

Department of Environmental Quality
INL Oversight Program

**ENVIRONMENTAL SURVEILLANCE PROGRAM
QUARTERLY DATA REPORT**

July - September, 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 have 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 has changed the methods used for qualifying and reporting sample results. These changes apply primarily to low-level results. The changes listed below 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) is no longer used as the criterion above which the result is considered a positive detection. The following criteria are 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), are 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.
2. Results greater than MDL but less than RDL are reported as detected estimates (J qualifier) with greater associated uncertainty.

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.

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 nine air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the third quarter, 2024 (**Figure 1**). The on-site locations include a new station at the MFC Guard House where data collection began the week of 5/16 – 5/23/24. 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 eleven 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 second quarter of 2024 for 47-mm and 8x10-inch TSP filters are presented in **Tables 3** and **4**. For the 47-mm filter composites, there was one reported gamma-emitting radionuclide concentration greater than 3 SD. For all site locations, beryllium-7 (Be-7), a naturally occurring, cosmogenic radionuclide was reported. At Materials and Fuels Complex (MFC Guard House) there was a detection of cesium-137 (Cs-137) greater than 3 SD. For the 8x10-inch filter composites, the cesium-137 (Cs-137) result was greater than or equal to 3 SD at the Sand Dunes Tower location for the month of July, the Craters of the Moon location for the month of August, and the Fort Hall location for the month of September. 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. Beryllium-7 results were greater than 3 SD at all site locations.

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 second quarter 2024 are presented in **Table 5**. There were positive Sr-90 detections at all on-site,

boundary, and distant locations. 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. All detections were well below DEQ-INL OP action levels. There was a positive Pu-239/240 detection at the on-site location Experimental Field Station. This result was greater-than-three sample standard deviations. The detection was 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 twelve 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 third quarter of 2024.

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the twelve 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 locations:

- On-Site – Big Lost River Rest Area (8/15-9/5/24). Experimental Field Station (8/22-9/26/24). Sand Dunes Tower (8/29-9/12/2024). Van Buren Avenue (8/1-9/5/2024 and 9/5-9/26/24).
- Boundary – none.
- Distant – Craters of the Moon (6/27– 7/18/24).

Weighted mean concentrations at Experimental Field Station and Van Buren Avenue were greater than 3 SD and are reported as positive detections. All results are well below the DEQ-INL OP action level of 150 pCi/m³ which is 10 percent of the compliance standard in 40 CFR 61, Appendix E, Table 2.

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 third 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. Tritium and 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**.

