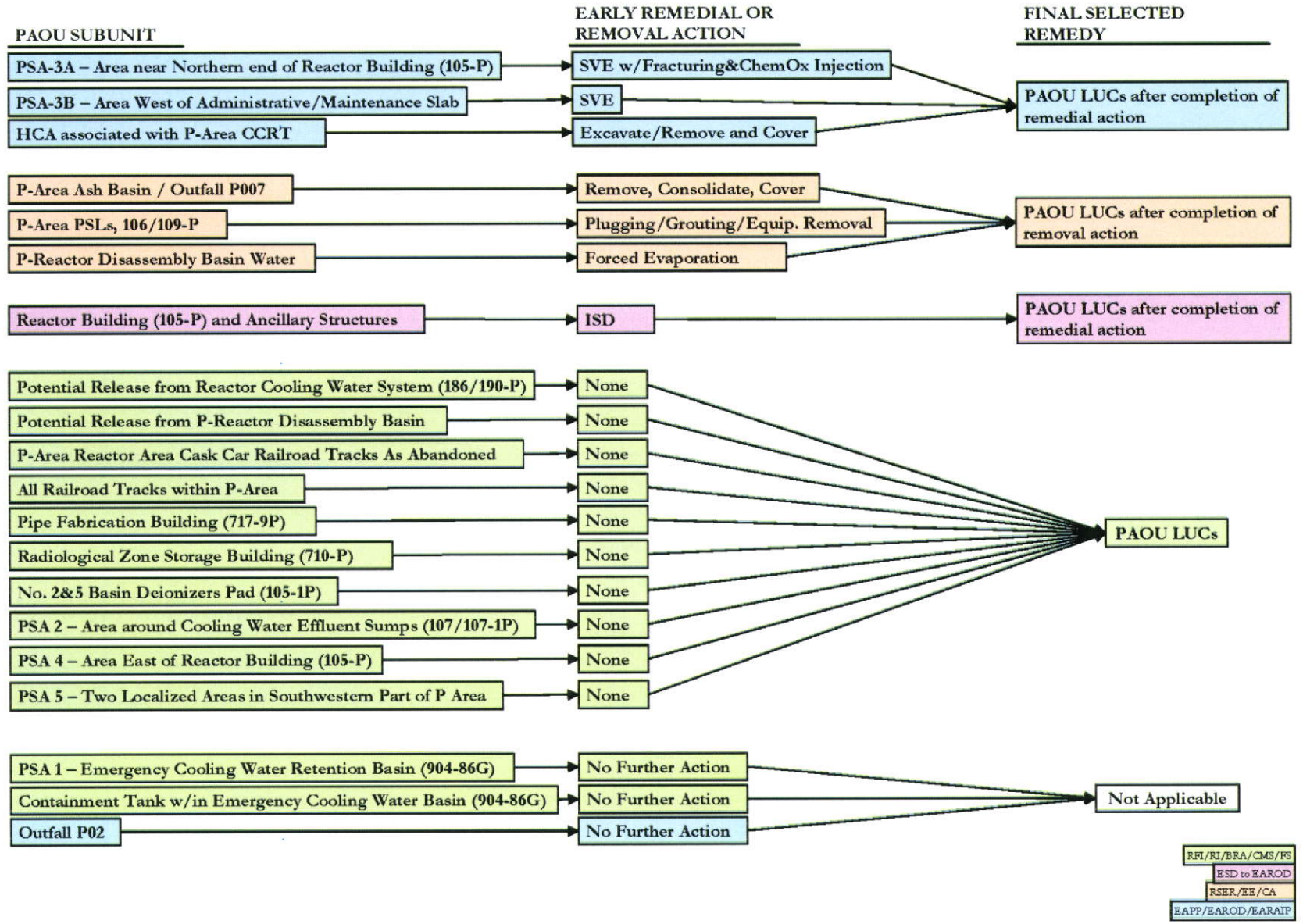


Figure 3. Administrative Paths for the PAOU Subunits

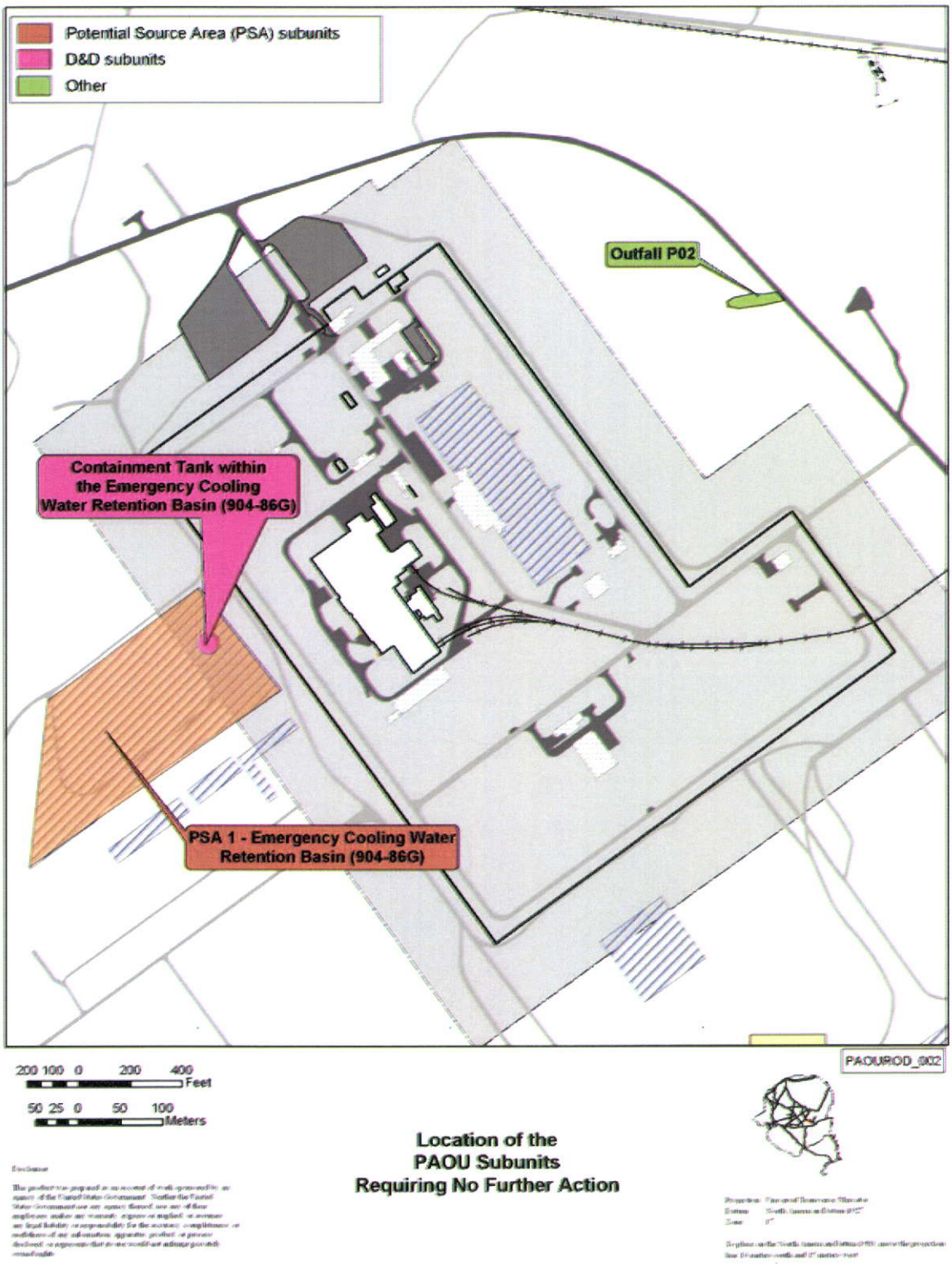


Figure 4. Location of the PAOU Subunits requiring No Further Action

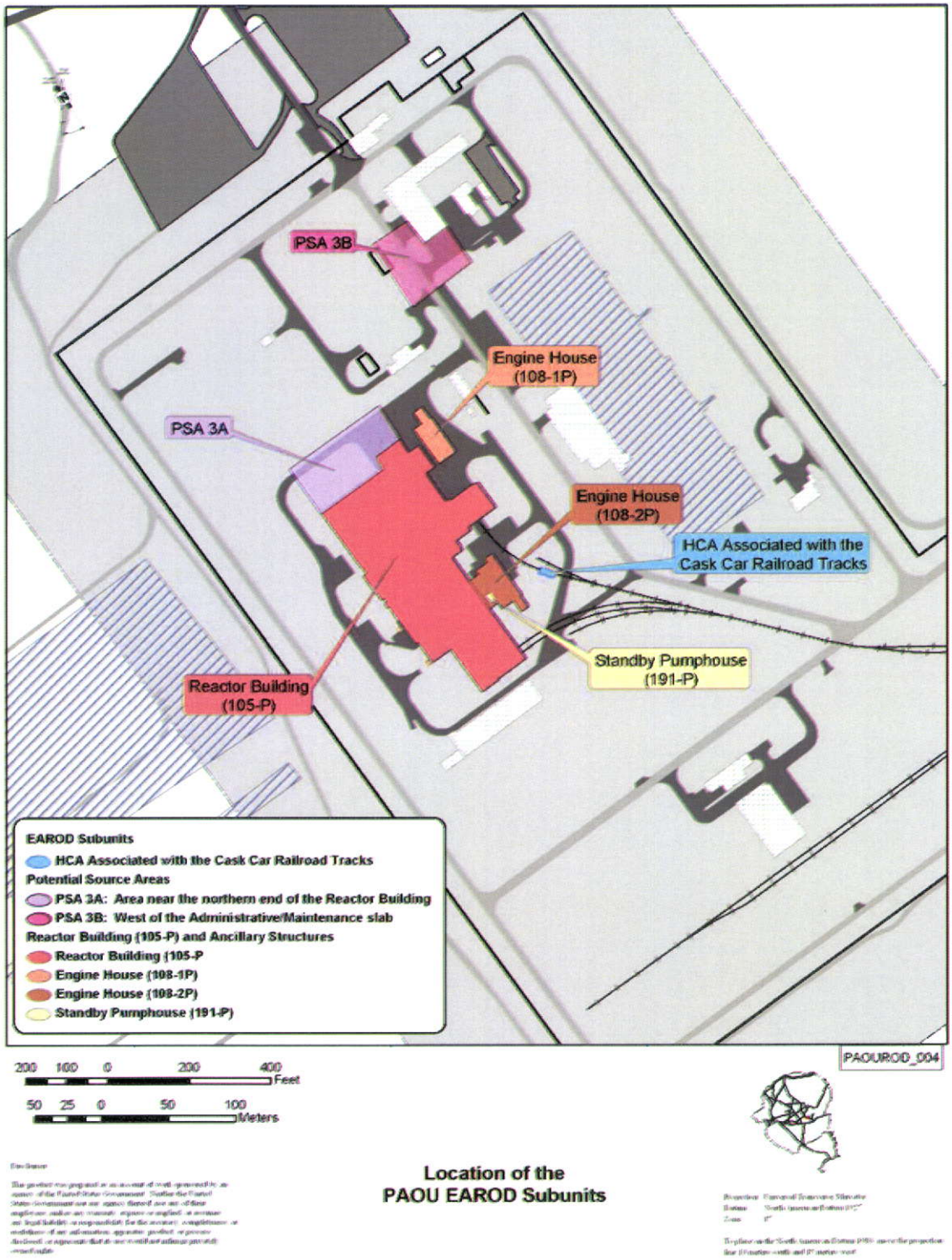


