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Addendum to the P-Area Operable Unit (PAOU) Effectiveness Monitoring Plan (U)

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SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

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LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CMCOC	contaminant migration constituent of concern
CMS/FS	Corrective Measures Study / Feasibility Study
DOECAP	Department of Energy Consolidated Audit Program
EMP	Environmental Monitoring Plan
ERDMS	Environmental Restoration Data Management System
ft	feet
IDW	Investigative Derived Waste
ISD	in-situ decommissioning
MCL	maximum contaminant level
MDL	method detection limit
µg/L	micrograms per Liter
mg/kg	milligrams per kilogram
msl	mean sea level
PAOU	P-Area Operable Unit
pCi/L	picocuries per liter
pCi/mL	picocuries per milliliter
PRG	Preliminary remediation goal
PSA	potential source area
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI/RI	RCRA Facility Investigation / Remedial Investigation
ROD	Record of Decision
SCDHEC	South Carolina Department of Environmental Control
SQL	Sample Quantitation Limit
SRS	Savannah River Site
SRNS	Savannah River Nuclear Solutions, LLC.
SVE	soil vapor extraction
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

The P-Area Operable Unit (PAOU) Effectiveness Monitoring Plan (EMP) (SRNS 2010a) presented the post-construction monitoring details for the following early remedial actions:

- in-situ decommissioning (ISD) of the P-Reactor Building (105-P) Complex;
- treatment of the vadose zone soils via soil vapor extraction (SVE) at potential source area (PSA)-3B; and
- treatment of the vadose zone soils via in-situ chemical oxidation and SVE at PSA-3A.

The ISD remedial activities were designed to significantly reduce contaminant mobility and allow for radioactive decay of contaminants and include grouting of all below-grade areas of the building, grouting and stabilization of disassembly basin and reactor vessel contaminants, demolition associated with the disassembly basin above-ground structure and stack, and construction of a cover system over the grouted disassembly basin and reactor vessel. In addition, the 2010 PAOU EMP identified the monitoring plan for eleven contaminant migration constituents of concern (CMCOCs) and tritium with the potential to exceed maximum contaminant levels (MCLs) in groundwater (Table 1). Because the timeframe for groundwater impacts (if any) is over 1,000 years, groundwater sampling for the CMCOCs was designed to occur every five years to support review of the ISD early action remedy. The purpose of this Addendum to the PAOU EMP is to revise the groundwater monitoring plan to monitor only the most mobile constituents (carbon-14, chlorine-36, and technetium-99) and tritium every five years, rather than all eleven CMCOCs. Section 2 provides more detail on the monitoring requirements.

2.0 MONITORING DETAILS

Post-construction monitoring details pertaining to the P-Reactor Building (105-P) Complex ISD early remedial action are provided in the following sections.

2.1 Monitoring of the P-Reactor Building (105-P) Complex

Results from the Tier 2 contaminant migration modeling conducted in the Resource Conservation and Recovery Act (RCRA) Facility Investigation / Remedial Investigation (RFI/RI) Report with

Baseline Risk Assessment (BRA) and Corrective Measures Study / Feasibility Study (CMS/FS) for the P-Area Operable Unit (WSRC 2008) indicated that eleven CMCOCs present in the P-Reactor Building (105-P) Complex may exceed their MCLs in the future if no action is taken. The predicted time-frame for this occurrence is estimated to be over 1,000 years from the present time. The ISD remedial action is designed to significantly reduce contaminant mobility and allow for radioactive decay of contaminants. However, modeling indicates that five radionuclides (i.e., carbon-14, chlorine-36, nickel-59, niobium-94, and molybdenum-93), may still exceed MCLs in groundwater under the ISD early remedial action, although not for at least 1,000 years. Given the conservative assumptions and long time-frame used in the model, the predictions are subject to high uncertainty. Table 1 lists the eleven CMCOCs plus tritium and their corresponding MCL or preliminary remedial goal (PRG) (1E-06 risk-based concentration) and the time of MCL exceedance. Because the time frame for groundwater impacts (if any) is over 1,000 years, groundwater monitoring is every five years to support review of the ISD early action remedy. The monitoring network consists of eight wells. Seven locations around the P-Reactor Building (105-P) Complex and one background location are identified on Figure 1 and Table 2. Well locations are proximal to the reactor vessel, disassembly basin, and purification area, sources of most of the modeled radionuclide inventory. The background well for monitoring the P-Reactor Building (105-P) Complex is designated as PRB003DU. Groundwater flow in the Upper Aquifer Zone of the Upper Three Runs Aquifer is radial around the P-Reactor Building (105-P) Complex (Figure 2).

Monitoring samples for the P-Reactor Building (105-P) Complex ISD were collected in March 2012 and May 2015. Twelve radionuclide and lead analyses were conducted on the 2012 samples. Tritium was the only analyte above the detection limit for the 2012 sample event. In 2012, the maximum tritium result was 66.5 pCi/mL for the sample at well PRB002DU. The 2012 P-Reactor Building (105-P) Complex ISD monitoring data were reported in the Fifth Five-Year Remedy Review report (SRNS 2017). SRS recommended in the Fifth Five-Year Remedy Review report to reduce the analytical list to those constituents that have the fastest travel times as predicted by the model (220 years for carbon-14, chlorine-36, and technetium-99). Tritium was also included in the monitoring suite due to its current presence and potential ability to interfere with other beta emitters (e.g., carbon-14). The SRS recommendation was approved by the U.S. Department of

Energy (USDOE), U.S. Environmental Protection Agency (USEPA), and South Carolina Department of Health and Environmental Control (SCDHEC).

In 2017, sampling of the reduced list of analytes (carbon-14, chlorine-36, technetium-99 and tritium) was conducted. In 2017, the maximum tritium result was 17.6 pCi/mL for the sample at well PRB002DU. All P-Reactor Building (105-P) Complex ISD monitoring data for the 2012 and 2017 sample events are provided in Table 3.

3.0 MONITORING OBJECTIVES

3.1 Monitoring of the P-Reactor Building (105-P) Complex

The PAOU Effectiveness Monitoring Plan (EMP) (SRNS 2010a) specifies the monitoring for the ISD early remedial action for the P-Reactor Building (105-P) Complex.

4.0 ANALYTICAL PLAN

4.1 Analytical Data Quality Levels for Subunit/Media

The laboratory data collected for the CMCOCs during the post-Record of Decision (ROD) monitoring for the P-Reactor Building (105-P) Complex ISD will be 100% verified and validated. The data are analytical data that are suitable for final decision-making which includes determining if well sampling can be discontinued or if additional wells are needed. Please refer to the Uniform Federal Policy for more information on the quality assurance process for remediation projects (USEPA 2005).

4.2 Analytical Methods

Groundwater sampled during the post-ROD monitoring will consist of CMCOCs identified in the PAOU ROD and tritium. Table 4 lists the specific methods and detection limits for analysis and the hold times, preservatives, and sample containers for all analysis.

4.3 Field Analytical Sampling Quality Assurance/Quality Control

Quality control (QC) samples consists of sample duplicates, rinsate blanks (if non-dedicated sampling equipment is used), and trip blanks. Field personnel ensure that QC samples are collected as described below.

Field QC/quality assurance (QA) are maintained through the use of QC/QA samples and methods as described in SW-846 (USEPA various updates) (USEPA 2010) which includes:

1. Field Duplicate: Two or more representative aliquots taken from one sample at the sampling site and analyzed in the same laboratory. Laboratory duplicate/replicate samples are QC samples that are used to assess intra-laboratory preparatory and analytical precision as well as sample homogeneity. Duplicates are planned at a combined rate of at least 1 per 20 samples and analyzed for the same parameters as the associated samples.

