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# Monitored Natural Recovery Effectiveness Plan for the Lower Three Runs Integrator Operable Unit – Upper Subunit (U)

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**SRNS-RP-2022-00085**

**Revision ~~0~~1 Redline**

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# DISCLAIMER



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

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## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ~ | approximate, approximately |
| ACP | Area Completion Projects |
| D Data | Definitive Level Data |
| DGT | diffusive gradients in thin films |
| DQO | Data Quality Objective |
| EA | Exposure Area |
| Hg | mercury |
| IOU | Integrator Operable Unit |
| LTR | Lower Three Runs |
| LUC | land use control |
| MDA | Minimum Detectable Activity |
| MNR | monitored natural recovery |
| MNREP | Monitored Natural Recovery Effectiveness Plan |
| OU | Operable Unit |
| pCi | picocurie(s) |
| pCi/g | picocurie per gram |
| PTSM | Principal Threat Source Material |
| QA/QC | Quality Assurance/Quality Control |
| RA | Remedial Action |
| ROD | Record of Decision |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SRNS | Savannah River Nuclear Solutions, LLC |
| SRS | Savannah River Site |
| USEPA | United States Environmental Protection Agency |
| USDOE | United States Department of Energy |

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## 1.0 INTRODUCTION

In December 2021, the *Record of Decision (ROD) for the Remedial Alternative Selection for the Lower Three Runs (LTR) Integrator Operable Unit (IOU)* was issued by the United States Department of Energy (USDOE) after being approved by the South Carolina Department of Health and Environmental Control (SCDHEC) and United States Environmental Protection Agency (USEPA) (SRNS 2021). For administrative purposes, the LTR IOU is segregated into three subunits: Upper, Middle, and Lower (Figure 1). IOUs are defined as surface water bodies (e.g., stream, lakes, and ponds) and associated wetlands/floodplains including surface water, sediment/soil (stream channel/floodplain sediment and floodplain/wetland soil), and related biota.

As stated in the ROD, the Middle and Lower subunits require only Land Use Controls (LUCs) as described in the *Early Action Land Use Control Implementation Plan (EALUCIP) for the Lower Three Runs Integrator Operable Unit Tail Portion (Middle and Lower Subunits)* (SRNS 2013) which have already been implemented. The Upper subunit is the focus of this *Monitored Natural Recovery Effectiveness Plan* (MNREP) (Figure 1).

Due to the variability of environmental conditions and large scale of the LTR IOU, the Upper subunit is segregated into nine exposure areas (EAs) (Figure 2):

- EA1 includes Pond A and the R-Area Discharge Canal
- EA2 consists of the section of the canal system between Pond A and Pond B.
- EA3 includes Pond B and the overflow canal connecting Pond B to Pond C.
- EA4 consists of the section of the canal system between Pond B and the North Arm of PAR Pond.
- EA5 consists of Joyce Branch (also known as the Old R-Area Discharge Canal).
- EA6 consists of PAR Pond.
- EA7 includes Pond 2 and the Discharge Canal between P-Area and Ponds 4 and 5.
- EA8 includes Ponds 4 and 5 and the Discharge Canal between Ponds 4 and 5 to Pond C.
- EA9 consists of Pond C.

The approved ROD (SRNS 2021) identified the selected remedy for the LTR IOU Upper subunit as:

- *LUCs with Monitored Natural Recovery (MNR)* for all nine EAs (EA1 through EA9),
- *Excavation, Treatment and Disposal of Principal Threat Source Material (PTSM) Sediment/Soil* in EA1 (Pond A – Including R-Area Discharge Canal), and
- *Maintain Water in Ponds* for EA3 (Pond B) and EA6 (PAR Pond).

The future land use specified for the LTR IOU will be non-residential and primarily used for environmental/ecological research with USDOE maintaining control of the land. A five-year remedy review will be required.

## 1.1 Purpose and Scope

Releases of cesium-137 (Cs-137) and, to a lesser extent, cobalt-60 (Co-60) occurred within the LTR IOU environment due to reactor discharges. Also, the use of river water that was pumped from the Savannah River for reactor cooling introduced mercury (Hg) to the LTR IOU stream system resulting in the presence of Hg, in addition to Cs-137 in fish tissue. This MNREP was prepared to support collection of MNR data that will support the five-year remedy reviews for the LTR IOU to assess the effectiveness of the MNR component for the Upper subunit of the LUC remedial action (RA).

MNR was identified to address the long-term monitoring component of the LUCs for the Upper subunit. MNR is a remedy that uses ongoing, naturally occurring processes to reduce the bioavailability or toxicity of contaminants in sediment/soil (e.g., radiological decay~~ and ongoing deposition~~). In addition, the anticipated land use for the LTR IOU is compatible with natural recovery.

The *LUCs with MNR* remedy involves the use of LUCs to limit access to the entire Upper subunit of the LTR IOU and MNR to monitor the decay of Cs-137 and Co-60 at all nine EAs. Aerial gamma surveys will be conducted to monitor radioactive decay of Cs-137 over time. Ground-truthing will be conducted based on results of the aerial surveys with collection of sediment/soil samples. The aerial gamma survey approach is discussed further in Section 3.2. Collection of sediment/soil samples is discussed in Section 3.3. The MNR component also includes consideration of biological or passive sampling techniques to assess bioavailability of Cs-137 and Hg. Fish serve as an integrator of contaminants within the environment where they reside. Fish samples will be collected to monitor Cs-137 and mercury within fish. The fish monitoring is discussed further in Section 3.3.

Results of the monitoring efforts will be presented in the five-year remedy reviews and will be used to document the effectiveness of the MNR component of the LUC RA. The scope of continued monitoring to support the five-year remedy reviews will be re-evaluated after Cs-137 activities in the Upper subunit of the LTR IOU decay below the PTSM threshold (144 picocuries per gram [pCi/g]) (SRNS 2021). This is expected to be most evidenced in Joyce Branch where PTSM gamma signatures have been previously observed.