Figure 5. Location of the PAOU EAROD Subunits

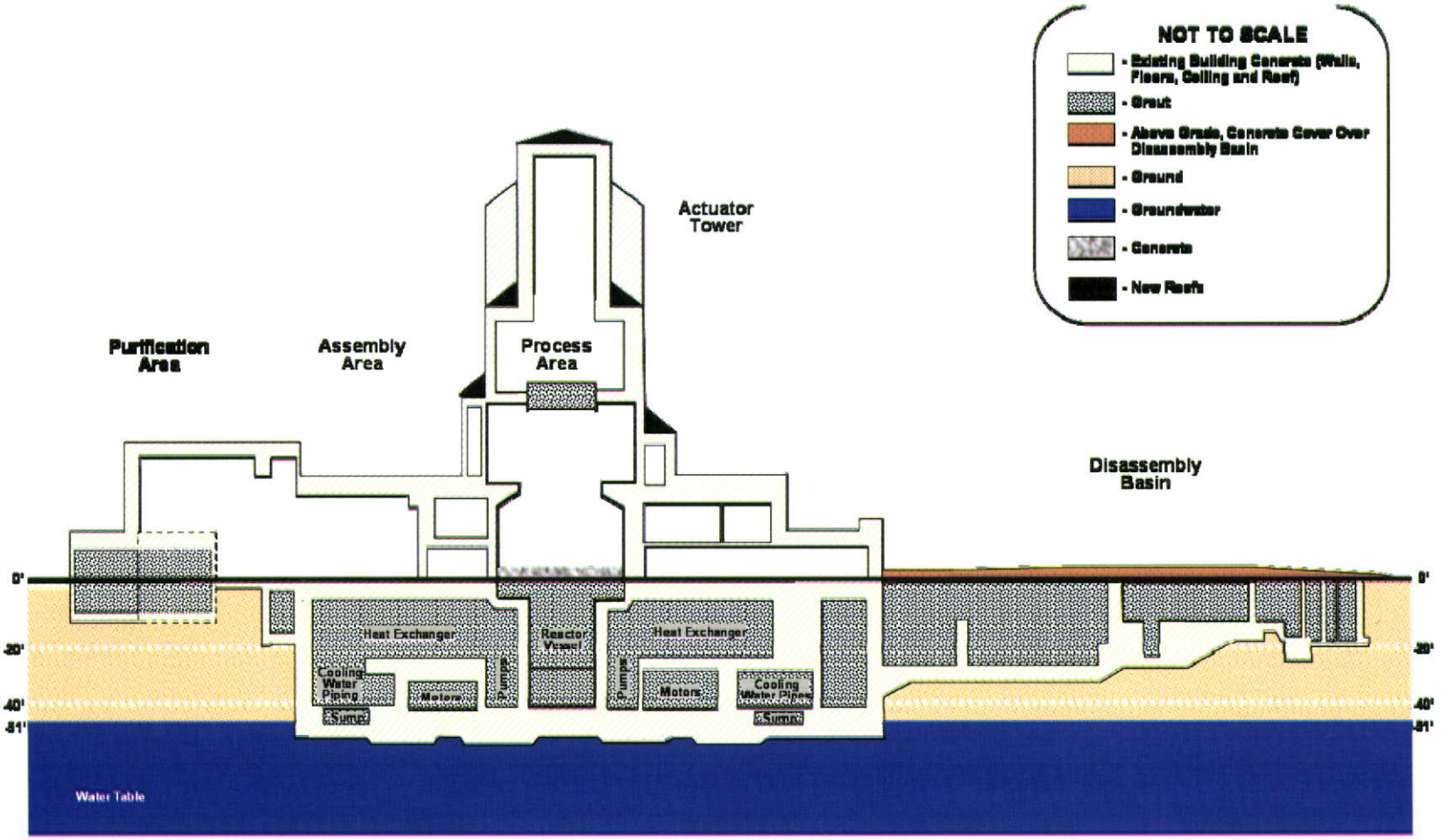


Figure 6. General Representation of the P-Reactor Building (105-P) depicting Alternative R-2A (ISD with the Reactor Vessel Grouted in Place)