2. Trip Blank: A clean sample of water, or other appropriate media, free of measurable contaminants that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures. Trip blanks are analyzed to assess whether contamination was introduced during sample shipment (typically analyzed for volatile organic compounds [VOCs] only). Trip blanks are used to monitor contamination of samples by VOCs during shipping and handling. A trip blank consists of distilled-deionized water provided by the laboratory to be placed in every cooler with VOC samples at the rate of 1 trip blank per cooler.

3. Split Samples: Split samples are field duplicates sent to a different laboratory than the primary samples and thus include a component of inter-laboratory precision. Split samples can be used for assessment of data comparability. One split sample will be collected during the comprehensive annual sampling event from a location that includes both tritium and VOC analysis.

4.4 Assessment of Data Usability with Precision, Accuracy, Representativeness, Completeness, Comparability Parameters

Data usability will be discussed in the environmental monitoring plans and will be assessed using the following criteria:

Precision is the mutual agreement between individual measurements of the same property under similar conditions. Precision is determined from the field and laboratory duplicate analyses and indicates the consistency of field and laboratory techniques. Acceptable precision for the laboratory analysis is specified by the method.

Accuracy is determined from the laboratory control samples, matrix spikes, serial dilutions, surrogates/tracers, internal standards/carriers, and the results of method, field, trip, and equipment rinsate blanks. Accuracy indicates the ability of field and laboratory processes to generate correct results. Blank results specifically monitor for any contamination from sample processing. Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population, variations in a parameter at a sampling point, or an environmental condition. Acceptable levels of accuracy for laboratory control samples are specified by method.

Representativeness of data will also be ensured through consistent application of established field and laboratory procedures. Laboratory, field, and trip blank samples will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. For this project, representative data will be obtained through selection of sampling locations and analytical parameters. Representative data will also be obtained through proper collection and handling of samples to avoid interference and minimize contamination. Data determined to be nonrepresentative, by comparison with existing data, will be used only if accompanied by appropriate qualifiers and limits of uncertainty.

Completeness is a measure of the percentage of project-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with a sampling matrix table (Table 6) and QC procedures outlined in this EMP and other documents, and none of the QC criteria that affect data usability are exceeded. Given the scope of this sampling, 90%

completeness is considered acceptable. When all data validation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

Comparability expresses the confidence with which one data set can be compared with another and is an indicator of both precision and accuracy. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data. Using standard field procedures adhering to Standard Operating Procedures (SOPs) will ensure comparability. The comparability of laboratory data will be assured by the use of established and approved analytical methods and by certified laboratories, consistency in the basis of analysis (wet weight, volume, or similar units), and consistency in reporting units (ppm, pCi/L, etc.). Comparability will be determined from split and duplicate sample comparisons or screening level and definitive level comparisons. Comparability is an indicator of both precision and accuracy.

4.5 Laboratory Quality Assurance/Quality Control

All SRS contract laboratories are certified by SCDHEC and use SW-846 methods, or other SCDHEC approved methodologies. All subcontract laboratories are also required to develop and implement their own quality assurance project plan (QAPP) for any work performed for SRS. SRS reviews, approves, and audits subcontract laboratory QA/QC programs for compliance with their written QAPP. In addition to the regulatory certification and subcontract specifications, all contract laboratories are also subject to a continuous and ongoing surveillance and auditing programs sponsored by USDOE called Department of Energy Consolidated Audit Program (DOECAP) Policies and Practices, Procedure AD-1 (USDOE 2009). If a DOECAP audit finding requires corrective action anywhere in the complex, it notifies all the laboratories of its findings and maintains a record of the corrective action.

The SRNS Quality Assurance Manual 1Q provides a detailed set of documented requirements for the following:

1. Analytical Measurement Systems, Procedure 2-7

2. Instructions, Procedures and Drawings, Procedure 5
3. Document Control, Procedure 6
4. Control of Processes, Procedure 9
5. Control of Measuring and Test Equipment, Procedure 12
6. Packaging, Handling, Shipping and Storage, Procedure 13.1
7. Corrective Action System, Procedure 16.3
8. Quality Assurance Records, Procedure 17.1
9. Audits, Procedure 18
10. Environmental Quality Assurance, Procedure 21

5.0 FIELD IMPLEMENTATION

5.1 Sample Collection Procedures and Processes

Groundwater samples are collected around P-Reactor Building (105-P) Complex to monitor the effectiveness of the ISD. The P-Reactor Building (105-P) Complex ISD is monitored by eight (8) permanent monitoring wells (Figure 1). Groundwater samples are collected from each well according to Manual 3Q1, Procedure 9015, *Sampling Groundwater Monitoring Wells* (SRNS 2010b). Surface water samples are collected according to Manual 3Q1, Procedure 3001, *Liquid Effluent and Surface Water Surveillance Sampling* (SRNS 2010b). The well samples are analyzed for field parameters (depth to water, water temperature, pH, conductivity, and turbidity) in addition to the CMCOCs and tritium.

5.2 Decontamination Procedures for Equipment

Dedicated pumps/hydrasleeves are used to sample groundwater wells. Non-dedicated equipment used to sample seepline wells or surface water is disposed of after use or decontaminated according to Manual 3Q1, Procedure 3005, *Soil and Sediment Sampling* (SRNS 2010b).

5.3 Sample Documentation

Sample documentation is conducted in accordance with *Obtaining and Managing Environmental Data for Area Completion Projects* (SRNS 2009a) and Manual 3Q1, *Environmental Requirements and Program Documents* (SRNS 2010b) which provide requirements and guidelines that are necessary for the documentation, record-keeping, mobilization, collection, verification, validation, reporting and storage of environmental data. The data results are maintained in the Environmental Restoration Data Management System (ERDMS), which requires that specific information pertaining to each sample collected accompany the analytical results including, but not limited to: sampling information, such as bar-coded dates, times, sample IDs, weather, etc. Sampling documentation is tracked through a series of documents including:

1. Mobilization Report
2. Chain-of-Custody Forms
3. Field Log Books
4. Analytical Data Packages
5. SCDHEC and SRS required logs and forms

5.4 Chain-of-Custody

Chain-of-Custody procedures establish requirements for sample custody and documenting custody from the time of collection through laboratory analysis. Chain-of-custody demonstrates that samples obtained in the field have been securely collected and transported and have reached the analytical laboratory without alteration. Chain-of-Custody requirements are established by SRNS Manuals 3Q (SRNS 2010d) and 3Q1 (SRNS 2010c). At a minimum, Chain-of-Custody documents will include the following information which is compliant with USEPA requirements:

- Project name – i.e., monitoring well name, stream name, etc.
- Sample identification
- Sampler's signature for each sample, the sampler indicates:

- Date of sample collection
- Time of sample collection
- Sample identifiers (bar coded labels)
- Sample description
- Whether a sample is preserved or unpreserved
- Analyses to be performed

A chain-of-custody record is used as physical and legal evidence of sample custody to trace the sample from collection through delivery to the analyzing laboratory and where the samples were stored. The chain-of-custody record must originate with the responsible organization or the person collecting the sample. Every sample is assigned a unique identification number that is entered on the chain-of-custody document. The chain-of-custody records each transfer of custody of the samples by a relinquishing party to a receiving organization whose name and identifying contact information is located on the form.

