

Department of Environmental Quality
INL Oversight Program

**ENVIRONMENTAL SURVEILLANCE PROGRAM
QUARTERLY DATA REPORT**

January - March, 2024



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Table of Acronyms

aCi/L	-	attocuries per liter	nCi/L	-	nanocuries per liter
ATR	-	Advanced Test Reactor	NCRP	-	National Council on Radiation Protection and Measurements
BEA	-	Battelle Energy Alliance, LLC	NOAA	-	National Oceanic and Atmospheric Administration
BLR	-	Big Lost River	NRF	-	Naval Reactors Facility
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act	PBF	-	Power Burst Facility
CFA	-	Central Facilities Area	pCi/g	-	picocuries per gram
CFR	-	Code of Federal Regulations	pCi/L	-	picocuries per liter
CITRC	-	Critical Infrastructure Test Range Complex	pCi/m ³	-	picocuries per cubic meter
DEQ-INL OP	-	The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program	QAPP	-	Quality Assurance Program Plan
DOE	-	U.S. Department of Energy	QA/QC	-	Quality Assurance/Quality Control
EBR I & II	-	Experimental Breeder Reactors I & II	RCRA	-	Resource Conservation and Recovery Act
EFS	-	Experimental Field Station	RPD	-	relative percent difference
EIC	-	electret ionization chamber	RTC	-	Reactor Technology Complex
EML	-	Environmental Monitoring Laboratory	RWMC	-	Radioactive Waste Management Complex
EPA	-	Environmental Protection Agency	SD	-	Sample standard deviation
ESER	-	Environmental Surveillance, Education and Research Program	SMC	-	Specific Manufacturing Capability
ESP	-	Environmental Surveillance Program	SMCL	-	secondary maximum contaminant level
ESRP	-	Eastern Snake River Plain	TAN	-	Test Area North
ESRPA	-	Eastern Snake River Plain Aquifer	TDS	-	total dissolved solids
Ft bls	-	feet below land surface	TMI	-	Three Mile Island
HPIC	-	high-pressure ion chamber	TRA	-	Test Reactor Area
IBL	-	Idaho Bureau of Laboratories	TSP	-	total suspended particulate
ICPP	-	Idaho Chemical Processing Plant	TSS	-	total suspended solids
ICP	-	Idaho Cleanup Project	USGS	-	U.S. Geological Survey
ISB	-	In-situ bioremediation	VOC	-	volatile organic compound
IDL	-	instrument detection limit	WLAP	-	Wastewater Land Application Permit
INL	-	Idaho National Laboratory			
INTEC	-	Idaho Nuclear Technology and Engineering Center			
ISU	-	Idaho State University			
LLD	-	lower limit of detection			
LSC	-	liquid scintillation counting			
MCL	-	maximum contaminant level			
MDA	-	minimum detectable activity			
MDC	-	minimum detectable concentration			
MFC	-	Materials and Fuels Complex			
µg/L	-	micrograms per liter			
mg/L	-	milligrams per liter			
MP	-	milepost			
mrem	-	millirem or 1/1000 th of a rem			
mR	-	milliRoentgen			
mR/hr	-	milliRoentgen per hour			
µR/hr	-	microRoentgen per hour			
MV	-	Magic Valley			
NIST	-	National Institute of Standards and Technology			

Introduction

The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program (DEQ-INL OP) conducts an Environmental Surveillance Program (ESP) at locations on the INL, near the boundaries of the INL, and at distant locations to the INL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

The primary objective for DEQ-INL OP's ESP is to maintain an independent environmental monitoring and verification program designed to verify and supplement DOE's environmental data and programs. This program also provides the citizens of Idaho with information on current and proposed DOE programs that has been independently evaluated to enable them to reach informed conclusions about DOE activities in Idaho and potential impacts to public health and the environment.

Results of the ESP are published using two distinct reporting formats: quarterly data reports and an annual ESP report. The annual ESP report is designed for a broad audience and summarizes the results of the ESP for the previous four quarters. The annual report's primary emphasis is to focus on trends, ascertain the impacts of DOE operations on the environment, and confirm the validity of DOE monitoring programs. This quarterly report is designed to document the results of the ESP on a quarterly basis and provide detailed data. It is organized according to the media sampled and also provides a quality assurance assessment.

Changes to Qualification and Reporting of Sample Results

Starting in the first quarter of 2024, DEQ-INL OP is changing the methods used for qualifying and reporting sample results. These changes apply primarily to low-level results. The changes listed below will bring DEQ-INL OP's qualification and reporting conventions more closely in line with the INL contractors' methods.

For radiological results, the minimum detectable concentration (MDC) will no longer be used as the criterion above which the result is considered a positive detection. The following criteria will be used instead^{1,2,3}:

1. Results greater or equal to 3 SD are reported as positive detections, where SD is the sample standard deviation.
2. Results less than 3 SD are reported as non-detections (U qualifier).
3. Field sample results are reported together with the 1-SD value.

For non-radiological results, the qualification and reporting conventions followed by the sample analysis contractor, Idaho Bureau of Laboratories (IBL), will be used. With each result, the IBL reports both the Method Detection Limit⁴ (MDL) and the higher Reporting Detection Limit⁵ (RDL).

1. Results greater than MDL and greater than RDL are reported as positive detections.

¹ Idaho National Laboratory Site Environmental Surveillance Program Report, Third Quarter 2023, INL/RPT-24-77413, p.

² HANDBOOK FOR THE DEPARTMENT OF ENERGY'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP), MAPEP-HB-1, July 6, 2022, p.30.

³ An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Eastern Snake River Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Idaho, Emphasis 2019–21, U. S. Geological Survey, DOE/ID-22261, p. 29.

⁴ The MDL is defined as the minimum concentration of substance that can be measured and reported with 99% confidence that an analyte concentration is greater than zero and is determined from an analysis of a sample in a given matrix containing the analyte.

⁵ IBL utilizes the Practical Quantitation Limit (PQL) as the Reporting Detection Limit (RDL) for final data reports. PQL represents a practical and routinely achievable quantitation limit with a high degree of certainty (> 99.9% confidence) that the result is a positive detection.

2. Results greater than MDL but less than RDL are reported as detected estimates (J qualifier) with greater associated uncertainty.
3. Results less than MDL are non-detections and reported as less than (RDL value).

Appendix C, new for CY 2024, is a summary of the analyzing laboratories' MDCs for radiological analytes and RDLs for non-radiological analytes, together with the EPA Maximum Contaminant Levels (MCLs) and DOE Derived Concentration Standards (DCSs) for comparison. MDCs are a measure of method/instrument performance. They are not a criterion above which a result is considered a detection. DCSs and MCLs are listed only as reference values for comparison to typical MDC or RDL ranges. The MCLs are the most restrictive and do not necessarily apply to the environmental media sampled.

Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the first quarter, 2024 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter, gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. The Fort Hall station uses identical instrumentation and sampling protocol as the ten stations operated by the ESP. The DEQ-INL OP reports the Fort Hall station data as an additional distant site.

Airborne particulate matter was sampled using both high-volume (8x10-inch filter) and low-volume (47-mm filter) total suspended particulate (TSP) air samplers. Weekly gross alpha and gross beta particulate radioactivity results for 47-mm filters from the low-volume TSP samplers are presented in **Appendix A** and summarized as a range of results in **Table 2**. Results are within the expected historical range.

Composites of 47-mm filters collected from low-volume TSP samplers during a calendar quarter are analyzed using gamma spectrometry. Composites of 8x10-inch filters collected from high-volume TSP samplers during each calendar month are also analyzed using gamma spectrometry. Typically, gamma spectrometry results are only reported by ISU-EML when exceeding their minimum detectable concentration (MDC). Gamma spectrometry results for the first quarter of 2024 for 47-mm and 8x10-inch TSP filters are presented in **Tables 3** and **4**. For the 47-mm filter composites, the only reported gamma-emitting radionuclide concentration greater than 3 SD was beryllium-7 (Be-7), a naturally occurring, cosmogenic radionuclide. For the 8x10-inch filter composites, Cs-137 was detected at the Van Buren Avenue location for the month of February 2024. The 1 SD value for cesium-137 (Cs-137) is also reported for all locations since Cs-137 is the most likely of the man-made gamma-emitting radionuclides to be detected.

Quarterly composites of high-volume 8x10-inch TSP filters are analyzed using radiochemical separation techniques. Results from these composite filter analyses are typically presented in the following quarter's report. The samples are analyzed for Strontium-90, Plutonium-238, Plutonium-239/240, and Americium-241. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons, and possibly from INL programs. DEQ-INL OP's action levels of 19 for Americium-241 (Am-241), 190 for Strontium-90 (Sr-90), 21 for Plutonium-238 (Pu-238), and 20 for Plutonium-239/240 (Pu-239/240) (in 1×10^{-5} pCi/m³) are 10 percent of the compliance values listed for the specific radionuclides in 40 CFR 61, Appendix E, Table 2. Field sample concentrations which exceed these levels require further investigation.

Radiochemical separation analysis results for 8x10-inch TSP particulate filter composites collected during fourth quarter 2023 are presented in **Table 5**. There were positive Sr-90 detections at all on-site, boundary, and distant locations for the fourth quarter of 2023. These results were all greater-than-three

sample standard deviations. This widespread distribution of detectable Sr-90 does not strongly suggest an INL source, although that is possible. There was also a detection of $^{239/240}\text{Pu}$ at Howe. All detections were well below DEQ-INL OP action levels.

Radioactive iodine samples are collected weekly. Samples are collected by drawing air through a canister filled with activated charcoal using a low-volume air pump. The activated charcoal contained in the canister traps the radioiodine by adsorption onto its porous surface. Each week, canisters are collected from all eleven air monitoring stations and analyzed together as a composite using gamma spectrometry (**Table 6**). If Iodine-131 is detected in this grouping, the canisters are individually analyzed. No radioactive isotopes of iodine, specifically Iodine-131, were detected on the weekly charcoal cartridges used to collect this nuclide during the first quarter of 2024.

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the 11 monitoring stations. This moisture was stripped from the hygroscopic media and analyzed to calculate the atmospheric tritium (H-3) concentration. Reported values are the result of either a single sample or a weighted mean based upon the volume of air sampled when more than one atmospheric moisture sample was collected during the calendar quarter. Atmospheric tritium concentrations and their weighted quarterly means are presented in **Table 7**. Individual sample tritium concentrations exceeded 3 SD and are reported as positive detections at the following three locations:

- On-Site – Big Lost River Rest Area (3/14 – 3/28/24).
- Distant – Craters of the Moon (1/4 – 2/8/24 and 3/14 – 3/28/24) and Fort Hall (1/4 - 2/1/24 and 2/22 – 3/14/24).

The weighted mean concentration at Craters of the Moon was greater than 3 SD and is reported as a positive detection. All results are well below the DEQ-INL OP action level of 150 pCi/m^3 (40 CFR 61).

Precipitation samples were collected at one on-site monitoring location (Big Lost River Rest Area), four boundary locations (Atomic City, Howe, Mud Lake, and Montevue) and one distant location (Idaho Falls) during the first quarter of 2024. Precipitation samples were analyzed for tritium and man-made gamma emitting radionuclides. Reported values were either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter. There was a positive detection of tritium at Howe for the period 01/04/24 - 03/08/24. This caused the Howe weighted mean for the quarter to be a positive detection. There was also a positive detection at Mud Lake for the period 02/08/24 - 03/28/24. Man-made gamma emitting radionuclides were not detected in precipitation collected during the quarter. Analysis results for tritium and Cesium-137, the most likely to be detected of man-made gamma emitting radionuclides, are presented in **Table 8**.

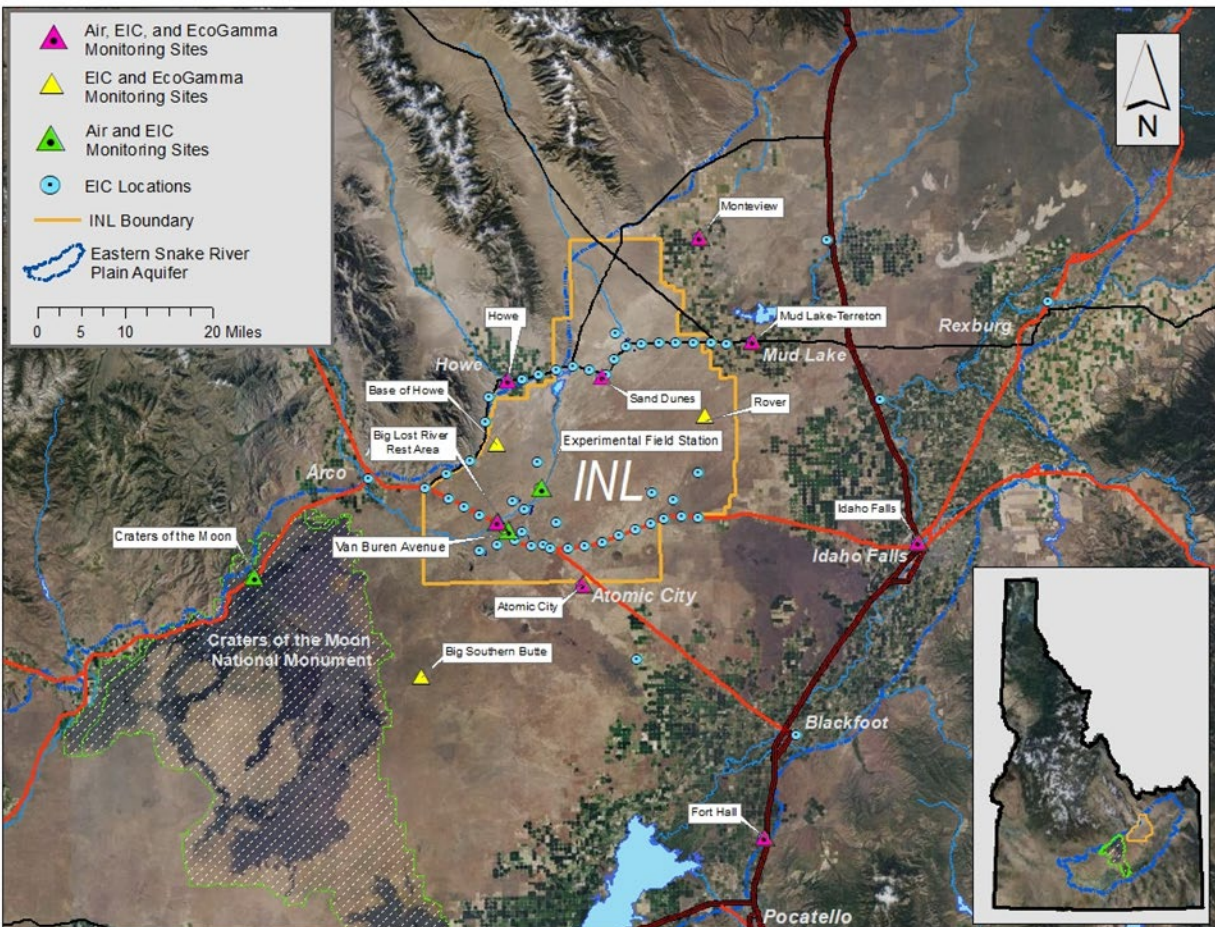


Figure 1. Air and radiation monitoring locations.

Table 1. Sampling locations and sample type.