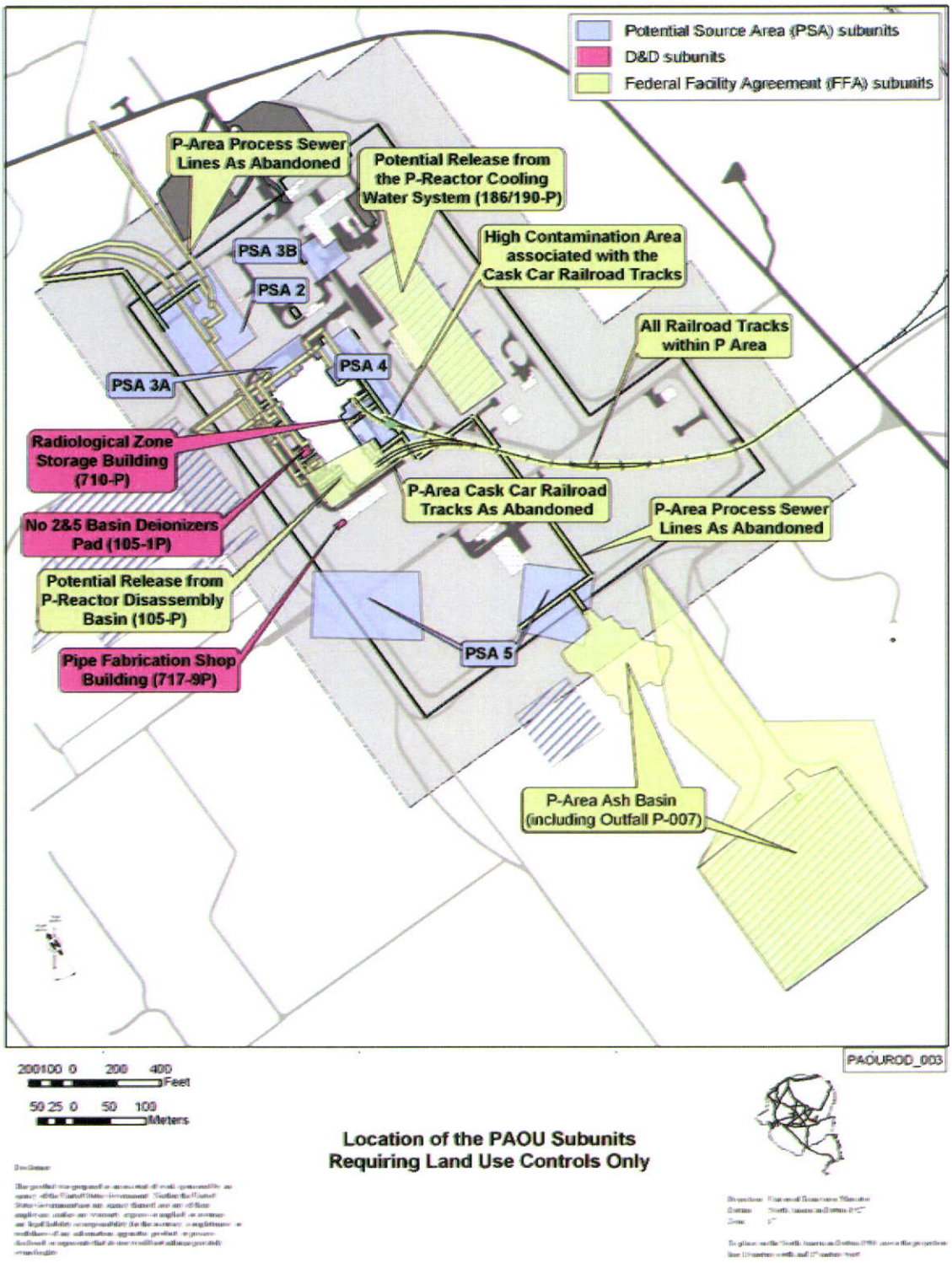


Figure 7. Location of the PAOU Subunits Requiring Land Use Controls Only

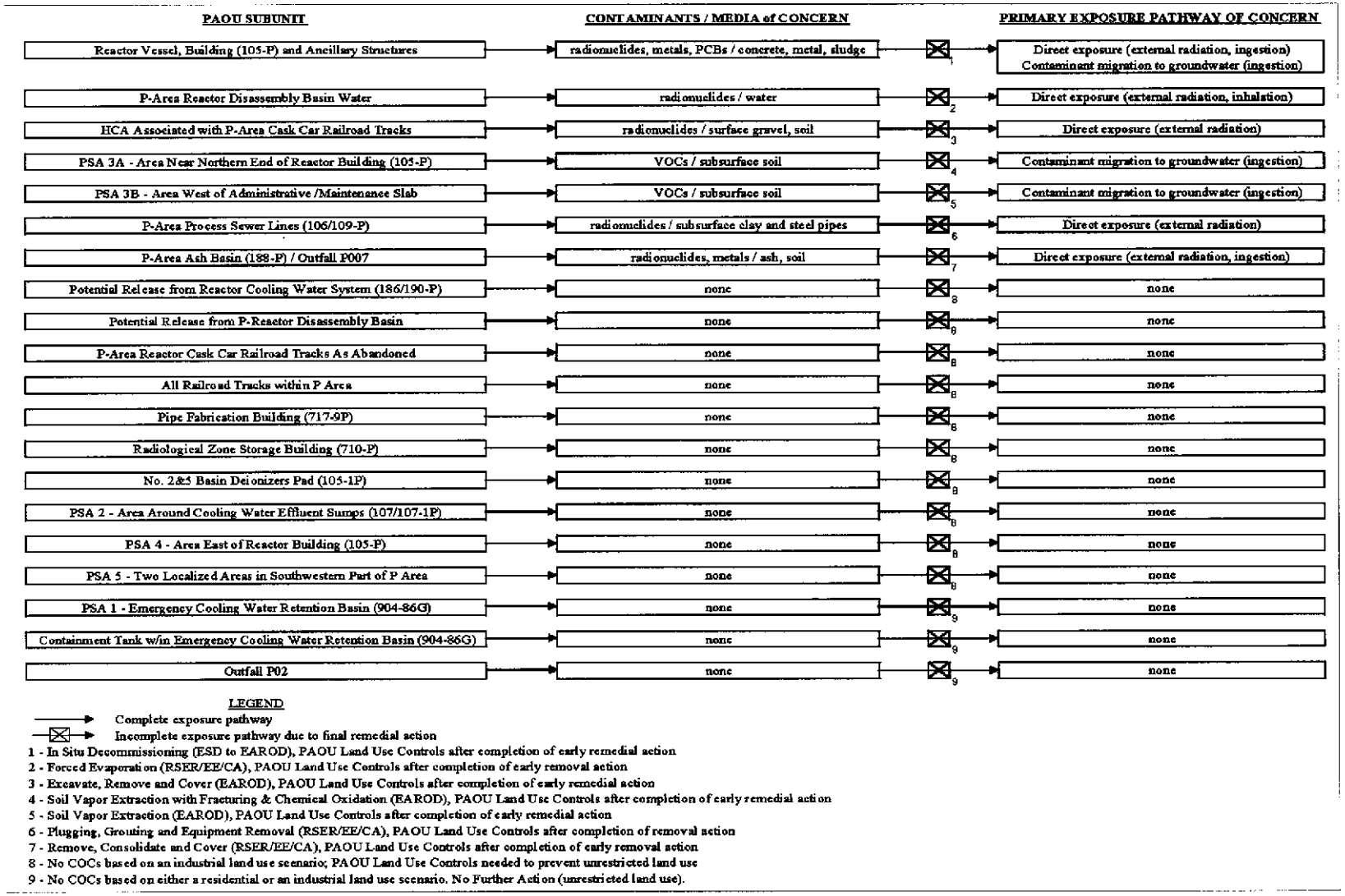


Figure 8. Generic Conceptual Site Model After Completion of Final Remedial Actions for the PAOU