5.5 Sample Management and Shipping

Sample management for analytical laboratories and intra-SRS facilities is primarily controlled by SRNS Quality Assurance Manual 1Q, *Packaging, Handling, Storage and Shipping* (SRS 2007). The purpose of this procedure is to define the requirements and specify the responsible parties and their roles for the Packaging, Handling, Shipping, and Storage of items to ensure that they are properly controlled to prevent damage or loss and to minimize their deterioration.

Sample shipment is also regulated by SRNS Manual 19Q, *General Transportation Requirements Approved for Radioactive and Non-Radioactive Hazardous Materials* (SRNS 2009b) and 3Q1 *Environmental Requirements and Program Documents* (SRNS 2010b). These manuals provide specific requirements to sampler personnel for the safe offsite shipment or onsite transfer of radioactive and non-radioactive hazardous materials and hazardous substances, mixed waste (radioactive/nonradioactive hazardous material) and empty packaging that have previously contained radioactive/nonradioactive hazardous material. It specifies the required packaging, labeling, record-keeping, selection of appropriate transportation carrier, and appropriate transport container based on the analytically pre-tested nature of a sample. Radiological samples must meet US Department of Transportation shipping regulations as well.

Table 5 lists preservatives, holding times, and sample containers.

5.6 Data Validation and Data Management

Requirements for data validation/verification and data management procedures are found in seven SRNS Procedures and Standard Operating Procedures, the USEPA Functional Guidelines, and two Department of Energy National Policies and Procedures:

SRNS Procedures

- ER-AP-302 – Data Summary Report
- ER-AP-303 – Analytical Data Validation Report
- ER-AP-304 – Statistical Summary Report
- ER-AP-305 – Use of Field-Generated Blanks
- ER-AP-306 – Laboratory Data Records Review

SRNS Standard Operating Procedures

- ER-SOP-033 – Analytical Data Qualification
- ER-SOP-043 – Obtaining And Managing Environmental Data For Area Completion Projects

USEPA Functional Guidelines

- Data Management Plan, Q-DMP-B-00001, Environmental Restoration Data Management System

USDOE National Policies and Procedures

- Department of Energy Consolidated Audit Program, Policies and Practices, Procedure AD-1, Revision 2, November 10, 2009
- Quality Systems for Analytical Services, Revision 2.5, Department of Energy, November 9, 2009.

In addition, SRS procedures incorporate the criteria found in the USEPA National Functional Guidelines to verify, validate, and qualify analytical data to assess its usability for risk and remedial management decisions. Adherence to this complex list of procedures and guidelines establishes: (a) if data meets the specific technical and QC criteria established by the DQOs and laboratory QAPPs; and (b) the usability of any data not meeting the specific technical and QC criteria. All data is qualified for usability using USEPA Functional Guidelines. Adherence to the guideline requirements and the DOECAP for analytical laboratories allows the data to be qualified based upon a set of nationally established functional guideline qualifiers for uniformity. Depending upon the DQOs, data will be verified and/or validated according to the following criteria:

- Verification – Confirmation by examination and provision of objective evidence that the specified analytical requirements have been met. This is to be an electronic data deliverable completeness check for all required fields. Data verification consists of a completeness check to confirm that all sampling data and data fields requested from the laboratory have been received and comply with specified requirements.
- Validation – Confirmation by manual examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Data validation consists of any analyte and sample specific process for evaluating compliance of the laboratory data received with methods, procedures, or contract requirements.

Properly completed and qualified data is entered into the ERDMS Database. Data records are updated, re-qualified, and continuously corrected for usability based on the results of electronic verification and manual validation evaluations as corrective actions are resolved with the analytical laboratories.

5.7 Investigation Derived Waste

Investigation Derived Waste (IDW) will be managed according to the site-specific IDW management plan developed for the project which is based on the *Savannah River Site Investigation-Derived Waste Management Plan* (WSRC 2007).

6.0 REPORTING REQUIREMENTS

As agreed to in the PAOU EMP (SRNS 2010a), SRS includes the sampling results from the eight monitoring wells surrounding the 105-P Reactor Building Complex in the Five-Year Remedy Reviews. Sampling results for the eleven PAOU CMCOCs were reported and discussed in the *Fifth Five-Year Remedy Review Report for Savannah River Site Operable Units with Geosynthetic or Stabilization/Solidification Cover Systems* (SRNS 2017). As per the approved recommendation from the Fifth Five-Year Remedy Review, the monitoring strategy will be revised to sample only the radionuclides with the fasted travel times (i.e., carbon-14, chlorine-26, and technetium-99) and tritium every five years to support review of the ISD early action remedy. The results of the reduced sampling list will be reported in the *Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Geosynthetic or Stabilization/Solidification Cover Systems* due for submittal in 2019.

7.0 REFERENCES

SRNS, 2009a. *Obtaining and Managing Environmental Data for Area Completion Projects (U)*, Area Completion Procedure Manual C3, ER-SOP-043, Revision 2, Savannah River Nuclear Solutions LLC, Savannah River Site, Aiken, SC

SRNS, 2009b. *Transportation Safety Manual*, Manual 19Q, latest revisions, Savannah River Nuclear Solutions LLC, Savannah River Site, Aiken, SC

SRNS, 2010a. *P-Area Operable Unit Effectiveness Monitoring Plan,* SRNS-RP-2010-00894, Rev. 1, October 2010, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

SRNS, 2010b. *Environmental Requirements and Program Documents*, Manual 3Q1, latest revisions, Savannah River Nuclear Solutions LLC, Savannah River Site, Aiken, SC

SRNS, 2010c. *Environmental Requirements and Program Documents*, Manual 3Q1, latest revisions, Savannah River Nuclear Solutions LLC, Savannah River Site, Aiken, South Carolina.

SRNS, 2010d. *Environmental Compliance*, Manual 3Q, latest revisions, Savannah River Nuclear Solutions LLC, Savannah River Site, Aiken, South Carolina.

SRNS, 2017. Fifth Five-Year Remedy Review Report for SRS OUs with Geosynthetic or S/S Cover Systems *P-Area Operable Unit,* SRNS-RP-2016-00610, Rev. 1.1, Appendix N, December 2017, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

USEPA, 2005. Uniform Federal Policy for Quality Assurance Project Plans, Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 1: UFP-QAPP Manual, EPA-505-B-04-900A, Final Version 1, March 2005, Intergovernmental Data Quality Task Force

WSRC, 2007. *Savannah River Site Investigation-Derived Waste Management Plan*, WSRC-RP-94-1227, Revision 9, Washington Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2008. RCRA Facility Investigation / Remedial Investigation (RFI/RI) Report with Baseline Risk Assessment and Corrective Measures Study / Feasibility Study (CMS/FS) for the P-Area Operable Unit (U), WSRC-RP-2007-4032, Rev. 1.1.

