

Appendix A: Chapter 5 Addendum



Table A-1. Advanced Test Reactor Complex cold waste pond effluent permit-required monitoring results (2023).^{a,b}

PARAMETER	MINIMUM	MAXIMUM	MEDIAN
pH (standard units)	6.26	7.00	6.80
Conductivity (µS/cm)	378	1454	397
Chromium, filtered (mg/L)	0.0026	0.0126	0.00383
Chromium, total (mg/L)	0.00295	0.0129	0.00374
Iron, filtered (mg/L)	0.03U ^c	0.0444	0.03U
Iron, total (mg/L)	0.03U	0.0617	0.03U
Nitrate + nitrite as nitrogen (mg/L)	0.925	4.03	0.975
Solids, total dissolved (mg/L)	192	1,200	215
Sulfate (mg/L)	20.9	667	26.8J ^d

- a. Reuse Permit I-161-03 does not specify maximum effluent constituent loading or concentration limits.
- b. Duplicate samples collected in July 2023 are included in the statistical summary.
- c. U qualifier indicates the result was below the detection limit.
- d. J flag indicates the associated value is an estimate and may be inaccurate or imprecise.

Table A-2. Hydraulic loading rates for the Advanced Test Reactor Complex cold waste pond (2023).

	YEARLY TOTAL VOLUME
2023 flow ^a	215.60 MG ^b
Annual permit limit ^c	375 MG
5-yr moving annual average permit limit	300 MG

- a. Annual volume is reported for the 2023 permit reporting year. The 2023 volume is estimated due to the flowmeter failing its annual calibration in 2022. A new flow meter was installed and calibrated in June 2023.
- b. MG = million gallons.
- c. The reuse permit specifies an annual limit based on a twelve-month reuse year from November 1 through October 31.



Table A-3a. Advanced Test Reactor Complex cold waste pond industrial wastewater reuse permit monitoring well results (2023).^a

WELL NAME	USGS-098 (GW-0161-01)		USGS-065 (GW-161-02)		USGS-076 (GW-161-04)		TRA-08 (GW-161-05)		MIDDLE-1823 (GW-161-06)		USGS-136 (GW-161-08)		STANDARD ^b PCS/SCS
	SAMPLE DATE:	05/11/23	09/18/23	05/12/23	09/20/23	05/15/23	09/21/23	05/12/23	09/19/23	05/16/23	09/19/23	05/15/23	
Water table depth (ft) bls ^c	431.25	431.90	477.20	477.77	486.53	487.19	492.34	493.00	496.19	496.86	491.89	492.53	NA ^d
Water table elevation (ft) ^e	4,457.96	4,457.31	4,451.37	4,450.80	4,446.68	4,446.02	4,446.72	4,446.06	4,446.68	4,446.01	4,446.84	4,446.20	NA
Borehole correction factor (ft) ^f	2.53	2.53	NA	NA	NA	NA	0.63	0.63	NA	NA	0.22	0.22	NA
Ph (s.u.)	6.76	7.07	6.59	7.41	6.91	7.07	6.84	7.03	6.88	7.08	6.94	7.03	6.5 to 8.5 (SCS)
Conductivity (µS/cm)	401	417	575	591	415	419	408	407	415	417	414	429	NA
Temperature (°F)	55.4	55.0	56.5	56.1	55.4	55.2	54.9	56.5	56.3	57.0	58.3	57.0	NA
Nitrite + nitrate as nitrogen (mg/L)	1.24	1.26	1.58J ^g	1.42	2.09R ^h	1.41J	1.17J	1.00	1.05 (1.07) ⁱ	0.995	1.30R	1.18	10 (PCS)
Sulfate (mg/L)	21.3J	23.4J	129	137	33.4J	34.0	40.3	41.6	30.9J (31.2J)	31.5	30.7J	30.3J	250 (SCS)
Solids, total dissolved (mg/L)	221	211	366	371	226	228	230	228	220 (214)	224	232	222	500 (SCS)
Chromium, total (mg/L)	0.00726	0.00706J	0.0841	0.092	0.0109J	0.0117	0.0201	0.0187	0.0107 (0.0103)	0.0106	0.0151J	0.0172J	0.1 (PCS)
Chromium, filtered (mg/L)	0.00753	0.00718J	0.0828	0.0827	0.0105J	0.0113	0.0198	0.018	0.010 (0.0103)	0.0107	0.0156J	0.0167J	0.1 (PCS)
Iron, filtered (mg/L)	0.03U ^j	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U (0.03U)	0.03U	0.03U	0.03U	0.3 (SCS)



Table A-3a. continued.