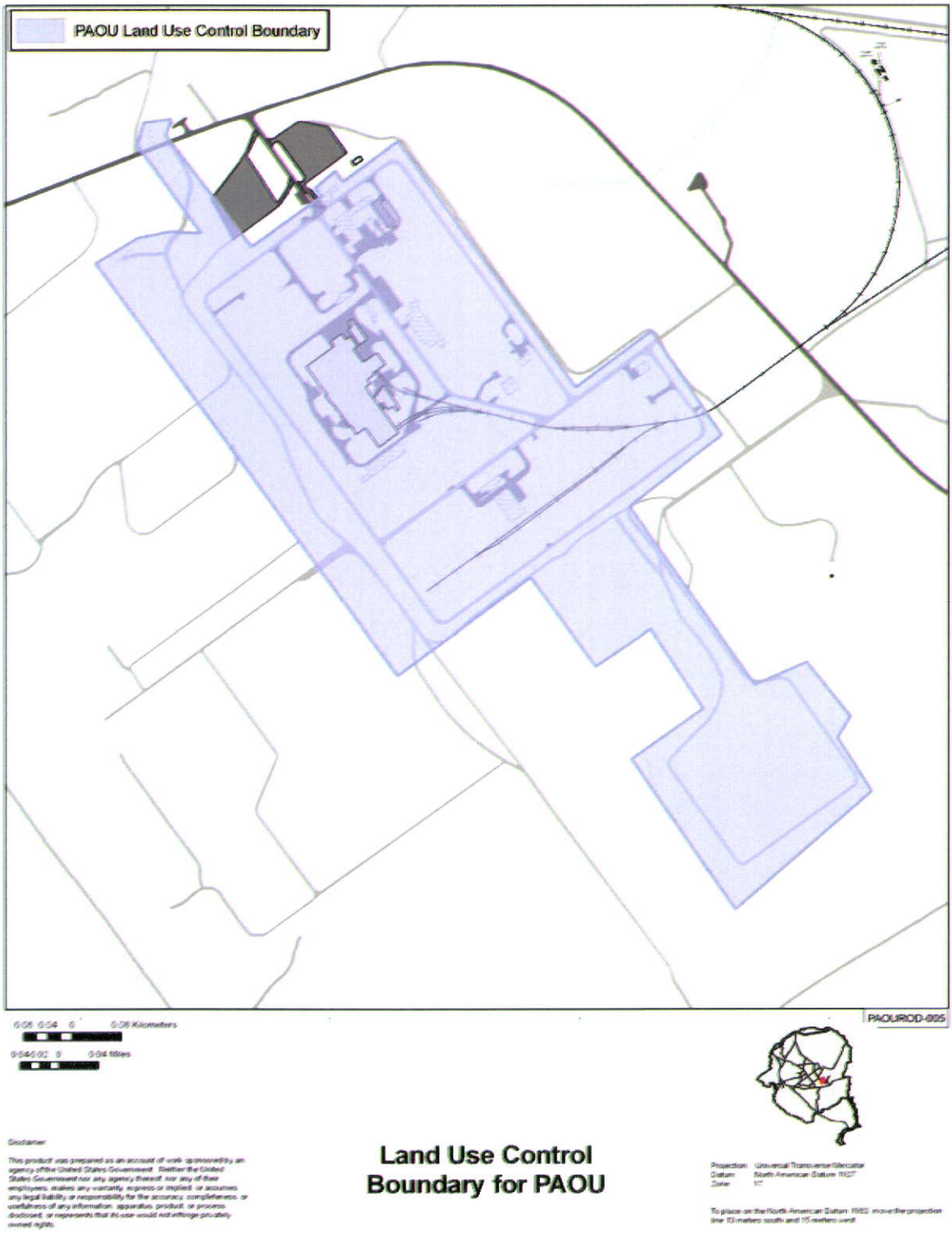
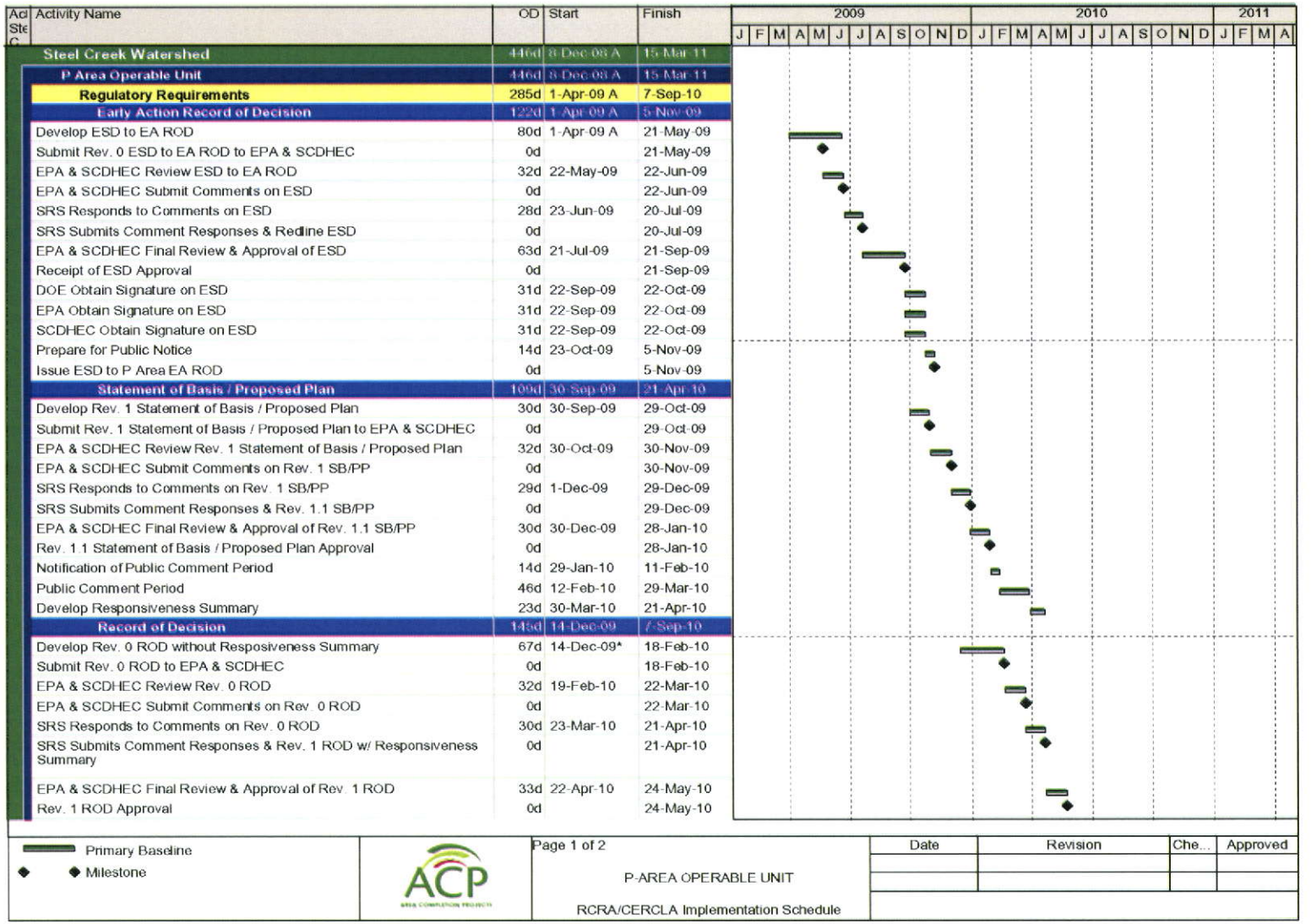
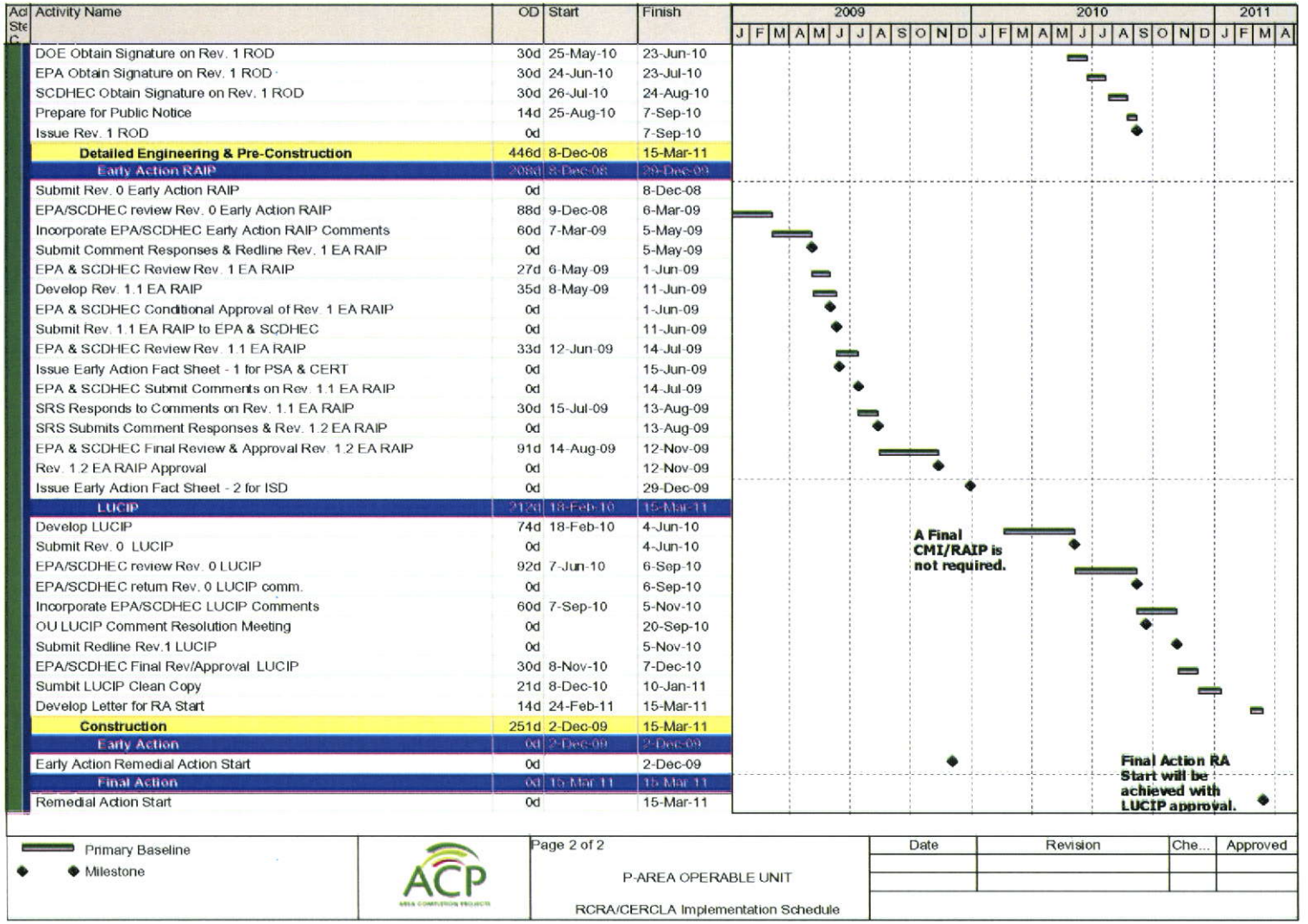