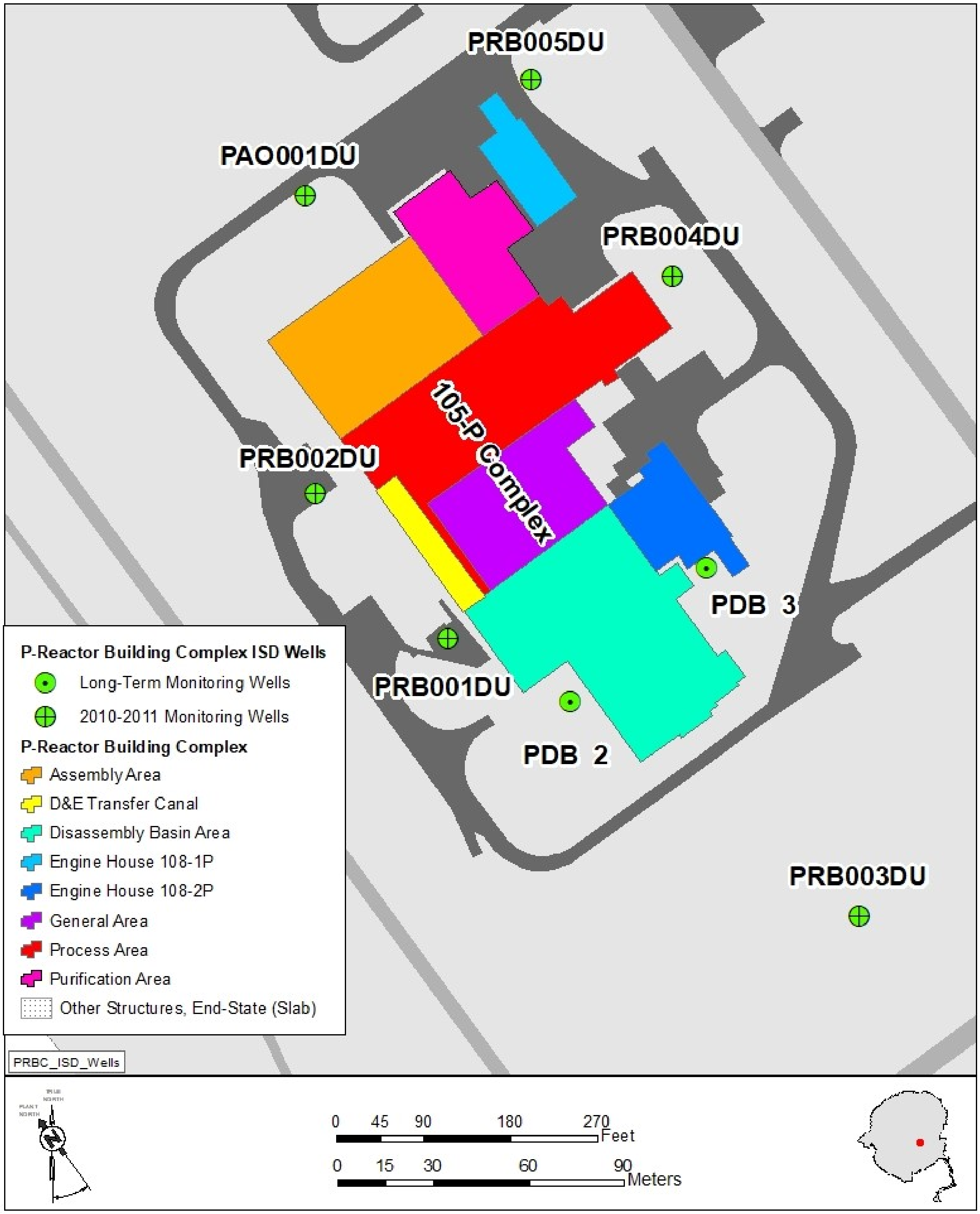

Figure 1. Monitoring Wells for the P-Reactor Building (105-P) Complex ISD

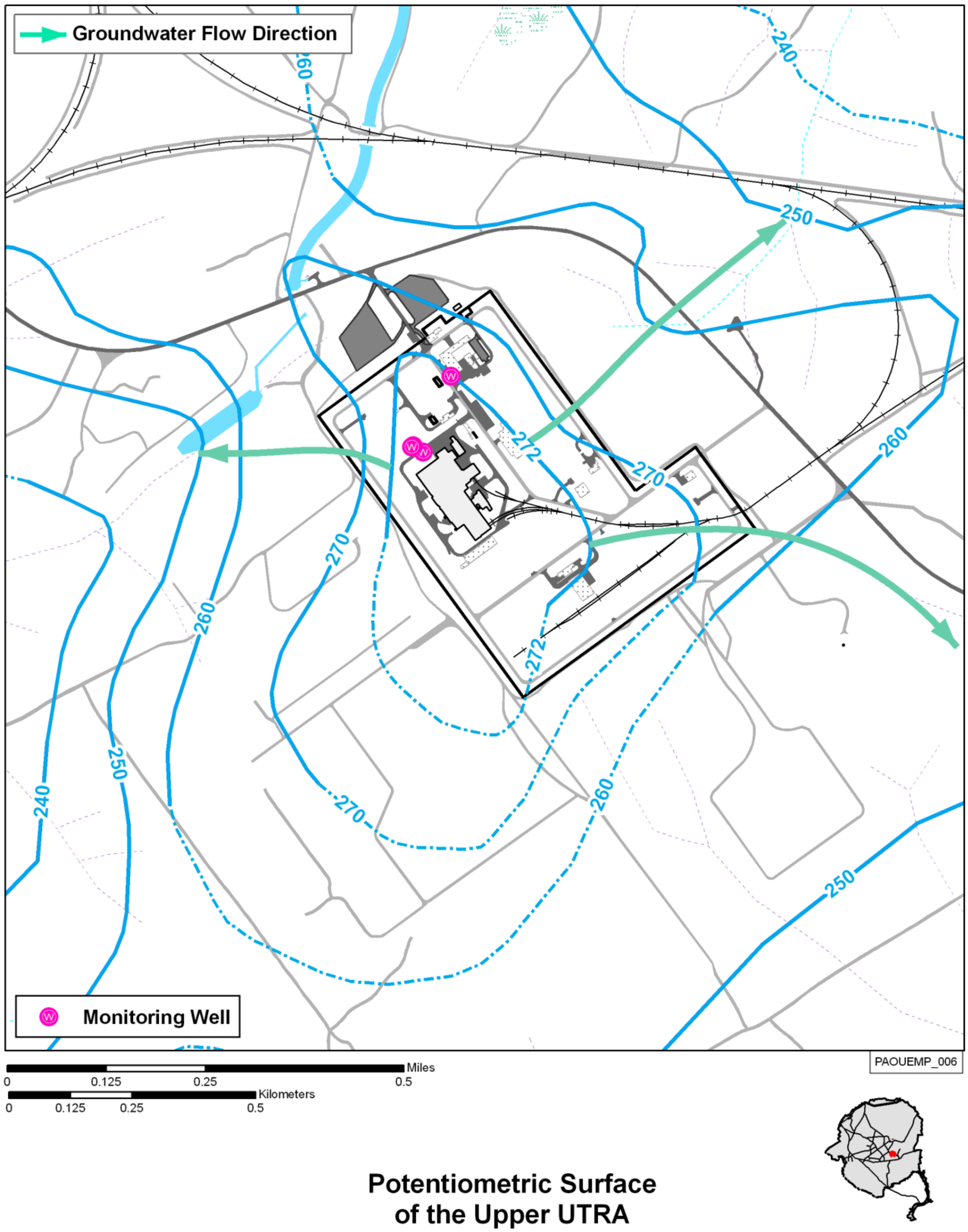

Figure 2. Potentiometric Surface of the Upper UTRA

Table 1. PAOU Constituents and Corresponding MCLs/PRGs

Constituent[1]	Concentration Time	MCL/PRG[2]	Alternatives[3] No Action	 ISD
Carbon-14	Max. (pCi/L)	2,000	**220,000**	**6,000**
	Time of Peak (yr)		400	4,500
	Time of Initial Exceedance (yr)		220	1,800
Chlorine-36	Max. (pCi/L)	700	**21,000**	**1,200**
	Time of Peak (yr)		380	4,600
	Time of Initial Exceedance (yr)		220	1,800
Potassium-40	Max. (pCi/L)	2	**3.9**	0.83
	Time of Peak (yr)		400	1,400
	Time of Initial Exceedance (yr)		300	--
Calcium-41	Max. (pCi/L)	135	**230**	21
	Time of Peak (yr)		2,200	10,000
	Time of Initial Exceedance (yr)		300	--
Nickel-59	Max. (pCi/L)	300	**28,000**	**6,400**
	Time of Peak (yr)		7,300	55,000
	Time of Initial Exceedance (yr)		520	25,000
Nickel-63[4]	Max. (pCi/L)	50	**1,900**	- [6]
	Time of Peak (yr)		660	
	Time of Initial Exceedance (yr)		420	-- [6]
Niobium-94	Max. (pCi/L)	6	**510**	**28**
	Time of Peak (yr)		2,400	30,000
	Time of Initial Exceedance (yr)		280	2,000
Molydenum-93	Max. (pCi/L)	14	**3,300**	**64**
	Time of Peak (yr)		500	3,000
	Time of Initial Exceedance (yr)		280	2,000
Technetium-99	Max. (pCi/L)	900	**1,100**	31
	Time of Peak (yr)		240	880
	Time of Initial Exceedance (yr)		220	--
Tritium[7]	Max. (pCi/L)	20,000	**15,000**	1,700
	Time of Peak (yr)		76	92
	Time of Initial Exceedance (yr)		--	--
Silver-108m	Max. (pCi/L)	6	**600**	0.032
	Time of Peak (yr)		1,400	4,400
	Time of Initial Exceedance (yr)		620	--
Total Dose[5]	Max. (mrem/yr)	4	**560**	**85**
	Time of Peak (yr)		400	55,000
	Time of Initial Exceedance (yr)		220	1,300
Lead (stable)	Max. (pCi/L)	15	**17**	9.1
	Time of Peak (yr)		180,000	380,000
	Time of Initial Exceedance (yr)		90,000	--

Table 1 Notes:

1) Only constituents with at least one environmental exceedance are shown.
2) Only potassium-40 and molydenum-93 use the PRGs.
3) Shaded cells indicate a simulated exceedance of the MCL/PRG.
4) The maximum concentration and the time of peak values for nickel-63 are not provided for in the P-Reactor Bldg. (105-P) Complex ISD Alternative, because nickel-63 does not reach the groundwater under the P-Reactor Bldg. (105-P) Complex ISD Alternative.
5) Total dose includes contributions from modeled beta- and gamma-decaying radionuclides with a defined MCL (primarily carbon-14, chlorine-36, nickel-59, nickel-63, and technetium-99).
6) "-" = concentration less than 0.001 pCi/L, and "—" indicates no exceedance will occur.
7) Only considers tritium associated with the P-Reactor Building (105-P) Complex.

Table 2. Monitoring Wells for the P-Reactor Building (105-P) Complex ISD