### 1.2 Sampling Unit Location

The Savannah River Site (SRS) occupies an area of approximately (~) 800 square kilometers (310 square miles) adjacent to the Savannah River principally in the Aiken and Barnwell counties of South Carolina. The LTR IOU is a large, blackwater stream that originates in the northeast portion of SRS and follows a southerly direction for ~40-kilometers (24.5-miles) before discharging into the Savannah River. The Upper subunit encompasses the canal and pond systems upgradient of PAR Pond dam (Figure 1).

### 1.3 Monitoring Objectives

The primary objective of this MNREP is to assess the natural recovery of the Upper subunit of the LTR IOU as required by the ROD (SRNS 2021) and in support of the required five-year remedy reviews. There are locations in the Upper subunit where samples have exceeded the PTSM threshold of 144 pCi/g for Cs-137 in sediment/soil (sediment and floodplain/wetland soils). These PTSM locations are found in EA1, EA3, and EA5 (Figure 3).

Aerial gamma surveying will be conducted to monitor relative levels and distribution of Cs-137 over time. Sediment/soil samples will be collected based on results of the aerial surveys. Sampling will also include collection of fish samples from ponds/reservoirs that can maintain fishable populations of fish (EA3, EA6, EA9) to monitor levels of Cs-137 and Hg over time (Figure 4).

The monitoring component of this MNREP includes flexibility to modify sampling methods and approaches such as remote sensing (e.g., remote gamma surveys) and ground-truthing (e.g., ground-based gamma surveys or fish or sediment/soil sampling) based on results of sampling efforts and as technological advancements occur over time. This plan will be re-assessed after levels fall below the PTSM threshold for Cs-137 (~30 years), based on gamma overflight data, or if environmental conditions change necessitating a modification to the existing effectiveness plan.

## 2.0 UNIT BACKGROUND

### 2.1 Operational History

The LTR IOU includes two main industrial operable units (OUs): P-Area Operable Unit which includes P-Reactor, and R-Area Operable Unit which includes R-Reactor. Both reactors received cooling water from the Savannah River via the river water distribution system. Thermal reactor effluent leaving R-Reactor was discharged directly into Joyce Branch (R-Area Old Discharge Canal) a tributary of LTR. After construction of PAR Pond in 1958, reactor discharges were routed through the canal system, pre-cooler ponds, and PAR Pond prior to entering the Middle and Lower portions of the LTR IOU. R-Reactor was shut down in 1964. P-Reactor discharges flowed to Pond 2, Ponds 4 and 5, and into PAR Pond via Pond C until P-Reactor ceased operation in 1987. Liquid releases to the ponds/canal system included process leaks, reactor disassembly basin purges, thermal discharges, and makeup cooling water that contained low levels of metals and radionuclides, primarily Cs-137, but also Co-60 in smaller quantities.

### 2.2 Previous Investigations/Regulatory Actions

In 2009/2010, extensive sampling of the LTR IOU was conducted. Sampling was undertaken to augment previously collected data to support the risk evaluation for final action determination. The sampling was performed as outlined in the approved sampling and analysis plans (SRNS 2010, SRNS 2016) and included sampling of sediment/soil, surface water, and fish. The sampling included the canals, pre-cooler ponds, PAR Pond, and the LTR stream system below PAR Pond dam.

The ROD for the LTR IOU (SRNS 2021) outlined the multiple remedies needed to address the nature and extent of contamination within the Upper subunit of the LTR IOU system: *LUCs with MNR* for all nine EAs (EA1 through EA9); *Excavation, Treatment and Disposal of Principal Threat Source Material (PTSM) Sediment/Soil* in EA1 (Pond A – Including R Discharge Canal); and *Maintain Water in Ponds* for EA3 (Pond B) and EA6 (PAR Pond). With contamination left in place, a five-year remedy review is required.

## 3.0 EFFECTIVENESS MONITORING AND REPORTING PLAN

This MNREP establishes the initial post-ROD monitoring efforts for the Upper subunit of the LTR IOU until levels of Cs-137 are below the PTSM threshold for Cs-137. The MNR component of the remedy follows a single comprehensive monitoring plan for the Upper subunit and is subject to USEPA and SCDHEC review and approval.

The Data Quality Objective (DQO) process was followed in development of this MNREP. The DQO process is a series of logical steps that guides managers or staff to a plan for the resource-effective acquisition of environmental data (USEPA 2006). It is both flexible and iterative, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation (e.g., ascertaining the mean concentration level of a contaminant). The DQO process is used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study. Use of the DQO process leads to efficient and effective expenditure of resources; consensus on the type, and quantity of data needed to meet the project goal; and the full documentation of actions taken during the development of the project.

Table 1 includes the DQO Worksheet developed for each media (fish or sediment/soil) and data type (aerial gamma survey) and specifies the quantity, type, and quality of data for this project. The Project Quality Objectives for this MNREP for sediment/soil and fish include the following:

1. Laboratory data will be used to support five-year remedy reviews.
2. Laboratory data will meet the analytical required detection limits listed in Table 2.
3. Radiological samples will follow analytical specifications, Minimum Detectable Activities (MDAs), as listed in Table 3.
4. Sample collection activities will follow quality assurance requirements.
5. 90% of planned samples are collected and their data are useable for the completeness data quality indicator.
6. 85% of samples sent to laboratory have useable (non-rejected) results for completeness data quality indicator. If critical decision-required data are rejected, samples will be re-analyzed if sample quantity is sufficient.