WELL NAME	USGS-098 (GW-0161-01)		USGS-065 (GW-161-02)		USGS-076 (GW-161-04)		TRA-08 (GW-161-05)		MIDDLE-1823 (GW-161-06)		USGS-136 (GW-161-08)		STANDARD ^b PCS/SCS
SAMPLE DATE:	05/11/23	09/18/23	05/12/23	09/20/23	05/15/23	09/21/23	05/12/23	09/19/23	05/16/23	09/19/23	05/15/23	09/18/23	

- a. Reuse Permit I-161-03 was issued October 30, 2019.
- b. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in the Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01 a and b.
- c. bls = below land surface.
- d. NA = not applicable.
- e. Water table elevation above mean sea level (ft). Elevation data provided using the North American Vertical Datum of 1988 (NAVD 88).
- f. The borehole correction factors were determined from gyroscopic surveys conducted by U.S. Geological Survey to reconcile discrepancies in water level measurements from well deviations.
- g. J flag indicates the associated value is an estimate and may be inaccurate or imprecise.
- h. R flag indicates it is recommended result not be used due to high relative percent difference between the field result and the laboratory quality control duplicate.
- i. Results shown in parenthesis are from the field duplicate samples.
- j. U qualification indicates the analyte was not detected above the instrument detection limit or the analyte was detected at or above the applicable detection limit but the value is not more than 5 times the highest positive amount in any laboratory blank and is U qualified as a result of data validation.



Table A-3b. Advanced Test Reactor Complex cold waste pond industrial wastewater reuse permit monitoring well results (2023).

WELL NAME	USGS-058 ^a (GW-161-07)		STANDARD (PCS/SCS) ^b
	SAMPLE DATE:	05/11/23	
Water table depth (ft) bgs ^c	474.46	475.19	NA ^d
Water table elevation (ft) ^e	4,447.43	4,446.70	NA
Borehole correction factor (ft) ^f	NA	NA	NA
pH (s.u.)	6.72	7.17	6.5 to 8.5 (SCS)
Conductivity (µS/cm)	412	418	NA
Temperature (°F)	56.5	56.5	NA
Solids, total dissolved (mg/L)	231	225	500 (SCS)
Sulfate (mg/L)	29.5J ^g	30.2	250 (SCS)

- a. Reuse permit I-161-03 only requires water table elevation, water table depth, pH, conductivity, temperature, total dissolved solids and sulfate reported for USGS-058.
- b. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in the Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01.a and b.
- c. bgs = below ground surface.
- d. NA = not applicable.
- e. Water table elevation above mean sea level (ft). Elevation data provided using the North American Vertical Datum of 1988 (NAVD 88).
- f. The borehole correction factors were determined from gyroscopic surveys conducted by U.S. Geological Survey to reconcile discrepancies in water level measurements from well deviations.
- g. J flag indicates the associated value is an estimate and may be inaccurate or imprecise.

Table A-4. Idaho Nuclear Technology and Engineering Center sewage treatment plant influent monitoring results at CPP-769 (2023).

PARAMETER	MINIMUM	MAXIMUM	MEAN
Biochemical oxygen demand (5-day) (mg/L)	34.8	467	221
Nitrate + nitrite, as nitrogen (mg/L)	0.017 U ^a	1.12	0.119
Total kjeldahl nitrogen (mg/L)	19.9	182	88.2
Total phosphorus (mg/L)	2.29	12.6J ^b	7.48
Total suspended solids (mg/L)	6.7	197	122.1

- a. U flag indicates the analyte was analyzed for but not detected above the method detection limit.
- b. J flag indicates the material was analyzed for and was detected at or above the detection limit. The associated value is an estimate and may be inaccurate or imprecise.



Table A-5. Idaho Nuclear Technology and Engineering Center sewage treatment plant effluent monitoring results at CPP-773 (2023).

PARAMETER	MINIMUM	MAXIMUM	MEAN
Biochemical oxygen demand (5-day) (mg/L)	5.83	28.6	13.9
Nitrate + nitrite, as nitrogen (mg/L)	0.174J ^a	3.32	1.27
pH (standard units) ^b	6.95	8.83	7.72
Total coliform (MPN ^c /100 mL) ^b	133.3	2419.2	1016.1
Total kjeldahl nitrogen (mg/L)	6.70	36	17.0
Total phosphorus (mg/L)	2.10 ^a	53.3	8.62
Total suspended solids (mg/L)	3.7	97	37

a. J flag indicates the parameter was analyzed for and was detected at or above the applicable detection limit. The associated value is an estimate and may be inaccurate or imprecise.

b. As required by the permit, the results for this parameter were obtained from a grab sample.

c. MPN = most probable number.