Well Name	SRS Northing	SRS Easting	UTM East	UTM North	Longitude	Latitude	Status	Depth to Top of Screen (ft bls)	Depth to Bottom of Screen (ft bgs)	Screen Length (ft)	Total Depth (ft bgs)	Casing Size
PAO001DU	44097.03	64830.00	445790.253	3676639.284	-81.581797	33.229054	Installed in 2010	45	65	20	70	2-in
PRB001DU	43638.16	64681.72	445836.064	3676499.588	-81.581297	33.227796	Installed in 2011	50	70	20	75	2-in
PRB002DU	43843.19	64656.05	445792.970	3676545.493	-81.581762	33.228208	Installed in 2011	50	70	20	75	2-in
PRB003DU	43156.94	64855.26	445965.113	3676412.162	-81.579907	33.227014	Installed in 2011	50	70	20	75	2-in
PRB004DU	43805.97	65086.35	445905.650	3676613.490	-81.580557	33.228827	Installed in 2011	50	70	20	75	2-in
PRB005DU	44057.15	65095.79	445862.93	3676677.060	-81.581019	33.229398	Installed in 2011	50	70	20	75	2-in
PDB 2	43513.09	64743.09	445873.610	3676479.780	-81.580893	33.227620	Long-Term Monitoring	48.2	69.2	21	71.8	4-in
PDB 3	43542.20	64938.18	445916.450	3676521.940	-81.580436	33.228002	Long-Term Monitoring	48	69	21	71.4	4-in

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
1Q12PISD	PAO001DU	3/6/12	CALCIUM-41	555.35		U	U	63.47	pCi/L
1Q12PISD	PAO001DU	3/6/12	CARBON-14	28.70	61.50	U	U	1.79	pCi/L
1Q12PISD	PAO001DU	3/6/12	CARBON-14	28.00	59.80	U	U	0.84	pCi/L
2Q17PISD	PAO001DU	5/18/17	CARBON-14	35.10	74.50	U	U	-16.30	pCi/L
2Q17PISD	PAO001DU	5/18/17	CARBON-14	35.20	75.40	U	U	-7.88	pCi/L
1Q12PISD	PAO001DU	3/6/12	CHLORINE-36	134.00	266.00	U	U	-96.10	pCi/L
1Q12PISD	PAO001DU	3/6/12	CHLORINE-36	140.00	282.00	U	U	-30.60	pCi/L
2Q17PISD	PAO001DU	5/18/17	CHLORINE-36	89.60	195.00	U	U	36.60	pCi/L
2Q17PISD	PAO001DU	5/18/17	CHLORINE-36	84.30	186.00	U	U	56.20	pCi/L
1Q12PISD	PAO001DU	3/6/12	IODINE-129	0.47	0.99	U	U	-0.21	pCi/L
2Q17PISD	PAO001DU	5/18/17	IODINE-129	0.68	1.28	U	U	0.24	pCi/L
2Q17PISD	PAO001DU	5/18/17	IODINE-129	0.90	1.75	U	U	0.22	pCi/L
1Q12PISD	PAO001DU	3/6/12	LEAD	5.00	20.00	U	U	20.00	µg/L
1Q12PISD	PAO001DU	3/6/12	LEAD	25.00	100.00	U	U	100.00	µg/L
1Q12PISD	PAO001DU	3/6/12	MOLYBDENUM-93	5.50		U	U	1.11	pCi/L
1Q12PISD	PAO001DU	3/6/12	NICKEL-59	32.10	71.70	U	U	-37.20	pCi/L
1Q12PISD	PAO001DU	3/6/12	NICKEL-63	7.27	15.90	U	U	3.43	pCi/L
1Q12PISD	PAO001DU	3/6/12	NICKEL-63	7.00	15.20	U	U	2.20	pCi/L
1Q12PISD	PAO001DU	3/6/12	NIOBIUM-94	4.07	8.39	U	U	0.85	pCi/L
1Q12PISD	PAO001DU	3/6/12	NIOBIUM-94	5.08	10.70	U	U	-0.01	pCi/L
1Q12PISD	PAO001DU	3/6/12	POTASSIUM-40	57.00	119.00	U	U	20.80	pCi/L
1Q12PISD	PAO001DU	3/6/12	POTASSIUM-40	53.00	141.00	U	U	2.19	pCi/L
1Q12PISD	PAO001DU	3/6/12	SILVER-108 METASTABLE	4.81	10.10	U	U	-0.43	pCi/L
1Q12PISD	PAO001DU	3/6/12	SILVER-108 METASTABLE	3.49	7.89	U	U	-3.09	pCi/L
1Q12PISD	PAO001DU	3/6/12	TECHNETIUM-99	96.80	207.00	U	U	-1.59	pCi/L
1Q12PISD	PAO001DU	3/6/12	TECHNETIUM-99	97.80	208.00	U	U	-12.20	pCi/L