## 3.1 Monitoring Design and Rationale

Implementation of the MNREP is outlined in the following sections and describes how the monitoring plan is designed and will be implemented to collect the data needed to meet the criteria developed during the DQO process. The MNREP encompasses the Upper subunit of the LTR IOU. The boundaries of the three aerial gamma survey campaigns, as well as the location of the fish sampling that will be conducted (EA3, EA6, EA9) are shown in Figure 4. Gamma aerial surveys will be initiated in 2024 as discussed in Section 3.2. Sampling for fish and sediment/soil (Section 3.3) will be initiated in 2025. The data collected for all media will support the first five-year remedy review. Additional sampling will be conducted on a 5-year cycle to support future five-year remedy reviews.

As technology advances, new innovative sampling techniques, such as passive sampling, may be employed. Current research associated with the use of diffusive gradients in thin films (DGT) has been used to assess contaminant bioavailability at the SRS (Paller et al 2019, Philips et al 2018), and is currently in development for applications for radionuclides such as Cs-137. It is anticipated that passive sampling may be able to replace or reduce the need for traditional sampling approaches (such as fish collections) and may be utilized in future sampling efforts, at which time this MNREP will be revised.

This plan is developed to support the MNR remedy, but additional sampling is occurring within the LTR system. The LTR IOU wetlands and pond systems have been actively studied as part of National Environmental Research Park research for various investigative purposes. The primary onsite entities that conduct research within the LTR IOU are the Savannah River Ecology Laboratory (University of Georgia) and the Savannah River National Laboratory. The emphasis in recent years has primarily been on aspects of radioecology in ~~the~~ Pond A, Pond B, and PAR Pond. Results of studies pertaining to the LTR IOU will be evaluated, and results may be included in the five-year remedy reviews, as appropriate, to further assess conditions within the LTR IOU Upper subunit.

### 3.2 Aerial Gamma Survey

Aerial gamma surveys have been proven to be an effective tool for the physical measurement of gamma radiation from the Earth's surface. This approach is particularly effective for large-scale applications such as the LTR IOU and have been used in the past at SRS (SRNS 2017, Feimster 1993). Figure 5 shows gamma overflight survey point data for EA1 conducted in 2013.

Aerial gamma surveys for the LTR IOU will be conducted to monitor Cs-137 covering the entire Upper subunit over a 15-year period. With a radioactive half-life of Cs-137 of 30.2 years, 15-year intervals represent half of the radiological half-life of Cs-137. The radioactive half-life of Co-60 is 5.27 years. Since all reactor discharges for the LTR system ceased by 1987, many half-lives have already occurred for Co-60. Co-60 was found to be co-located with Cs-137. Gamma surveys for Co-60 would not be as effective or add additional information for monitoring radioactive decay over time.

The aerial gamma survey will be conducted to assess relative activities of Cs-137 as conditions dictate. The data will also be used to evaluate the distribution of Cs-137 to determine if significant sediment/soil transport has occurred. Since surface water cover can mask gamma signatures, these aerial surveys will focus on the floodplain areas of the canals and edges of the ponds/reservoirs. The intent is to survey the entire Upper subunit, covering three separate aerial campaigns over a 15-year cycle (one area every five years) to support the five-year remedy reviews. The three campaign boundaries primarily encompass 1) the canal from Pond B to PAR Pond, the north arm and main body of PAR Pond, 2) P-Area Discharge Canal, Ponds 2, 4, and 5, and connecting canals, and 3) R-Area Discharge Canal, Ponds A, B, C, and Joyce Branch. Figure 4 outlines the approximate areas for each survey campaign.

To conduct the surveys, aerial gamma data will be collected. The gamma signatures from the ground surface will be collected using gamma detectors (e.g., sodium-iodide or lanthium-bromide detectors). The gamma spectral data will be analyzed to spatially interpolate the gamma readings to Cs-137 providing a point survey across the land surface. These gamma surveys may also be conducted or supplemented using drone technology. Aerial surveys may be supplemented with ground-based surveys using hand-held monitors/detectors to provide a more detailed surface interpretation.

### 3.3 Fish and Sediment/Soil Monitoring

Fish serve as an integrator of contaminants and are considered an indicator of environmental health. Fish have been used to assess long-term trends of Cs-137 at the SRS (Paller et al 2014, Paller et al 1999). Fish will be monitored to assess bioavailability of Cs-137 and Hg within the pond systems that maintain fishable populations of various fish species. Samples will consist of at least three different fish species to assess bioavailability. Fish data will be collected every 5 years under this MNREP and will follow the *Area Completion Projects Quality Assurance Project Plan for Environmental Data Collection and Management* (SRNS 2012).

Three composite fish samples will be collected from EA3, EA6, EA9 (Figure 4). At each pond system, the three composite fish samples will represent a predator (e.g., largemouth bass), a benthic species (e.g., catfish, chub), and a pelagic regional species (e.g., bluegill, red-breast sunfish). Considerations for choosing a particular species of fish for analysis will be based on the amount of fish tissue obtainable, trophic level, the size of the fish, and the representativeness of the fish species as compared to the other fish sampling locations. Analyzing comparable species will be useful when comparing body burdens from different locations. Each composite sample will consist of a minimum of three fish of the same species for a total of at least 300 grams (the minimum acceptable for laboratory analysis). Each sample will be analyzed as a whole fish composite. Fish will be collected by angling or electrofisher equipment. Given sufficient fish tissue mass is obtained to conduct analyses, fish will be analyzed for Cs-137 and Hg.

Sediment/soil sampling for Cs-137 will be conducted on a ~~15~~five-year schedule for ground-truthing to confirm areas where aerial gamma surveys indicate elevated Cs-137 levels (e.g., two elevated areas in Joyce Branch as indicated in Figure 5), in addition to areas where gamma signatures may indicate sediment transport.

