



**Addendum to the Site Evaluation Report for the Spill on
2/1/57 of Unknown of Seepage Basin Pipe Leak from 904-
44G (NBN) (WSRC-RP-2003-4049, Revision 0, June 2003)
(U)**

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

LIST OF ACRONYMS AND ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
COPC	constituent of potential concern
EN	essential nutrient
EPC	exposure point concentration
FFA	Federal Facility Agreement
ft	feet
ft ²	square feet
GPR	ground penetrating radar
<u>GSA</u>	<u>General Separations Area</u>
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HWMF	hazardous waste management facility
ISOCS	in situ object counting system
LLC	limited liability company
m	meter
m ²	square meter
mg/kg	milligrams per kilogram
NA	not applicable
NBN	no building number
ND	non-detect
O&M	operations and maintenance
pCi/g	picoCuries per gram
pCi/L	picoCuries per liter
pCi/mL	picoCuries per milliliter
PCB	polychlorinated biphenyl
POC	point of compliance
PRG	preliminary remediation goal
PTSM	principal threat source material
RBA	risk-based activity
RCOC	refined constituent of concern
RCRA	Resource Conservation and Recovery Act
RME	reasonable maximum exposure
ROD	record of decision
RSL	regional screening level
SCDES ¹	South Carolina Department of Environmental Services
SE	site evaluation
SER	site evaluation report

¹ South Carolina Department of Environmental Services (SCDES) was previously known as South Carolina Department of Health and Environmental Control prior to July 1, 2024.

LIST OF ACRONYMS AND ABBREVIATIONS (*continued*)

SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
UCL	upper confidence limit
URMA	underground radioactive material area
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WSRC	Westinghouse Savannah River Company

background samples. A total of 55 samples were collected. A map of the sampling locations from the SER (WSRC 2003) is shown in Figure 3.

A review of the analytical results for these constituents indicated that arsenic, iron, 13 radiological isotopes, gross alpha, and nonvolatile beta were in soil samples at concentrations above the USEPA Region IX residential preliminary remediation goals (PRGs) or SRS risk-based activities (RBAs)². The USDOE believes that the arsenic exceedances are naturally occurring or due to pre-SRS farming activities. The iron exceedances are naturally occurring. The majority of the radiological exceedances are naturally occurring or a result of atmospheric deposition from nuclear bomb testing. However, the radiological exceedances at sample location HSB1-04 are believed to be the result of the liquid effluent from Seepage Basin 904-44G seeping through the side berm at this location. Sample location HSB1-04 is the closest location to the release area and is 8.2 m (27 ft) from the fence surrounding Seepage Basin 904-44G (Figure 4).

Of the 13 radiological isotopes that were detected in soil samples above their RBAs, six (actinium-228, bismuth-214, lead-212, lead-214, potassium-40, and thallium-208) are naturally occurring isotopes that are decay products of uranium or thorium with half-lives of fewer than 24 hours (USDOE 1996). These isotopes are not a result of SRS operations. This is supported by the fact that most of the exceedances (272 out of 281) are less than twice the site-specific background mean from the up-gradient background locations at the corresponding depth.

Six of the remaining seven isotope exceedances (americium-241, cobalt-60, plutonium-239/240, uranium-233/234, uranium-235, and uranium-238), as well as the gross alpha and nonvolatile beta exceedances, were detected at concentrations above their residential RBAs at sample location HSB1-04 only. All of these isotopes were in use at SRS as either reactor fuel or isotopes produced in the reactors (WSRC 1996) and were present in the seepage basin effluent. The presence of these isotopes at a single location suggests that these exceedances are the result of a release of seepage basin water at this location.

The remaining radiological isotope (cesium-137) is produced from nuclear fission. Approximately 35 million curies of cesium-137 were released into the atmosphere during nuclear bomb testing.

² USEPA Region IX PRGs (nonrads) and SRS RBAs (rads) are risk-based thresholds that were current at the time of the SER publication in 2003. Current nomenclature uses USEPA regional screening levels (RSLs) for nonrads and USEPA PRGs for rads.