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results (continued)

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
2Q17PISD	PAO001DU	5/18/17	TECHNETIUM-99	15.10	32.50	U	U	-3.28	pCi/L
2Q17PISD	PAO001DU	5/18/17	TECHNETIUM-99	15.30	33.00	U	U	-0.78	pCi/L
1Q12PISD	PAO001DU	3/6/12	TRITIUM	0.36	0.94			1.97	pCi/mL
1Q12PISD	PAO001DU	3/6/12	TRITIUM	0.35	0.93			2.14	pCi/mL
2Q17PISD	PAO001DU	5/18/17	TRITIUM	0.51	1.35			1.57	pCi/mL
2Q17PISD	PAO001DU	5/18/17	TRITIUM	0.51	1.35			1.64	pCi/mL
1Q12PISD	PDB 2	3/6/12	CALCIUM-41	67.80		U	U	-4.52	pCi/L
1Q12PISD	PDB 2	3/6/12	CALCIUM-41	54.79		U	U	11.48	pCi/L
1Q12PISD	PDB 2	3/6/12	CARBON-14	11.50	24.30	U	U	-2.96	pCi/L
1Q12PISD	PDB 2	3/6/12	CARBON-14	11.10	23.90	U	U	1.77	pCi/L
2Q17PISD	PDB 2	5/17/17	CARBON-14	35.10	75.50	U	U	-2.92	pCi/L
1Q12PISD	PDB 2	3/6/12	CHLORINE-36	138.00	291.00	U	U	17.80	pCi/L
1Q12PISD	PDB 2	3/6/12	CHLORINE-36	135.00	292.00	U	U	51.50	pCi/L
2Q17PISD	PDB 2	5/17/17	CHLORINE-36	81.70	176.00	U	U	9.94	pCi/L
1Q12PISD	PDB 2	3/6/12	IODINE-129	0.26	0.51	U	U	-0.01	pCi/L
1Q12PISD	PDB 2	3/6/12	IODINE-129	0.39	0.83	U	U	0.10	pCi/L
2Q17PISD	PDB 2	5/17/17	IODINE-129	0.81	1.80	UJ	UJ	-0.02	pCi/L
1Q12PISD	PDB 2	3/6/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PDB 2	3/6/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PDB 2	3/6/12	MOLYBDENUM-93	1.05		U	U	0.20	pCi/L
1Q12PISD	PDB 2	3/6/12	MOLYBDENUM-93	1.27		U	U	-0.51	pCi/L
1Q12PISD	PDB 2	3/6/12	NICKEL-59	52.00	112.00	U	U	-19.20	pCi/L
1Q12PISD	PDB 2	3/6/12	NICKEL-59	58.20	126.00	U	U	-23.50	pCi/L
1Q12PISD	PDB 2	3/6/12	NICKEL-63	6.83	15.10	U	U	5.90	pCi/L
1Q12PISD	PDB 2	3/6/12	NICKEL-63	7.09	15.40	U	U	2.22	pCi/L
1Q12PISD	PDB 2	3/6/12	NIOBIUM-94	4.61	9.67	U	U	-0.94	pCi/L

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results (continued)

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
1Q12PISD	PDB 2	3/6/12	NIOBIUM-94	4.36	9.32	U	U	-0.79	pCi/L
1Q12PISD	PDB 2	3/6/12	POTASSIUM-40	67.90	132.00	U	U	13.30	pCi/L
1Q12PISD	PDB 2	3/6/12	POTASSIUM-40	69.80	141.00	U	U	-12.90	pCi/L
1Q12PISD	PDB 2	3/6/12	SILVER-108 METASTABLE	4.24	8.66	U	U	0.92	pCi/L
1Q12PISD	PDB 2	3/6/12	SILVER-108 METASTABLE	4.85	9.79	U	U	1.91	pCi/L
1Q12PISD	PDB 2	3/6/12	TECHNETIUM-99	100.00	212.00	U	U	-14.10	pCi/L
1Q12PISD	PDB 2	3/6/12	TECHNETIUM-99	102.00	217.00	U	U	-1.67	pCi/L
2Q17PISD	PDB 2	5/17/17	TECHNETIUM-99	17.50	37.90	U	U	0.38	pCi/L
1Q12PISD	PDB 2	3/6/12	TRITIUM	0.35	2.02			30.20	pCi/mL
1Q12PISD	PDB 2	3/6/12	TRITIUM	0.35	2.04			30.80	pCi/mL
2Q17PISD	PDB 2	5/17/17	TRITIUM	1.00	27.60			682.00	pCi/mL
1Q12PISD	PDB 3	3/6/12	CALCIUM-41	70.95		U	U	15.84	pCi/L
1Q12PISD	PDB 3	3/6/12	CARBON-14	11.30	23.70	U	U	-3.26	pCi/L
2Q17PISD	PDB 3	5/17/17	CARBON-14	35.20	75.60	U	U	-3.48	pCi/L
1Q12PISD	PDB 3	3/6/12	CHLORINE-36	135.00	268.00	U	U	-20.50	pCi/L
2Q17PISD	PDB 3	5/17/17	CHLORINE-36	79.30	176.00	U	U	68.10	pCi/L
1Q12PISD	PDB 3	3/6/12	IODINE-129	0.45	0.94	U	U	0.16	pCi/L
2Q17PISD	PDB 3	5/17/17	IODINE-129	0.80	1.47	UJ	UJ	0.29	pCi/L
1Q12PISD	PDB 3	3/6/12	LEAD	0.50	2.00	J	J	1.48	µg/L
1Q12PISD	PDB 3	3/6/12	MOLYBDENUM-93	1.26		U	U	-0.10	pCi/L
1Q12PISD	PDB 3	3/6/12	NICKEL-59	28.00	60.20	U	U	-5.00	pCi/L
1Q12PISD	PDB 3	3/6/12	NICKEL-63	7.70	17.00	U	U	6.35	pCi/L
1Q12PISD	PDB 3	3/6/12	NIOBIUM-94	4.87	10.10	U	U	-0.15	pCi/L
1Q12PISD	PDB 3	3/6/12	POTASSIUM-40	43.60	133.00	U	U	18.10	pCi/L
1Q12PISD	PDB 3	3/6/12	SILVER-108 METASTABLE	4.89	9.95	U	U	1.85	pCi/L
1Q12PISD	PDB 3	3/6/12	TECHNETIUM-99	98.80	211.00	U	U	3.02	pCi/L

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results (continued)