The sediment/soil samples will be collected from the 0- to 0.3-meter (0- to 1-feet) surface interval. The locations will be determined/adjusted in the field based on potential interferences, feasibility of access, and representativeness of the sample location to the surrounding area.

The sediment/soil and fish samples will be 100% Definitive level (D) data (D Data). D Data is verified data which has achieved the USEPA's Screening Level Validation category (EPA 540-R-93-071) and meet the following selected aspects of USEPA Functional Guideline criteria: Quantitation Limits, Surrogate or Tracer Recoveries, Blanks (Method/Lab/Prep, Trip, Field, Equipment/Rinsate), Laboratory Control Sample Recoveries, Matrix Spike Recoveries/ Duplicates, Lab Replicates, Field Replicates, Cooler Temps, Chemical Preservation, Holding Times.

Field Quality Assurance/Quality Control (QA/QC) will be maintained through the use of QA/QC samples and methods as described below (Table 4):

1. Field Duplicate (co-located) Samples: Two independent samples collected from side-by-side locations at the same point in time and space so as to be considered identical. These separate samples are intended to represent the same population and are carried through all steps of the sampling and analytical procedures in an identical manner. These samples are used to assess precision of the total method, including sampling, analysis, and site heterogeneity. Field duplicate samples are planned at a combined minimum rate of 5% according to Manual C3, Volume X, *EC&ACP Geochemical Monitoring Procedures*, ER-SOP-043, *Obtaining and Managing Environmental Data for Environmental Compliance & Area Completion Projects (U)* (SRNS 2014), or typically 1 per 20 samples and analyzed for the same parameters

as the associated samples. Field duplicates may also be taken for each sampling effort if fewer than 20 samples are collected.

2. Split Samples: Two or more representative portions from a sample in the field, analyzed by at least two different laboratories and/or methods. Prior to splitting, a sample is mixed (except volatiles, oil and grease, or when otherwise determined) to minimize sample heterogeneity. These are quality control samples used to assess precision, variability, and data comparability between laboratories. Split samples are planned at a combined minimum rate of 5% or typically 1 per 20 samples and analyzed for the same parameters as the associated samples. A split sample may also be taken for each sampling effort if fewer than 20 samples are collected.

Table 5 is the Sampling Matrix table that includes detailed information for all fish samples planned to be collected. A similar Sampling Matrix will be prepared for the sediment/soil samples once those locations have been identified. The exact number of samples may change based on field conditions. Figure 4 illustrates the proposed locations where fish samples are to be collected.

The data acquired from the sampling will be processed to determine the maximum and mean constituent levels. A summary of cleanup levels for the Upper subunit of the LTR IOU are summarized in Table 6. Data obtained as a result of this MNREP will be compared to risk screening levels for chemicals (Hg), and Preliminary Remediation Goals for radiological constituents (Cs-137), as well as background levels.

### 3.4 Reporting

Results of the sampling and surveying for the LTR Upper subunit conveyed in this MNREP will be presented in five-year remedy review reports for *SRS OUs with Native Soil Covers and/or Land Use Controls*. The RA start date for the LTR Upper subunit is scheduled for May 24, 2023, (FFA 1993).

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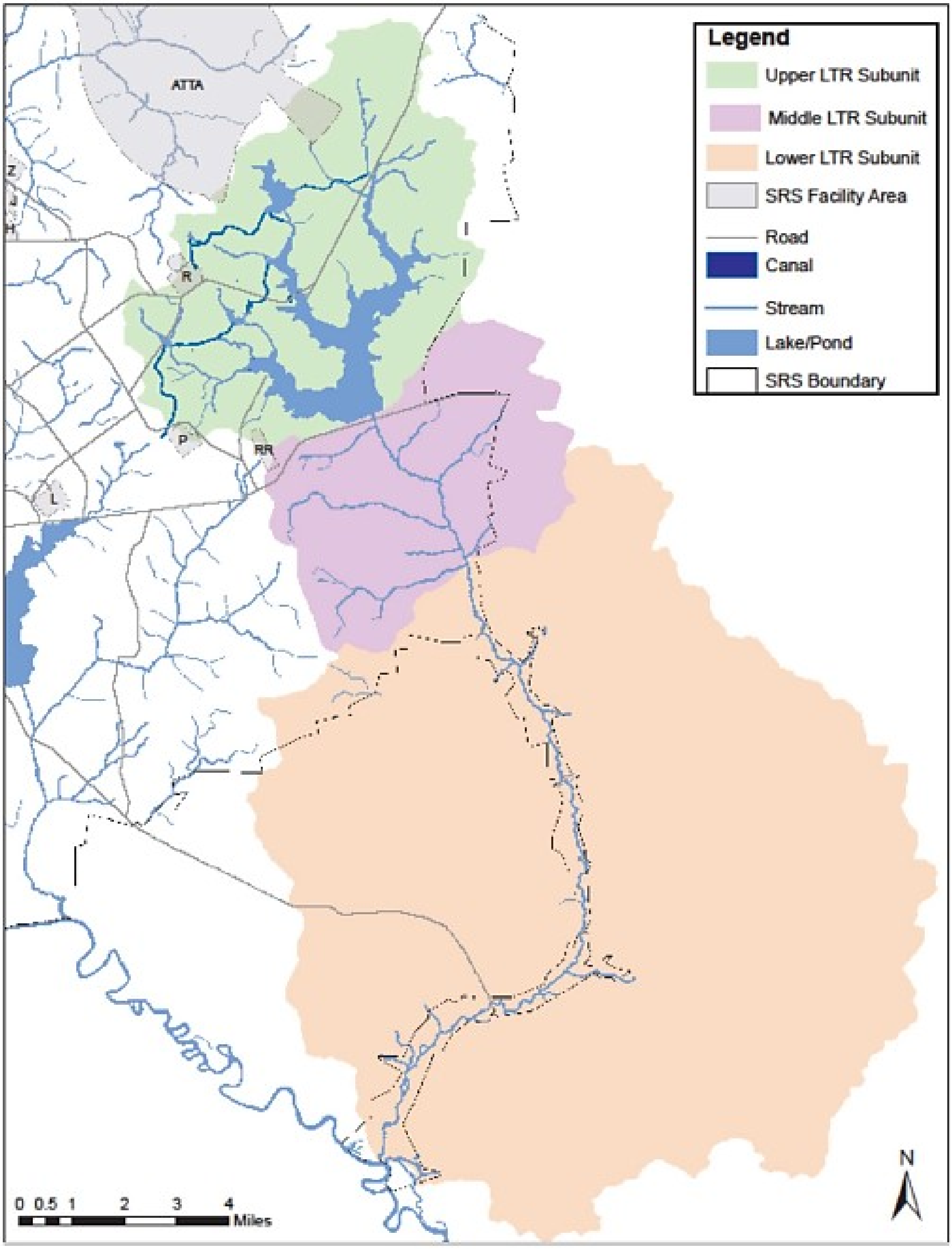