Table A-6. Idaho Nuclear Technology and Engineering Center new percolation ponds effluent monitoring results at CPP-797 (2023).

PARAMETER	MINIMUM	MAXIMUM	MEAN
Chloride (mg/L)	13.0	539.0	80.8
Chromium (mg/L)	0.00558	8.05	1.64
Coliform, fecal (MPN/100 mL) ^a	1	387	66
Coliform, total (MPN/100 mL) ^a	39.3	2419.2	773.7
Fluoride (mg/L)	0.129	0.297	0.220
Manganese, total (mg/L)	ND (<0.002) ^b	0.00332	0.00211
Nitrate + nitrite, as nitrogen (mg/L)	0.715	3.66	1.50
pH (standard units) ^a	7.05	9.21	8.22
Selenium (mg/L)	ND (<0.002)	ND (<0.002)	ND (<0.002)
Total dissolved solids (mg/L)	186	1220	403
Total phosphorus (mg/L)	0.263	2.66	1.10

a. As required by the permit, the results for this parameter were obtained from a grab sample.

b. ND = Parameter not detected in sample. Value in parentheses is the detection limit.

Table A-7. Hydraulic loading rates for the Idaho Nuclear Technology and Engineering Center new percolation ponds (2023).

	MAXIMUM DAILY FLOW	YEARLY TOTAL FLOW
2023 flow	932,120 gallons	158,361,710 gallons
Permit limit	3,000,000 gallons	1,095 MG ^a

a. MG = million gallons.



Table A-8. Idaho Nuclear Technology and Engineering Center new percolation ponds aquifer monitoring well groundwater results (2023).

PARAMETER	ICPP-MON-A-165 (GW-13006)		ICPP-MON-A-166 (GW-13007)		ICPP-MON-A-164B (GW-13011)		STANDARD PCS/SCS ^a	
	SAMPLE DATE:	05/16/23	09/19/23	05/16/23	09/19/23	05/15/23		09/18/23
Water table depth (ft below brass cap)		510.18	510.88	515.76	517.76	508.86	509.54	NA ^b
Water table elevation (at brass cap in ft) ^c		4,446.09	4,445.39	4,446.57	4,444.82	4,446.26	4,444.5	NA
Chloride (mg/L)		30.1J ^d	28.5	19.1J ^d	17.9	10.5J ^d	10.2	250
Chromium (mg/L)		0.00968	0.0173	0.00496	0.00490	0.0115	0.0122	0.1
Coliform, fecal (MPN ^e /100 mL)		<1	<1	<1	<1	<1	<1	<1 CFU ^f /100 mL
Coliform, total (MPN/100 mL)		<1	<1	<1	<1	<1	<1	1 CFU/100 mL ^g
Dissolved oxygen (mg/L)		6.69	6.97	4.79	4.85	6.35	5.79	NA
Electrical conductivity (µmhos/cm)		438	460	327	350	405	417	NA
Fluoride (mg/L)		0.136	0.191	0.180	0.222	0.095J ^h	0.152	4
Manganese, dissolved (mg/L) ⁱ		NR ^j	NR ^j	NR ^j	NR ^j	NR ^j	NR ^j	0.05
Manganese, total (mg/L)		ND (<0.001) ^k	ND (<0.001) ^k	0.00747	0.0150	ND (<0.001) ^k	0.00124J ^h	0.05
Nitrate/nitrite, as nitrogen (mg/L)		1.24J ^d	1.21	0.385J ^d	0.467	1.09J ^d	1.11	10
pH (standard units)		7.71	7.57	7.65	7.27	7.61	7.50	6.5–8.5
Selenium (mg/L)		ND (<0.0015) ^k	ND (<0.0015) ^k	ND (<0.0015) ^k	ND (<0.0015) ^k	ND (<0.0015) ^k	ND (<0.0015) ^k	0.05
Temperature (°F)		54.80	54.55	53.92	58.29	54.75	54.05	NA
Total dissolved solids (mg/L)		244	236	172	177	222	211	500
Total phosphorus (mg/L)		ND (<0.0500) ^k	0.0430J ^h	ND (<0.0500) ^k	0.0240J ^h	ND (<0.0500) ^k	0.0270J ^h	NA

a. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01.a and b.

b. NA = not applicable.

c. Water table elevations referenced to North American Vertical Datum of 1988 (NAVD 88).

d. J flag indicates the parameter was positively identified, but the reported value is an estimate. The results may be biased high.

e. MPN = most probable number.

f. CFU = colony forming unit.