Station Locations	Sample type ¹			
	TSP	Radioiodine	Water Vapor	Precipitation
On-site Locations				
Big Lost River Rest Area	☐	☐	■	■
Experimental Field Station	☐	☐	■	
Sand Dunes Tower	☐	☐	■	
Van Buren Avenue	☐	☐	■	
Boundary Locations				
Atomic City	☐	☐	■	■
Howe	☐	☐	■	■
Monteview	☐	☐	■	■
Mud Lake	☐	☐	■	■
Distant Locations				
Craters of the Moon	☐	☐	■	
Fort Hall ²	☐	☐	■	
Idaho Falls	☐	☐	■	■

¹☐ Samples collected weekly; ■ Samples collected quarterly, or more frequently if sample containers reach capacity.

²TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

Table 2. Range of gross alpha and gross beta concentrations for 47-mm TSP filters, first quarter, 2024.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.2	-	0.8	7.1	-	63.6
Experimental Field Station	0.1	-	1.3	7.0	-	63.8
Sand Dunes Tower ³	0.2	-	1.4	8.4	-	72.4
Van Buren Avenue	-0.1	-	3.5	7.6	-	77.2
Boundary Locations						
Atomic City	0.0	-	2.6	9.2	-	66.5
Howe	-0.1	-	1.7 J ²	7.0	-	52.6 J ²
Monteview	0.1	-	1.2	6.9	-	54.6
Mud Lake	0.1	-	1.6	6.1	-	67.6
Distant Locations						
Craters of the Moon	-0.1 J ³	-	2.9 J ³	8.8	-	53.8 J ³
Fort Hall ^{1,2}	-0.2	-	2.4	7.8	-	55.6
Idaho Falls	0.1	-	1.7	7.2	-	57.6

Concentrations are expressed in 1×10^{-3} pCi/m³.

¹Operated by Shoshone-Bannock Tribes.

²Total air volume was mis-recorded. Result is a (usable) estimate (J).

³Faulty dry gas meter reading. Total air volume is estimated. Result is a usable estimate (J). The dry gas meter was replaced on 2/9/24.

Table 3. Gamma spectrometry analysis data for 47-mm TSP filters, quarterly composite samples, first quarter, 2024.

Station Location	Naturally Occurring Radionuclide Beryllium-7			Man-Made Gamma Emitting Radionuclides		
	Concentration		1 SD	Concentration ²		1 SD ²
On-site Locations						
Big Lost River Rest Area	65.3	-	2.8	0.01	U	0.04
Experimental Field Station	61.8	-	2.6	0.06	U	0.03
Sand Dunes Tower	64.2	-	2.2	0.00	U	0.03
Van Buren Avenue	63.5	-	2.2	0.00	U	0.03
Boundary Locations						
Atomic City	62.3	-	2.2	0.01	U	0.03
Howe	58.6	J ⁴	2.5	0.06	UJ	0.04
Monteview	59.1	-	2.5	0.03	U	0.03
Mud Lake	54.1	-	1.9	0.00	U	0.02
Distant Locations						
Craters of the Moon	58.2	J ³	2.0	-0.02	UJ	0.02
Fort Hall ¹	54.3	J ⁴	1.9	-0.04	UJ	0.02
Idaho Falls	55.7	-	1.9	0.03	U	0.02

Concentrations are reported in 1×10^{-3} pCi/m³ with associated uncertainty (1 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹Operated by Shoshone-Bannock Tribes.

²Concentration and uncertainty values are for Cs-137. No man-made gamma emitting radionuclides were detected.

³Faulty dry gas meter readings for part of the quarter. Total air volume is estimated. Result is a (usable) estimate (J).

⁴Total air volume was mis-recorded for part of the quarter. Result is a (usable) estimate (J).

Table 4. Gamma spectrometry analysis data for 8x10-inch TSP filters, monthly composite samples, first quarter, 2024.

Station Location	Month ³	Naturally Occurring Radionuclide Beryllium-7			Man-Made Gamma Emitting Radionuclides		
		Concentration		1 SD	Concentration ²		1 SD ²
On-site Locations							
Big Lost River Rest Area	Jan	93.9	-	2.8	0.03	U	0.02
	Feb	72.1	-	2.1	0.01	U	0.01
	Mar	115.9	-	3.4	0.03	U	0.02
Experimental Field Station	Jan	95.0	-	2.8	0.02	U	0.02
	Feb	74.0	-	2.2	0.01	U	0.01
	Mar	90.0	-	2.8	0.02	U	0.01
Sand Dunes Tower	Jan	82.4	-	2.6	-0.03	U	0.01
	Feb	63.7	-	2.0	0.00	U	0.01
	Mar	95.9	-	3.0	-0.01	U	0.01
Van Buren Avenue	Jan	98.9	-	3.1	0.00	U	0.02
	Feb	72.8	J ⁴	2.2	0.06	J	0.02
	Mar	116.9	-	3.4	0.03	U	0.02
Boundary Locations							
Atomic City	Jan	71.0	-	2.2	-0.02	U	0.01
	Feb	57.0	-	1.8	0.01	U	0.01
	Mar	77.6	-	2.4	0.00	U	0.02
Howe	Jan	79.2	-	2.5	-0.03	U	0.02
	Feb	62.4	-	2.0	0.01	U	0.01
	Mar	111.8	-	3.4	0.00	U	0.01
Montevieu	Jan	111.2	-	3.2	0.02	U	0.02
	Feb	84.4	-	2.5	0.02	U	0.02
	Mar	128.3	-	3.7	0.02	U	0.02
Mud Lake	Jan	92.5	-	2.9	0.01	U	0.01
	Feb	78.2	-	2.4	0.00	U	0.01
	Mar	111.9	-	3.4	0.00	U	0.01
Distant Locations							
Craters of the Moon	Jan	63.8	-	2.0	0.03	U	0.03
	Feb	63.4	-	2.0	-0.01	U	0.01
	Mar	111.3	-	3.2	0.04	U	0.02
Fort Hall ¹	Jan	65.1	-	4.0	0.05	U	0.02
	Feb	56.8	-	1.8	0.00	U	0.01
	Mar	88.3	-	2.7	-0.01	U	0.01
Idaho Falls	Jan	89.6	-	2.8	0.00	U	0.01
	Feb	63.1	J ⁵	2.4	-0.01	U	0.01
	Mar	126.1	-	3.6	0.01	U	0.02

Concentrations are reported in 1×10^{-3} pCi/m³ with associated uncertainty (1 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹Operated by Shoshone-Bannock Tribes.

²Concentration and 1 SD values are for Cs-137.

³Four filters/composite for January and March, five filters/composite for February.

⁴The volume is an estimate due mechanical malfunctions; the sampler was replaced. The resulting data are estimates (J).

⁵This result is qualified as an estimate (J) because it and its duplicate did not agree within acceptance criteria.

Table 5. Radiochemical separation analysis results for 8x10-inch TSP particulate filter composites collected during fourth quarter 2023.

Station Location	⁹⁰ Sr			²³⁸ Pu			^{239/240} Pu			²⁴¹ Am		
	Value ¹		1 SD	Value ¹		1 SD	Value ¹		1 SD	Value ¹		1 SD
On-Site Locations												
BLR ⁴ Rest Area	0.78	-	0.18	0.06	U	0.05	0.03	U	0.02	0.11	U	0.07
EFS ³	1.13	J ⁵	0.25	0.06	UJ	0.06	0.05	UJ	0.02	0.15	UJ	0.10
Sand Dunes	1.58	-	0.23	-0.01	U	0.03	0.05	U	0.03	0.01	U	0.05
Van Buren	1.22	-	0.20	0.06	U	0.03	0.06	U	0.03	0.19	U	0.08
Boundary Locations												
Atomic City	0.61	-	0.17	0.04	U	0.03	0.04	U	0.02	0.06	U	0.06
Howe	1.90	-	0.24	0.09	U	0.04	0.06	-	0.02	0.04	U	0.06
Monteview	1.87	-	0.25	0.04	U	0.03	0.03	U	0.02	0.00	U	0.06
Mud Lake	2.61	-	0.29	0.13	U	0.05	0.02	U	0.03	0.07	U	0.06
Distant Locations												
Craters of the Moon	0.79	-	0.18	0.03	U	0.04	0.03	U	0.02	-0.04	U	0.06
Fort Hall ²	0.52	-	0.17	0.07	U	0.04	0.03	U	0.02	0.00	U	0.07
Idaho Falls	1.99	-	0.25	0.03	U	0.04	0.04	U	0.02	0.04	U	0.06

Note: Concentrations are reported in 1 x 10⁻⁵ pCi/m³ with associated uncertainty (1 SD) and correspond to filter composites collected during the calendar quarter.

Bold concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹ Measurable quantities of these radionuclides are expected in the environment due to historic above-ground testing of nuclear weapons, and possibly from INL programs. DEQ-INL OP's action levels of 19 for americium-241, 190 for strontium-90, 21 for plutonium-238, and 20 for plutonium-239/240 (in 1 x 10⁻⁵ pCi/m³) are 10 percent of the compliance values listed for the specific radionuclide in 40 CFR 61, Appendix E, Table 2.

² Operated by Shoshone-Bannock Tribes.

³ EFS - Experimental Field Station.

⁴ BLR – Big Lost River.

⁵ The air volume was zero through three of the filters and low for one of the filters due to electrical power issues in October 2023. All EFS results for the fourth quarter of 2023 are considered estimates (J).

Table 6. Iodine-131 activity in weekly charcoal filter composites, first quarter, 2024.

Start Date	Collection Date	Iodine-131 activity (pCi/composite)		
		Activity		1 SD
12/28/23	01/04/24	1.48	U	1.40
01/04/24	01/11/24	1.23	U	1.11
01/11/24	01/18/24	-0.49	U	1.14
01/18/24	01/25/24	0.05	U	0.83
01/25/24	02/01/24	-0.33	U	0.90
02/01/24	02/08/24	-0.01	U	0.85
02/08/24	02/15/24	-1.54	U	1.07
02/15/24	02/22/24	0.91	U	0.86
02/22/24	02/29/24	1.13	U	0.90
02/29/24	03/07/24	-1.67	U	0.95
03/07/24	03/14/24	0.42	U	0.98
03/14/24	03/21/24	-1.44	U	0.85
03/21/24	03/28/24	-1.35	U	1.62

Activities are reported in pCi/composite with associated uncertainty (1 SD). **Bold activities** are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 7. Tritium concentrations in air from atmospheric moisture, first quarter, 2024.

Station Location	Start Date	Collection Date	Tritium		
			Concentration		1 SD
On-site Locations					
Big Lost River Rest Area	01-04-2024	02-08-2024	NS ²	-	NS
Big Lost River Rest Area	02-08-2024	03-14-2024	0.17	U	0.10
Big Lost River Rest Area	03-14-2024	03-28-2024	0.44	-	0.13
Big Lost River Rest Area Mean	01-04-2024	03-28-2024	0.25	U	0.11
Experimental Field Station	01/04/2024	02/08/2024	0.32	U	0.11
Experimental Field Station	02/08/2024	03/28/2024	0.18	U	0.11
Experimental Field Station Mean	01/04/2024	03/28/2024	0.24	U	0.11
Sand Dunes Tower	01/04/2024	02/15/2024	0.29	U	0.11
Sand Dunes Tower	02/15/2024	03/28/2024	0.14	U	0.10
Sand Dunes Tower Mean	01/04/2024	03/28/2024	0.21	U	0.11
Van Buren Avenue	01/04/2024	02/22/2024	0.20	U	0.10
Van Buren Avenue	02/22/2024	03/28/2024	0.03	U	0.10
Van Buren Avenue Mean	01/04/2024	03/28/2024	0.12	U	0.10
Boundary Locations					
Atomic City	01/04/2024	02/08/2024	0.26	U	0.11
Atomic City	02/08/2024	03/28/2024	0.04	U	0.11
Atomic City Mean	01/04/2024	03/28/2024	0.13	U	0.11
Howe	01/04/2024	02/01/2024	0.19	U	0.09
Howe	02/01/2024	02/22/2024	0.23	U	0.11
Howe	02/22/2024	03/28/2024	0.10	U	0.05
Howe Mean	01/04/2024	03/28/2024	0.16	U	0.08
Mud Lake	01/04/2024	02/08/2024	0.11	U	0.11
Mud Lake	02/08/2024	03/07/2024	-0.04	U	0.11
Mud Lake	03/07/2024	03/28/2024	0.17	U	0.13
Mud Lake Mean	01/04/2024	03/28/2024	0.07	U	0.11
Montevieu	01/04/2024	02/08/2024	0.18	U	0.09
Montevieu	02/08/2024	03/07/2024	0.15	U	0.15
Montevieu	03/07/2024	03/28/2024	-0.12	U	0.12
Montevieu Mean	01/04/2024	03/28/2024	0.09	U	0.11
Distant Locations					
Craters of the Moon	01/04/2024	02/08/2024	0.34	-	0.10
Craters of the Moon	02/08/2024	03/14/2024	0.18	U	0.09
Craters of the Moon	03/14/2024	03/28/2024	0.50	-	0.12
Craters of the Moon Mean	01/04/2024	03/28/2024	0.30	-	0.10
Fort Hall ¹	01/04/2024	02/01/2024	0.48	-	0.12
Fort Hall	02/01/2024	02/22/2024	0.22	U	0.13
Fort Hall	02/22/2024	03/14/2024	0.39	-	0.12
Fort Hall	03/14/2024	03/28/2024	0.10	U	0.30
Fort Hall Mean	01/04/2024	03/28/2024	0.32	U	0.15
Idaho Falls	01/04/2024	02/01/2024	0.17	U	0.10
Idaho Falls	02/01/2024	02/29/2024	0.12	U	0.12
Idaho Falls	02/29/2024	03/28/2024	-0.04	U	0.12
Idaho Falls Mean	01/04/2024	03/28/2024	0.09	U	0.12

Note: Concentrations are reported in pCi/m³ with associated uncertainty (1 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹Station operated by the Shoshone-Bannock Tribes.

²NS = No sample for this time period.

Table 8. Tritium and gamma-emitting radionuclide concentrations from precipitation, first quarter, 2024.

Station Location	Start Date	Stop Date	Tritium			Cs-137		
			Concentration		1 SD	Concentration		1 SD
On-site Locations								
Big Lost River Rest Area	01/04/24	02/08/24	10	U	30	-0.8	U	0.6
Big Lost River Rest Area	02/08/24	03/28/24	30	U	60	-0.5	U	0.6
Big Lost River Rest Area	01/04/24	03/28/24	19	U	43	-0.7	U	0.6
Boundary Locations								
Atomic City	01/04/24	02/08/24	70	U	30	1.1	U	1.0
Atomic City	02/08/24	03/07/24	-10	U	30	1.1	U	0.8
Atomic City	03/07/24	03/28/24	30	U	30	-0.8	U	0.8
Atomic City Mean	01/04/24	03/28/24	33	U	30	1.0	U	0.9
Howe	01/04/24	03/08/24	180	-	30	0.1	U	0.6
Howe	03/08/24	03/28/24	0	U	30	0.3	U	0.8
Howe Mean	01/04/24	03/28/24	119	-	30	0.2	U	0.7
Mud Lake	01/04/24	02/08/24	30	U	30	0.3	U	0.9
Mud Lake	02/08/24	03/28/24	140	-	30	0.2	U	0.9
Mud Lake Mean	01/04/24	03/28/24	65	U	30	0.3	U	0.9
Montevieu	01/04/24	02/08/24	60	U	30	0.7	U	0.7
Montevieu	02/08/24	03/28/24	70	U	30	-0.6	U	0.6
Montevieu Mean	01/04/24	03/28/24	61	U	30	0.5	U	0.7
Distant Locations								
Idaho Falls	01/04/24	02/08/24	40	U	30	1.0	U	0.7
Idaho Falls	02/08/24	03/07/24	30	U	30	0.6	U	0.7
Idaho Falls	03/07/24	03/28/24	30	U	30	1.0	U	0.8
Idaho Falls Mean	01/04/24	03/28/24	34	U	30	0.8	U	0.7

Concentrations are reported in pCi/L with associated uncertainty (1 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD. Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Environmental Radiation Monitoring Results

The ESP operated 13 environmental radiation stations during the first quarter of 2024 (**Figure 1**). To detect gamma radiation, each station is instrumented with triplicate electret ionization chambers (EIC), and 10 of the stations also are equipped with an EcoGamma gamma radiation monitor with low and high range Geiger-Müller detectors (**Table 9**).