**Figure 1. Location of the Lower Three Runs IOU**

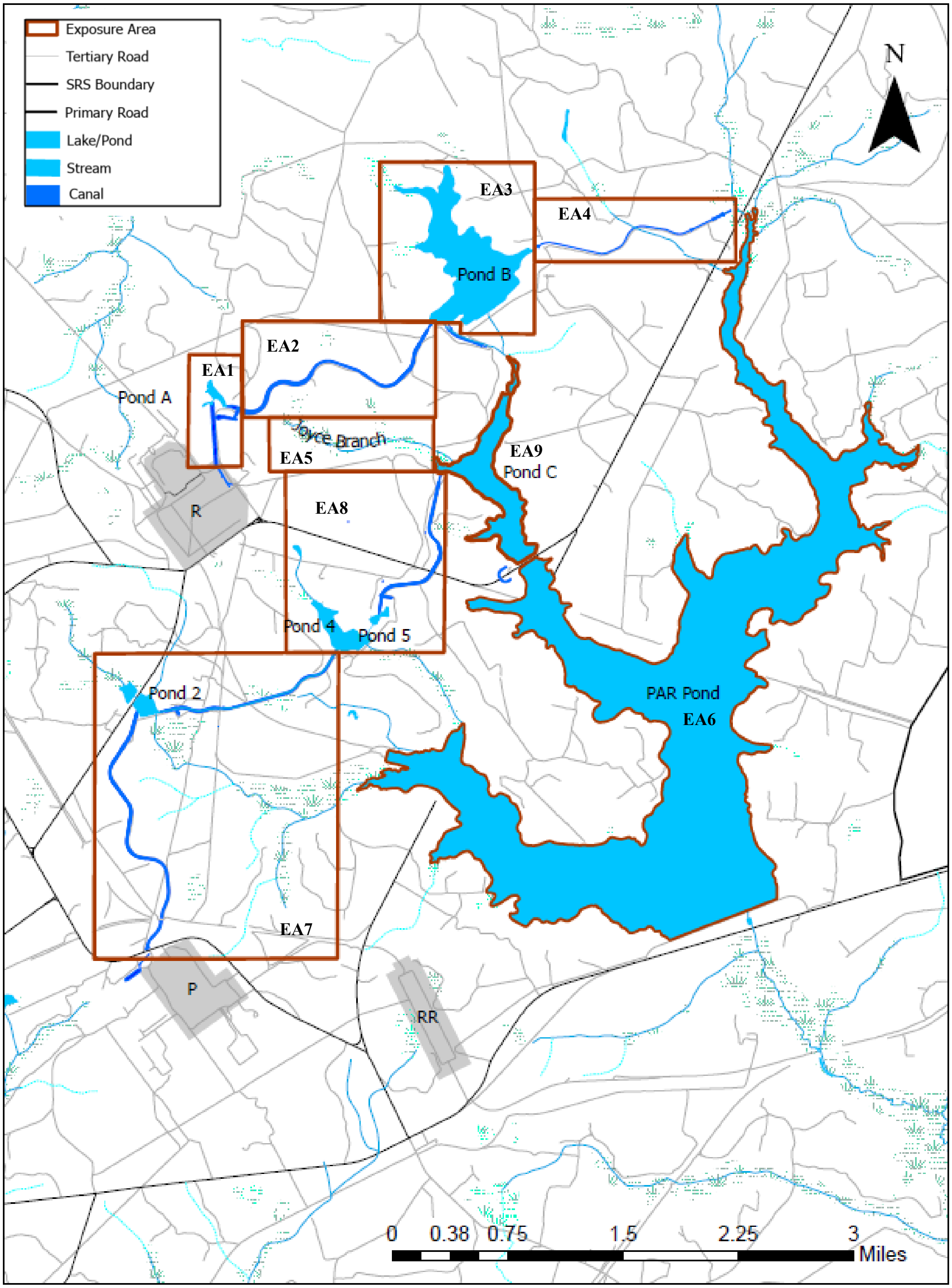


**Figure 2. Exposure Areas of the Lower Three Runs IOU Upper Subunit**

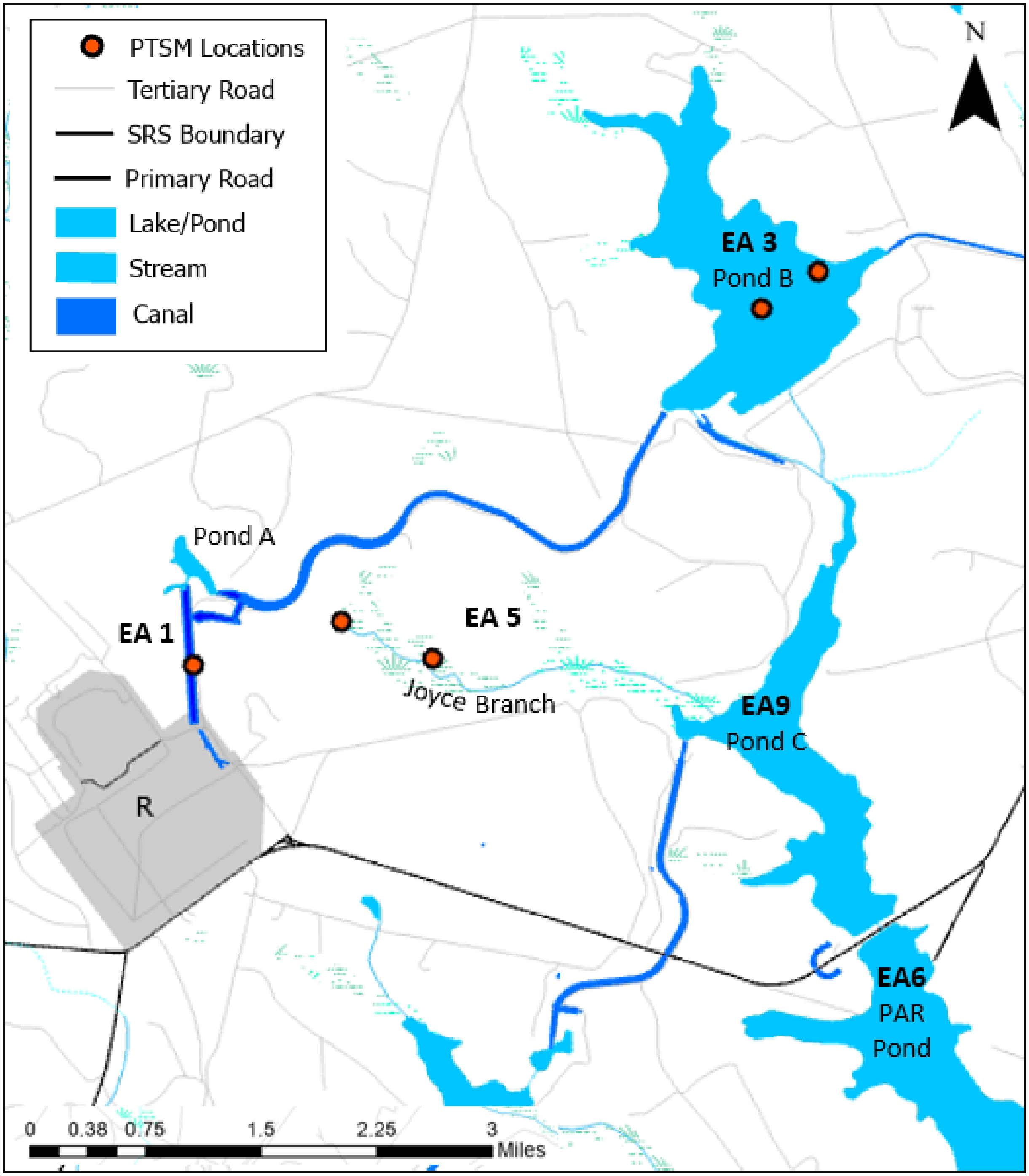