Most of these releases have been deposited to the earth as fallout (USDOE 1996). All of the exceedances, with the exception of the two exceedances found at sample location HSB1-04, are most likely anomalies caused by atmospheric deposition from nuclear bomb testing. This is supported by the fact that the exceedances are scattered throughout the 904-44G spill release area including all three of the up-gradient background locations. Also, the samples did not contain other isotopes such as antimony-125, cobalt-60, or europium, which would typically be present in samples as a result of spill materials from SRS separations facilities. However, the two exceedances found at sample location HSB1-04 are most likely the result of a release of seepage basin water, since they do contain the isotopes which would typically be present as a result of spill materials from SRS separations facilities.

Based on these findings, the 2003 SER recommended that the Spill on 2/01/57 of Unknown of Seepage Basin Pipe Leak from 904-44G (NBN) be removed from Appendix G.1, *Areas to Be Investigated*, and transferred to Appendix C, *RCRA/CERCLA Units*, for further evaluation and action, as needed. The 904-44G spill release area was transferred to Appendix C in 2003.

4.0 SUPPLEMENTAL DATA EVALUATION

This evaluation uses the definitive quality level data for soil samples collected in 2002 for the 904-44G spill release area but updates the risk information with decay-corrected data and current risk threshold criteria described in more detail below. Appendix H of the SER provides all analytical results and a data screening summary of constituents that were above the risk-based screening thresholds that were in effect at the time the SER was published in 2003. The maximum detected concentrations/activities in the 0 to 0.3 m (0 to 1 ft) and 0.3 m to 1.2 m (1 to 4 ft) soil intervals are summarized in Tables 1 and 2 respectively. The output from the ProUCL software (version 5.2) (USEPA 2022) for each analyte is summarized in Table 1 for the 0 to 0.3 m (0 to 1 ft) interval.

The half-life of cesium-137 is 30.1 years and the half-life of cobalt-60 is 5.3 years. Since the data presented in the SER was collected and analyzed in 2002, the activities of these two isotopes were adjusted to acknowledge their decay over the last 21 years to provide a more accurate data evaluation that is representative of current conditions. Therefore, the original analytical results were adjusted assuming a laboratory analysis date of September 1, 2002, and a decay-corrected

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Table 1. Maximum Detected Concentrations at 904-44G Spill Release Area (0-1 ft interval)