The Shoshone-Bannock Tribes operate an air monitoring station at Fort Hall which is also equipped with EICs and an EcoGamma, both of which are owned and operated by the DEQ-INL OP. The DEQ-INL OP reports these results as a distant site.

EcoGammas are instruments capable of real-time measurements and are sensitive enough to detect small changes in gamma radiation levels. The real-time gamma radiation measurements collected by the EcoGammas at each location are transmitted to DEQ-INL OP and presented graphically via the worldwide web at <https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/gamma-radiation-measurements>. Historically, DEQ-INL OP has used high-pressure ion chambers (HPIC) for real-time gamma radiation measurements. We completed a change-over of removing the old HPICs and replacing them with EcoGammas at each of our monitoring stations in the first quarter 2022. Slight differences between EcoGamma data and historical HPIC data are expected.

EICs are a passive-integrating system that provides a cumulative measure of environmental gamma radiation exposure in the field. EICs are deployed, collected, and analyzed quarterly. EICs offer an inexpensive methodology to measure gamma radiation over a wide area, particularly in regions which do not have a power source. EICs can also provide valuable gamma radiation data in the event of an emergency. For this reason, EICs are deployed at 67 locations by DEQ-INL OP in a widespread network around the INL measuring external radiation. This information is tabulated in **Appendix B**.

These two systems are used by DEQ-INL OP to measure external gamma radiation for various radiological monitoring objectives. **Table 10** lists the average and median radiation exposure rates and exposure rate ranges measured by EcoGammas for the first quarter of 2024. **Table 11** lists the EIC monitoring results for the first quarter of 2024. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation.

Table 9. Summary of instrumentation at radiation monitoring stations.

Station Location	Instrument Type	
	EcoGamma	EIC
On-site Locations		
Base of Howe	■	■
Big Lost River Rest Area	■	■
Experimental Field Station		■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
Boundary Locations		
Atomic City	■	■
Big Southern Butte	■	■
Howe Met Tower	■	■
Monteview	■	■
Mud Lake/Terreton	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall	■	■
Idaho Falls	■	■

Table 10. Average gamma exposure rates, first quarter, 2024, EcoGamma* network.

Station Location	Exposure Rate (µR/hr)			
	Quarterly Average*	1 SD	Median	Range**
On-site Locations				
Base of Howe	13.3	0.8	13.2	10.8 – 18.8
Big Lost River Rest Area ¹	13.6	0.8	13.6	11.1 – 17.5
Rover ²	14.4	0.7	14.4	11.8 – 18.9
Sand Dunes Tower	13.9	0.7	13.9	11.7 – 18.6
Boundary Locations				
Atomic City	12.7	1.0	12.6	9.9 -19.3
Big Southern Butte ³	13.5	0.6	13.6	11.5 – 15.8
Howe Met. Tower	12.8	0.8	12.7	10.6 – 16.7
Monteview	12.9	0.7	12.9	11.0 – 19.6
Mud Lake / Terreton ⁴	12.7	0.7	12.6	10.7 – 16.1
Distant Locations				
Fort Hall	11.7	0.9	11.7	9.3 – 17.8
Idaho Falls	13.9	0.9	13.9	11.2 – 20.7

*EcoGammas are sensitive electronic devices that can experience intermittent malfunctions and/or interference; this typically results in characteristic positive and/or negative data spikes. These aberrations are removed from the data set based on the judgement of the data analyst.

**The range of background exposure rates from EcoGamma data collected to date is approximately 7 – 34 µR/hr.

¹No data from the EcoGamma at this location for 02/01 – 02/03/24, 02/05 – 02/10/24, 02/11 – 02/12/24, 02/13 – 03/12/24 and 03/13 – 03/26/24.

²No data from the EcoGamma at this location for 01/22 – 01/23/24, 01/25 – 01/26/24, and 02/14 – 02/18/24.

³No data from the primary Ecogamma at this location for the entire quarter. The duplicate EcoGamma at this location was in operation intermittently, producing several significant gaps in the dataset.

⁴No data from the EcoGamma at this location for 02/19 – 02/21/24, 02/24 – 02/25/24, 02/26 – 02/27/24, and 03/04 – 03/06/24.

Table 11. Electret ionization chamber (EIC) cumulative average exposure rates, first quarter, 2024.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average ¹	1 SD
On-Site Locations		
Base of Howe	11.5	0.4
Big Lost River Rest Area	10.9	1.4
Experimental Field Station	13.2	0.9
Rover	12.9	1.3
Sand Dunes	10.0, 10.4	-
Van Buren Avenue	14.0	1.4
Boundary Locations		
Atomic City	12.1	0.7
Big Southern Butte	9.0	0.6
Howe Met. Tower	10.2, 12.3	-
Monteview	11.9	1.0
Mud Lake/Terreton	10.2, 11.7	-
Distant Locations		
Craters of the Moon	9.5	1.5
Ft. Hall	9.2	1.3
Idaho Falls	6.9	0.9

¹Results are the average of triplicate exposure rate measurements with the associated sample variability (1 SD), or the 2 measured exposure rates remaining after removal of an outlying value. One of the triplicate measurements is rejected if it is outside the average of the triplicate measurements ± 2 SD of the historical population variability. Typically, the two most consistent measurements are reported, based on judgment of the data analyst.

Water Monitoring Results

DEQ-INL OP collects groundwater samples from wells and springs located within, upgradient of, and downgradient of the INL in order to evaluate the effects of INL contaminants on water quality in the eastern Snake River Plain (ESRP) aquifer and verify the results of DOE and USGS monitoring. Each year, DEQ-INL OP samples approximately 85-90 locations concurrently with a DOE contractor or the USGS and 15-20 locations independently. Co-sampled locations are primarily on or near the INL Site and are usually sampled during the second and fourth calendar quarters. DEQ-INL OP publishes a comparison of its own analytical results with those obtained by co-samplers in the DEQ-INL Oversight Program Annual Report. Locations sampled independently by DEQ-INL OP are mostly in the Magic Valley and are typically sampled during the third calendar quarter.

Most water samples are collected from wells drilled into the aquifer or springs formed by the intersection of the aquifer water table with the surface. Each aquifer well or spring is categorized as upgradient, facility, boundary, or distant based on its location (**Figure 2** and **Figure 3**):

- *Upgradient* sites are situated north or northeast of INL facilities in areas that have not been affected by INL operations. They are used to monitor background concentrations in the aquifer.
- *Facility* sites are located near facility complexes within the INL, including the Advanced Test Reactor complex (ATR), the Central Facilities Area (CFA), the Idaho Nuclear Technology and Engineering Center (INTEC), the Materials and Fuels Complex (MFC), the Naval Reactors Facility (NRF), the Radioactive Waste Management Complex (RWMC), and Test Area North (TAN). Facility sites are located within or immediately downgradient of known areas of contamination and are sampled to monitor the concentrations and migration of specific contaminants.

- *Boundary* sites are located near the southern boundary of the INL, downgradient of potential sources of INL contamination. These include several wells equipped with Westbay Multilevel Groundwater Monitoring Systems (“Westbay wells”), which offer a look at the vertical distribution of constituents in the aquifer.
- *Distant* sites are located farther downgradient of the INL, primarily in the Magic Valley, and include wells and springs used for agricultural, municipal, domestic, and industrial purposes.

A small number of samples are also collected each year from streams, waste-pond effluent, and wells drilled into perched groundwater (groundwater that sits above the aquifer).

Samples collected from water-monitoring sites are analyzed for radiological and non-radiological constituents, many of which are present in the aquifer both naturally and as a result of INL operations. All locations are sampled for gross alpha and gross beta radioactivity, manmade gamma-emitting nuclides, tritium, chloride, sulfate, alkalinity, chromium, and nitrate-plus-nitrite.⁶ Samples from locations at which tritium concentrations are too low to be detected by the standard method are re-analyzed for tritium using an electrolytic enrichment method (referred to as the low-level method), which has a minimum detectable concentration (MDC) about ten times lower than the standard method. Selected sites are also sampled for specific radionuclides—including uranium isotopes (²³⁴U, ²³⁵U, and ²³⁸U), plutonium isotopes (²³⁸Pu, ^{239/240}Pu), americium-241 (²⁴¹Am), strontium-90 (⁹⁰Sr), iodine-129 (¹²⁹I), and technetium-99 (⁹⁹Tc)—selected trace metals, common ions, total phosphorous, and/or volatile organic compounds (VOCs) based on past and present INL operations or a history of elevated concentrations. If unexpected levels of radioactivity are detected in gross measurements, samples will be reanalyzed or additional samples will be collected and analyzed for specific radionuclides.

During the first quarter of 2024, DEQ-INL OP sampled groundwater from the aquifer at two facility locations. **Table 12** lists the sample date, co-sampler, well depth, and analyses requested for the location sampled this quarter. Analytical results are reported in **Tables 14 through 23** and summarized below.

Table 13 shows the range of background concentrations for each constituent in the ESRP aquifer and the EPA drinking water maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL). Background concentrations depend on local geology, and the concentrations of constituents at sites not influenced by INL activities may on occasion be higher than the given background ranges due to local factors and natural variability.

Gross alpha and gross beta radioactivity

Gross alpha and gross beta analyses are used to screen for unexpectedly high levels of radioactivity in samples. DEQ-INL OP has determined from past sampling that background concentration ranges for gross alpha and gross beta radioactivity in the ESRP aquifer are approximately 0-5.6 pCi/L and 0-8.6 pCi/L, respectively. Occasional measurements of concentrations above these background ranges in uncontaminated samples are statistically probable due to uncertainties inherent in measuring low levels of radioactivity. Additionally, some samples will have levels of radioactivity slightly higher than background ranges due to higher-than-average concentrations of naturally occurring uranium, thorium, or potassium-40.

TAN-2336 exhibited a high gross beta concentration of 755.7 ± 13.3 pCi/L. This well is undergoing active remediation, and the results are below the historical mean. All other results were within background ranges (**Table 14**).

⁶ Distant locations Alpheus Spring, Bill Jones Hatchery, Clear Spring, Minidoka Water Supply, and Shoshone Water Supply and upgradient location Mud Lake Water Supply are sampled for gross alpha and gross beta radioactivity, gamma-emitting radionuclides, and tritium during the second quarter. In the fourth quarter, samples are collected for common ions, metals, nitrate-plus-nitrate, and other constituents along with gross alpha and gross beta radioactivity, gamma-emitting radionuclides, and tritium.

Manmade gamma-emitting radionuclides

The TAN-2336 sample produced a positive detection for Cs-137 of 6.2 ± 1.1 pCi/L (**Table 14**). This value is within the historical range for this location. Gamma-emitting radionuclides were not detected in the USGS-123 sample.

Tritium

A tritium concentration of 1230 ± 50 pCi/L was measured in a sample from USGS-123 using the standard analytical method (**Table 15**). USGS-123 is located in a known tritium plume that extends south from INTEC. The tritium concentration at this location has been steadily decreasing since 2003. The concentration measured this quarter is the lowest measured by DEQ-INL OP to date.

Tritium concentrations reported this quarter were well below the drinking water MCL of 20,000 pCi/L.

Enriched Tritium

All enriched tritium samples from 2023 were within expected ranges (**Table 16**). Samples from Q4 2023 were not analyzed until Q1 2024 due to a backlog. This report also includes results for TAN-2312. Samples for TAN-2312 were collected in Q2 2023, resulting in an enriched tritium concentration of 113 ± 4 pCi/L with an MDC of 7 pCi/L. This elevated level is unusual for this well, which has shown non-detectable results since monitoring began in 2019. To verify these findings, the lab was asked to reanalyze the sample, resulting in a non-detectable result of 2 ± 2 pCi/L with an MDC of 6 pCi/L. This result is consistent with historical values and considered the official result.

Strontium-90

A sample from TAN-2336 resulted in a ^{90}Sr concentration of 303 ± 13 pCi/L (**Table 17**). This concentration is well within the historical range for this location.

Technetium-99

As shown in **Table 18**, no detectible concentrations of ^{99}Tc were observed this quarter.

Uranium Isotopes

TAN-2336 was sampled for uranium isotopes this quarter (**Table 19**). This location yielded positive detections for ^{234}U and ^{238}U . ^{234}U analysis resulted in a concentration of 3.68 ± 0.53 pCi/L; while elevated, it is within the expected range. ^{238}U results were also marginally elevated at 0.887 ± 0.256 pCi/L, but still within the historical range. All results were below the MCL of 30 $\mu\text{g/L}$ of total uranium.

Common ions, trace metals, and nutrients

All non-radiological analytes were consistent with past observations for USGS-123 (**Tables 20 – 22**).

Unlike INTEC well USGS-123, most analytes at TAN-2336 are above background ranges due to active bioremediation activities, which alter geochemical conditions in the aquifer resulting in the mobilization of various chemical constituents. TAN-2336 exceeded the previous historical maximums for arsenic, lead, total phosphorus, and potassium. The arsenic concentration was measured at 60 $\mu\text{g/L}$, which is approximately a 150% increase from the previous maximum of 24 $\mu\text{g/L}$. This concentration is significantly above the MCL, set at 10 $\mu\text{g/L}$. Lead was measured at 6.2 $\mu\text{g/L}$, which increased from the previous historical maximum of 1.6 $\mu\text{g/L}$, but still below the MCL of 15 $\mu\text{g/L}$. Total phosphorus was

measured at 39 mg/L and potassium was measured at 29 mg/L. Neither phosphorus nor potassium have MCLs defined by the Environmental Protection Agency.

Volatile Organic Compounds

Volatile organic compounds were not detected in the sample taken from TAN-2336 that was analyzed this quarter (**Table 23**).