**Figure 3. Location of PTSM Sampling Locations in the LTR IOU Upper Subunit**

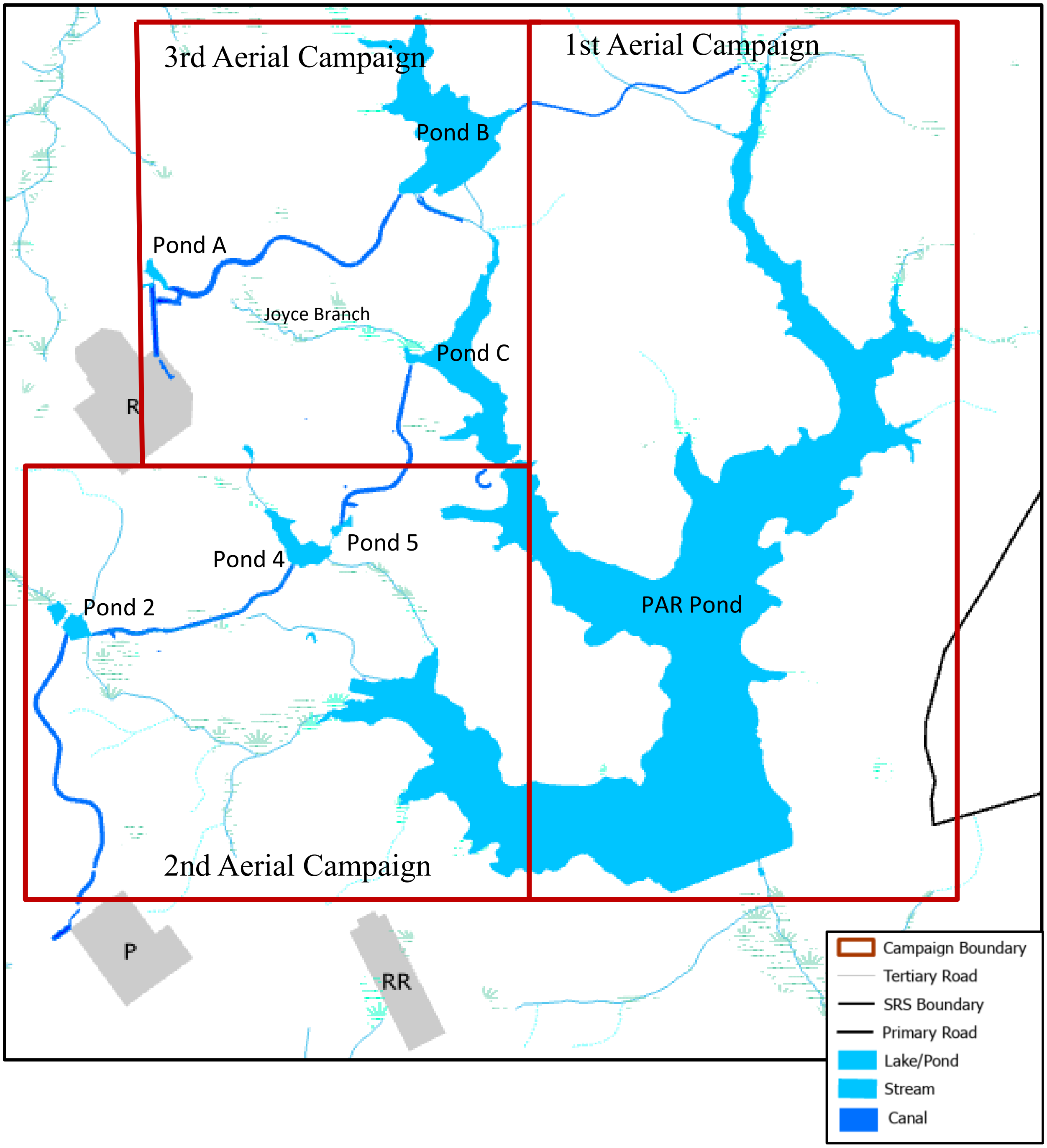


**Figure 4. Approximate Aerial Gamma Survey Campaign Boundaries and Fish Sampling Locations (Pond B, Pond C, and PAR Pond)**