**Table A-8. continued.**

PARAMETER	ICPP-MON-A-165 (GW-13006)		ICPP-MON-A-166 (GW-13007)		ICPP-MON-A-164B (GW-13011)		STANDARD PCS/SCS ^a
SAMPLE DATE:	05/16/23	09/19/23	05/16/23	09/19/23	05/15/23	09/18/23	

- g. An exceedance of the PCS for total coliform is not a violation. If the PCS for total coliform is exceeded, analysis for fecal coliform is conducted. An exceedance of the PCS for fecal coliform is a violation.
- h. J flag indicates the material was analyzed for and was detected at or above the applicable detection limit. The associated value is an estimate and may be inaccurate or imprecise.
- i. The result of the dissolved concentrations of this parameter are used for SCS compliance determinations.
- j. NR = parameter was not a monitoring requirement since the analytical result for total manganese did not exceed the standard in Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01.b, manganese standard of 0.05 mg/L.
- k. ND = Parameter not detected in sample. Value in parentheses is the detection limit.



Table A-9. Idaho Nuclear Technology and Engineering Center new percolation ponds perched water monitoring well groundwater results (2023).

PARAMETER	ICPP-MON-V-191 (GW-13008)		ICPP-MON-V-200 (GW-13009)		ICPP-MON-V-212 (GW-13010)		STANDARD PCS/SCS ^a	
	SAMPLE DATE:	05/15/23	09/18/23	05/31/23	10/25/23	05/31/23		09/18/23
Depth to water (ft below brass cap)		Dry ^b	Dry ^b	122.53	113.50	239.67	238.91	NA ^c
Water table elevation (at brass cap in ft) ^d		NA	NA	4,833.07	4,842.1	4,721.74	4,721.5	NA
Chloride (mg/L)		NA	NA	72J ^e	61.9	68.1J ^e	72.2	250
Chromium (mg/L)		NA	NA	0.00712	0.00787	0.0449	0.0232	0.1
Coliform, fecal (MPN ^f /100 mL)		NA	NA	<1	<1	<1	<1	<1 CFU ^g /100 mL
Coliform, total (MPN/100 mL)		NA	NA	<1	<1	1	<1	1 CFU/100 mL ^h
Dissolved oxygen (mg/L)		NA	NA	6.91	5.66	5.38	8.18	NA
Electrical conductivity (µmhos/cm)		NA	NA	603	545	578	599	NA
Fluoride (mg/L)		NA	NA	0.134J ^e	0.286	0.152J ^e	0.219	4
Manganese, dissolved (mg/L) ⁱ		NA	NA	NR ^j	NR	NR	NR	0.05
Manganese, total (mg/L)		NA	NA	0.00485J ^k	0.00214J ^k	0.0201	0.0130	0.05
Nitrate/nitrite, as nitrogen (mg/L)		NA	NA	2.70J ^e	1.05	1.86J ^e	2.05	10
pH (standard units)		NA	NA	7.60	7.23	7.79	7.87	6.5–8.5
Selenium (mg/L)		NA	NA	ND (<0.0015) ^l	ND (<0.0015) ^l	ND (<0.0015) ^l	ND (<0.0015) ^l	0.05
Temperature (°F)		NA	NA	59.72	59.55	63.30	63.44	NA
Total dissolved solids (mg/L)		NA	NA	307J ^e	292	293J ^e	307	500
Total phosphorus (mg/L)		NA	NA	0.277J ^e	0.402	0.0840J ^e	0.0280J ^m	NA

- Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01.a and b.
- ICPP-MON-V-191 was dry in May and September 2023.
- NA = not applicable.
- Water table elevations referenced to North American Vertical Datum of 1988 (NAVD 88).
- J flag indicates the parameter was positively identified, but the reported value is an estimate. Due to shipping issues the sample was above 4°C upon receipt.
- MPN = most probable number.
- CFU = colony forming units.



Table A-9. continued.