Sample Location	Analyte	Analytical Method	Qualifier	95% UCL	DISTR Code	UCL Method	Max Result	Result Units	Top Sample Interval (ft)	Bottom Sample Interval (ft)
HSB1-14	ALUMINUM	EPA6010B		1.85E+04	N	1	2.86E+04	mg/kg	0	1
HSB1-19	ANTIMONY	EPA6010B	J	1.03E+00	N	2	1.75E+00	mg/kg	0	1
HSB1-09	ARSENIC	EPA6010B		3.42E+00	N	2	5.41E+00	mg/kg	0	1
HSB1-04	BARIUM	EPA6010B		3.06E+01	N	1	4.72E+01	mg/kg	0	1
HSB1-15	CALCIUM	EPA6010B		6.19E+02	G	3	1.41E+03	mg/kg	0	1
HSB1-09	CHROMIUM	EPA6010B	J	2.40E+01	N	1	3.59E+01	mg/kg	0	1
HSB1-18	COBALT	EPA6010B	J	1.00E+00	N	2	1.44E+00	mg/kg	0	1
HSB1-09	COPPER	EPA6010B	J	3.80E+00	N	2	7.48E+00	mg/kg	0	1
HSB1-09	IRON	EPA6010B		1.81E+04	N	1	2.91E+04	mg/kg	0	1
HSB1-25	LEAD	EPA6010B		2.02E+01	N	1	6.78E+01	mg/kg	0	1
HSB1-04	MAGNESIUM	EPA6010B		3.24E+02	N	1	7.98E+02	mg/kg	0	1
HSB1-04	MANGANESE	EPA6010B		1.08E+02	N	1	2.87E+02	mg/kg	0	1
HSB1-13	NICKEL	EPA6010B	J	4.12E+00	N	2	6.14E+00	mg/kg	0	1
HSB1-04	POTASSIUM	EPA6010B		2.06E+02	G	3	5.29E+02	mg/kg	0	1
HSB1-09	VANADIUM	EPA6010B		4.12E+01	N	1	6.87E+01	mg/kg	0	1
HSB1-09	ZINC	EPA6010B		2.15E+01	N	1	3.57E+01	mg/kg	0	1
HSB1-13	MERCURY	EPA7471A		6.07E-02	N	1	1.32E-01	mg/kg	0	1
HSB1-05	DDE	EPA8081A		2.83E-03	X	2	4.92E-03	mg/kg	0	1
HSB1-05	DDT	EPA8081A		2.84E-03	X	2	2.16E-03	mg/kg	0	1
HSB1-25	1,1-DICHLOROETHYLENE	EPA8260B		--	--	--	1.22E-03	mg/kg	0	1
HSB1-26	DICHLOROMETHANE (METHYLENE CHLORIDE)	EPA8260B	J	6.04E-04	N	2	1.09E-03	mg/kg	0	1
HSB1-16	STYRENE	EPA8260B	J	2.40E-04	X	2	8.29E-04	mg/kg	0	1
HSB1-04	TOLUENE	EPA8260B	J	4.97E-04	N	2	9.38E-04	mg/kg	0	1
HSB1-26	BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	EPA8270C		3.71E-01	N	2	1.22E+00	mg/kg	0	1
HSB1-04	STRONTIUM-90	RADA-004	J	--	--	--	1.70E+00	pCi/g	0	1
HSB1-04	URANIUM-233/234	RADA-011		--	--	--	9.22E-01	pCi/g	0	1
HSB1-04	URANIUM-238	RADA-011		6.28E-01	N	2	1.22E+00	pCi/g	0	1
HSB1-23	ACTINIUM-228	RADA-013		1.75E+00	N	1	3.73E+00	pCi/g	0	1
HSB1-04	BISMUTH-214	RADA-013		5.04E-01	N	2	9.77E-01	pCi/g	0	1
HSB1-04	CESIUM-137 ¹	RADA-013		6.96E-01	L	2	1.00E+01	pCi/g	0	1
HSB1-23	LEAD-212	RADA-013		1.49E+00	N	1	3.22E+00	pCi/g	0	1
HSB1-04	LEAD-214	RADA-013		6.28E-01	N	2	1.06E+00	pCi/g	0	1
HSB1-04	POTASSIUM-40	RADA-013		2.98E+00	G	3	9.52E+00	pCi/g	0	1
HSB1-23	THALLIUM-208	RADA-013		5.73E-01	N	1	1.24E+00	pCi/g	0	1

Distribution Code:

N - Normal Distribution G - Gamma Distribution
L - Lognormal Distribution X - Non-Parametric

UCL Method Code: (as determined by ProUCL)

- 1) Student's t UC
- 2) Kaplan-Meier (KM) t UCL
- 3) Adjusted Gamma UCL
- 4) KM Approximate Gamma UCL
- 5) Hall's Bootstrap UC
- 6) Land's H-Statistic (H) UCL
- 7) KM Adjusted Gamma UCL
- 8) 95% Approximate Gamma UCL
- 9) 95% H-UCL (KM-log)

1 Cs137 95% UCL EPC calculated using data that has been decay-adjusted to September 1, 2023 as shown in Table 3.
UCL = Upper Confidence Limit

Table 2. Maximum Detected Concentrations at 904-44G Spill Release Area (1-4 ft interval)