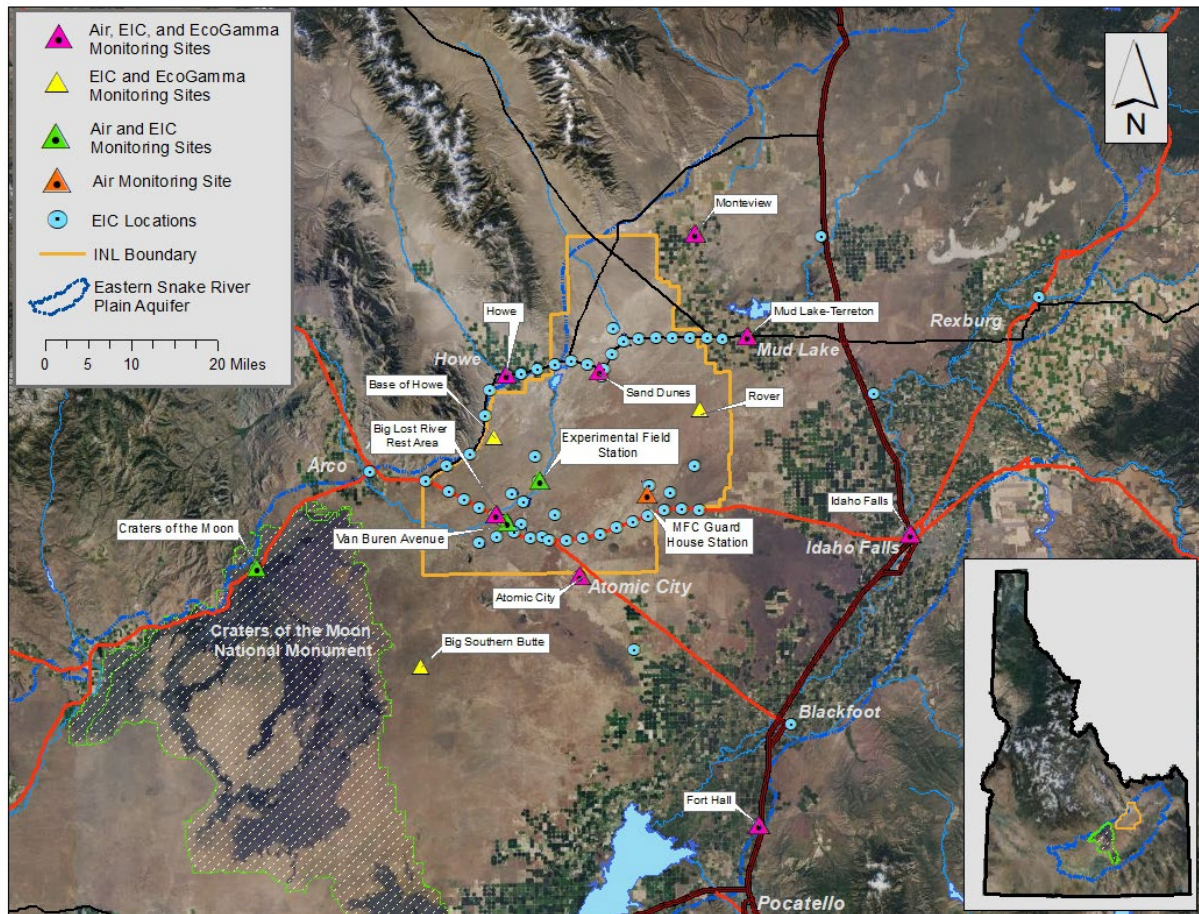


Figure 1. Air and radiation monitoring locations.

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	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Experimental Field Station	<input type="checkbox"/>	<input type="checkbox"/>	■	
MFC ³ Guard House	<input type="checkbox"/>	<input type="checkbox"/>	■	
Sand Dunes Tower	<input type="checkbox"/>	<input type="checkbox"/>	■	
Van Buren Avenue	<input type="checkbox"/>	<input type="checkbox"/>	■	
Boundary Locations				
Atomic City	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Howe	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Monteview	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Mud Lake	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Distant Locations				
Craters of the Moon	<input type="checkbox"/>	<input type="checkbox"/>	■	
Fort Hall ²	<input type="checkbox"/>	<input type="checkbox"/>	■	
Idaho Falls	<input type="checkbox"/>	<input type="checkbox"/>	■	■

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

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

³ MFC – Materials and Fuels Complex. MFC Guard House is a new monitoring location. Data collection began here during the week of 5/16 - 5/23/24.

Table 2. Range of gross alpha and gross beta concentrations for TSP filters, third quarter, 2024.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.9	-	3.7	19.4	-	46.4
Experimental Field Station	1.2	-	3.4	16.6	-	38.0
MFC Guard House ³	0.8	-	3.4	18.0	-	36.4
Sand Dunes Tower	1.0 J⁴	-	5.3	23.2	-	56.1 J⁴
Van Buren Avenue	1.2 J⁴	-	5.0	18.8	-	41.6
Boundary Locations						
Atomic City	0.4	-	4.7 J⁴	17.5	-	49.7 J⁴
Howe	1.3 J⁺²	-	2.8	23.4	-	34.2 J⁵
Monteview	0.4	-	2.4	16.0	-	35.6
Mud Lake	0.7	-	3.0	16.9	-	40.9 J⁶
Distant Locations						
Craters of the Moon	0.8	-	2.6	18.7	-	38.6 J⁵
Fort Hall ¹	0.7	-	2.6	17.8	-	36.3
Idaho Falls	0.6	-	1.9	16.1	-	36.7

Concentrations are expressed in 1×10^{-3} pCi/m³. **Bold** concentrations are positive detections, greater than or equal to 3 SD.