PARAMETER	ICPP-MON-V-191 (GW-13008)		ICPP-MON-V-200 (GW-13009)		ICPP-MON-V-212 (GW-13010)		STANDARD PCS/SCS ^a
	SAMPLE DATE:	05/15/2023	09/18/2023	05/31/2023	10/25/2023	05/31/2023	

- h. An exceedance of the PCS for total coliform is not a violation. If the PCS for total coliform is exceeded, analysis for fecal coliform is conducted. An exceedance of the PCS for fecal coliform is a violation.
- i. The results of dissolved concentrations of this parameter are used for SCS compliance determinations.
- j. NR = not required since the analytical result for total manganese did not exceed the standard in Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01.b for manganese of 0.05 mg/L.
- k. J flag indicates the parameter was analyzed for and was detected at or above the applicable detection limit. The associated value is an estimate and may be inaccurate or imprecise.
- l. ND = Parameter not detected in sample. Value in parentheses is the detection limit.
- m. J flag indicates that the parameter was analyzed for and was detected at or above the applicable detection limit. The associated value is an estimate and may be inaccurate or imprecise.



Table A-10. Materials and Fuels Complex industrial waste pond effluent monitoring results for the reuse permit (2023).^{a,b,c}

PARAMETER	MINIMUM	MAXIMUM	MEDIAN
pH (standard units)	6.68	7.47	7.01
Conductivity ^d (μS/cm)	384	464	403
Chloride ^d (mg/L)	17.9J ^e	26.6	20.1J
Nitrate + nitrite as nitrogen (mg/L)	2.40	3.85J	2.92
Iron (mg/L)	0.03U ^f	0.170	0.03U
Iron, filtered (mg/L)	0.03U	0.03U	0.03U
Manganese (mg/L)	0.002U	0.00421	0.002U
Manganese, filtered (mg/L)	0.002U	0.00364	0.002U
Sodium ^d (mg/L)	18.4	29.1	21.8
Sodium ^d , filtered (mg/L)	18.6	26.7	21.8
Solids, total dissolved (mg/L)	208	283	236

- a. Liquid effluent results for permit-required constituents collected at the sampling station located on the Industrial Wastewater Collection System (IWCS) primary line prior to discharge into the pond. The results represent effluent contributions from both the IWCS Primary Line and Southwestern Branch Line, which are combined upstream of the sampling station.
- b. Duplicate samples were collected in July 2023. The duplicate results are included in the data summary.
- c. Reuse permit I-160-02 does not specify maximum constituent loading or concentration limits.
- d. Conductivity, chloride and sodium are not required effluent monitoring parameters in the reuse permit.
- e. J flag indicates the associated value is an estimate and may be inaccurate or imprecise.
- f. U qualifier indicates the result was below the detection limit.

Table A-11. Materials and Fuels Complex effluent hydraulic loading to the industrial waste pond (2023).

YEARLY TOTAL FLOW	
2023 flow ^a	9.435 MG ^b
Annual permit limit ^c	17 MG

- a. Annual flow is reported for the 2023 permit reporting year. The annual flow is an estimate due to adjustments during instances when the flow rate exceeded the maximum measurable flow rate of the flow meter.
- b. MG = million gallons.
- c. The reuse permit specifies an annual limit based on a twelve-month reuse year from November 1 through October 31.



Table A-12. Materials and Fuels Complex industrial waste pond summary of groundwater quality data collected for the reuse permit (2023).

WELL NAME	ANL-MON-A-012 (GW-16001)		ANL-MON-A-013 (GW-16002)		ANL-MON-A-014 (GW-16003)		PCS/SCS ^a
	SAMPLE DATE:	05/08/23	09/13/23	05/09/23	09/14/23	05/09/23	
Water table depth (ft bls) ^b	661.85	663.78	650.23	652.11	649.41	651.28	NA ^c
Water table elevation (ft above mean sea level) ^d	4,470.85	4,468.92	4,470.14	4,468.26	4,468.67	4,466.80	NA
Temperature (°F)	57.0	57.4	53.6	55.9	54.9	57.0	NA
pH (s.u)	6.95	7.02	6.89	6.91	6.75	6.96	6.5 to 8.5 (SCS)
Conductivity (µmhos/cm)	385	369	380 (375) ^e	376	380	368	NA
Nitrite + nitrate as N (mg/L)	3.00	2.65	2.75 (2.78)	2.63	2.90	2.70	10 (PCS)
Total dissolved solids (mg/L)	108	190	124 (186)	210	178	201	500 (SCS)
Iron, total (mg/L)	0.03U ^f	0.03U	0.0635 (0.120)	0.03U	0.03U	0.03U	0.3 (SCS)
Iron, filtered (mg/L)	0.03U	0.03U	0.03U (0.03U)	0.03U	0.03U	0.03U	0.3 (SCS)
Manganese, total (mg/L)	0.002U	0.002U	0.002U (0.00217)	0.002U	0.002U	0.002U	0.05 (SCS)
Manganese, filtered (mg/L)	0.002U	0.002U	0.002U (0.002U)	0.002U	0.002U	0.002U	0.05 (SCS)

a. Primary Constituent Standard (PCS) or Secondary Constituent Standard (SCS) specified in the Ground Water Quality Rule, Idaho Ground Water Quality Rule, IDAPA 58.01.11.200.01.a and b.