Figure 9. Land Use Control Boundary for the P-Area Operable Unit



Activity Name	OD	Start	Finish
Steel Creek Watershed	446d	8-Dec-08 A	15-Mar-11
P Area Operable Unit	446d	8-Dec-08 A	15-Mar-11
Regulatory Requirements	285d	1-Apr-09 A	7-Sep-10
Early Action Record of Decision	122d	1-Apr-09 A	5-Nov-09
Develop ESD to EA ROD	80d	1-Apr-09 A	21-May-09
Submit Rev. 0 ESD to EA ROD to EPA & SCDHEC	0d		21-May-09
EPA & SCDHEC Review ESD to EA ROD	32d	22-May-09	22-Jun-09
EPA & SCDHEC Submit Comments on ESD	0d		22-Jun-09
SRS Responds to Comments on ESD	28d	23-Jun-09	20-Jul-09
SRS Submits Comment Responses & Redline ESD	0d		20-Jul-09
EPA & SCDHEC Final Review & Approval of ESD	63d	21-Jul-09	21-Sep-09
Receipt of ESD Approval	0d		21-Sep-09
DOE Obtain Signature on ESD	31d	22-Sep-09	22-Oct-09
EPA Obtain Signature on ESD	31d	22-Sep-09	22-Oct-09
SCDHEC Obtain Signature on ESD	31d	22-Sep-09	22-Oct-09
Prepare for Public Notice	14d	23-Oct-09	5-Nov-09
Issue ESD to P Area EA ROD	0d		5-Nov-09
Statement of Basis / Proposed Plan	109d	30-Sep-09	21-Apr-10
Develop Rev. 1 Statement of Basis / Proposed Plan	30d	30-Sep-09	29-Oct-09
Submit Rev. 1 Statement of Basis / Proposed Plan to EPA & SCDHEC	0d		29-Oct-09
EPA & SCDHEC Review Rev. 1 Statement of Basis / Proposed Plan	32d	30-Oct-09	30-Nov-09
EPA & SCDHEC Submit Comments on Rev. 1 SB/PP	0d		30-Nov-09
SRS Responds to Comments on Rev. 1 SB/PP	29d	1-Dec-09	29-Dec-09
SRS Submits Comment Responses & Rev. 1.1 SB/PP	0d		29-Dec-09
EPA & SCDHEC Final Review & Approval of Rev. 1.1 SB/PP	30d	30-Dec-09	28-Jan-10
Rev. 1.1 Statement of Basis / Proposed Plan Approval	0d		28-Jan-10
Notification of Public Comment Period	14d	29-Jan-10	11-Feb-10
Public Comment Period	46d	12-Feb-10	29-Mar-10
Develop Responsiveness Summary	23d	30-Mar-10	21-Apr-10
Record of Decision	145d	14-Dec-09	7-Sep-10
Develop Rev. 0 ROD without Resposiveness Summary	67d	14-Dec-09*	18-Feb-10
Submit Rev. 0 ROD to EPA & SCDHEC	0d		18-Feb-10
EPA & SCDHEC Review Rev. 0 ROD	32d	19-Feb-10	22-Mar-10
EPA & SCDHEC Submit Comments on Rev. 0 ROD	0d		22-Mar-10
SRS Responds to Comments on Rev. 0 ROD	30d	23-Mar-10	21-Apr-10
SRS Submits Comment Responses & Rev. 1 ROD w/ Responsiveness Summary	0d		21-Apr-10
EPA & SCDHEC Final Review & Approval of Rev. 1 ROD	33d	22-Apr-10	24-May-10
Rev. 1 ROD Approval	0d		24-May-10