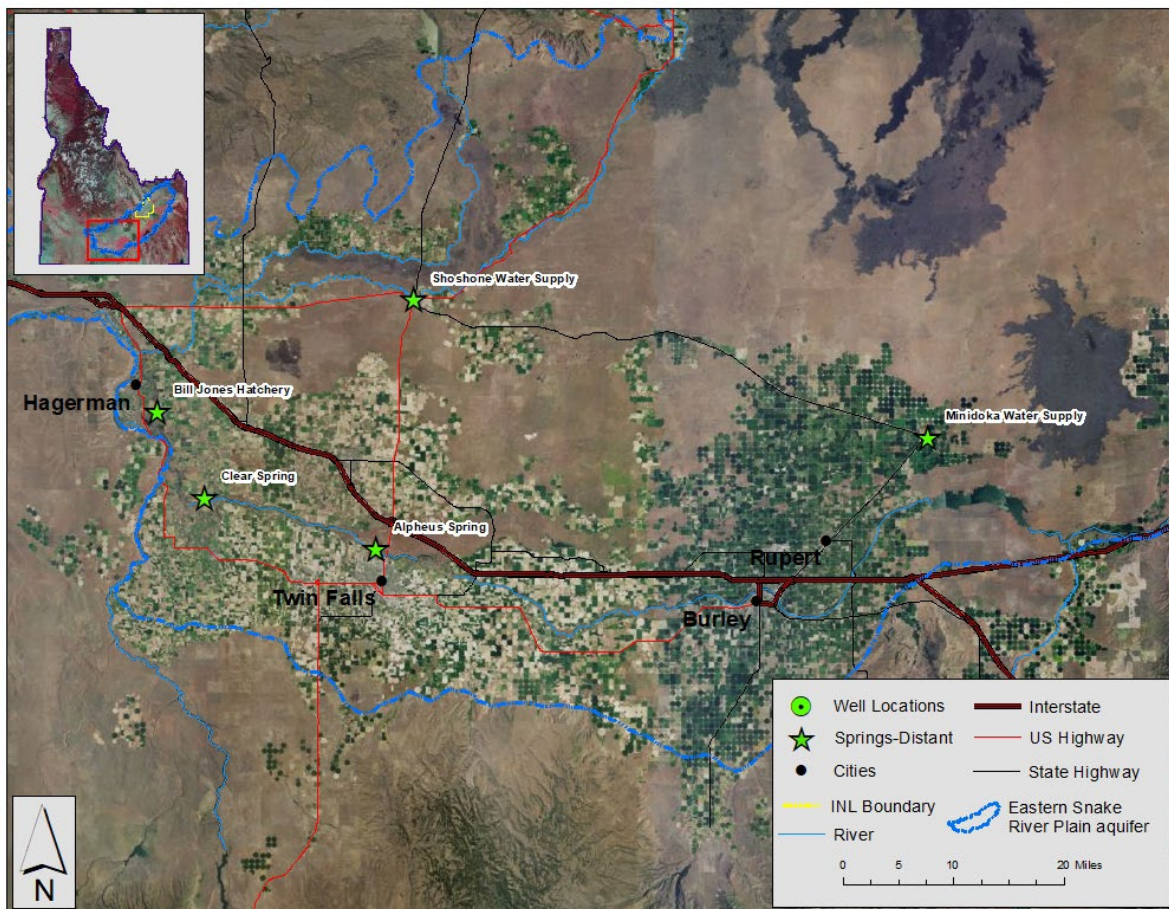


Figure 2. Distant water monitoring locations. For all locations identified on the map, enriched tritium samples were collected in 2023 and analyzed in 2024 due to a backlog. No distant water monitoring sites were sampled during the reporting period.

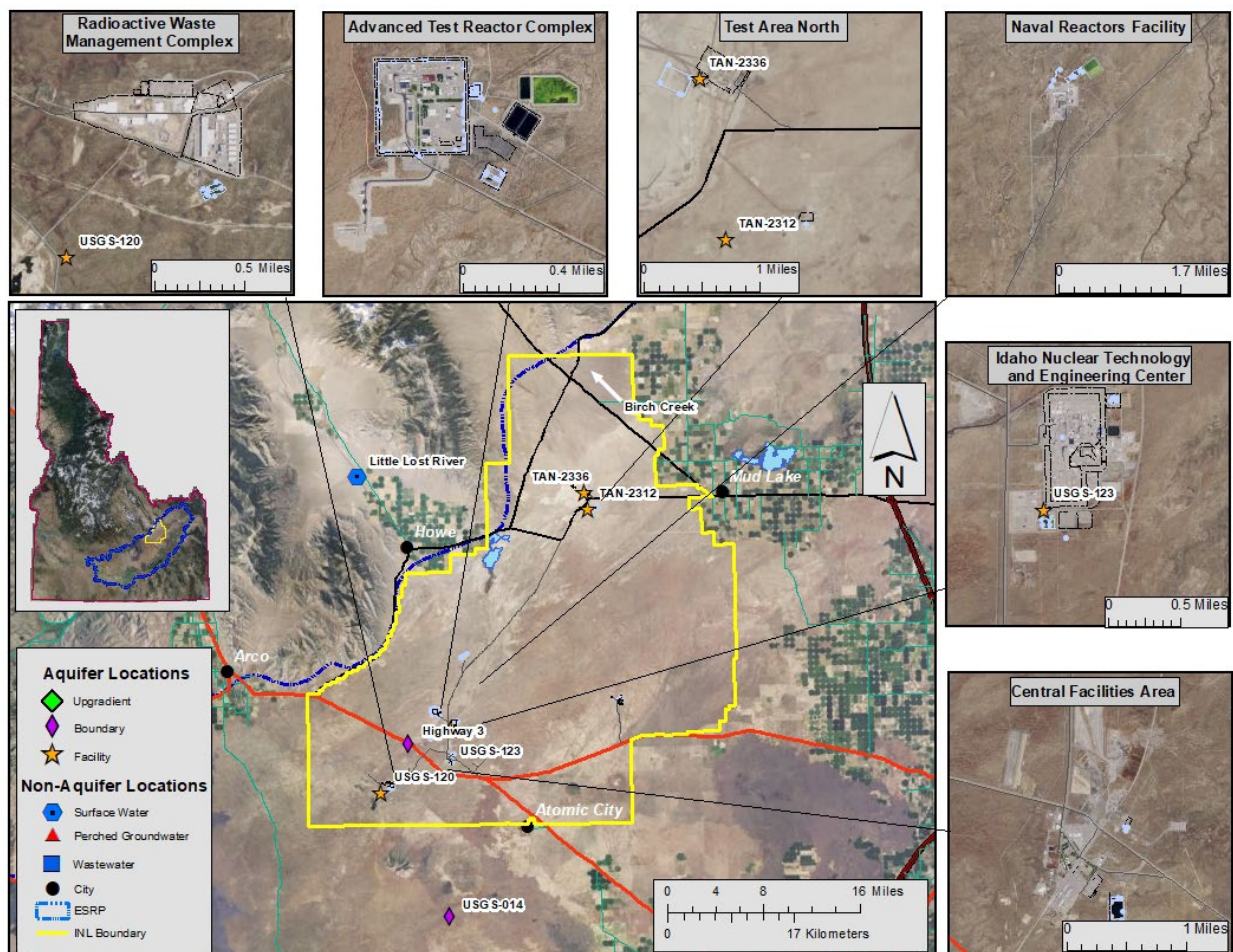


Figure 3. Up-gradient, facility, boundary, perched groundwater (GW), surface water, and wastewater monitoring locations.

Table 12. Locations sampled for water, first quarter, 2024.

Sample Location	Date Sampled	Co-sampler	Well Depth (ft bgs)	Analyses*
Aquifer Samples				
Facility				
<i>Test Area North</i>				
TAN-2336	01/11/2024	IEC	255	α, β, γ, ³ H, ⁹⁰ Sr, U iso., com. ions, trace metals, NO ₃ +NO ₂ , P, VOCs
<i>Idaho Nuclear Technology and Engineering Center:</i>				
USGS-123	03/05/2024	IEC	744.2	α, β, γ, ³ H, ⁹⁰ Sr, ⁹⁹ Tc, Cl, SO ₄ , Alkalinity, Cr, NO ₃ +NO ₂

ft bgs = feet below ground surface. *α = gross alpha radioactivity; β = gross beta radioactivity; γ = manmade gamma-emitting radionuclides; ³H = tritium; ⁹⁰Sr = Strontium-90; ⁹⁹Tc = Technetium-99; ²⁴¹Am = Americium-241; P iso. = ²³⁸Pu, ^{239/240}Pu; ¹²⁹I = Iodine-129; U iso. = ²³⁴U, ²³⁵U, ²³⁸U; Cl⁻ = chloride; Cr = chromium; com. ions = calcium (Ca²⁺), magnesium (Mg²⁺), sodium (Na⁺), potassium (K⁺), chloride (Cl⁻), sulfate (SO₄²⁻), alkalinity; trace metals = arsenic (As), barium (Ba), chromium (Cr), iron (Fe), manganese (Mn), lead (Pb); selenium (Se); NO₃+NO₂ = nitrate plus nitrite; P = phosphorus, and VOCs = volatile organic compounds.

Table 13. Constituent background concentration ranges and EPA drinking water standards.

Constituent	Background ¹	MCL or SMCL ²
Radiological Constituents (pCi/L)		
Gross alpha	0-5.6 ^a	15
Gross beta	0-8.6 ^a	4 mrem/yr
Cesium-137	0	200
Tritium	0-33 ^a	20,000
Strontium-90	0	8
Technetium-99	0	900
Iodine-129	0.0000054 ^e	1
Uranium-234	0.043-1.9 ^b	30 µg/L (total U)
Uranium-235	0-0.048 ^b	
Uranium-238	0.021-0.719 ^b	
Plutonium-238	0	15 ^g
Plutonium-239/240	0	15 ^g
Americium-241	0	15 ^g
Non-radiological Constituents		
Common Ions (mg/L)		
Alkalinity (as CaCO ₃)	91-261 ^a	---
Calcium	23 – 71 ^a	---
Chloride	4.9 – 66.6 ^a	250*
Fluoride	0.1 – 1.50 ^a	4
Magnesium	10.1 – 27.4 ^a	---
Potassium	1.2 – 5.8 ^a	---
Sodium	2.6 – 27.0 ^a	---
Sulfate	9.6 – 40.4 ^a	250*
Trace Metals (µg/L)		
Arsenic	2 – 3 ^c	10
Barium	50 – 70 ^c	2000
Chromium	<1.0 – 5.2 ^a	100
Iron	4 – 16 ^d	300*
Lead	<5 ^c	15
Manganese	<1 – 4 ^a	50*
Selenium	<1 ^c	50
Zinc	<3 – 10.5 ^d	5000*
Nutrients (mg/L)		
Nitrate plus nitrite	<0.04 – 3.59 ^b	10 for NO ₃ ⁻ , 1 for NO ₂ ⁻
Phosphorus	<0.01 – 0.02 ^d	---
Volatile Organic Compounds (µg/L)		
Tetrachloroethene (PCE)	0	5
Trichloroethene (TCE)	0	5
1,1-Dichloroethene	0	7
cis-1,2-dichloroethene	0	70
trans-1,2-dichloroethene	0	100
Vinyl chloride	0	2
Carbon tetrachloride	0	5
Chloroform	0	80 ^f
Chloromethane	0	---
Methylene Chloride	0	5
Methyl Ethyl Ketone	0	---
1,1-Dichloroethane	0	---

¹ Sources for background ranges are: ^a DEQ data compiled from distant, boundary, and surface water sites from 1993-2018; ^b Bartholomay and Hall, 2016 (DOE/ID-22237); ^c Knobel and others, 1992; ^d Knobel and others, 1999 (DOE/ID-22164). ^e The actual background of I-129 in the aquifer from atmospheric deposition and rock weathering is 0.0000054 pCi/L per Cecil and others, 2003 (DOE/ID-22186); ^f MCL is for total trihalomethanes. ^g There are no specific MCLs for these nuclides. Listed MCLs are the gross alpha activity MCL. ² Maximum Contaminant Levels (MCLs) are the highest levels of contaminants legally allowed in public drinking water systems in Idaho. Most wells sampled by DEQ-INL OP are not used for drinking water. A * designates a Secondary MCL (SMCL), which is a guideline recommended by the EPA for constituents that may affect the taste, color, or odor of drinking water.

Table 14. Gross alpha, gross beta, and man-made gamma-emitting radionuclide concentrations (pCi/L) in water samples, first quarter, 2024.

Sample Location	Sample Date	Gross Alpha			Gross Beta			Cesium-137*		
		Concentration	1 SD		Concentration	1 SD		Concentration	1 SD	
Aquifer Samples										
Facility										
<i>Test Area North</i>										
TAN-2336	01/11/2024	9.1	U	7.0 ¹	755.7	-	13.3	6.2	-	1.1
<i>Idaho Nuclear Technology and Engineering Center</i>										
USGS-123	03/05/2024	1.1	U	0.4	3.4	J+	0.4	-0.3	U	0.8

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively. *ISU-EML analyzes water samples for all common manmade gamma-emitting radionuclides. If none are detected, only the results for ¹³⁷Cs, the manmade gamma-emitter most likely to be detected in groundwater, are reported in this table.

Bold concentrations are positive detections, greater than or equal to 3 SD.

¹ISU-EML reported that the elevated 1 SD is attributable to the low aliquant of sample (0.010 L) that was required to keep the residual mass within the maximum value of 200 mg for which their mass correction formula is valid.

Table 15. Tritium concentrations (pCi/L) in water samples, first quarter, 2024.

Sample Location	Sample Date	Tritium		
		Concentration	1 SD	
Aquifer Samples				
Facility				
<i>Test Area North</i>				
TAN-2336	01/11/2024	310	-	40
<i>Idaho Nuclear Technology and Engineering Center</i>				
USGS-123	03/05/2024	1230	-	50

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Bold concentrations are positive detections, greater than or equal to 3 SD.

Table 16. Low-level tritium concentrations (pCi/L) in water samples collected during 2023 and analyzed using the electrolytic enrichment method, first quarter, 2024.

Sample Location	Sample Date	Tritium		
		Concentration	1 SD	
Aquifer Samples				
Facility				
<i>Radioactive Waste Management Complex</i>				
USGS-120	10/16/2023	15	-	1
<i>Test Area North</i>				
TAN-2312	06/13/2023	2	U	2
Boundary				
Highway 3	10/10/2023	48		3
USGS-014	10/12/2023	4	U	2
Upgradient				
Birch Creek	10/18/2023	2	U	2
Little Lost River	10/18/2023	8	-	2
Distant				
Alpheus Spring	11/27/2023	10	-	2
Bill Jones Hatchery	11/27/2023	0	U	2
Clear Spring	11/27/2023	3	U	2
Minidoka Water Supply	11/27/2023	3	U	2
Shoshone Water Supply	11/27/2023	4	U	2

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively. ft bgs = feet below ground surface.

Bold concentrations are positive detections, greater than or equal to 3 SD.

Table 17. Strontium-90 concentrations (pCi/L) in water samples, first quarter, 2024.

Sample Location	Sample Date	Strontium-90		
		Concentration		1 SD
Aquifer Samples				
Facility				
<i>Test Area North</i>				
TAN-2336	01/11/2024	303	-	13
<i>Idaho Nuclear Technology and Engineering Center</i>				
USGS-123	03/05/2024	0.097	U	0.136

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Bold concentrations are positive detections, greater than or equal to 3 SD.

Table 18. Technetium-99 concentrations (pCi/L) for water samples, first quarter, 2024.

Sample Location	Sample Date	Technetium-99		
		Concentration		1 SD
Aquifer Samples				
Facility				
<i>Idaho Nuclear Technology and Engineering Center</i>				
USGS-123	03/05/2024	-1.71	U	1.45

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Bold concentrations are positive detections, greater than or equal to 3 SD.

Table 19. Uranium isotope concentrations (pCi/L) for water samples, first quarter, 2024.

Sample Location	Sample Date	Uranium-234		Uranium-235		Uranium-238				
		Concentration	1 SD	Concentration	1 SD	Concentration	1 SD			
Aquifer Samples										
Facility										
<i>Test Area North</i>										
TAN-2336	01/11/2024	3.68	J+	0.53	0.316	U	0.250	0.887	-	0.256

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.
 U* – result is equal to the MDC but less than 2 SD and is therefore considered a non-detection.

Bold concentrations are positive detections, greater than or equal to 3 SD.

Table 20. Common ion concentrations (mg/L) in water samples, first quarter, 2024.

Sample Location	Sample Date	Calcium*	Magnesium*	Sodium*	Potassium*	Fluoride	Chloride	Sulfate	Alkalinity†								
Aquifer Samples																	
Facility																	
<i>Test Area North</i>																	
TAN-2336	01/11/2024	4.3	-	100 ²	-	5600 ²	-	29 ²	-	-	-	81.4 ³	-	2.28 ³	J	10700	-
<i>Idaho Nuclear Technology and Engineering Center</i>																	
USGS-123	03/05/2024	-	-	-	-	-	-	-	-	19.9	-	22.2	-	128	-		

Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

*Samples are filtered for calcium, magnesium, sodium, and potassium.