b. bls = below land surface.

c. NA = not applicable.

d. Elevations are given in the National Geodetic Vertical Datum of 1929.

e. Duplicate sample results are shown in parentheses.

f. U qualification indicates the analyte was not detected above the instrument detection limit or the analyte was detected at or above the applicable detection limit, but the value is not more than five times the highest positive amount in any laboratory blank.



Table A-13. Advanced Test Reactor Complex cold waste ponds effluent radiological surveillance monitoring results (2023).^a

PARAMETER	MINIMUM	MAXIMUM	DCS ^b (pCi/L)
Gross alpha (pCi/L \pm 1s) ^{c,d}	ND ^e	6.42 (\pm 1.84)	NA ^f
Gross beta (pCi/L \pm 1s) ^g	ND	10.1 (\pm 1.44)	NA
Radium-228 (pCi/L \pm 1s) ^h	ND	0.755 (\pm 0.165)	73

- a. Monthly samples were analyzed for gross alpha, gross beta, tritium, and gamma-emitting radionuclides including americium-241, antimony-125, cerium-144, cesium-134, cesium-137, cobalt-58, cobalt-60, europium-152, europium-154, europium-155, manganese-54, niobium-95, potassium-40, radium-226, ruthenium-103, ruthenium-106, silver-108m, silver-110m, uranium-235, zinc-65, and zirconium-95.
- b. DOE Derived Concentration Standards for ingested water.
- c. Result \pm 1 σ . Results are shown only for constituents with at least one statistically positive detection greater than 3 σ .
- d. Gross alpha was positively detected in May, July, and December 2023. Results were non-detect for the other nine months of 2023.
- e. ND = not detected
- f. NA = not applicable. Derived Concentration Standards values are not established.
- g. Gross beta was positively detected in January, April, May, June, August, September, and November 2023. Results were non-detect for the other five months of 2023.
- h. Additional analysis of radium-226 and radium-228 are performed when gross alpha exceeds a threshold of 5 pCi/L. Radium-226 and radium-228 were analyzed in May, June, and September 2023. Radium-228 was positively detected once in May 2023. Radium-226 was not positively detected.



Table A-14. Groundwater radiological surveillance monitoring results for the Advanced Test Reactor Complex (2023).

MONITORING WELL	SAMPLE DATE	GAMMA EMITTERS ^a (pCi/L)	GROSS ALPHA (pCi/L)	GROSS BETA (pCi/L)	STRONTIUM -90 (pCi/L)	TRITIUM (pCi/L)
PCS/SCS ^b		NA	15	4 mrem/yr ^c	8	20,000
USGS-098	05/11/2023	ND ^d	ND	0.939 (±0.228) ^e	ND	ND
	09/18/2023	ND	1.44 (±0.401)	2.08 (±0.218)	ND	ND
USGS-058	05/11/2023	ND	1.97 (±0.388)	1.15 (±0.174)	ND	ND
	09/20/2023	ND	ND	3.21 (±0.265)	ND	ND
USGS-065	05/12/2023	ND	2.53 (±0.737)	3.36 (±0.472)	ND	845 (±152)
	09/20/2023	ND	ND	3.08 (±0.406)	ND	963 (±168)
TRA-08	05/12/2023	ND	1.20 (±0.351)	1.69 (±0.164)	ND	359 (±105)
	09/19/2023	ND	1.86 (±0.412)	2.75 (±0.214)	ND	463 (±113)
USGS-076	05/15/2023	ND	ND	1.55 (±0.178)	ND	ND
	09/21/2023	ND	ND	1.26 (±0.23)	ND	356 (±116)
MIDDLE-1823	05/16/2023	ND	ND	1.91 (±0.183)	ND	318 (±103)
	09/19/2023	[ND] ^f	[ND]	[2.13 (±0.251)]	[ND]	[ND]
USGS-136	05/15/2023	ND	1.20 (±0.386)	1.19 (±0.177)	ND	549 (±126)
	09/18/2023	ND	1.74 (±0.417)	2.28 (±0.219)	ND	698 (±131)