SAMPLE LOCATION	ANALYTE	ANALYTICAL METHOD	QUALIFIER	RESULT	RESULT UNITS	TOP SAMPLE INTERVAL	BOTTOM SAMPLE INTERVAL
HSB1-07	ALUMINUM	EPA6010B		35200	mg/kg	1	4
HSB1-19	ANTIMONY	EPA6010B	J	1.63	mg/kg	1	4
HSB1-13	ARSENIC	EPA6010B		7.52	mg/kg	1	4
HSB1-24	BARIUM	EPA6010B		58.4	mg/kg	1	4
HSB1-09	CALCIUM	EPA6010B	J	1590	mg/kg	1	4
HSB1-10	CHROMIUM	EPA6010B	J	48.3	mg/kg	1	4
HSB1-21	COBALT	EPA6010B	J	1.57	mg/kg	1	4
HSB1-09	COPPER	EPA6010B	J	6.33	mg/kg	1	4
HSB1-09	IRON	EPA6010B		36300	mg/kg	1	4
HSB1-07	LEAD	EPA6010B		10.7	mg/kg	1	4
HSB1-19	MAGNESIUM	EPA6010B	J	232	mg/kg	1	4
HSB1-24	MANGANESE	EPA6010B	J	200	mg/kg	1	4
HSB1-22	NICKEL	EPA6010B	J	6.1	mg/kg	1	4
HSB1-24	POTASSIUM	EPA6010B		211	mg/kg	1	4
HSB1-09	SODIUM	EPA6010B	J	119	mg/kg	1	4
HSB1-09	VANADIUM	EPA6010B		88.9	mg/kg	1	4
HSB1-09	ZINC	EPA6010B		315	mg/kg	1	4
HSB1-04	MERCURY	EPA7471A		0.913	mg/kg	1	4
HSB1-04	1,1-DICHLOROETHYLENE	EPA8260B		0.00163	mg/kg	1	4
HSB1-10	ACETONE	EPA8260B	J	0.00192	mg/kg	1	4
HSB1-18	DICHLOROMETHANE (METHYLENE CHLORIDE)	EPA8260B	J	0.00302	mg/kg	1	4
HSB1--04	ETHYLBENZENE	EPA8260B	J	0.000363	mg/kg	1	4
HSB1-04	STYRENE	EPA8260B	J	0.000692	mg/kg	1	4
HSB1-04	TOLUENE	EPA8260B	J	0.00092	mg/kg	1	4
HSB1-15	XYLENES	EPA8260B	J	0.000254	mg/kg	1	4
HSB1-24	BENZALDEHYDE	EPA8270C	J	0.0553	mg/kg	1	4
HSB1-15	BIS(2-ETHYLHEXYL)PHTHALATE (DEHP)	EPA8270C	J	1.69	mg/kg	1	4
HSB1-23	CYANIDE	EPA9014	J	0.521	mg/kg	1	4
HSB1-04	STRONTIUM-90	RADA-004		4.81	pCi/g	1	4
HSB1-04	AMERICIUM-241	RADA-011		1.38	pCi/g	1	4
HSB1-04	PLUTONIUM-238	RADA-011	J	0.57	pCi/g	1	4
HSB1-04	PLUTONIUM-239/240	RADA-011		6.69	pCi/g	1	4
HSB1-04	URANIUM-233/234	RADA-011		17.4	pCi/g	1	4
HSB1-04	URANIUM-235	RADA-011		1.15	pCi/g	1	4
HSB1-04	URANIUM-238	RADA-011		18.9	pCi/g	1	4
HSB1-16	ACTINIUM-228	RADA-013		1.93	pCi/g	1	4
HSB1-16	BISMUTH-214	RADA-013		1.01	pCi/g	1	4
HSB1-04	CESIUM-137	RADA-013		22.6	pCi/g	1	4
HSB1-04	COBALT-60	RADA-013		0.0618	pCi/g	1	4
HSB1-16	LEAD-212	RADA-013		1.64	pCi/g	1	4
HSB1-16	LEAD-214	RADA-013		1.1	pCi/g	1	4
HSB1-18	POTASSIUM-40	RADA-013		2.66	pCi/g	1	4
HSB1-16	THALLIUM-208	RADA-013		0.648	pCi/g	1	4