"-" = not analyzed.

Note 1. Lab indicates a dilution factor of 2:1.

Note 2. Lab indicates a dilution factor of 5:1.

Note 3. Lab indicates a dilution factor of 20:1.

Table 21. Dissolved metals concentrations (µg/L) in water samples, first quarter, 2024.

Sample Location	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc							
Aquifer Samples																
Facility																
<i>Test Area North</i>																
TAN-2336	01/11/2024	60 ¹	-	1300 ¹	-	300 ¹	-	7100 ¹	-	6.2 ¹	-	290 ¹	-	-	-	-
<i>Idaho Nuclear Technology and Engineering Center</i>																
USGS-123	03/05/2024	-	-	-	-	6.1	J	-	-	-	-	-	-	-	-	-

Samples were filtered in the field unless otherwise noted.

Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

"-" = not analyzed.

Note 1. Lab indicates a dilution factor of 5:1.

Table 22. Dissolved nutrient concentrations (mg/L) in water samples, first quarter, 2024.

Sample Location	Sample Date	Nitrate + Nitrite*	Total Phosphorus
Aquifer Samples			
Facility			
<i>Test Area North</i>			
TAN-2336	01/11/2024	0.35	-
<i>Idaho Nuclear Technology and Engineering Center</i>			
USGS-123	03/05/2024	1.0 ¹	-

Samples were filtered in the field unless otherwise noted.

Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Note 1: Lab indicates a dilution factor of 2:1.

Note 2: Lab Indicates a dilution factor of 100:1.

Table 23. Volatile organic compound concentrations (µg/L) in water samples, first quarter, 2024.
No VOCs were detected this quarter.

Sample Location	Sample Date	PCE		TCE		1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		Vinyl chloride	
TAN-2336	01/11/2022	<0.0	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U	<0.5	U

Abbreviations: PCE = tetrachloroethene; TCE = trichloroethene; 1,1-DCE = 1,1-dichloroethene; cis-1,2-DCE = cis-1,2-dichloroethene; trans-1,2-DCE = trans-1,2-dichloroethene.

Data qualifiers: U = undetected, J = estimate, R = rejected, "<" = less than detection limit, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Terrestrial Monitoring Results

The DEQ-INL OP conducts terrestrial (soil and milk) monitoring to characterize deposition and migration of contaminants and provide independent verification of DOE's terrestrial monitoring programs. Physical soil sampling and *in-situ* gamma spectrometry are used to characterize actual deposition and accumulation of radioactive contaminants in soils. No *in-situ* gamma spectroscopic measurements of soil were performed during the first calendar quarter of 2024, and no physical soil samples were collected during the quarter. Milk samples are collected to evaluate the potential for ingestion of radioactivity by the population around the INL. Nine milk samples were analyzed during the quarter.

Milk

DEQ-INL OP monitors milk for the naturally occurring radionuclide potassium-40 (^{40}K) and man-made iodine-131 (^{131}I). Milk samples are collected monthly. Results for gamma spectrometric analyses of milk samples are presented in **Table 24**. ^{40}K was detected in all samples within the expected range of concentrations. ^{131}I was not detected. Based on measurements of radionuclides in milk, there were no discernable impacts to the off-site environment from INL operations.

Table 24. Gamma spectrometry analysis data for milk samples, first quarter, 2024.

Sample Location/Dairy	Sample Date	Naturally occurring Potassium-40		Man-made Iodine-131		
		Concentration ²	1 SD	Concentration ²		1 SD
Monitoring Samples						
Gooding	01/16/24	1462	60	-1.2	U	1.2
Gooding	02/22/24	1394	56	-0.1	U	0.6
Gooding	03/20/24	1514	60	0.2	U	0.9
Monteview	01/19/24	1418	58	0.2	U	0.9
Monteview	02/21/24	1209	51	0.5	U	1.0
Monteview	03/22/24	1241	52	0.0	U	0.9
Verification Samples¹						
Terreton	01/15/24	1412	58	-0.8	U	0.8
Dietrich	02/19/24	1412	58	0.0	U	0.9
Monteview	03/19/24	1293	53	-1.0	U	1.0

¹ DEQ-INL OP samples collected by the off-site INL environmental surveillance contractor.

² Concentrations with associated uncertainties (1 SD) are expressed in pCi/L. **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Quality Assurance

Measurements of constituent concentrations in environmental media are subject to inaccuracy from errors that may be introduced during the collection, transportation, and analysis of samples, calibration of equipment, and recording and reporting of results. While it is impossible to quantify every error that may affect a result, a quality assurance (QA) program can evaluate the overall quality of a dataset and, in many cases, identify and address errors or inaccuracies. DEQ-INL OP's QA program is designed to (1) ensure sample integrity, (2) evaluate the precision and accuracy of analytical results, and (3) ensure that the environmental data are representative and complete.

This section summarizes the quality assurance assessment of the data collected by DEQ-INL OP in the first quarter of 2024. Included are the results of quality control (QC) samples (blanks, duplicates, and spikes) that DEQ-INL OP submitted to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses and to the Idaho Bureau of Laboratories-Boise (IBL) for non-radiological analyses during the quarter. The analytical results of QC samples are used to assess the precision, accuracy, and representativeness of the environmental data presented in this report. During the first quarter of 2024, DEQ-INL OP submitted 76 QC samples for various radiological and non-radiological analyses (**Table 25**).

All samples referenced in this report were collected in accordance with written procedures maintained by the DEQ-INL OP. Analytical methods and QC procedures used by the laboratories were performed in accordance with approved written procedures maintained by each lab. QC samples analyzed by the labs as part of each lab's internal QA program are not discussed in this report.

Blank Samples

Blank samples consist of matrices that contain immeasurable or acceptably low concentrations of the analyte(s) of interest. They are used to monitor contamination introduced during sample collection, storage, shipment, and analysis. For water matrices other than tritium, a blank sample consists of 18-megaohm deionized water from the DEQ-Idaho Falls Regional office. Mud Lake Well #2 serves as the water source for tritium analysis blanks, notable for its low atmospheric recharge, which results in tritium concentrations below detectable levels.

A blank sample is categorized as a field blank, equipment blank, or trip blank depending on how the blank is handled. A field blank is used to monitor for contamination introduced from the environment during sample collection, an equipment blank is used to monitor for contamination introduced by contaminated equipment, and a trip blank is used to monitor for contamination introduced during transportation of samples (trip blanks are typically only used for VOCs). Also, method blanks for airborne tritium are used to monitor for contamination introduced during processing of molecular sieve sample material. Most water blank samples submitted to laboratories by DEQ-INL OP are field blanks.

For all analyses a blank sample result is considered acceptable if it is less than or equal to three standard deviations (3 SD) of the result. If a blank result exceeds acceptance criteria, detected results in other samples collected, transported, or analyzed together with the failed blank may be qualified as biased high (J+) or rejected (R), or may remain unqualified, depending on the relative sizes of the blank detection and other sample results.

Sample results for blank 47-mm TSP filters submitted for gross alpha and gross beta screening in air for the first quarter of 2024 are presented in **Table 26**. Blank sample results for selected gamma emitters in air from 47-mm TSP filter quarterly composites and 8x10-inch monthly composites are presented in **Table 27**. Blank sample results for radiochemical analysis of 8x10-inch TSP filter quarterly composites from fourth quarter 2023 are presented in **Table 28**. The gross beta result for the 47-mm TSP filter blank

exceeded 3 SD for the week of 3/21-3/28/24. Associated 47-mm TSP filter sample gross beta results for that week are qualified as biased-high estimates (J+). All other TSP filter blank results met acceptance criteria for the first quarter 2024.

Method blank and control sample analysis results used to assess data quality for tritium in water vapor in air are presented in **Table 29**. Method blanks are prepared by vaporizing tritium-free water and passing the air-vapor mixture through molecular sieve columns. The molecular sieve material is then processed identically to the field samples. Control samples are used to determine if tritium contamination is introduced into the samples from areas used for processing field samples and storage of the processed water. All tritium method blank and control sample results met acceptance criteria for the first quarter 2024.

Blank sample results for radiological constituents in water are presented in **Table 30**. The result for the field blank taken on 1/11/24 minimally exceeded acceptance criteria for gross alpha and gross beta. The associated field sample gross beta result from USGS-123 has been qualified as a biased high estimate (J+). The gross alpha result remains qualified as a non-detection (U). Associated field sample results from TAN-2336 have not been qualified as biased high estimates because they are large compared to the exceedances. The result for the field blank taken on 1/11/24 exceeded acceptance criteria for uranium-234. The associated field sample U-234 result from TAN-2336 has been qualified as a biased high estimate (J+). Blank sample results for metals in water are presented in **Table 31**. Blank sample results for common ions and nutrients in water are presented in **Table 32**. Blank sample results for VOCs in water are presented in **Table 33**. All other blank sample results for water met acceptance criteria for first quarter 2024.

Duplicate Samples

A duplicate sample is one that is collected at the same location and approximately the same time as another sample (referred to as the “original” sample). Duplicate sample results are compared to the original sample’s results to evaluate reproducibility. Significant differences between the two could indicate poor analytical precision or a non-uniform sample matrix.

The difference between the results of an original and duplicate sample (referred to below as a “duplicate-sample pair”) is evaluated differently for radiological and non-radiological analyses. For radiological analyses, the results of a duplicate-sample pair are considered to be in agreement if their absolute difference is less than or equal to three times the pooled error of the results:

$$|R_1 - R_2| \leq 3 \sqrt{SD_1^2 + SD_2^2}$$

R_1 = Original sample result

R_2 = Duplicate sample result

SD_1 = Analytical uncertainty (1 sample standard deviation) of the original result

SD_2 = Analytical uncertainty (1 sample standard deviation) of the duplicate result

Duplicate radiological results are also considered to be in agreement if their relative percent difference (RPD) is no more than ± 20 percent. RPD is calculated as:

$$RPD = \frac{R_1 - R_2}{(R_1 + R_2)/2} \times 100$$

For non-radiological analyses, the RPD is used to evaluate duplicate sample pairs in which both results exceed five times the reporting detection limit (RDL). An RPD of up to ± 20 percent is acceptable. If one or both sample results are less than five times the RDL, the results agree if their absolute difference is less than or equal to the RDL.

Duplicate sample results for selected gamma emitters in air from 8x10-inch monthly TSP filter composites from the Idaho Falls monitoring location are presented in **Table 34**. The naturally-occurring Be-7 duplicate results for February did not meet acceptance criteria. The Be-7 original result from Idaho Falls was qualified as an estimate (J). Duplicate sample results for radiochemical analysis of 8x10-inch TSP filter quarterly composites from fourth quarter 2023, from the Idaho Falls monitoring location, are presented in **Table 35**.

Duplicate results for quarterly average EcoGamma readings from the Big Southern Butte monitoring location are presented in **Table 36**.

Duplicate results for radiological analyses in groundwater and surface water are presented in **Table 37**. Duplicate results for metals and common ions and nutrients in groundwater are presented in **Tables 38** and **39**. The USGS-123 duplicate results for chromium did not meet acceptance criteria. The original USGS-123 result is qualified as an estimate (J). All other duplicate sample results met acceptance criteria for the first quarter 2024.

Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added. They are used to assess a laboratory's analytical accuracy. The percent recovery (%R) of each spiked-sample analysis is calculated as the ratio of the spike concentration determined by the lab to the known spike concentration. DEQ-INL OP considers the lab's result to be in control if the percent recovery is $100 \pm 25\%$. If the percent recovery of a spiked sample is 50-74%, detected results of samples analyzed in the same batch as the spiked sample may be qualified as low-biased estimates (J-), and undetected results may be qualified as undetected estimates (UJ). If the percent recovery of a spiked sample is 126-150%, detected results of associated samples may be qualified as high-biased estimates (J+), and undetected results may be qualified as undetected (U). If the percent recovery of a spiked sample is $<50\%$ or $>150\%$, the results of all associated samples may be qualified as rejected (R), except for undetected sample results associated with a spiked-sample analysis having a percent recovery $>150\%$, in which case the sample result remains qualified as undetected (U).

No spiked samples were analyzed this quarter.

DEQ-INL OP also prepares additional "spike-like" quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL OP irradiates several electret ionization chambers (EICs) at ISU to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of near 30 mR and two additional higher and lower exposures, ranging from 15 to 60 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement has a percent recovery of $100 \pm 25\%$ when compared to the known irradiated quantity. Overall response for each control set is considered acceptable if the average of the three individual results for the set has a percent recovery of $100 \pm 25\%$. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets. The ISU irradiation results for the first quarter 2024 are presented in **Table 40**. All individual EIC results and all EIC control set averages passed the DEQ-INL OP acceptance criterion.

Laboratory QC Issues

None.

DEQ-INL OP Equipment QC Issue

None.

Qualification and Reporting of Sample Results

Starting in the first quarter of 2024, DEQ-INL OP is changing the methods used for qualifying and reporting sample results. These changes apply primarily to low-level results. The changes listed below will bring DEQ-INL OP's qualification and reporting conventions more closely in line with the INL contractors' methods.

For radiological results, the minimum detectable concentration (MDC) will no longer be used as the criterion above which the result is considered a positive detection. The following criteria will be used instead^{7,8,9}:

1. Results greater or equal to 3 SD are reported as positive detections, where SD is the sample standard deviation.
2. Results less than 3 SD are reported as non-detections (U qualifier).
3. Field sample results are reported together with the 1-SD value.

For non-radiological results, the qualification and reporting conventions followed by the sample analysis contractor, Idaho Bureau of Laboratories (IBL), will be used. With each result, the IBL reports both the Method Detection Limit¹⁰ (MDL) and the higher Reporting Detection Limit¹¹ (RDL).

1. Results greater than MDL and greater than RDL are reported as positive detections.
2. Results greater than MDL but less than RDL are reported as detected estimates (J qualifier) with greater associated uncertainty.
3. Results less than MDL are non-detections and reported as less than (RDL value).

Analytical QA/QC Assessment

Other than those discussed above, no issues involving sample chain of custody, sample holding times, and the analysis of blank, duplicate, and spiked samples were observed during the first quarter of 2024 which significantly affected data quality. The ratio of total QC analyses to total field sample analyses of 13.8% is above the DEQ-INL OP minimum requirement of 10%. Methodologies and data reports issued by the contracting laboratories conformed to the requirements of DEQ-INL OP during the first quarter of 2024.

Data usability is the measure of field sample results that are not rejected divided by the total number of field sample results obtained. The overall data usability (non-rejected results divided by the total number of field sample results reported) of 100.0% for the first quarter of 2024 is well above the acceptable value of 90% for the DEQ-INL OP ESP and is summarized in **Table 25**. The overall data completeness (usable results divided by the total number of field sample results expected) of 99.6% is also well above the acceptable value of 90%.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to prescribed periodicity. Service reliability for air sampling equipment for the first quarter of 2024 is summarized in **Table 41**.

⁷ Idaho National Laboratory Site Environmental Surveillance Program Report, Third Quarter 2023, INL/RPT-24-77413, p.

⁸ HANDBOOK FOR THE DEPARTMENT OF ENERGY'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP), MAPEP-HB-1, July 6, 2022, p.30.

⁹ An Update of Hydrologic Conditions and Distribution of Selected Constituents in Water, Eastern Snake River Aquifer and Perched Groundwater Zones, Idaho National Laboratory, Idaho, Emphasis 2019–21, U. S. Geological Survey, DOE/ID-22261, p. 29.

¹⁰ The MDL is defined as the minimum concentration of substance that can be measured and reported with 99% confidence that an analyte concentration is greater than zero and is determined from an analysis of a sample in a given matrix containing the analyte.