- a. Gamma-emitting radionuclides including americium-241, antimony-125, cerium-144, cesium-134, cesium-137, cobalt-58, cobalt-60, europium-152, europium-154, europium-155, manganese-54, niobium-95, potassium-40, radium-226, ruthenium-103, ruthenium-106, silver-108m, silver-110m, uranium-235, zinc-65, and zirconium-95.
- b. Primary Constituent Standards (PCS) in the Ground Water Quality Rule, IDAPA 58.01.11.200.01.a, are provided for perspective.
- c. Gross Beta PCS = 4 mrem/yr effective dose, Ground Water Quality Rule, IDAPA 58.01.11.200.01.a. For perspective, the U.S. Environmental Protection Agency public drinking water system regulations also specify a maximum contaminant limit of 4 mrem/yr for gross beta and use a screening level of 50 pCi/L to determine when speciation of individual beta/photon emitters is necessary.
- d. ND = not detected.
- e. Results shown are for statistically positive detections greater than 3σ , along with the reported 1σ uncertainty.
- f. Results from field duplicate samples shown in brackets.



Table A-15. Liquid effluent radiological monitoring results for the Idaho Nuclear Technology and Engineering Center New Percolation Ponds CPP-797 (2023).

SAMPLE DATE	GAMMA EMITTERS ^a (pCi/L)	GROSS ALPHA ^b (pCi/L)	GROSS BETA ^b (pCi/L)	TOTAL STRONTIUM (pCi/L)
PCS/SCS ^b	NA	15	4 mrem/yr ^c	8
January 2023	ND ^d	ND	4.48 (±0.853)	ND
February 2023	ND	ND	3.30 (±0.956)	ND
March 2023	ND	ND	4.82 (±0.487)	ND
April 2023	ND	4.01 (±1.18)	6.38 (±0.593)	ND
May 2023	ND	ND	3.54 (±0.636)	ND
June 2023	ND	ND	3.39 (±0.647)	ND
July 2023	ND	4.48 (±1.21)	9.39 (±0.841)	ND
August 2023	ND	3.39 (±0.783)	7.41 (±0.528)	ND
September 2023	ND	ND	4.54 (±0.702)	ND
October 2023	ND	ND	4.16 (±0.664)	ND
November 2023	ND	ND	5.85 (±0.789) ^J ^e	ND
December 2023	ND	ND	6.09 (±0.513)	ND

- Gamma-emitting radionuclides include americium-241, antimony-125, cerium-144, cesium-134, cesium-137, cobalt-58, cobalt-60, europium-152, europium-154, europium-155, manganese-54, niobium-95, potassium-40, radium-226, ruthenium-103, ruthenium-106, silver-108m, silver-110m, uranium-235, zinc-65, and zirconium-95.
- Detected results are shown along with the reported 1 σ uncertainty.
- Primary constituent standards (PCS) in the Ground Water Quality Rule, IDAPA 58.01.11.200.01.a, are provided for perspective.
- ND = no radioactivity was detected. The result was not statistically positive at the 95% confidence interval and was below its minimum detectable activity.
- J flag indicates the associated value is an estimate.



Table A-16. Groundwater radiological monitoring results for the Idaho Nuclear Technology and Engineering Center (2023).

MONITORING WELL	SAMPLE DATE	GROSS ALPHA ^a (pCi/L)	GROSS BETA ^a (pCi/L)
ICPP-MON-A-165	05/16/2023	ND ^b	2.95 (±0.792)
	09/19/2023	3.30 (±1.17) ^{Jc}	4.76 (±0.756)
ICPP-MON-A-166	05/16/2023	ND	ND
	09/19/2023	ND	4.83 (±0.981)
ICPP-MON-V-200	05/31/2023	ND	4.96 (±0.757)
	10/25/2023	2.50 (±0.619)	4.97 (±0.396)
ICPP-MON-V-212	05/31/2023	ND	14.1 (±0.847)
	09/18/2023	3.29 (±1.21) ^{Jc}	10.3 (±1.07)

- a. Detected results are shown along with the reported 1 σ uncertainty.
- b. ND = no radioactivity was detected. The result was not statistically positive at the 95% confidence interval and was below its minimum detectable activity.
- c. J flag indicates the associated value is an estimate.