Table 3. Decay-Adjusted Activities for Cesium-137 and Cobalt-60

SAMPLE LOCATION	ANALYTE	QUAL	ORIGINAL RESULT ¹ (pCi/g)	DECAY ADJUSTMENT FACTOR	DECAY-ADJUSTED RESULT ² (pCi/g)	INTERVAL (FT)
HSB1-04	CESIUM-137		10	0.616	6.16	0-1
HSB1-05	CESIUM-137		0.549	0.616	0.338184	0-1
HSB1-06	CESIUM-137		0.155	0.616	0.09548	0-1
HSB1-07	CESIUM-137		0.0797	0.616	0.0490952	0-1
HSB1-08	CESIUM-137		0.101	0.616	0.062216	0-1
HSB1-09	CESIUM-137		0.0902	0.616	0.0555632	0-1
HSB1-10	CESIUM-137		0.299	0.616	0.184184	0-1
HSB1-11	CESIUM-137		0.154	0.616	0.094864	0-1
HSB1-12	CESIUM-137		0.821	0.616	0.505736	0-1
HSB1-13	CESIUM-137		1.72	0.616	1.05952	0-1
HSB1-14	CESIUM-137		0.211	0.616	0.129976	0-1
HSB1-15	CESIUM-137		0.645	0.616	0.39732	0-1
HSB1-16	CESIUM-137		0.547	0.616	0.336952	0-1
HSB1-18	CESIUM-137	U	0.0219	NA ³	NA ³	0-1
HSB1-19	CESIUM-137		0.247	0.616	0.152152	0-1
HSB1-20	CESIUM-137		0.0757	0.616	0.0466312	0-1
HSB1-21	CESIUM-137		0.0489	0.616	0.0301224	0-1
HSB1-22	CESIUM-137		0.166	0.616	0.102256	0-1
HSB1-23	CESIUM-137		0.118	0.616	0.072688	0-1
HSB1-24	CESIUM-137		0.196	0.616	0.120736	0-1
HSB1-25	CESIUM-137		0.214	0.616	0.131824	0-1
HSB1-26	CESIUM-137		0.34	0.616	0.20944	0-1
HSB1-04	CESIUM-137		22.6	0.616	13.9216	1-4
HSB1-05	CESIUM-137	J	0.0204	0.616	0.0125664	1-4
HSB1-06	CESIUM-137	U	0.00684	NA ³	NA ³	1-4
HSB1-07	CESIUM-137	U	0.0147	NA ³	NA ³	1-4
HSB1-08	CESIUM-137	U	-0.000415	NA ³	NA ³	1-4
HSB1-09	CESIUM-137	U	-0.00221	NA ³	NA ³	1-4
HSB1-10	CESIUM-137	J	0.0371	0.616	0.0228536	1-4
HSB1-11	CESIUM-137	U	0.01	NA ³	NA ³	1-4
HSB1-12	CESIUM-137		0.0601	0.616	0.0370216	1-4
HSB1-13	CESIUM-137		0.047	0.616	0.028952	1-4
HSB1-14	CESIUM-137	U	-0.00144	NA ³	NA ³	1-4
HSB1-15	CESIUM-137	J	0.0434	0.616	0.0267344	1-4
HSB1-16	CESIUM-137	J	0.0371	0.616	0.0228536	1-4
HSB1-18	CESIUM-137	U	0.00079	NA ³	NA ³	1-4
HSB1-19	CESIUM-137	J	0.025	0.616	0.0154	1-4
HSB1-20	CESIUM-137	U	-0.0107	NA ³	NA ³	1-4
HSB1-21	CESIUM-137	U	-0.00262	NA ³	NA ³	1-4
HSB1-22	CESIUM-137	U	0.00124	NA ³	NA ³	1-4
HSB1-23	CESIUM-137	U	0.00697	NA ³	NA ³	1-4
HSB1-24	CESIUM-137	U	0.00115	NA ³	NA ³	1-4
HSB1-25	CESIUM-137	U	-0.00118	NA ³	NA ³	1-4
HSB1-26	CESIUM-137	U	0.00883	NA ³	NA ³	1-4
HSB1-04	COBALT-60 ⁴		0.0618	0.063	0.00389919	1-4

1 - Original Result assumes a laboratory analysis date of September 1, 2002.
 2 - Decay-Adjusted Result assumes a date of September 1, 2023.
 3 - NA = not applicable, nondetects (U-qualified) were not decay-adjusted.
 4 - Cobalt-60 had only 1 detect in the entire dataset (0-1 ft and 1-4 ft).