¹¹ IBL utilizes the Practical Quantitation Limit (PQL) as the Reporting Detection Limit (RDL) for final data reports. PQL represents a practical and routinely achievable quantitation limit with a high degree of certainty (> 99.9% confidence) that the result is a positive detection.

Conclusion

All data collected for the first quarter of 2024 have been assigned the applicable qualifiers to designate the appropriate use of the data. The overall data usability of 100.0% and data completeness of 99.6% are well above the acceptable value of 90% for the quarter, with the data meeting the requirements and data quality objectives established by DEQ-INL OP.

Table 25. Summary of the analyses performed, first quarter, 2024.

Media Sampled	Collection Device	Analyte	Sample Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected ¹	Analyzing Lab ²
Air								
Total Suspended Particulate	47-mm filters	Gross alpha	143	13	0	0	0	ISU-EML
		Gross beta	143	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
	8x10-inch filters	Gamma emitters	33	3	3	0	0	ISU-EML
		Radiochemical ⁶ :						
		Sr-90	11	1	1	0	0	ISU-Sub
		Pu-238, 239/240	11	1	1	0	0	ISU-Sub
Am-241	11	1	1	0	0	ISU-Sub		
Water Vapor	Desiccant column	Tritium	29	6 ⁸	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Plastic carboy	Tritium	14	0	0	0	0	ISU-EML
		Gamma emitters	14	0	0	0	0	ISU-EML
Water								
Ground water, perched ground water, waste pond effluent, and surface water	Grab or composite	Gross alpha	2	1	1	0	0	ISU-EML
		Gross beta	2	1	1	0	0	ISU-EML
		Gamma emitters	2	1	1	0	0	ISU-EML
		Tritium	2	1	1	0	0	ISU-EML
		Low-level tritium	11	1	2	0	0	ISU-EML
		Radiochemical ⁷ :						
		Sr-90	2	1	1	0	0	ISU-Sub
		Tc-99	1	0	1	0	0	ISU-Sub
		U-234, 235,238	1	1	0	0	0	ISU-Sub
		Pu-238, 239/240	0	0	0	0	0	ISU-Sub
		Am-241	0	0	0	0	0	ISU-Sub
		I-129	0	0	0	0	0	ISU-Sub
		Metals	2	1	1	0	0	IBL
		Common Ions	2	1	1	0	0	IBL
		Nutrients	2	1	1	0	0	IBL
Volatile Organics	1	1	0	0	0	IBL		
Terrestrial								
Milk	Grab or composite	Gamma emitters	9	0	0	0	0	ISU-EML
Soil	<i>in situ</i>	Gamma emitters	0	0	0	0	0	DEQ-INL OP
	Grab – “puck”	Gamma emitters	0	0	0	0	0	ISU-EML
Radiation								
Ambient	EICs	Gamma Radiation	67	0	0	9	0	DEQ-INL OP
	EcoGamma	Gamma Radiation	11	NA	0	NA	0	DEQ-INL OP
Total analyses performed			550	50	17	9	0	
Total QC analyses performed (blanks, duplicates, and spikes)			76					
Ratio of total QC analyses to total sample analyses³			13.8%					
Data usability⁴, percent			100.0%					
Data completeness⁵, percent			99.6%					

¹ Combined Laboratory and DEQ-INL OP rejection criteria (data was rejected for any reason).

² ISU-EML = Idaho State University – Environmental Monitoring Laboratory; ISU Sub = Subcontract laboratory to ISU-EML; IBL = Idaho Bureau of Laboratories, Boise; IBL Sub = Subcontract laboratory to IBL; DEQ-INL OP = Analyzed by INL Oversight Program, Idaho Department of Environmental Quality.

³ DEQ-INL OP requires that the number of QC analyses performed be at least 10 percent of the number of sample analyses performed.

⁴ Data usability is calculated as [total analyses – rejected data]/[total analyses]. DEQ-INL OP considers a data usability rate of 90 percent or higher to be acceptable.

⁵ Data completeness is calculated as usable results divided by the total number of field sample results expected. DEQ-INL OP considers a data completeness rate of 90 percent or higher to be acceptable.

⁶ Radiochemical analyses for these filter composites include Strontium-90 (Sr-90), Plutonium-238 and 239/240 (Pu-238, 239/240), and Americium-241 (Am-241).

⁷ Radiochemical analyses for these water samples may include Strontium-90, Technetium-99 (Tc-99), Uranium 234, 235, and 238 (U-234, 235, 238), Plutonium-238 and 239/240, Americium-241, and Iodine-129 (I-129).

⁸ Method blanks and control samples are included here.

Table 26. Blank analysis results for gross alpha and beta in 47-mm particulate air (TSP) filters, first quarter, 2024.

Collection Period		Corrected volume (m ³) ¹	Gross alpha			Gross beta		
Start	Stop		Value		3 SD	Value		3 SD
12/28/23	01/04/24	555	0.2	U	0.6	0.4	U	0.9
01/04/24	01/11/24	555	0.3	U	0.3	-0.4	U	0.9
01/11/24	01/18/24	555	-0.1	U	0.3	-0.4	U	0.9
01/18/24	01/25/24	555	-0.2	U	0.3	0.2	U	1.2
01/25/24	02/01/24	555	-0.3	U	0.3	-0.2	U	1.2
02/01/24	02/08/24	555	-0.4	U	0.6	0.1	U	0.9
02/08/24	02/15/24	555	-0.4	U	0.6	-0.3	U	0.9
02/15/24	02/22/24	555	0.1	U	0.3	0.4	U	0.9
02/22/24	02/29/24	555	-0.1	U	0.6	-0.4	U	1.2
02/29/24	03/07/24	555	-0.1	U	0.3	0.0	U	0.9
03/07/24	03/14/24	555	0.1	U	0.6	-0.5	U	0.9
03/14/24	03/21/24	555	-0.1	U	0.3	-0.1	U	0.9
03/21/24	03/28/24	555	0.2	U	0.3	1.6	-	0.9

Concentration values and associated uncertainty (3 SD) are expressed in 1×10^{-3} pCi/m³. **Bold** concentrations are positive detections, greater than or equal to 3 SD. Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹ A volume equal to the average of the weekly volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

Table 27. Blank results for gamma spectrometry analysis of monthly composites of 8x10-inch TSP air filters, and quarterly composites of 47-mm TSP air filters, first quarter, 2024.

Time period	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125			Cesium-134			Cesium-137			
	Conc		3 SD	Conc		3 SD	Conc		3 SD	Conc		3 SD	Conc		3 SD	
Monthly composites¹ of 8x10-inch TSP air filters																
Jan		-11	U	78	0	U	138	-1	U	18	0	U	6	3	U	6
Feb		2	U	30	5	U	69	-1	U	6	-1	U	3	1	U	3
Mar		2	U	27	1	U	81	0	U	6	2	U	3	-1	U	3
Quarterly composite² of 47-mm TSP air filters																
1 st Qtr.		20	U	75	125	U	192	7	U	15	-2	U	6	-2	U	9

Concentrations (Conc) are expressed in 1×10^{-6} pCi/m³ with associated uncertainty (3 SD) and minimum detectable concentration (MDC). **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹These concentrations (Conc) are from blank 8x10-inch filters collected weekly, composited, and analyzed for the calendar month. ²These concentrations are from blank 47-mm filters collected weekly, composited, and analyzed for the calendar quarter. A composite volume equal to the sum of the weekly average volumes collected through each valid field filter was used to compute "air concentrations" for the blank for meaningful comparison to sample results. No air actually passed through the blank filters.

Table 28. Blank results for radiochemical analysis of 8x10-inch TSP air filters, quarterly composite samples, from fourth quarter, 2023.

Sample Description	⁹⁰ Sr			²³⁸ Pu			²³⁹ Pu/ ²⁴⁰ Pu			²⁴¹ Am		
	Value ¹		3 SD	Value ¹		3 SD	Value ¹		3 SD	Value ¹		3 SD
4Q 23 Blank	0.26	U	0.39	-0.01	U	0.06	-0.01	U	0.03	0.01	U	0.18

Concentrations are expressed in 1×10^{-6} pCi/m³ with associated uncertainty (3 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD. Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

¹These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A composite volume equal to the sum of the weekly average volumes collected through each valid field filter was used to compute "air concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

Table 29. Method blank and control sample analysis results for tritium in water vapor from air samples, first quarter, 2024.

Sample Number	Start Date	Collection Date	Analysis Date	Tritium		
				Concentration		3 SD
Method Blanks						
OP241ZTR01	01/09/24	01/12/24	03/14/24	0.02	U	0.09
OP241ZTR02	01/16/24	01/18/24	04/24/24	0.04	U	0.09
OP241ZTR03	03/19/24	03/21/24	04/08/24	0.00	U	0.09
OP241ZTR04	03/25/24	03/27/24	04/08/24	0.02	U	0.09
Control Samples						
Refrigerator	01/09/24	03/29/24	04/08/24	-0.04	U	0.09
Sink	01/09/24	03/29/24	04/08/24	-0.02	U	0.09

Concentrations are expressed in nCi/L with associated uncertainty (3 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD. Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Note: Concentrations are expressed in nCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Table 30. Blank analysis results (pCi/L) for radiological constituents in water, first quarter, 2024.

Sample Number	Sample Date	Blank Type	Concentration		3 SD	Within Blank Criteria?
Gross Alpha						
241W001	01/11/24	Field	0.4	-	0.3	No
Gross Beta						
241W001	01/11/24	Field	1.4	-	0.3	No
Cesium-137						
241W001	01/11/24	Field	-0.7	U	1.8	Yes
Tritium (standard method)						
241W003	01/11/24	Field	-10	U	90	Yes
Tritium (enriched method)						
231W775	11/27/23	Field	-1	U	6	Yes
Strontium-90						
241W002	01/11/24	Field	-0.004	U	0.255	Yes
Uranium-234						
231W004	01/11/24	Field	1.06	-	0.897	No
Uranium-235						
231W004	01/11/24	Field	0.576	U	0.822	Yes
Uranium-238						
231W004	01/11/24	Field	0.198	U	0.594	Yes

Concentrations are expressed in pCi/L with associated uncertainty (3 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 31. Blank analysis results (µg/L) for metals in water, first quarter, 2024.

Sample Number	Sample Date	Blank Type	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
241W006	01/11/2024	Field	<2.0	<1.0	<1.0	<10	<1.0	<1.0	-	-

Table 32. Blank analysis results (mg/L) for common ions and nutrients in water, first quarter, 2024.

Sample Number	Sample Date	Blank Type	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Alkalinity [†]	NO ₃ +NO ₂ [*]	Total Phosphorus
241W005, 007	01/11/2024	Field	<0.10	<0.10	<0.10	<0.10	-	<0.4	<0.8	<1.0	<0.01	<0.005

[†] As CaCO₃.

^{*} As N.

Table 33. Blank analysis results (µg/L) for VOCs in water, first quarter, 2024.

Sample Number	Sample Date	Blank Type	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	1,1-DCA	Carbon Tetrachloride	Methylene Chloride	Chloroform	Chloro-methane	MEK
241W008	1/11/2024	Field	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10

Abbreviations: PCE = tetrachloroethene; TCE = trichloroethene; 1,1-DCE = 1,1-dichloroethene; cis-1,2-DCE = cis-1,2-dichloroethene; trans-1,2-DCE = trans-1,2-dichloroethene; 1,1-DCA = 1,1-dichloroethane; MEK = Methyl Ethyl Ketone

Table 34. Duplicate sample results for gamma emitters from monthly composited 8x10-inch TSP air filters, first quarter, 2024.

Month and Nuclide	Original Sample ID	Concentration (R ₁)	1 SD ₁	Duplicate Sample ID	Concentration (R ₂)	1 SD ₂	RPD (%)	R ₁ -R ₂	3(SD ₁ ² +SD ₂ ²) ^{1/2}	Within either criterion?
January 2024										
⁷ Be	Idaho Falls	89.6	2.8	Idaho Falls Dup	74.0	2.3	19	15.6	10.9	Yes
¹⁰⁶ Ru/ ¹⁰⁶ Rh		0.12 U	0.21		-0.34 U	0.50	-418	0.46	1.63	Yes
¹²⁵ Sb		-0.03 U	0.02		0.07 U	0.04	-500	0.10	0.13	Yes
¹³⁴ Cs		0.03 U	0.01		-0.01 U	0.01	400	0.04	0.04	Yes
¹³⁷ Cs		0.00 U	0.01		0.02 U	0.02	-200	0.02	0.07	Yes
February 2024										
⁷ Be	Idaho Falls	63.1	2.0	Idaho Falls Dup	82.1	2.4	-26	19	9.3	No
¹⁰⁶ Ru/ ¹⁰⁶ Rh		0.24 U	0.20		0.22 U	0.29	9	0.02	1.06	Yes
¹²⁵ Sb		0.01 U	0.04		0.03 U	0.04	-133	0.02	0.17	Yes
¹³⁴ Cs		0.02 U	0.02		0.00 U	0.01	200	0.02	0.07	Yes
¹³⁷ Cs		-0.01 U	0.01		0.02 U	0.02	-600	0.03	0.07	Yes
March 2024										
⁷ Be	Idaho Falls	126.1	3.6	Idaho Falls Dup	120.6	3.5	5	5.5	15.1	Yes
¹⁰⁶ Ru/ ¹⁰⁶ Rh		0.21 U	0.32		-0.35 U	0.31	-800	0.56	1.34	Yes
¹²⁵ Sb		-0.07 U	0.06		0.00 U	0.06	200	0.07	0.26	Yes
¹³⁴ Cs		0.01 U	0.02		0.00 U	0.02	200	0.01	0.09	Yes
¹³⁷ Cs		0.01 U	0.02		0.05 U	0.02	-133	0.04	0.09	Yes

RPD = relative percent difference. Air concentrations and uncertainties (1 SD) are expressed in units of 10⁻³ pCi/m³. **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 35. Duplicate sample results for radiochemical analyses of composited 8x10 inch TSP air filters from the fourth quarter of 2023.

Nuclide	Original Sample ID	Concentration (R ₁)	1 SD ₁	Duplicate Sample ID	Concentration (R ₂)	1 SD ₂	RPD (%)	R ₁ -R ₂	3(SD ₁ ² +SD ₂ ²) ^{1/2}	Within either criterion?
^{89/90} Sr	Idaho Falls	1.99	0.25	Idaho Falls Dup	1.81	0.24	9	0.18	1.04	Yes
²³⁸ Pu		0.03 U	0.04		0.02 U	0.04	40	0.01	0.17	Yes
²³⁹ Pu/ ²⁴⁰ Pu		0.04 U	0.02		0.04 U	0.02	0	0.00	0.08	Yes
²⁴¹ Am		0.04 U	0.06		0.03 U	0.06	29	0.01	0.25	Yes

RPD = relative percent difference. Air concentrations and uncertainties (1 SD) are expressed in units of 10⁻⁵ pCi/m³. **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

Table 36. Duplicate results for quarterly average EcoGamma readings (µR/hr) for the first quarter of 2024.

Primary EcoGamma ID	Quarterly Average (R ₁)	1 SD ₁	Duplicate EcoGamma ID	Quarterly Average (R ₂)	1 SD ₂	RPD (%)	R ₁ -R ₂	3(SD ₁ ² +SD ₂ ²) ^{1/2}	Within either criterion?
Big Southern Butte ¹	-	-	Big Southern Butte Dup ¹	13.5	0.6	NA	NA	NA	NA

RPD = relative percent difference.

¹No data from the primary Ecogamma at this location for the entire quarter. The duplicate EcoGamma at this location was in operation intermittently, producing several significant gaps in the dataset.

Table 37. Duplicate sample results (pCi/L) for radiological constituents in groundwater and/or surface water, first quarter, 2024.