Figure 10. Post-ROD Schedule



Activity Name	OD	Start	Finish
DOE Obtain Signature on Rev. 1 ROD	30d	25-May-10	23-Jun-10
EPA Obtain Signature on Rev. 1 ROD	30d	24-Jun-10	23-Jul-10
SCDHEC Obtain Signature on Rev. 1 ROD	30d	26-Jul-10	24-Aug-10
Prepare for Public Notice	14d	25-Aug-10	7-Sep-10
Issue Rev. 1 ROD	0d		7-Sep-10
Detailed Engineering & Pre-Construction	446d	8-Dec-08	15-Mar-11
Early Action RAIP	208d	8-Dec-08	29-Dec-09
Submit Rev. 0 Early Action RAIP	0d		8-Dec-08
EPA/SCDHEC review Rev. 0 Early Action RAIP	88d	9-Dec-08	6-Mar-09
Incorporate EPA/SCDHEC Early Action RAIP Comments	60d	7-Mar-09	5-May-09
Submit Comment Responses & Redline Rev. 1 EA RAIP	0d		5-May-09
EPA & SCDHEC Review Rev. 1 EA RAIP	27d	6-May-09	1-Jun-09
Develop Rev. 1.1 EA RAIP	35d	8-May-09	11-Jun-09
EPA & SCDHEC Conditional Approval of Rev. 1 EA RAIP	0d		1-Jun-09
Submit Rev. 1.1 EA RAIP to EPA & SCDHEC	0d		11-Jun-09
EPA & SCDHEC Review Rev. 1.1 EA RAIP	33d	12-Jun-09	14-Jul-09
Issue Early Action Fact Sheet - 1 for PSA & CERT	0d		15-Jun-09
EPA & SCDHEC Submit Comments on Rev. 1.1 EA RAIP	0d		14-Jul-09
SRS Responds to Comments on Rev. 1.1 EA RAIP	30d	15-Jul-09	13-Aug-09
SRS Submits Comment Responses & Rev. 1.2 EA RAIP	0d		13-Aug-09
EPA & SCDHEC Final Review & Approval Rev. 1.2 EA RAIP	91d	14-Aug-09	12-Nov-09
Rev. 1.2 EA RAIP Approval	0d		12-Nov-09
Issue Early Action Fact Sheet - 2 for ISD	0d		29-Dec-09
LUCIP	212d	18-Feb-10	15-Mar-11
Develop LUCIP	74d	18-Feb-10	4-Jun-10
Submit Rev. 0 LUCIP	0d		4-Jun-10
EPA/SCDHEC review Rev. 0 LUCIP	92d	7-Jun-10	6-Sep-10
EPA/SCDHEC return Rev. 0 LUCIP comm.	0d		6-Sep-10
Incorporate EPA/SCDHEC LUCIP Comments	60d	7-Sep-10	5-Nov-10
OU LUCIP Comment Resolution Meeting	0d		20-Sep-10
Submit Redline Rev.1 LUCIP	0d		5-Nov-10
EPA/SCDHEC Final Rev/Approval LUCIP	30d	8-Nov-10	7-Dec-10
Sumbit LUCIP Clean Copy	21d	8-Dec-10	10-Jan-11
Develop Letter for RA Start	14d	24-Feb-11	15-Mar-11
Construction	251d	2-Dec-09	15-Mar-11
Early Action	0d	2-Dec-09	2-Dec-09
Early Action Remedial Action Start	0d		2-Dec-09
Final Action	0d	15-Mar-11	15-Mar-11
Remedial Action Start	0d		15-Mar-11

Figure 10. Post-ROD Schedule (continued)

Table 1. List and Status of Subunits at the PAOU

		Subunit	Early Action or Removal Action	Reference Document	Final Selected Remedy
Federal Facility Agreement Subunits		Potential Release from Reactor Cooling Water System (186/190-P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU Land Use Controls (LUCs)
		Potential Release from P-Reactor Disassembly Basin (105-P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
	P-Area Process Sewer Lines	Process Sewer Lines As Abaondoned (no building number [NBN]); including the spill on 03/15/79 of 500 gallons of contaminated water	Alternative P-2: Isolation Plugging of P-Reactor Building (105-P) PSLs and Drainage System; Grouting of Manholes, Diversion Boxes, and Process Tanks; Select Removal of Process Equipment External to the P-Reactor Building (105-P); Sealing/Plugging of Outfalls; LUCs	RSER/EE/CA - P-Area PSLs	Manage with PAOU LUCs
	P-Area Process Sewer Lines	Process Water Storage Tank (106-P)			
	P-Area Process Sewer Lines	Process Water Storage Basin (109-P)			
	P-Area Cask Car Railroad Tracks	P-Area Reactor Area Cask Car Railroad Tracks As Abandoned (NBN)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
	P-Area Cask Car Railroad Tracks	All railroad tracks within the P Area fence	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
	P-Area Cask Car Railroad Tracks	High Contamination Area near the 105-P	Alternative AC-2: Alternative Excavation and Removal; Confirmatory Sampling	EAROD	Manage with PAOU LUCs
	P-Reactor Building (105-P) Complex	P-Reactor Building (105-P)	Alternative R-2A: In-Situ Decommissioning	ESD	Manage with PAOU LUCs
	P-Reactor Building (105-P) Complex	Engine House (108-1P)			
	P-Reactor Building (105-P) Complex	Enging House (108-2P) with Standby Pumphouse (191-P)			
		P-Area Ash Basin (Including Outfall P-007) (188-P)	Alternative P-3: Removal and Disposal of Cesium-137; Consolidation as Needed; Soil Cover; LUCs	RSER/EE/CA - P-Area Ash Basin (Including Outfall P-007)	Manage with PAOU LUCs
		Containment Tank within Emergency Cooling Water Retention Basin (904-86G)	None	RFI/RI/BRA/CMS/FS	No Futher Action
		Pipe Fabrication Shop Building (717-9P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
		Radiological Zone Storage Building (710-P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
		No. 2 & 5 Basin Deionizers Pad (105-1P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
Potential Source Area Subunits		PSA-1 - Emergency Cooling Water Retention Basin (904-86G)	None	RFI/RI/BRA/CMS/FS	No Further Action
		PSA-2 - Area around the Cooling Water Effluent Sumps (107/107-1P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
	PSA 3	PSA-3A - Area near the northern end of the Reactor Building (105-P)	Alternative AV-3: Soil Vapor Extraction [SVE] with Fracturing and Chemical Oxidation Injection)	EAROD	Manage with PAOU LUCs
	PSA 3	PSA-3B - West of the Administrative/Maintenance slab	Alternative AV-2: SVE		
		PSA-4 - Area east of the Reactor Building (105-P)	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
		PSA-5 - Two localized areas in the southwestern part of P Area	None	RFI/RI/BRA/CMS/FS	Manage with PAOU LUCs
Other		P02 Outfall	No Further Action	EARAIP	No Further Action
		Disposition of Water in the P-Reactor Disassembly Basin	Alternative 3: Forced Evaporation	RSER/EE/CA & Action Memos - Disposition of Water in the P-Reactor Disassembly Basin	Manage with PAOU LUCs

- Early Action Record of Decision (EAROD) or Early Action Remedial Action Implementation Plan (EARAIP)
- Explanation of Significant Difference for the Revision 1.1 Early Action Record of Decision for the P-Area Operale Unit (ESD)
- RCRA Facility Investigation / Remedial Investigation with Baseline Risk Assessment and Corrective Measure Study / Feasibility Study (RFI/RI/BRA/CMS/FS)
- Removal Site Evalution Reports / Engineering Evaluation / Cost Assessments (RSER/EE/CA)

Table 2. Summary of Risk Assessment Results (SRNS 2008b)