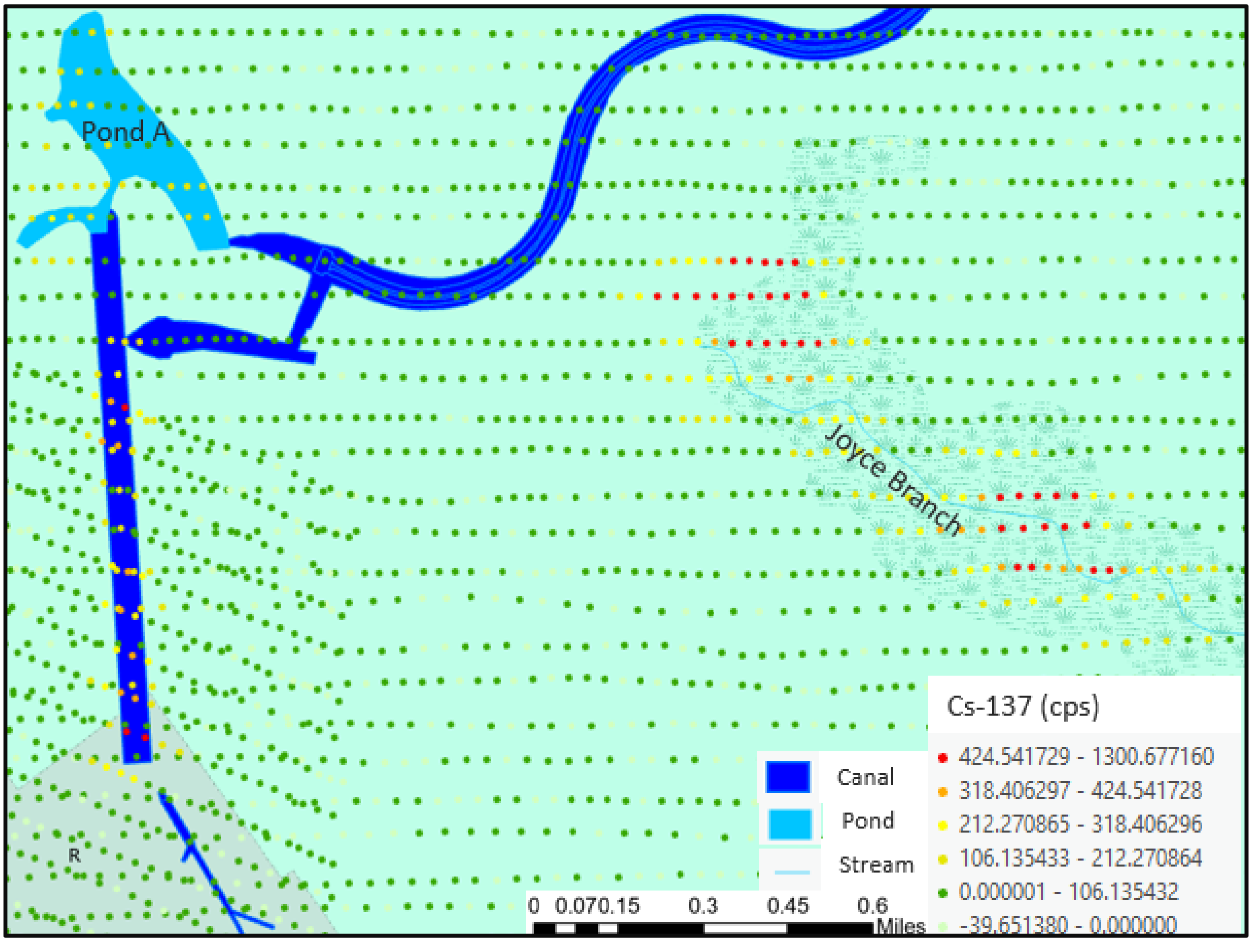


**Figure 5. 2013 Aerial Gamma Survey for LTR IOU (EA1)**

**Table 1. Data Quality Objectives**

| Media | Probable Conditions | Exposure Pathway and/or Release Mechanisms | Data Needs and DQOs | Field Activities | Parameters | Potential Remedial Action Alternatives |
|---|---|---|---|---|---|---|
| Fish | Fish contaminant body burdens due to historic reactor discharges | Ingestion of fish for consumption | Determine the nature of contamination.<br>Quantitative concentration data of constituents in whole fish to support MNR. | Collection of 3 species of fish for composite samples for three fish types representing different trophic levels (predator, benthic, and regional) | Definitive Data Quality Level for Hg and Cs-137 | Long-term monitoring of fish body burdens to support MNR for five-year remedy reviews for the LTR IOU Upper subunit |
| Sediment/ Soil | Sediment/soil contaminants due to historic reactor discharges | Ingestion, dermal contact or external exposure (rad only) with contaminated sediment/soil | Determine the nature of contamination.<br>Quantitative concentration data in sediment/soil to support MNR. | Collection of sediment/soil samples to determine levels of Cs-137 | Definitive Data Quality Level for Cs-137 | Ground-truthing for areas with elevated aerial gamma signatures |
| Gamma Surveys | Sediment/soil contaminated from historical reactor discharges | Ingestion, dermal contact or external exposure (rad only) with contaminated sediment/soil | Relative activity of Cs-137 gamma signature from surface sediment/soil | Conduct aerial or ground-based gamma survey for Cs-137 | Gamma survey data spatially interpolated to Cs-137 | Gamma land surface surveys to support MNR for five-year remedy reviews for the LTR IOU Upper subunit |

### Table 2. Laboratory Analytical Specifications for Solid Media

| Method | ID | Name | Matrix | Type | Limit | Units | Description |
|---|---|---|---|---|---|---|---|
| SW846 7471B | 7439-97-6 | Mercury | Solid | EQL | 24 | µg/kg | PQL-W Mercury Solid 2019 |
| SW846 7471B | 7439-97-6 | Mercury | Solid | MDL | 8.04 | µg/kg | MDL-W Mercury Soil 2019 |

EQL = estimated quantitation limit
MDL = method detection limit

### Table 3. Standard Minimum Detectable Activities for Radiochemistry Analyses

| Analysis | Product | Technique | Method | MDA Units | Typical Aliquot Size |
|---|---|---|---|---|---|
| Gamma Spec (based on Cs-137) | GSCGAMMS, Gammaspec, Gamma Solid (Standard List) | Gamma Spectroscopy | DOE HASL 300, 4.5.2.3/Ga-01-R | 0.1 pCi/g | 200 g |

### Table 4. Field Quality Control/Quality Assurance Sampling Requirements

| Data Quality Level | Field Quality Control/ Quality Assurance Samples | Frequency of Field Quality Control/ Quality Assurance Sample |