Analysis/Sample Location	Original Sample Number	Concentration (R ₁)	1 SD ₁	Duplicate Sample Number	Concentration (R ₂)	1 SD ₂	RPD (%)	R ₁ -R ₂	3(SD ₁ ² +SD ₂ ²) ^{1/2}	Within either criterion?
Gross Alpha										
USGS-123	241W017	1.1 U	0.4	241W024	1.3 J+	0.4	-17	0.2	1.7	Yes
Gross Beta										
USGS-123	241W017	3.4 J+	0.4	241W024	3.1 J+	0.4	9	0.3	1.7	Yes
Cesium-137										
USGS-123	241W017	-0.3 U	0.8	241W024	0.5 U	0.8	-800	0.8	3.4	Yes
Tritium (standard method)										
USGS-123	241W020	1233	50	241W027	1340	50	-9	107	212	Yes
Strontium-90										
USGS-123	241W018	0.097 U	0.136	241W025	0.307 U	0.156	-104	0.210	0.621	Yes
Technetium-99										
USGS-123	241W019	-1.71 U	1.45	241W026	-0.801 U	2.65	72	0.909	9.06	Yes

Concentrations are reported in pCi/L with associated uncertainty (1 SD). **Bold** concentrations are positive detections, greater than or equal to 3 SD.

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively.

RPD = relative percent difference.

Table 38. Duplicate results for metals (µg/L) in groundwater, first quarter, 2024.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
USGS-123	241W022	03/05/24	-	-	6.1	-	-	-	-	-
USGS-123	241W029	03/05/24	-	-	10	-	-	-	-	-
RPD (%)			-	-	-48	-	-	-	-	-

RPD = relative percent difference.

Table 39. Duplicate sample results for common ions and nutrients (mg/L) in groundwater, first quarter, 2024.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity [†]	Total Nitrogen	Total Phosphorus
USGS-123	241W021, 023	03/05/24	-	-	-	-	-	19.9	22.2	128	1.0	-
USGS-123	241W028, 030	03/05/24	-	-	-	-	-	19.8	22.2	129	0.99	-
RPD (%)			-	-	-	-	-	0.5	0.0	0.8	1.0	-

RPD = relative percent difference.

[†] As CaCO₃.

Table 40. ISU-EML Electret ionization chamber (EIC) irradiation results (categorized as spiked samples), first quarter, 2024.

Electret #	Exposure Received		Net Measured Exposure ¹		%R	Within Spec?
	(mR)	Uncertainty (1 SD, mR)	(mR)	Uncertainty (1 SD, mR)		
SKR515	40.0	1.4	34.7	1.3	86.8%	Yes
SMD247	40.0	1.4	34.8	1.3	87.0%	Yes
SMD617	40.0	1.4	32.1	1.3	80.3%	Yes
Triplicate AVG:					84.7%	Yes
SMD624	30.0	1.1	28.5	1.4	95.0%	Yes
SMV254	30.0	1.1	28.7	1.4	95.7%	Yes
SMD335	30.0	1.1	30.9	1.3	103.0%	Yes
Triplicate AVG:					97.9%	Yes
SMD590	20.0	0.7	19.9	1.3	99.5%	Yes
SMV082	20.0	0.7	18.5	1.4	92.5%	Yes
SMD490	20.0	0.7	17.7	1.3	88.5%	Yes
Triplicate AVG:					93.5%	Yes

Note: A percent recovery (%R) of 100 ± 25 is considered acceptable.

¹ Net measured exposure estimate includes a correction for atmospheric pressure.

Table 41. Air sampling field equipment service reliability (percent operational), first quarter, 2024.

Station Locations	Sample Type				
	47-mm TSP	8x10-inch TSP	Radioiodine	Atmospheric Moisture	Precipitation
Onsite Locations					
Big Lost River Rest Area	100%	100%	100%	100%	100%
Experimental Field Station	100%	100%	100%	100%	NC ¹
Sand Dunes Tower	100%	100%	100%	100%	NC ¹
Van Buren Avenue	100%	100%	100%	100%	NC ¹
Boundary Locations					
Atomic City	100%	100%	100%	100%	100%
Howe	100%	100%	100%	100%	100%
Monteview	100%	100%	100%	100%	100%
Mud Lake	100%	100%	100%	100%	100%
Distant Locations²					
Craters of the Moon	100%	100%	100%	100%	NC ¹
Idaho Falls	100%	100%	100%	100%	100%
Idaho Falls Duplicate ³	NC ¹	100%	-	-	-

Note: The values in this table were calculated by dividing the number of weeks the equipment was in operation by the number of weeks in the quarter.

¹ NC = Sample not collected at this location.

² The Fort Hall Station, operated by the Shoshone-Bannock Tribes, is not included here.

³ A duplicate 8x10-inch filter TSP sampler is currently installed at the Idaho Falls location.

Appendix A

Table A-1. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses of 47-mm TSP filters for all locations, first quarter, 2024.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	1 SD	Concentration	1 SD
On-Site Locations						
Big Lost River Rest Area	12/28/23	01/04/24	0.8	0.2	63.6	1.1
	01/04/24	01/11/24	0.8	0.2	19.9	0.7
	01/11/24	01/18/24	0.3	0.2	23.8	0.7
	01/18/24	01/25/24	0.5	0.2	21.2	0.7
	01/25/24	02/01/24	0.5	0.2	23.2	0.7
	02/01/24	02/08/24	0.2	0.2	13.1	0.6
	02/08/24	02/15/24	0.4	0.2	22.7	0.7
	02/15/24	02/22/24	0.4	0.2	16.1	0.6
	02/22/24	02/29/24	0.4	0.2	16.6	0.7
	02/29/24	03/07/24	0.2	0.2	7.1	0.5
	03/07/24	03/14/24	0.7	0.2	22.2	0.7
	03/14/24	03/21/24	0.5	0.2	19.2	0.7
	03/21/24	03/28/24	0.7 J+⁶	0.2 J+	21.5 J+	0.7 J+
Experimental Field Station	12/28/23	01/04/24	1.3	0.2	63.8	1.0
	01/04/24	01/11/24	0.7	0.2	19.4	0.7
	01/11/24	01/18/24	0.7	0.2	25.7	0.7
	01/18/24	01/25/24	0.5	0.2	22.8	0.7
	01/25/24	02/01/24	0.3	0.2	23.9	0.7
	02/01/24	02/08/24	0.1	0.2	14.2	0.5
	02/08/24	02/15/24	0.2	0.2	21.7	0.7
	02/15/24	02/22/24	0.3	0.2	18.5	0.6
	02/22/24	02/29/24	0.3	0.2	16.5	0.6
	02/29/24	03/07/24	0.1	0.1	7.0	0.4
	03/07/24	03/14/24	0.6	0.2	34.9	0.8
	03/14/24	03/21/24	0.4	0.2	18.6	0.6
	03/21/24	03/28/24	0.8 J+⁶	0.2 J+	20.5 J+	0.6 J+
Sand Dunes Tower	12/28/23	01/04/24	1.4	0.3	72.4	1.1
	01/04/24	01/11/24	1.3	0.2	20.3	0.7
	01/11/24	01/18/24	0.6	0.2	25.9	0.8
	01/18/24	01/25/24	0.3	0.2	24.0	0.7
	01/25/24	02/01/24	0.6	0.2	28.0	0.8
	02/01/24	02/08/24	0.2	0.2	13.9	0.6
	02/08/24	02/15/24	0.3	0.2	22.9	0.7
	02/15/24	02/22/24	0.5	0.2	17.4	0.6
	02/22/24	02/29/24	0.6	0.2	18.1	0.7
	02/29/24	03/07/24	0.3	0.2	8.4	0.5
	03/07/24	03/14/24	0.8	0.2	21.8	0.7
	03/14/24	03/21/24	0.4	0.2	20.2	0.7
	03/21/24	03/28/24	0.9 J+⁶	0.2 J+	21.5 J+	0.7 J+

Table A-1 continued. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses of 47-mm TSP filters for all locations, first quarter, 2024.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	1 SD	Concentration	1 SD
Van Buren Avenue	12/28/23	01/04/24	3.5	0.3	77.2	1.2
	01/04/24	01/11/24	0.9	0.2	19.8	0.7
	01/11/24	01/18/24	0.6	0.2	22.9	0.7
	01/18/24	01/25/24	0.2	0.2	21.2	0.7
	01/25/24	02/01/24	0.2	0.2	23.3	0.7
	02/01/24	02/08/24	1.9	0.4	20.5	0.9
	02/08/24	02/15/24 ⁵	-0.1	0.4	26.3	1.2
	02/15/24	02/22/24	0.3	0.2	16.6	0.6
	02/22/24	02/29/24	0.0	0.2	14.9	0.6
	02/29/24	03/07/24	0.1	0.1	7.6	0.5
	03/07/24	03/14/24	0.4	0.2	19.3	0.7
	03/14/24	03/21/24	0.4	0.2	19.6	0.7
	03/21/24	03/28/24	0.8 J+⁶	0.2 J+	20.5 J+	0.6 J+
Boundary Locations						
Atomic City	12/28/23	01/04/24	1.9	0.3	66.5	1.1
	01/04/24	01/11/24	2.5	0.3	17.7	0.7
	01/11/24	01/18/24	0.8	0.2	23.9	0.7
	01/18/24	01/25/24	2.5	0.3	22.9	0.7
	01/25/24	02/01/24	2.6	0.3	23.1	0.7
	02/01/24	02/08/24	0.0	0.2	12.0	0.5
	02/08/24	02/15/24	2.0	0.3	24.7	0.7
	02/15/24	02/22/24	2.3	0.3	18.4	0.6
	02/22/24	02/29/24	2.1	0.3	20.0	0.7
	02/29/24	03/07/24 ¹	1.9	0.3	9.2	0.5
	03/07/24	03/14/24	1.9	0.3	22.3	0.7
	03/14/24	03/21/24	0.4	0.2	19.2	0.7
	03/21/24	03/28/24	0.6 J+⁶	0.1 J+	18.7 J+	0.6 J+
Howe	12/28/23	01/04/24	1.7 J⁴	0.3 J	52.6 J	0.9 J
	01/04/24	01/11/24	1.4 J⁴	0.2 J	17.2 J	0.6 J
	01/11/24	01/18/24	0.5 J ⁴	0.2 J	25.8 J	0.7 J
	01/18/24	01/25/24	0.3 J ⁴	0.2 J	31.3 J	0.9 J
	01/25/24	02/01/24	0.4 J ⁴	0.2 J	20.9 J	0.7 J
	02/01/24	02/08/24	0.1	0.2	12.1	0.5
	02/08/24	02/15/24	-0.1	0.2	20.4	0.6
	02/15/24	02/22/24	0.4	0.1	16.2	0.6
	02/22/24	02/29/24	0.1	0.2	14.7	0.6
	02/29/24	03/07/24	0.2	0.1	7.0	0.4
	03/07/24	03/14/24	0.6	0.2	19.3	0.6
	03/14/24	03/21/24	0.7	0.2	15.8	0.6
	03/21/24	03/28/24	0.9 J+⁶	0.2 J+	17.4 J+	0.6 J+

Table A-1 continued. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses of 47-mm TSP filters for all locations, first quarter, 2024.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	1 SD	Concentration	1 SD
Montevieu	12/28/23	01/04/24	1.1	0.2	54.6	1.0
	01/04/24	01/11/24	1.2	0.2	22.0	0.7
	01/11/24	01/18/24	0.4	0.2	25.8	0.8
	01/18/24	01/25/24	0.7	0.2	20.8	0.7
	01/25/24	02/01/24	0.4	0.2	16.5	0.6
	02/01/24	02/08/24	0.3	0.2	16.9	0.6
	02/08/24	02/15/24	0.1	0.2	18.9	0.6
	02/15/24	02/22/24	0.6	0.2	16.7	0.6
	02/22/24	02/29/24	0.4	0.2	17.8	0.7
	02/29/24	03/07/24	0.4	0.2	6.9	0.4
	03/07/24	03/14/24	0.7	0.2	19.5	0.6
	03/14/24	03/21/24	0.4	0.2	17.0	0.6
	03/21/24	03/28/24	1.0 J+⁶	0.2 J+	19.3 J+	0.6 J+
Mud Lake	12/28/23	01/04/24	1.6	0.3	67.6	1.1
	01/04/24	01/11/24	0.9	0.2	20.7	0.7
	01/11/24	01/18/24	0.5	0.2	24.1	0.7
	01/18/24	01/25/24	0.4	0.2	24.4	0.7
	01/25/24	02/01/24	0.1	0.2	18.0	0.6
	02/01/24	02/08/24	0.3	0.2	14.4	0.6
	02/08/24	02/15/24	0.1	0.2	20.2	0.6
	02/15/24	02/22/24	0.3	0.2	17.7	0.6
	02/22/24	02/29/24	0.8	0.2	17.9	0.6
	02/29/24	03/07/24	0.3	0.1	6.1	0.4
	03/07/24	03/14/24	0.7	0.2	19.3	0.6
	03/14/24	03/21/24	0.8	0.2	16.8	0.6
	03/21/24	03/28/24	0.8 J+⁶	0.2 J+	20.0 J+	0.6 J+
Distant Locations						
Craters of the Moon	12/28/23	01/04/24	2.9 J³	0.3 J	53.8 J	1.0 J
	01/04/24	01/11/24	0.7 J³	0.1 J	16.5 J	0.6 J
	01/11/24	01/18/24	0.5 J ³	0.2 J	19.7 J	0.7 J
	01/18/24	01/25/24	0.2 J ³	0.2 J	24.8 J	0.8 J
	01/25/24	02/01/24	0.0 J ³	0.2 J	21.1 J	0.7 J
	02/01/24	02/08/24	-0.1 J ³	0.2 J	3.4 J	0.4 J
	02/08/24	02/15/24	0.3 J ³	0.2 J	20.5 J	0.6 J
	02/15/24	02/22/24	0.7	0.2	16.0	0.6
	02/22/24	02/29/24	0.5	0.2	15.4	0.6
	02/29/24	03/07/24	0.6	0.2	8.8	0.5
	03/07/24	03/14/24	0.5	0.2	18.5	0.6
	03/14/24	03/21/24	2.7	0.3	19.6	0.7
	03/21/24	03/28/24	0.9 J+⁶	0.2 J+	18.3 J+	0.6 J+

Table A-1 continued. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses of 47-mm TSP filters for all locations, first quarter, 2024.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	1 SD	Concentration	1 SD
Fort Hall²	12/28/23	01/04/24	2.4	0.3	55.6	1.0
	01/04/24	01/11/24	0.7	0.2	10.1	0.5
	01/11/24	01/18/24	0.5	0.2	20.1	0.7
	01/18/24	01/25/24	1.0	0.2	26.8	0.7
	01/25/24	02/01/24	0.3	0.2	17.2	0.6
	02/01/24	02/08/24	-0.2	0.2	11.6	0.5
	02/08/24	02/15/24	0.2	0.2	18.0	0.6
	02/15/24	02/22/24	0.5	0.2	12.7	0.5
	02/22/24	02/29/24	0.4	0.2	13.5	0.6
	02/29/24	03/07/24	0.3	0.2	7.8	0.5
	03/07/24	03/14/24	0.7 J⁴	0.2 J	19.2 J	0.6 J
	03/14/24	03/21/24	1.0 J⁴	0.2 J	19.2 J	0.6 J
	03/21/24	03/28/24	0.7 J+⁶	0.1 J+	18.7 J+	0.6 J+
Idaho Falls	12/28/23	01/04/24	1.4	0.2	57.6	1.0
	01/04/24	01/11/24	0.9	0.2	12.6	0.6
	01/11/24	01/18/24	1.7	0.2	26.7	0.7
	01/18/24	01/25/24	0.6	0.2	19.6	0.7
	01/25/24	02/01/24	0.2	0.2	19.1	0.6
	02/01/24	02/08/24	0.2	0.2	13.0	0.5
	02/08/24	02/15/24	0.1	0.2	18.9	0.6
	02/15/24	02/22/24	0.3	0.2	14.9	0.6
	02/22/24	02/29/24	0.7	0.2	13.1	0.5
	02/29/24	03/07/24	0.3	0.2	7.2	0.4
	03/07/24	03/14/24	0.8	0.2	20.6	0.6
	03/14/24	03/21/24	1.0	0.2	32.0	0.8
	03/21/24	03/28/24	1.1 J+⁶	0.2 J+	18.9 J+	0.6 J+

Note: **Bold** concentrations are positive detections, greater or equal to 3 SD.