¹Operated by Shoshone-Bannock Tribes.

²The weekly blank filter gross alpha result was greater than or equal to 3 SD. Associated gross alpha results are qualified as biased-high estimates (J+).

³MFC Guard House is a new monitoring location. Data collection began here during the week of 5/16 – 5/23/24.

⁴Volume is an estimate due to mechanical failure. The result is a usable estimate (J).

⁵Volume is less than expected due to mechanical failure but is considered to be a usable estimate. The result is a usable estimate (J).

⁶Partial sample due to mechanical failure. The result is a usable estimate (J).

Table 3. Gamma spectrometry analysis data for 47-mm TSP filters, quarterly composite samples, third 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	125.7	-	4.0	0.01	U	0.04
Experimental Field Station	113.0	-	3.6	-0.02	U	0.03
MFC Guard House ⁴	122.6	-	4.7	0.12	-	0.04
Sand Dunes Tower	137.4	J ³	4.4	-0.01	UJ ³	0.04
Van Buren Avenue	120.7	J ⁴	3.7	-0.03	UJ ⁴	0.04
Boundary Locations						
Atomic City	118.9	J ⁵	3.5	0.03	UJ ⁵	0.04
Howe	133.2	J ⁶	4.2	0.15	UJ ⁶	0.09
Montevieu	113.7	-	4.4	0.06	U	0.03
Mud Lake	131.1	J ⁷	4.0	0.08	UJ ⁷	0.05
Distant Locations						
Craters of the Moon	141.0	J ⁸	4.3	0.10	UJ ⁸	0.04
Fort Hall ¹	115.5	-	3.7	0.00	U	0.04
Idaho Falls	112.6	-	3.4	0.10	U	0.05

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.

³Volume is an estimate for four weeks due to mechanical failure. Volume is less than expected due to mechanical failure but is considered to be a usable estimate for one week due to mechanical failure. No sample was collected for one week due to mechanical failure. Results are usable estimates (J).

⁴Volume is an estimate for two weeks due to mechanical failure. No sample for one week due to technician error. Results are usable estimates (J).

⁵Volume is an estimate for four weeks due to mechanical failure. Results are usable estimates (J).

⁶Volume is less than expected due to mechanical failure but is considered to be a usable estimate for one week due to mechanical failure. No sample for five weeks due to mechanical failure. Results are usable estimates (J).

⁷Partial sample for one week due to mechanical failure. No sample for one week due to mechanical failure. Results are usable estimates (J).

⁸Volume is less than expected due to mechanical failure but is considered to be a usable estimate for one week due to mechanical failure. No sample for one week due to mechanical failure. Results are usable estimates (J).