Subunit	RCOCs	Human Health (Carcinogens >1E-06) (Noncarcinogens >1)	Ecological Hazard Quotient >1)	PTSM (Carcinogens >1E-03) Noncarcinogens >10	Contaminant Migration (Mean Travel Time <1000 yrs)
Potential Release from Reactor Water Cooling Water System (186/190-P)	none	none	none	none	none
Potential Release from the P-Reactor Disassembly Basin (105-P)	none	none	none	none	none
Process Sewer Lines As Abandoned (NBN); including spill on 03/15/79 of 5000 gal of contaminated water[1]	none	none	none	none	none
P-Area Cask Car Railroad Tracks As Abandoned	none	none	none	none	none
HCA Asscíated with the Cask Car Railroad Tracks	Cesium-137 (+D)	5.6E-03	none	1.8E-02	none
	Cobalt-60	9.9E-06	none	none	none
P-Reactor Vessel	Barium-133	1.8E-02	none	1.8E-02	Yes
	Carbon-14	2.8E-05	none	none	none
	Cobalt-60	1.3E+03	none	1.3E+03	Yes
	Europium-152	5.3E-03	none	5.3E-03	Yes
	Europium-154	4.8E-04	none	none	Yes
	Iron-55	8.2E-05	none	none	Yes
	Molydenum-93	7.3E-06	none	none	none
	Nickel-59	9.3E-06	none	none	none
	Nickel-63	2.2E-03	none	2.2E-03	Yes
	Niobium-94	6.1E-05	none	none	Yes
	Potassium-40	1.1E-05	none	none	none
	Technetium-99	none	none	none	Yes
P-Reactor Disassembly Basin[2]	Americium-241	6.5E-03	none	6.5E-03	none
	Americium-243 (+D)	7.2E-03	none	7.2E-03	none
	Antimony-125 (+D)	1.5E-03	none	1.5E-03	none
	Carbon-14	1.5E-04	none	none	Yes
	Curium-243/244	3.1E-03	none	3.1E-03	none
	Curium-245	4.3E-03	none	4.3E-03	none
	Cobalt-60	3.6E+00	none	3.6E+00	none
	Cesium-137 (+D)	5.4E-01	none	5.4E-01	none
	Europium-152	1.9E-02	none	1.9E-02	none
	Europium-154	5.2E-02	none	5.2E-02	none
	Molydenum-93	none	none	none	Yes
	Nickel-59	none	none	none	Yes
	Niobium-94	1.2E-02	none	1.2E-02	none
	Plutonium-238	1.8E-02	none	1.8E-02	none
	Plutonium-239/240	1.4E-03	none	1.4E-03	none
	Potassium-40	3.0E-03	none	3.0E-03	Yes
	Radium-228 (+D)	9.4E-03	none	9.4E-03	none
	Sodium-22	5.6E-03	none	5.6E-03	none
	Strontium-90 (+D)	3.1E-03	none	3.1E-03	none
	Thorium-228 (+D)	1.2E-03	none	1.2E-03	none
	Tritium	2.0E+00	none	2.0E+00	none
	Total Uranium	HQ=19	none	HQ=19	none

Table 2. Summary of Risk Assessment Results (SRNS 2008b) *(Continued)*

Subunit	RCOCs	Human Health (Carcinogens >1E-06) (Noncarcinogens >1)	Ecological Hazard Quotient >1)	PTSM (Carcinogens >1E-03) Noncarcinogens >10	Contaminant Migration (Mean Travel Time <1000 yrs)
Minus 20 ft Level of the Reactor Building (105-P) and Ancillary Structures	**Aroclor 1254**	**3.2E-05**	none	none	**Yes**
	Cesium-137 (+D)	**9.9E-03**	none	**9.9E-03**	**Yes**
	Cobalt-60	**4.2E-03**	none	**4.2E-03**	**Yes**
	Strontium-90 (+D)	**2.6E-05**	none	none	**Yes**
	Uranium-238 (+D)	**6.0E-06**	none	none	**Yes**
Minus 40 ft Level of the Reactor Building (105-P) and Ancillary Structures	**Aroclor 1254**	**5.7E-06**	none	none	**Yes**
	Cesium-137 (+D)	**1.3E-02**	none	**1.3E-02**	**Yes**
	Cobalt-60	**5.7E-05**	none	none	**Yes**
	Strontium-90 (+D)	**6.6E-05**	none	none	**Yes**
Minus 49.5 ft Level of the Reactor Building (105-P) and Ancillary Structures	**Cesium-137 (+D)**	**1.7E-04**	none	none	none
Slab Associated with the Containment Tank within the Emergency Cooling Water Retention Basin (904-86G)	none	none	none	none	none
Slab Associated with the Pipe Fabrication Shop Building (717-9P)	none	none	none	none	none
Slab Associated with the Radiological Zone Storage Building (710-P)	none	none	none	none	none
Slab and Sumps Associated with No. 2&5 Basin Deionizers Pad (105-1P)	none	none	none	none	none
P-Area Ash Basin	**Arsenic**	**1.70E-05**	none	none	none
	Potassium-40	**4.60E-05**	none	none	none
	Radium-226 (+D)	**1.50E-04**	none	none	none
	Radium-228 (+D)	**2.10E-05**	none	none	none
	Thorium-228 (+D)	**1.20E-05**	none	none	none
	Uranium-238 (+D)	**2.30E-06**	none	none	none
P007 Outfall	**Arsenic**	**2.40E-05**	none	none	none
	Cesium-137 (+D)	**4.50E-04**	none	none	none
	Cobalt-60	**2.30E-06**	none	none	none
	Potassium-40	**3.30E-05**	none	none	none
	Radium-226 (+D)	**8.60E-05**	none	none	none
	Uranium-238 (+D)	**1.40E-06**	none	none	none
Potential Source Area 1	none	none*	none	none	none
Potential Source Area 2	none	none	none	none	none
Potential Source Area 3A	**TCE**	none	none	none	**Yes**
Potential Source Area 3B	**PCE**	none	none	none	**Yes**
Potential Source Area 4	none	none	none	none	none
Potential Source Area 5	none	none	none	none	none
P02 Outfall[3]	none	none*	none	none	none

NC = Not Conducted
* = Residential human health risk assessment conducted.
1. Based on soil sampling and data evaluations (risk assessment, PTSM, contamination migration), no contamination was determined as a result of a release from the PSLs. However, there is fixed contamination within the PSLs which could be released to the environment.
2. Only the major risk drivers (i.e., risk > 1E-03) for the P-Reactor Disassembly Basin are identified on this table. Thirty-one constituents have a risk < 1E-03 but > 1E-06.
3. P02 Outfall residential risk assessment is documented in the PAOU EARAIP (2009a)

Table 3. List of ARARs for the P-Area Operable Unit

Chemical-Specific			
Citation	**Status**	**Requirement Summary**	**Reason for Inclusion**
National Primary Drinking Water Regulations 40 CFR 141 SC R.61-58 State Primary Drinking Water Regulations SC R.61-68 Water Classification and Standards	Applicable	Established requirements and standards for chemicals and radionuclides to protect human health from the potential effects of drinking water contamination.	The state of South Carolina classifies all groundwater as potential sources of drinking water and mandates that groundwater meet MCLs established by the Safe Drinking water Act.
Radiation Protection of the Public and the Environment USDOE Order 5400.5	To Be Considered	Establishes standards and requirements for operation of the USDOE and USDOE contractors with respect to protection of members of the public and the environment against undue risk from radiation.	P-Reactor facilities, PSLs, and Outfall P-007 contain radioactive contamination and radioactive material. As such, the requirements of the Order must be followed.
USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-18	To Be Considered	Cleanups of radioactive contamination outside the risk range (in general, exceeding 15 mrem/yr effective dose equivalent which equates to approximately 3E-04 increased lifetime risk) are not protective.	USEPA policy establishes protective range for radionuclide cleanups at CERCLA sites. Mandates use of CERCLA risk range rather than dose limits established under other regulations.
Action-Specific			
SC R.61-107 Solid Waste Management Subarticle 19, Part IV (F)(1)(a)-(d) & Subarticle 19, Part IV (F)(2)(a)(1)-(2)	Relevant and Appropriate	Maintain 76% or greater vegetative ground cover. Monitor groundwater.	Closure and long-term maintenance of the P-Area Ash Basin must be in compliance with SC regulations.