¹ Partial sample. Intermittent power issues.

² Operated by Shoshone-Bannock Tribes.

³ Faulty dry gas meter reading. Total air volume is estimated. Result is a usable estimate (J). Dry gas meter replaced on 2/9/24.

⁴ Total air volume was mis-recorded. Result is a usable estimate (J).

⁵ Partial sample. No power on 2/8/24.

⁶ The blank filter gross beta result exceeded 3 SD for the week of 3/21-3/28/24. Associated gross beta results for that week are qualified as biased-high estimates (J+).

Appendix B

Table B-1. Results for all electret ionization chamber (EIC) locations, first quarter, 2024.

Sample Location	Net Corrected Exposure Rate ($\mu\text{R/hr}$) ¹	1 SD ($\mu\text{R/hr}$)
Arco	11.1	0.7
Craters of the Moon	9.5	1.5
Big Lost River Rest Area	10.9	1.4
Van Buren Avenue	14.0	1.4
Experimental Field Station	13.2	0.9
Main Gate	9.0	0.3
Atomic City	12.1	0.7
Taber	8.7	2.2
Blackfoot	7.9	0.6
Fort Hall	9.2	1.3
Idaho Falls	6.9	0.9
Mud Lake/ Terreton	10.2, 11.7	-
Monteview	11.9	1.0
Sand Dunes Tower	10.0, 10.4	-
Howe Met. Tower	10.2, 12.3	-
MP282 -20	11.3	1.3
MP280 -20	10.4	1.3
MP278 -20	10.1	0.4
MP276 -20	13.3	1.1
MP274 -20	9.9	1.4
MP272 -20	10.9	1.2
MP270 -20	10.9	0.4
MP268 -20	12.3	2.0
MP266 -20	12.6	1.3
MP264 -20	10.6	1.5
MP270 -20/26	10.5	2.5
MP268 -20/26	10.4	1.3
MP266 -20/26	12.6	1.4
MP263 -20/26	12.1	2.0
MP261 -20/26	9.8	1.8
MP259 -20/26	11.4	1.5
MP256 -20/26	11.2	0.9
MFC (EBR II)	10.0	1.0
EBR I	10.9	2.4
RWMC	9.9	0.7
CFA	12.7	1.0
CITRC (PBF)	11.8	2.1
INTEC	14.6	0.1
ATR (TRA)	12.0	1.6
NRF	10.1	2.0
TAN/SMC	9.2	1.3
Mud Lake Bank of Commerce	11.5	0.3
MP43-33	11.1	0.4
MP41-33	11.3	1.4
MP39-33	13.7	1.2
MP37-33	13.8	1.2
MP35-33	12.0	1.4
MP33-33	11.7	1.2
MP31-33	9.8	1.4
MP29-33	11.7	1.7

Table B-1 cont. Results for all electret ionization chamber (EIC) locations, first quarter, 2024.

Sample Location	Net Corrected Exposure Rate ($\mu\text{R/hr}$) ¹	1 SD ($\mu\text{R/hr}$)
MP27-33	11.8	0.7
MP25-33	10.5	0.7
MP23-33	10.0	2.2
MP21-33	9.1	1.7
MP19-33	13.0	0.6
MP14-33	9.7	0.9
MP11-33	10.1	1.9
MP06-33	9.1	1.6
MP03-33	12.0	0.1
Base of Howe	11.5	0.4
Rover	12.9	1.3
Hamer	13.1	0.9
Sugar City	15.9	2.1
Roberts	15.1	1.5
Big Southern Butte	9.0	0.6
T4 North	13.9	2.3
T4 South	9.4	1.4

¹Results are the average of triplicate exposure rate measurements with the associated sample variability (1 SD), or the 2 measured exposure rates remaining after removal of an outlying value. One of the triplicate measurements is rejected if it is outside the average of the triplicate measurements ± 2 SD of the historical population variability. Typically, the two most consistent measurements are reported, based on judgment of the data analyst.

Appendix C

Table C-1. Summary of the minimum detectable concentrations (MDCs) for radiological analytes and reporting detection limits (RDLs) for non-radiological analytes, together with the EPA Maximum Contaminant Levels (MCLs) and DOE Derived Concentration Standards (DCSs) for comparison.

Media Sampled	Collection Device	Analyte	Typical MDC or RDL range ¹	Units	EPA Limit ^{2,3}	DOE DCS ⁴	Notes	
Air								
Total Suspended Particulate	47-mm filters	Gross alpha	$(0.3 - 0.7) \times 10^{-3}$	pCi/m ³	--	0.11	5	
		Gross beta	$(1 - 2) \times 10^{-3}$	pCi/m ³	1	9.6	5, 16	
		Gamma emitters	$(0.1 - 0.2) \times 10^{-3}$	pCi/m ³ (¹³⁷ Cs)	1.9×10^{-2}	38		
	8x10-inch filter	Gamma emitters	$(0.03 - 0.07) \times 10^{-5}$	pCi/m ³ (¹³⁷ Cs)	1.9×10^{-2}	38		
		Radiochemical:						
		Sr-90	$(0.4 - 0.7) \times 10^{-5}$	pCi/m ³	1.9×10^{-2}	9.6		
		Pu-238	$(0.05 - 0.2) \times 10^{-5}$	pCi/m ³	2.1×10^{-3}	0.12		
		Pu-239/240	$(0.03 - 0.1) \times 10^{-5}$	pCi/m ³	2.0×10^{-3}	0.11		
Am-241	$(0.2 - 0.4) \times 10^{-5}$	pCi/m ³	1.9×10^{-3}	0.13				
Water Vapor	Desiccant column	Tritium	0.3 - 0.6	pCi/m ³	1.5×10^3	1.3×10^5		
Gaseous	Charcoal filter	Iodine-131	$(6 - 8) \times 10^{-4}$	pCi/m ³	2.1×10^{-1}	4.5×10^2		
Precipitation	Plastic Carboy	Tritium	100 - 140	pCi/L	--	--	6	
		Gamma emitters	2 - 3	pCi/L (¹³⁷ Cs)	--	--	6	
Water								
Ground water, perched ground water, waste pond effluent, and surface water	Grab or composite	Gross alpha	0.3 - 1.9	pCi/L	15	4.0×10^2		
		Gross beta	0.8 - 1.9	pCi/L	4 mrem/yr	1.7×10^3		
		Gamma emitters	0.5 - 3.0	pCi/L (¹³⁷ Cs)	200	4.1×10^3		
		Tritium - standard analytical method	140 - 189	pCi/L	20,000	2.6×10^6		
		Tritium - low-level analytical method	5 - 15	pCi/L	20,000	2.6×10^6	7	
		Radiochemical:						
		Sr-90	0 - 0.8	pCi/L	8	1.7×10^3		
		Tc-99	0.8 - 1.4	pCi/L	900	3.9×10^5		
		U-234	0.01 - 0.8	pCi/L	30 µg/L (total U)	1.2×10^3	8	
		U-235	0.02 - 0.6	pCi/L		1.3×10^3		
		U-238	0.01 - 0.7	pCi/L		1.4×10^3		
		Pu-238	0.01 - 0.2	pCi/L		4.3×10^2		
		Pu-239/240	0.01 - 0.2	pCi/L	15	4.0×10^2	9	
		Am-241	0.03 - 0.1	pCi/L	15	7.4×10^2	9	
		I-129	0.002	pCi/L	1	5.7×10^2		
		Metals						
Arsenic	2	µg/L	10	--				
Barium	1	µg/L	2000	--				

Media Sampled	Collection Device	Analyte	Typical MDC or RDL range ¹	Units	EPA Limit ^{2,3}	DOE DCS ⁴	Notes		
		Chromium	1	µg/L	100	--			
		Iron	10	µg/L	300*	--			
		Lead	1	µg/L	15	--			
		Manganese	1	µg/L	50*	--			
		Selenium	2	µg/L	50	--			
		Zinc	5	µg/L	5000*	--			
		Common Ions							
				Alkalinity (as CaCO ₃)	1.0	mg/L	--	--	
				Calcium	0.1	mg/L	--	--	
				Chloride	0.4	mg/L	250*	--	
				Magnesium	0.1	mg/L	--	--	
				Potassium	0.1	mg/L	--	--	
				Sodium	0.1	mg/L	--	--	
				Sulfate	0.8	mg/L	250*	--	
		Nutrients							
				Nitrate/Nitrite	0.01	mg/L	10 (NO ₃ ⁻), 1 (NO ₂ ⁻)	--	
				Total Phosphorus	0.005	mg/L	--	--	
		Volatile Organics							
				Tetrachloroethene (PCE)	0.5	µg/L	5	--	
				Trichloroethene (TCE)	0.5	µg/L	5	--	
				1,1-Dichloroethene	0.5	µg/L	7	--	
				cis-1,2-dichloroethene	0.5	µg/L	70	--	
				trans-1,2-dichloroethene	0.5	µg/L	100	--	
				Vinyl chloride	0.5	µg/L	2	--	
				Carbon tetrachloride	0.5	µg/L	5	--	
				Chloroform	0.5	µg/L	80	--	10
		Chloromethane	0.5	µg/L	--	--			
		Methylene Chloride	0.5	µg/L	5	--			
		Methyl Ethyl Ketone	10	µg/L	--	--			
		1,1-Dichloroethane	0.5	µg/L	--	--			
Terrestrial									
Milk	Grab or composite	Gamma emitters	4.0	pCi/L (¹³¹ I)	4.59 x10 ³	1.0 x10 ⁴	11		
Soil	<i>in situ</i>	Gamma emitters	0.02 – 0.03	pCi/g (¹³⁷ Cs)	6.8	6.8	12		
	Grab	Gamma emitters	0.09	pCi/g (¹³⁷ Cs)	6.8	6.8	12		
Radiation									
Ambient	EICs	Gamma Radiation	5	mR	--	100 mrem/yr (103.5 mR/yr)	13, 14,		
	EcoGamma	Gamma Radiation	1	µR/hr	--	100 mrem/yr (103,500 µR/yr)	13, 15,		

Notes:

Media Sampled	Collection Device	Analyte	Typical MDC or RDL range ¹	Units	EPA Limit ^{2,3}	DOE DCS ⁴	Notes
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1. Minimum Detectable Concentrations (MDCs) are a measure of method/instrument performance. They are not a criterion above which a result is considered a detection. DOE Derived concentration standards (DCS) and EPA Maximum Contaminant Levels (MCLs) are listed here only as reference values for comparison to typical MDC or Reporting Detection Limit (RDL) ranges. The MCLs are the most restrictive and do not necessarily apply to the environmental media sampled. For example, the MCLs for water listed here are the highest levels of contaminants legally allowed in public drinking water systems in Idaho, but most wells sampled by DEQ-INL OP are not used for drinking water.
2. For radionuclides in water - EPA derived concentrations (pCi/l) of Beta and Photon Emitters in Drinking Water Yielding a Dose of 4 mrem/year to the Total Body or to any Critical Organ as defined in NBS Handbook 69. For non-radiological analytes – 40 CFR Part 141: National Primary Drinking Water Regulations. The Maximum Contaminant Levels (MCLs) listed here are the highest levels of contaminants legally allowed in public drinking water systems in Idaho. A * designates a Secondary MCL (SMCL), which is a guideline recommended by the EPA for constituents that may affect the taste, color, or odor of drinking water. The values listed are generally consistent with the Idaho Primary Constituent Standards (PCSs) and Secondary Constituent Standards in IDAPA 58.01.11, Ground Water Quality Rule, Tables II and III.
3. For radionuclides in air – EPA Concentration Levels for Environmental Compliance as defined in 40 CFR 61, subpart H -National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities, and Appendix E, Table 2.
4. Derived concentration standards (DCS) set by the DOE, represent reference values for radiation exposure. They are based on a radiation dose of 100 mrem/year for exposure through a particular exposure mode such as direct exposure, inhalation, or ingestion of water (DOE-STD-1196-2022).
5. Based on the most restrictive human-made alpha emitter (²³⁹Pu) and beta-emitter (⁹⁰Sr) and the most restrictive absorption type in DOE-STD-1196-2022, Table 7.
6. There are no regulatory standards for precipitation. For comparison only, the MCL is 20,000 pCi/L for tritium and 200 pCi/L for Cs-137.
7. Water samples from locations at which tritium concentrations are too low to be detected by the standard method are re-analyzed for tritium using an electrolytic enrichment method (referred to as the low-level method), which has a minimum detectable concentration (MDC) about ten times lower than the standard method.
8. Example: For natural uranium, 30 µg/L (total U) is equivalent to approximately 10.3 pCi/L U-234, 0.468 pCi/L U-235, and 10.0 pCi/L U-238.
9. There are no specific MCLs for these nuclides. Listed MCLs are the gross alpha activity MCL.
10. MCL is for total trihalomethanes.
11. The Food and Drug Administration derived intervention level for I-131 in milk is 170 Bq/L or 4590 pCi/L. The DOE DCS for I-131 in milk is 1.0 x10⁴ pCi/L.
12. Recommended federal screening limit for surface soil is 6.8 pCi/g (NCRP Report No. 129, "Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies", Table 2.1, Agricultural (AG) land use).
13. Mrem/hr is converted to µR/yr assuming 1.035 R/rad in muscle.
14. The "Typical MDC" for EICs is expressed as the EIC sensitivity for gamma radiation with less than a 10% error, which is 5 mR per the EPERM System Manual.
15. The "Typical MDC" for the EcoGamma is expressed as the lower end of EcoGamma low range.
16. Per the EPA RadNet Sampling and Analyses Schedules, Routine Sample Analyses [for air filters], "If the beta concentration is greater than 1 pCi/m³, gamma spectroscopy and possibly other analyses are performed."

Appendix D

Table D-1. List of volatile organic compounds (VOCs) analyzed for water samples.

Analyte	Reporting detection limit (RDL) (expressed in µg/L)
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
1,4-Dichlorobenzene	0.5
1,2-Dichlorobenzene	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
Ethylbenzene	0.5
Methylene Chloride	0.5
Styrene	0.5
Tetrachloroethene (PCE)	0.5
Toluene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethylene	0.5
Vinyl chloride	0.5
Xylenes (total)	0.5
Bromodichloromethane	0.5
Dibromochloromethane	0.5
Bromoform	0.5
Chloroform	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	1.0
tert-Butylbenzene	0.5
Chloroethane	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5

Table D-1 continued. List of volatile organic compounds (VOCs) analyzed for water samples.

Analyte	Reporting detection limit (RDL) (expressed in µg/L)
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.5
1,2-Dibromoethane (EDB)	0.5
Dibromomethane	0.5
1,3-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	1.0
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Ethyl Ketone (MEK)	10
Methyl Tert Butyl Ether (MTBE)	0.5
Naphthalene	0.5
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	0.5
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	1.0
1,3,5-Trimethylbenzene	0.5