|---|---|---|
| D | Co-located Field Duplicate | Minimum 5% |
| | Split Sample | Minimum 5% |

Data Quality Levels:
D Data = USEPA Definitive Level Data

**Table 5. Sampling Matrix Table (Fish)**

| Sample Count | Sample Station[1] | Sample Number | Sample Type | Sample Media | Collection Method | Analytical Code | Proposed Northing | Proposed Easting |
|---|---|---|---|---|---|---|---|---|
| 1 | LTR-PB-P | 01 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3684050.28 | 449029.64 |
| 2 | LTR-PB-B | 02 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3684050.28 | 449029.64 |
| 3 | LTR-PB-R | 03 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3684050.28 | 449029.64 |
| 4 | LTR-PC-P | 04 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3681366.68 | 449312.66 |
| 5 | LTR-PC-B | 05 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3681366.68 | 449312.66 |
| 6 | LTR-PC-B | 05SPL | SPL | Fish composite | Angling/Electrofisher | 1,2 | 3681366.68 | 449312.66 |
| 7 | LTR-PC-R | 06 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3681366.68 | 449312.66 |
| 8 | LTR-PAR-P | 07 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3677612.00 | 451528.00 |
| 9 | LTR-PAR-P | 07FD | FD | Fish composite | Angling/Electrofisher | 1,2 | 3677612.00 | 451528.00 |
| 10 | LTR-PAR-B | 08 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3677612.00 | 451528.00 |
| 11 | LTR-PAR-R | 09 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3677612.00 | 451528.00 |
| 12 | LTR-PAR-R | 10 | REG | Fish composite | Angling/Electrofisher | 1,2 | 3677612.00 | 451528.00 |

| Analytical Codes | | | |
|---|---|---|---|
| Regular Samples: 10 | Total Planned Samples: 12 | 1. Mercury | *One per media type |
| Field Duplicates*: 1 | Split Samples*: 1 | 2. PHA gamma scan for Cesium-137 | |

[1] "P" "B" and "R" refer to the types of fish intended (Predator, Benthic and Regional)

**Table 6. Summary of the Cleanup Levels for the Upper Subunit of the LTR IOU[1]**

| Media | RCOC | Units | IOU Onsite worker | Recreational Fisherman | SRS BKGRD 95th %tile | 2X SRS BKGRD 95th %tile | SRS BKGRD Max | IOU BKGRD Max | Selected Cleanup Level |
|---|---|---|---|---|---|---|---|---|---|
| **Sediment/ Soil** | Cesium-137 (+D) | pCi/g | 0.144 | NA | 0.34 | *0.68* | 3.3 | 0.623 | 0.68 |
| | Cobalt-60 | pCi/g | *0.0295* | NA | NA | NA | NA | 0.011 | 0.0295 |
| **Fish Tissue** | Cesium-137 (+D) | pCi/g | NA | *0.0544* | NA | NA | NA | 0.488 | 0.0544 |
| | Mercury | mg/kg | NA | *0.154* | NA | NA | NA | 0.24 | 0.154 |

[1] From the Feasibility Study for the Lower Three Runs Integrator Operable Unit (U), Revision 1.1, February 2020, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

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