Table 4. Alternative PAOU-1 - Detailed Cost Estimate – No Action

Alternative PAOU-1 - P-Area Operable Unit
No Action
P Area OU
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
No Action				
Subtotal - Direct Capital Cost				$0 *
Mobilization/Demobilization	20%	of subtotal direct capital		$0 *
Site Preparation/Site Restoration	20%	of subtotal direct capital		$0 *
Total Direct Capital Cost		(sum of * items)		**$0**
Indirect Capital Costs				
Engineering & Design	18%	of direct capital		$0
Project/Construction Management	25%	of direct capital		$0
Health & Safety	5%	of direct capital		$0
Overhead	30%	of direct capital		$0
Contingency	20%	of direct capital		$0
Total Indirect Capital Cost				**$0**
Total Estimated Capital Cost				**$0**
Direct O&M Costs	2.7%	discount rate for costs > 200 years duration[1]		
Annual Costs	200	years O&M		*Years 2010 - 2209*
Subtotal - Annual Costs				$0
Present Worth Annual Costs (2.7% Discount Rate)				$0
Five Year Costs	0			
Remedy Review	0	ea	$15,000	$0
Subtotal - Five Year O&M Costs				$0
Present Worth Five Year Costs				$0
Total Present Worth Direct O&M Cost				**$0**
Indirect O&M Costs				
Project/Admin Management	100%	of direct O&M		$0
Health & Safety	30%	of direct O&M		$0
Overhead	30%	of direct O&M		$0
Contingency	15%	of direct O&M		$0
Total Present Worth Indirect O&M Cost				**$0**
Total Estimated Present Worth O&M Cost				**$0**
TOTAL ESTIMATED COST				**$0**

1. Interest rate for costs with duration < 200 years (i.e., before 2209) is based on SRNS's 25 August 2009 Technical Memorandum.

Table 5. Alternative PAOU-2 - Detailed Cost Estimate – Land Use Controls

Alternative PAOU-2 - P-Area Operable Unit
Land Use Controls
P Area OU
Savannah River Site

Item	Quantity	Units	Unit Cost	Total Cost
Direct Capital Costs				
Land Use Controls				
Posting of Warning Signs	170	ea	$50	$8,500
Land Use Control Implementation Plan	1	ea	$5,000	$5,000
Deed Restrictions	1	ea	$5,000	$5,000
Subtotal - Direct Capital Cost				$18,500 *
Mobilization/Demobilization	20% of subtotal direct capital			$3,700 *
Site Preparation/Site Restoration	20% of subtotal direct capital			$3,700 *
Total Direct Capital Cost	(sum of * items)			**$25,900**
Indirect Capital Costs				
Engineering & Design	18% of direct capital			$4,662
Project/Construction Management	25% of direct capital			$6,475
Health & Safety	5% of direct capital			$1,295
Overhead	30% of direct capital			$7,770
Contingency	20% of direct capital			$5,180
Total Indirect Capital Cost				**$25,382**
Total Estimated Capital Cost				**$51,282**
Direct O&M Costs	2.7% discount rate for costs > 200 years duration[1]			
Annual Costs	200 years O&M			*Years 2010 - 2209*
Access Controls	1	ea	$500	$500
Annual Inspections / Maintenance	1	ea	$10,000	$10,000
Subtotal - Annual Costs				$10,500
Present Worth Annual Costs (2.7% Discount Rate)				$387,002
Five Year Costs	40			
Well Monitoring (Annual Sampling & Analysis	20	ea	$460	$9,200
Remedy Review	1	ea	$15,000	$15,000
Subtotal - Five Year O&M Costs				$24,200
Present Worth Five Year Costs				$169,013
Total Present Worth Direct O&M Cost				**$556,015**
Indirect O&M Costs				
Project/Admin Management	100% of direct O&M			$556,015
Health & Safety	30% of direct O&M			$166,805
Overhead	30% of direct O&M			$166,805
Contingency	15% of direct O&M			$83,402
Total Present Worth Indirect O&M Cost				**$973,026**
Total Estimated Present Worth O&M Cost				**$1,529,041**
TOTAL ESTIMATED COST				**$1,580,323**

1. Interest rate for costs with duration < 30 years (i.e., before 2209) is based on SRNS's 25 August 2009 Technical Memorandum.

Table 6. Comparative Analysis Summary for the P-Area Operable Unit.

Alternative	Overall Protection of Human health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	State Acceptance	Cost	Comments
PAOU-1 – No Action	No	No	Very Low	Very Low	Very Low	Very Easy	No	$0	No Action alternative is required by NCP.
PAOU-2 – Land Use Controls	Yes	Yes	Moderate	Very Low	Very High	Very Easy	Yes	$1,580,323	No additional remedial action is needed after completion of the early remedial/removal actions.

Table 7. Land Use Controls for the P-Area Operable Unit

Type of Control	Purpose of Control	Duration	Implementation	Affected Areas[a]
1. Property Record Notices[b]	Provide notice to anyone searching records about the existence and location of contaminated areas.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	PAOU where hazardous substances are left in place at levels requiring land use restrictions.
2. Property record restrictions[c]: A. Land Use	Restrict use of property by imposing limitations.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Drafted and implemented by USDOE upon any transfer of affected areas. Recorded by USDOE in accordance with state law at County Register of Deeds office.	PAOU where hazardous substances are left in place at levels requiring land use restrictions.
3. Other Notices[d]	Provide notice to city &/or county about the existence and location of waste disposal and residual contamination areas for zoning/ planning purposes.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Notice recorded by USDOE in accordance with state laws at County Register of Deeds office if the property or any portion thereof is ever transferred to non-federal ownership.	PAOU where hazardous substances are left in place at levels requiring land use restrictions.
4. Site Use Program[e]	Provide notice to worker/developer (i.e., permit requestor) on extent of contamination and prohibit or limit excavation/penetration activity.	As long as property remains under USDOE control	Implemented by USDOE and site contractors Initiated by permit request	Subunits at PAOU where remedy components cannot be disturbed and where levels requiring land use and groundwater restrictions.
5. Physical Access Controls[f] (e.g., fences, gates, portals)	Control and restrict access to workers and the public to prevent unauthorized access.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Controls maintained by USDOE.	Security is provided at site boundaries in accordance with SRS procedures.
6. Warning Signs[g]	Provide notice or warning to prevent unauthorized uses.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Signage maintained by USDOE.	Warning signs will be posted in accordance with applicable site procedures and will be placed in appropriate areas of the PAOU.
7. Security Surveillance Measures	Control and monitor access by workers/public.	Until the concentration of hazardous substances associated with the unit have been reduced to levels that allow for unlimited exposure and unrestricted use.	Established and maintained by USDOE Necessity of patrols evaluated upon completion of remedial actions.	Security and surveillance measures are in place at the SRS boundary in accordance with RCRA-permit requirements.

[a] Affected areas – Specific locations identified in the LUCIP or subsequent post-ROD documents.
[b] Property Record Notices – Refers to any non-enforceable, purely informational document recorded along with the original property acquisition records of USDOE and its predecessor agencies that alerts anyone searching property records to important information about residual contamination; waste disposal areas in the property.
[c] Property Record Restrictions – Includes conditions and/or covenants that restrict or prohibit certain uses of real property and are recorded along with original property acquisition records of USDOE and its predecessor agencies.
[d] Other Notices – Includes information on the location of waste disposal areas and residual contamination depicted on as survey plat, which is provided to a zoning authority (i.e., city planning commission) for consideration in appropriate zoning decisions for non-USDOE property.
[e] Site Use Program – Refers to the internal USDOE/USDOE contractor administrative program(s) that requires the permit requestor to obtain authorization, usually in the form of a permit, before beginning any excavation/penetration activity (e.g., well drilling) for the purpose of ensuring that the proposed activity will not affect underground utilities/structures, or in the case contaminated soil or groundwater, will not disturb the affected areas without the appropriate precautions and safeguards.
[f] Physical Access Controls – Physical barriers or restrictions to entry.
[g] Signs – Posted command, warning or direction.

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APPENDIX A - RESPONSIVENESS SUMMARY

Responsiveness Summary

The 45-day public comment period for the SB/PP for the PAOU began on February 12, 2010 and ended on March 29, 2010. No comments were received from the public.