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
2Q17PISD	PDB 3	5/17/17	TECHNETIUM-99	23.30	49.90	U	U	-8.35	pCi/L
1Q12PISD	PDB 3	3/6/12	TRITIUM	0.35	1.30			8.33	pCi/mL
2Q17PISD	PDB 3	5/17/17	TRITIUM	0.51	1.19	J	J	0.65	pCi/mL
1Q12PISD	PRB001DU	3/6/12	CALCIUM-41	209.93		U	U	98.21	pCi/L
1Q12PISD	PRB001DU	3/6/12	CARBON-14	11.20	23.70	U	U	-1.79	pCi/L
2Q17PISD	PRB001DU	5/17/17	CARBON-14	35.10	74.70	U	U	-13.10	pCi/L
1Q12PISD	PRB001DU	3/6/12	CHLORINE-36	140.00	297.00	U	U	26.60	pCi/L
2Q17PISD	PRB001DU	5/17/17	CHLORINE-36	88.40	196.00	U	U	67.10	pCi/L
1Q12PISD	PRB001DU	3/6/12	IODINE-129	0.28	0.58	U	U	-0.04	pCi/L
2Q17PISD	PRB001DU	5/17/17	IODINE-129	0.96	1.74	UJ	UJ	0.20	pCi/L
1Q12PISD	PRB001DU	3/6/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PRB001DU	3/6/12	MOLYBDENUM-93	2.23		U	U	0.17	pCi/L
1Q12PISD	PRB001DU	3/6/12	NICKEL-59	47.70	99.70	U	U	-1.86	pCi/L
1Q12PISD	PRB001DU	3/6/12	NICKEL-63	7.15	15.80	U	U	6.18	pCi/L
1Q12PISD	PRB001DU	3/6/12	NIOBIUM-94	4.82	9.54	U	U	3.13	pCi/L
1Q12PISD	PRB001DU	3/6/12	POTASSIUM-40	47.30	115.00	U	U	-33.30	pCi/L
1Q12PISD	PRB001DU	3/6/12	SILVER-108 METASTABLE	3.76	7.80	U	U	1.16	pCi/L
1Q12PISD	PRB001DU	3/6/12	TECHNETIUM-99	100.00	216.00	U	U	14.20	pCi/L
2Q17PISD	PRB001DU	5/17/17	TECHNETIUM-99	15.10	32.50	U	U	-1.22	pCi/L
1Q12PISD	PRB001DU	3/6/12	TRITIUM	0.44	2.17			25.00	pCi/mL
2Q17PISD	PRB001DU	5/17/17	TRITIUM	0.60	1.45	J	J	1.00	pCi/mL
1Q12PISD	PRB002DU	3/6/12	CALCIUM-41	100.18		U	U	-67.02	pCi/L
1Q12PISD	PRB002DU	3/6/12	CARBON-14	11.30	24.20	U	U	0.34	pCi/L
2Q17PISD	PRB002DU	5/17/17	CARBON-14	35.20	76.20	U	U	5.63	pCi/L
1Q12PISD	PRB002DU	3/6/12	CHLORINE-36	139.00	277.00	U	U	-19.10	pCi/L
2Q17PISD	PRB002DU	5/17/17	CHLORINE-36	86.10	190.00	U	U	55.80	pCi/L

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results (continued)

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
1Q12PISD	PRB002DU	3/6/12	IODINE-129	0.29	0.58	U	U	-0.03	pCi/L
2Q17PISD	PRB002DU	5/17/17	IODINE-129	0.76	1.44	UJ	UJ	-0.07	pCi/L
1Q12PISD	PRB002DU	3/6/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PRB002DU	3/6/12	MOLYBDENUM-93	1.62		U	U	-1.34	pCi/L
1Q12PISD	PRB002DU	3/6/12	NICKEL-59	48.50	100.00	U	U	-4.82	pCi/L
1Q12PISD	PRB002DU	3/6/12	NICKEL-63	7.54	16.50	U	U	4.44	pCi/L
1Q12PISD	PRB002DU	3/6/12	NIOBIUM-94	3.76	7.96	U	U	0.01	pCi/L
1Q12PISD	PRB002DU	3/6/12	POTASSIUM-40	58.10	123.00	U	U	0.96	pCi/L
1Q12PISD	PRB002DU	3/6/12	SILVER-108 METASTABLE	3.14	6.94	U	U	-2.05	pCi/L
1Q12PISD	PRB002DU	3/6/12	TECHNETIUM-99	101.00	218.00	U	U	23.70	pCi/L
2Q17PISD	PRB002DU	5/17/17	TECHNETIUM-99	14.80	31.80	U	U	-4.04	pCi/L
1Q12PISD	PRB002DU	3/6/12	TRITIUM	0.36	2.84			66.50	pCi/mL
2Q17PISD	PRB002DU	5/17/17	TRITIUM	0.50	2.64			17.60	pCi/mL
1Q12PISD	PRB003DU	3/7/12	CALCIUM-41	89.72		U	U	76.98	pCi/L
1Q12PISD	PRB003DU	3/7/12	CARBON-14	11.40	24.60	U	U	3.08	pCi/L
2Q17PISD	PRB003DU	5/17/17	CARBON-14	35.10	76.10	U	U	6.63	pCi/L
1Q12PISD	PRB003DU	3/7/12	CHLORINE-36	100.00	202.00	U	U	1.42	pCi/L
2Q17PISD	PRB003DU	5/17/17	CHLORINE-36	80.40	176.00	U	U	38.00	pCi/L
1Q12PISD	PRB003DU	3/7/12	IODINE-129	0.38	0.80	U	U	0.12	pCi/L
2Q17PISD	PRB003DU	5/17/17	IODINE-129	0.78	1.60	UJ	UJ	0.08	pCi/L
1Q12PISD	PRB003DU	3/7/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PRB003DU	3/7/12	MOLYBDENUM-93	1.48		U	U	0.10	pCi/L
1Q12PISD	PRB003DU	3/7/12	NICKEL-59	52.90	108.00	U	U	11.90	pCi/L
1Q12PISD	PRB003DU	3/7/12	NICKEL-63	6.44	14.10	U	U	3.03	pCi/L
1Q12PISD	PRB003DU	3/7/12	NIOBIUM-94	3.53	7.71	U	U	-1.49	pCi/L
1Q12PISD	PRB003DU	3/7/12	POTASSIUM-40	53.60	105.00	U	U	28.30	pCi/L

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results (continued)

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
1Q12PISD	PRB003DU	3/7/12	SILVER-108 METASTABLE	3.74	7.80	U	U	1.31	pCi/L
1Q12PISD	PRB003DU	3/7/12	TECHNETIUM-99	98.30	213.00	U	U	29.30	pCi/L
2Q17PISD	PRB003DU	5/17/17	TECHNETIUM-99	16.20	34.90	U	U	-1.73	pCi/L
1Q12PISD	PRB003DU	3/7/12	TRITIUM	0.35	0.87			1.27	pCi/mL
2Q17PISD	PRB003DU	5/17/17	TRITIUM	0.69	1.52	U	U	0.43	pCi/mL
1Q12PISD	PRB004DU	3/7/12	CALCIUM-41	107.88		U	U	-67.96	pCi/L
1Q12PISD	PRB004DU	3/7/12	CARBON-14	11.30	24.10	U	U	0.18	pCi/L
2Q17PISD	PRB004DU	5/17/17	CARBON-14	35.40	75.60	U	U	-10.40	pCi/L
1Q12PISD	PRB004DU	3/7/12	CHLORINE-36	134.00	260.00	U	U	-79.60	pCi/L
2Q17PISD	PRB004DU	5/17/17	CHLORINE-36	77.60	171.00	U	U	51.80	pCi/L
1Q12PISD	PRB004DU	3/7/12	IODINE-129	0.51	1.07	U	U	0.14	pCi/L
2Q17PISD	PRB004DU	5/17/17	IODINE-129	0.61	1.20	UJ	UJ	0.07	pCi/L
1Q12PISD	PRB004DU	3/7/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PRB004DU	3/7/12	MOLYBDENUM-93	1.78		U	U	0.21	pCi/L
1Q12PISD	PRB004DU	3/7/12	NICKEL-59	47.80	101.00	U	U	-7.17	pCi/L
1Q12PISD	PRB004DU	3/7/12	NICKEL-63	6.79	15.10	U	U	6.67	pCi/L
1Q12PISD	PRB004DU	3/7/12	NIOBIUM-94	3.83	8.11	U	U	-1.10	pCi/L
1Q12PISD	PRB004DU	3/7/12	POTASSIUM-40	66.20	131.00	U	U	-3.24	pCi/L
1Q12PISD	PRB004DU	3/7/12	SILVER-108 METASTABLE	3.86	8.44	U	U	-1.54	pCi/L
1Q12PISD	PRB004DU	3/7/12	TECHNETIUM-99	94.60	204.00	U	U	17.80	pCi/L
2Q17PISD	PRB004DU	5/17/17	TECHNETIUM-99	15.10	32.70	U	U	0.93	pCi/L
1Q12PISD	PRB004DU	3/7/12	TRITIUM	0.52	2.10			16.20	pCi/mL
2Q17PISD	PRB004DU	5/17/17	TRITIUM	0.62	1.34	U	U	0.26	pCi/mL
1Q12PISD	PRB005DU	3/7/12	CALCIUM-41	81.81		U	U	-53.10	pCi/L
1Q12PISD	PRB005DU	3/7/12	CALCIUM-41	150.07		U	U	13.47	pCi/L
1Q12PISD	PRB005DU	3/7/12	CARBON-14	11.20	23.80	U	U	-0.72	pCi/L