Table 4. Human Health COPC Screening for 904-44G Spill Release Area (0-1 ft)

Analyte	Maximum Concentration ¹	Qual	Human Health Screening Value	Human Health Screening Value Source ²	Exceeds Human Health Screening Value?	2X Average Background Concentration ³	Exceeds 2X Average Background ⁴	COPC ⁵
Inorganics (mg/kg)								
ALUMINUM	28600		7.7E+03	0.1xRSL	YES	1.05E+04	YES	YES
ANTIMONY	1.75	J	3.1E+00	0.1xRSL	NO	2.69E+00	NO	NO
ARSENIC	5.41		6.8E-01	RSL	YES	4.28E+00	YES	YES
BARIUM	47.2		1.5E+03	0.1xRSL	NO	3.91E+01	YES	NO
CALCIUM	1410		EN ⁶	Nutrient	NO	4.76E+02	YES	NO
CHROMIUM ⁷	35.9	J	3.0E-01	RSL	YES	1.54E+01	YES	YES
COBALT	1.44	J	2.3E+00	0.1xRSL	NO	1.55E+00	NO	NO
COPPER	7.48	J	3.1E+02	0.1xRSL	NO	4.34E+00	YES	NO
IRON	29100		5.5E+03	0.1xRSL	YES	1.27E+04	YES	YES
LEAD	67.8		4.0E+01	0.1xRSL	YES	1.03E+01	YES	YES
MAGNESIUM	798		EN ⁶	Nutrient	NO	2.75E+02	YES	NO
MANGANESE	287		1.8E+02	0.1xRSL	YES	1.53E+02	YES	YES
MERCURY	0.132		1.1E+00	0.1xRSL	NO	7.10E-02	YES	NO
NICKEL	6.14	J	1.5E+02	0.1xRSL	NO	3.48E+00	YES	NO
POTASSIUM	529		EN ⁶	Nutrient	NO	2.16E+02	YES	NO
VANADIUM	68.7		3.9E+01	0.1xRSL	YES	3.91E+01	YES	YES
ZINC	35.7		2.3E+03	0.1xRSL	NO	9.47E+00	YES	NO
Organics (mg/kg)								
1,1-DICHLOROETHYLENE	0.00122		2.3E+01	0.1xRSL	NO	--	--	NO
BIS(2-ETHYLHEXYL) PHTHALATE	1.22		3.9E+01	RSL	NO	--	--	NO
DICHLOROMETHANE (METHYLENE CHLORIDE)	0.00109	J	3.5E+01	0.1XRSL	NO	--	--	NO
STYRENE	0.000829	J	6.0E+02	0.1xRSL	NO	--	--	NO
TOLUENE	0.000938	J	4.9E+02	0.1xRSL	NO	--	--	NO
Pesticides/PCBs (mg/kg)								
DDE	0.00492		2.0E+00	RSL	NO	--	--	NO
DDT	0.00216		1.9E+00	RSL	NO	--	--	NO
Radionuclides (pCi/g)								
CESIUM-137 ⁸	6.16		6.1E-02	PRG	YES	0.28	YES	YES
POTASSIUM-40	9.52		1.4E-01	PRG	YES	2.33	YES	YES
STRONTIUM-90	1.7	J	4.2E+00	PRG	NO	0.75	YES	NO
THORIUM-232 ⁹	3.73		9.9E-03	PRG	YES	1.80	YES	YES
ACTINIUM-228	3.73		NA	NA	--	--	--	--
LEAD-212	3.22		NA	NA	--	--	--	--
THALLIUM-208	1.24		NA	NA	--	--	--	--
URANIUM-238 ¹⁰	1.22		1.3E-02	PRG	YES	1.01	YES	YES
URANIUM-233/234	0.922		NA	NA	--	--	--	--
LEAD-214	1.06		NA	NA	--	--	--	--
BISMUTH-214	0.977		NA	NA	--	--	--	--