Table A-17. Radiological Surveillance Monitoring Results for Materials and Fuels Complex industrial waste pond (2023).^a

PARAMETER ^b (pCi/L)	MINIMUM	MAXIMUM	DCS ^c (pCi/L)
Gross alpha	ND ^d	3.16 (±0.593)	NA ^e
Gross beta	3.38 (± 0.805)	6.38 (± 0.423)	NA
Uranium-238 ^f	0.388 (± 0.0571)	0.388 (± 0.0571)	1,400
Uranium-233/234 ^f	0.88 (± 0.096)	0.88 (± 0.096)	1,200

- a. Samples were analyzed for gross alpha; gross beta; plutonium-241; strontium-90; tritium; gamma-emitting radionuclides, including americium-241, antimony-125, cerium-144, cesium-134, cesium-137, cobalt-58, cobalt-60, europium-152, europium-154, europium-155, manganese-54, niobium-95, potassium-40, radium-226, ruthenium-103, ruthenium-106, silver-108m, silver-110m, uranium-235, zinc-65, zirconium-95; alpha-emitting radionuclides including americium-241, uranium-233/234, uranium-235, uranium-238, plutonium-236, plutonium-238, plutonium-239/240, and plutonium-242.
- b. Results shown are for statistically positive detections greater than 3 σ , along with the reported 1 σ uncertainty. Only parameters with at least one positively detected result are shown.
- c. DCS = DOE Derived Concentration Standard for ingested water (DOE-STD-1196-2022).
- d. ND indicates the result was below the detection limit.
- e. NA = not applicable. DCS values are not established.
- f. Parameter was analyzed in August only; therefore, the minimum and maximum are the same.



Table A-18. Groundwater radiological surveillance monitoring results for the Materials and Fuels Complex (2023).

MONITORING WELL	SAMPLE DATE	ALPHA EMITTERS ^a (pCi/L)		GAMMA EMITTERS ^b (pCi/L)	GROSS ALPHA (pCi/L)	GROSSBETA (pCi/L)	TRITIUM (pCi/L)
PCS/SCS ^c		NA		NA	15	4 mrem/yr ^d	20,000
ANL-MON-A-012	05/08/2023	Uranium-233/234	1.39 (±0.21) ^e	ND ^f	2.45 (±0.469)	2.41 (±0.23)	ND
		Uranium-238	0.905 (±0.161)				
	09/13/2023	Uranium-233/234	1.35 (±0.19)	ND	ND	3.83 (±0.541)	ND
		Uranium-238	0.538 (±0.111)				
ANL-MON-A-013	05/09/2023	Uranium-233/234	1.58 (±0.229)	ND	1.66 (±0.537)	2.73 (±0.29)	ND
			[1.04 (±0.179)] ^g	[ND]	[1.31 (±0.402)]	[2.93 (±0.286)]	[ND]
		Uranium-238	0.627 (±0.131)				
			[0.884 (±0.158)]				
	09/14/2023	Uranium-233/234	1.3 (±0.163)	ND	ND	2.94 (±0.382)	ND
		Uranium-238	0.702 (±0.111)				
ANL-MON-A-014	05/09/2023	Uranium-233/234	1.54 (±0.219)	ND	ND	3.3 (±0.261)	ND
		Uranium-238	0.334 (±0.0898)				
	09/14/2023	Uranium-233/234	1.16 (±0.138)	ND	1.94 (±0.623)	3.11 (±0.386)	ND
		Uranium-238	0.504 (±0.0836)				

- a. Alpha-emitting radionuclides include americium-241, uranium 233/234, uranium-235, and uranium-238. Results are shown only for statistically positive detections.
- b. Gamma-emitting radionuclides include americium-241, antimony-125, cerium-144, cesium-134, cesium-137, cobalt-58, cobalt-60, europium-152, europium-154, europium-155, manganese-54, niobium-95, potassium-40, radium-226, ruthenium-103, ruthenium-106, silver-108m, silver-110m, uranium-235, zinc-65, and zirconium-95.
- c. Primary Constituent Standards (PCS) in the Ground Water Quality Rule, IDAPA 58.01.11.200.01.a, are provided for perspective.
- d. Gross Beta PCS = 4 mrem/yr effective dose, Ground Water Quality Rule, IDAPA 58.01.11.200.01.a. For perspective, the U.S. Environmental Protection Agency public drinking water system regulations also specify a maximum contaminant limit of 4 mrem/yr for gross beta and use a screening level of 50 pCi/L to determine when speciation of individual beta/photon emitters is necessary.
- e. Results shown are for statistically positive detections greater than 3σ , along with the reported 1σ uncertainty.
- f. ND = not detected.
- g. Results from field duplicate samples collected from ANL-MON-A-013 on May 9, 2023, shown in brackets.