Table 3. P-Reactor Building (105-P) Complex ISD Monitoring Results (continued/end)

SAMPLE EVENT	STATION	DATE	ANALYTE	MDL	SQL	LAB QUALIFIER	REVIEW QUALIFIER	RESULT	UNITS
2Q17PISD	PRB005DU	5/17/17	CARBON-14	35.10	75.50	U	U	-1.82	pCi/L
2Q17PISD	PRB005DU	5/17/17	CARBON-14	28.90	62.30	U	U	-7.42	pCi/L
1Q12PISD	PRB005DU	3/7/12	CHLORINE-36	138.00	266.00	U	U	-41.40	pCi/L
2Q17PISD	PRB005DU	5/17/17	CHLORINE-36	76.80	170.00	U	U	56.80	pCi/L
2Q17PISD	PRB005DU	5/17/17	CHLORINE-36	86.60	191.00	U	U	54.90	pCi/L
1Q12PISD	PRB005DU	3/7/12	IODINE-129	0.53	1.14	U	U	-0.03	pCi/L
2Q17PISD	PRB005DU	5/17/17	IODINE-129	1.14	2.54	UJ	UJ	-0.07	pCi/L
2Q17PISD	PRB005DU	5/17/17	IODINE-129	1.13	2.09	UJ	UJ	0.12	pCi/L
1Q12PISD	PRB005DU	3/7/12	LEAD	0.50	2.00	U	U	2.00	µg/L
1Q12PISD	PRB005DU	3/7/12	MOLYBDENUM-93	2.17		U	UJ	0.21	pCi/L
1Q12PISD	PRB005DU	3/7/12	MOLYBDENUM-93	1.49		U	U	-0.01	pCi/L
1Q12PISD	PRB005DU	3/7/12	NICKEL-59	54.60	112.00	U	U	9.15	pCi/L
1Q12PISD	PRB005DU	3/7/12	NICKEL-63	6.95	15.40	U	U	6.27	pCi/L
1Q12PISD	PRB005DU	3/7/12	NIOBIUM-94	4.66	9.74	U	U	0.29	pCi/L
1Q12PISD	PRB005DU	3/7/12	POTASSIUM-40	74.40	158.00	U	U	-1.78	pCi/L
1Q12PISD	PRB005DU	3/7/12	SILVER-108 METASTABLE	3.61	7.89	U	U	-1.10	pCi/L
1Q12PISD	PRB005DU	3/7/12	TECHNETIUM-99	95.70	207.00	U	U	20.90	pCi/L
2Q17PISD	PRB005DU	5/17/17	TECHNETIUM-99	14.50	31.30	U	U	0.15	pCi/L
2Q17PISD	PRB005DU	5/17/17	TECHNETIUM-99	16.40	35.40	U	U	-0.97	pCi/L
1Q12PISD	PRB005DU	3/7/12	TRITIUM	0.35	0.85			1.02	pCi/mL
2Q17PISD	PRB005DU	5/17/17	TRITIUM	0.51	1.23	J	J	0.88	pCi/mL

Table 3 Notes:

1) MDL = Method Detection Limit.
2) SQL = Sample Quantitation Limit.
3) Lab Qual = Laboratory result qualifier.
4) J = Analyte detected but result quantification has greater than usual uncertainty.
5) U = Analyte not detected above the MDL.
6) pCi/L = picocuries per liter.
7) pCi/mL = picocuries per milliliter.

Table 4. Methods and SQLs for P-Reactor Building (105-P) Complex ISD Analyses

Analyte	Analyte ID	Preparation Method	Analytical Method	SQL[1]
Tritium	10028-17-8		EPA906.0MOD, RAD002	5 pCi/mL
Carbon-14	14762-75-5		RADA-003	100 pCi/L
Chlorine-36	13981-43-6		RADA-033	300 pCi/L
Technetium-99	14133-76-7		RADA-005	50 pCi/L

Table 4 Notes:

1) SQL = The achievable sample quantitation limit (SQL) based on the 2012 and 2017 P-Reactor Building (105-P) Complex ISD sample events.
2) pCi/L = picocuries per liter.
3) pCi/mL = picocuries per milliliter.

Table 5. Sample Hold Times, Preservatives, and Sample Containers

Analyte	Preservative	Holding Time	Containers
Tritium	None	6 months	1x 250 mL Amber Glass bottle
Carbon-14	Cold (4 +/- 2 ºC)	6 months	3 x 1 L Amber Nalgene
Chlorine-36	HNO_3 to pH <2.	6 months	2 L HDPE
Technetium-99	HNO_3 to pH <2.	6 months	2 L HDPE

Table 5 Notes:

1) mL = milliliter.
2) HNO_3 = Nitric Acid
3) HDPE = high density polyethylene
4) L = liter.
5) ºC = degrees Celsius.

Table 6. Sampling Matrix Table

Station Count	Monitoring Type	Station ID	Screen Top Elevation *(ft msl)*	Screen Bottom Elevation *(ft msl)*	Aquifer Zone	Analyses
1	P-Reactor Bldg. (105-P) Complex ISD	PAO001DU	272.0	252.0	TZ	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
2	P-Reactor Bldg. (105-P) Complex ISD	PDB 2	268.7	247.7	A/AA	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
3	P-Reactor Bldg. (105-P) Complex ISD	PDB 3	269.1	248.1	A/AA	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
4	P-Reactor Bldg. (105-P) Complex ISD	PRB001DU	267.0	246.9	A/AA	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
5	P-Reactor Bldg. (105-P) Complex ISD	PRB002DU	266.8	246.8	TZ	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
6	Background P-Reactor Bldg. (105-P) Complex ISD	PRB003DU	267.5	247.4	A/AA	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
7	P-Reactor Bldg. (105-P) Complex ISD	PRB004DU	266.3	246.3	A/AA	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.
8	P-Reactor Bldg. (105-P) Complex ISD	PRB005DU	266.1	246.1	TZ	Field parameters, Carbon-14, Chlorine-36, Technetium-99 and Tritium.

Table 6 Notes:

1) ft msl = feet above mean sea level
2) ISD = In-Situ Decommissioning
3) TZ = Transmissive Zone within the Upper Aquifer Zone of the Upper Three Runs Aquifer.
4) A/AA = A Horizon/AA Horizon within the Upper Aquifer Zone of the Upper Three Runs Aquifer.

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