1 Maximum detected concentration from 0-1 ft soil interval (HSB1-04 through HSB1-26) as identified in Table 1.
2 Nonradiological RSLs are default residential soil values from the EPA Regional Screening Levels Table (carcinogen RSL = 1; noncarcinogen RSL HQ = 0.1), dated May 2023. If a substance causes both cancer and noncancer effects, the more stringent criteria is used. Radiological PRGs are residential site-specific values derived using the EPA Preliminary Remediation Goals website calculator (dated February 2023) and eliminating the fruit and vegetable consumption pathways. All other inputs are default values.
3 Background screening values obtained from Background Soils Statistical Summary Report for Savannah River Site, ERD-EN-2005.0223, Rev. 1, 10/06, App. B.-1.
4 For screening purposes, maximum concentration of only the naturally-occurring (nonanthropogenic) constituents are compared to 2X average background concentration.
5 Constituents are identified as COPCs if the maximum detected concentration exceeds the human health screening value and the 2X average background concentration.
6 EN = essential nutrient, RSL not available for this constituent.
7 Chemical analysis for total chromium. A total chromium RSL is not available; hexavalent chromium RSL used as a conservative screen.
8 Cs137 original analytical result from September 2002 (10 pCi/g) was decay adjusted to September 2023 (6.16 pCi/g) as identified in Table 3.
9 Th232 was not measured directly in the laboratory. Ac228, Pb212 and Tl208 are daughter products of Th232 and can be used to estimate its activity since these isotopes are in secular equilibrium. The highest detected activity in the entire decay chain was used in this assessment. The daughter products are not screened separately since they are considered in the Th232 PRG for the entire decay chain.
10 U238 was measured directly in the laboratory. U234, Pb214 and Bi214 are daughter products of U238 and can be used to estimate its activity since these isotopes are in secular equilibrium. The highest detected activity in the entire decay chain was used in this assessment. The daughter products are not screened separately since they are considered in the U238 PRG for the entire decay chain.
NA = not applicable per footnotes 9 and 10 above.

Table 5. Residential Risk/Hazard Estimate for 904-44G Spill Release Area (0-1 ft)

Analyte ¹	Exposure Point Concentration ²	Residential RSL/PRG ³	Residential Hazard Estimate (HQ) ⁴ (unitless)	Residential Risk Estimate ⁵ (unitless)	COC? ⁶
Noncarcinogenic Hazard Estimate (mg/kg)					
ALUMINUM	1.85E+04	7.7E+04	2.41E-01	--	NO
IRON	1.81E+04	5.5E+04	3.28E-01	--	NO
ARSENIC	3.42E+00	3.5E+01	9.77E-02	--	NO
CHROMIUM ⁷	2.40E+01	2.3E+02	1.04E-01	--	NO
LEAD	2.02E+01	4.0E+02	5.05E-02	--	NO
MANGANESE	1.08E+02	1.8E+03	5.99E-02	--	NO
VANADIUM	4.12E+01	3.9E+02	1.06E-01	--	NO
Total Media Hazard Index (HI) =			9.87E-01		
Carcinogenic Risk Estimate (mg/kg)					
ARSENIC	3.42E+00	6.8E-01	--	5.0E-06	YES
CHROMIUM ⁷	2.40E+01	3.0E-01	--	8.0E-05	YES
Total Chemical Risk =				8.5E-05	
CESIUM-137 ⁸	6.96E-01	6.1E-02	--	1.2E-05	YES
POTASSIUM-40	2.98E+00	1.4E-01	--	2.1E-05	YES
THORIUM-232 ⁹	1.75E+00	9.9E-03	--	1.8E-04	YES
URANIUM-238 ¹⁰	6.28E-01	1.3E-02	--	5.0E-05	YES
Total Radiological Risk =				2.6E-04	
Total Media Risk =				3.4E-04	

1 Analytes that were identified as COPCs in Table 4.
 2 EPC = exposure point concentration: this preliminary calculation is the lesser of the 95%UCL and the maximum detected concentration.
 3 Nonradiological RSLs are default residential soil values from the EPA Regional Screening Levels table, dated May 2023. Radiological PRGs are site-specific soil values derived from the EPA Preliminary Remediation Goals calculator website (dated February 2023) and eliminating the fruit and vegetable consumption pathway.
 4 Residential Hazard Estimate (HQ) = EPC / RSL
 5 Residential Risk Estimate = (EPC / RSL or PRG) x 1E-06
 6 For noncarcinogens, no constituents are identified as COCs if the total media hazard index < 1. For carcinogens, constituents are identified as COCs if the individual cancer risk > 1E-06.
 7 Chemical analysis for total chromium. A total chromium RSL is not available; hexavalent chromium RSL conservatively used to calculate risk.
 8 Cs137 95%UCL EPC calculated using data that has been decay-adjusted to September 1, 2023 as shown in Table 3.
 9 Th232 was not measured directly in the laboratory. Ac228, Pb212 and Tl208 are daughter products of Th232 and can be used to estimate its activity since these isotopes are in secular equilibrium. The highest detected activity in the entire decay chain was used in this calculation. The 95%UCL is calculated from the Ac228 analytical results. A separate risk calculation for daughter products is not provided since they are considered in the Th232 PRG for the entire chain.
 10 U238 was only measured in 1 sample and a 95%UCL could not be calculated. U234, Pb214 and Bi214 are daughter products of U238 and can be used to estimate its activity since these isotopes are in secular equilibrium. The highest detected activity in the entire decay chain was used in this calculation. The 95%UCL is calculated from the Pb214 analytical results. A separate risk calculation for daughter products is not provided since they are considered in the U238 PRG for the entire chain.

Table 6. Industrial Risk/Hazard Estimate for 904-44G Spill Release Area (0-1 ft)

Analyte ¹	Exposure Point Concentration ²	Industrial RSL/PRG ³	Industrial Hazard Estimate (HQ) ⁴ (unitless)	Industrial Risk Estimate ⁵ (unitless)	COC? ⁶
Noncarcinogenic Hazard Estimate (mg/kg)					
ALUMINUM	1.85E+04	1.1E+06	1.68E-02	--	NO
ARSENIC	3.42E+00	4.8E+02	7.13E-03	--	NO
CHROMIUM ⁷	2.40E+01	3.5E+03	6.85E-03	--	NO
IRON	1.81E+04	8.2E+05	2.20E-02	--	NO
LEAD	2.02E+01	8.0E+02	2.52E-02	--	NO
MANGANESE	1.08E+02	2.6E+04	4.15E-03	--	NO
VANADIUM	4.12E+01	5.8E+03	7.10E-03	--	NO
Total Media Hazard Index (HI) =			8.93E-02		
Carcinogenic Risk Estimate (mg/kg)					
ARSENIC	3.42E+00	3.0E+00	--	1.1E-06	YES
CHROMIUM ⁷	2.40E+01	6.3E+00	--	3.8E-06	YES
Total Chemical Risk =				4.9E-06	
CESIUM-137 ⁸	6.96E-01	9.1E-02	--	7.7E-06	YES
POTASSIUM-40	2.98E+00	2.2E-01	--	1.4E-05	YES
THORIUM-232 ⁹	1.75E+00	1.5E-02	--	1.1E-04	YES
URANIUM-238 ¹⁰	6.28E-01	2.0E-02	--	3.1E-05	YES
Total Radiological Risk =				1.7E-04	
Total Media Risk =				1.7E-04	

1 Analytes that were identified as COPCs in Table 4.
2 EPC = exposure point concentration is the lesser of the 95%UCL and the maximum detected concentration.
3 Nonradiological RSLs are default industrial worker soil values from the EPA Regional Screening Levels Table, dated May 2023. Radiological PRGs are default industrial worker soil values from the EPA Preliminary Remediation Goals Table, dated February 2023.
4 Industrial Hazard Estimate (HQ) = EPC / RSL
5 Industrial Risk Estimate = (EPC / RSL or PRG) x 1E-06
6 For noncarcinogens, no constituents are identified as COCs if the total media hazard index < 1. For carcinogens, constituents are identified as COCs if the individual cancer risk > 1E-06.
7 Chemical analysis for total chromium. A total chromium RSL is not available; hexavalent chromium RSL conservatively used to calculate risk.
8 Cs137 95%UCL EPC calculated using data that has been decay-adjusted to September 1, 2023 as shown in Table 3.
9 Th232 was not measured directly in the laboratory. Ac228, Pb212 and Tl208 are daughter products of Th232 and can be used to estimate its activity since these isotopes are in secular equilibrium. The highest detected activity in the entire decay chain was used in this calculation. The 95%UCL is calculated from the Ac228 analytical results. A separate risk calculation for daughter products is not provided since they are considered in the Th232 PRG for the entire decay chain.
10 U238 was only measured in 1 sample and a 95%UCL could not be calculated. U234, Pb214 and Bi214 are daughter products of U238 and can be used to estimate its activity since these isotopes are in secular equilibrium. The highest detected activity in the entire decay chain was used in this calculation. The 95%UCL is calculated from the Pb214 analytical results. A separate risk calculation for daughter products is not provided since they are considered in the U238 PRG for the entire decay chain.