Table 4. Gamma spectrometry analysis data for 8x10-inch TSP filters, monthly composite samples, third 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	Jul	160.1	J ⁵	5.1	-0.01	UJ ⁵	0.03
	Aug	138.9	-	4.3	0.00	U	0.02
	Sep	140.7	-	4.7	0.04	U	0.03
Experimental Field Station	Jul	174.3	-	5.4	0.05	U	0.03
	Aug	137.2	-	4.2	0.05	U	0.02
	Sep	135.5	-	4.6	0.06	U	0.03
MFC Guard House ⁴	Jul	177.2	-	5.3	0.06	U	0.04
	Aug	125.3	-	4.2	0.02	U	0.02
	Sep	129.0	-	4.0	0.01	U	0.02
Sand Dunes Tower	Jul	169.8	-	5.8	0.10	-	0.03
	Aug	130.2	-	4.0	0.00	U	0.01
	Sep	131.9	-	4.1	0.00	U	0.02
Van Buren Avenue	Jul	152.5	-	4.8	0.05	U	0.03
	Aug	163.0	-	4.7	0.04	U	0.02
	Sep	138.9	-	4.7	0.04	U	0.02
Boundary Locations							
Atomic City	Jul	171.1	-	5.3	0.01	U	0.02
	Aug	132.0	-	4.1	0.00	U	0.01
	Sep	162.2	-	4.7	0.04	U	0.03
Howe	Jul	149.0	J ⁵	4.8	0.00	UJ ⁵	0.03
	Aug	159.1	-	4.6	0.03	U	0.02
	Sep	130.3	-	4.0	0.00	U	0.02
Montevieu	Jul	195.1	-	5.8	0.05	U	0.04
	Aug	128.7	-	4.0	0.01	U	0.02
	Sep	123.7	-	3.8	-0.01	U	0.01
Mud Lake	Jul	170.2	-	5.1	0.00	U	0.00
	Aug	126.1	-	4.3	0.03	U	0.02
	Sep	159.9	-	4.9	-0.01	U	0.02
Distant Locations							
Craters of the Moon	Jul	255.3	-	7.4	0.05	U	0.03
	Aug	178.1	-	5.1	0.06	-	0.02
	Sep	139.1	-	4.3	0.01	U	0.01
Fort Hall ¹	Jul	170.9	-	5.3	0.03	U	0.02
	Aug	130.9	-	4.4	0.04	U	0.02
	Sep	101.3	-	3.0	0.06	-	0.02
Idaho Falls	Jul	223.9	-	6.6	0.09	U	0.04
	Aug	150.8	-	4.4	0.03	U	0.03
	Sep	138.1	-	4.7	0.04	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 SD values are for Cs-137 unless otherwise noted.

³Four filters/composite for July and September, five filters/composite for August unless otherwise noted.

⁴MFC Guard House is a new monitoring location. Data collection began here during the week of 5/16 – 5/23/24.

⁵The July air volume is an estimate due to mechanical failure. The resulting composite data are estimates (J).

Table 5. Radiochemical separation analysis results for 8x10-inch TSP particulate filter composites collected during second quarter 2024.

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	3.18	-	0.32	0.00	U	0.04	0.06	U	0.03	0.06	U	0.06
EFS ³	5.57	J ⁵	0.45	0.08	UJ ⁵	0.05	0.20	J ⁵	0.05	0.10	UJ ⁵	0.06
MFC Guard House	3.91	J ⁶	0.55	-0.01	UJ ⁶	0.10	0.10	UJ ⁶	0.07	-0.01	UJ ⁶	0.10
Sand Dunes Tower	2.99	-	0.31	-0.01	U	0.03	0.05	U	0.03	0.05	U	0.05
Van Buren Avenue	4.11	-	0.35	0.01	U	0.04	0.02	U	0.03	0.01	U	0.06
Boundary Locations												
Atomic City	4.32	-	0.38	0.08	U	0.04	0.10	U	0.04	0.03	U	0.05
Howe	4.12	J ⁷	0.37	0.13	UJ ⁷	0.06	0.07	UJ ⁷	0.03	-0.08	UJ ⁷	0.05
Monteview	4.50	-	0.39	0.05	U	0.04	0.05	U	0.03	-0.01	U	0.05
Mud Lake	3.14	-	0.29	0.01	U	0.03	0.09	U	0.04	0.04	U	0.06
Distant Locations												
Craters of the Moon	4.28	-	0.38	0.09	U	0.05	0.06	U	0.03	0.04	U	0.05
Fort Hall ²	1.78	-	0.22	-0.01	U	0.04	0.04	U	0.03	0.02	U	0.05
Idaho Falls	3.07	-	0.31	0.10	U	0.05	0.04	U	0.02	-0.01	U	0.04

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.

⁴BLR – Big Lost River.

⁵The May air volume was an estimate due to planned power outages. The resulting composite data are estimates (J).

⁶ MFC Guard House is a new monitoring location. Data collection began here during the week of 5/16 – 5/23/24, producing two filters for the May composite.

⁷The April air volume was an estimate due to planned power outages. The resulting composite data are estimates (J).

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

Start Date	Collection Date	Iodine-131 activity (pCi/composite)		
		Activity		1 SD
06/27/24	07/03/24 ¹	1.93	U	1.20
07/03/24	07/11/24 ¹	-0.30	U	0.88
07/11/24	07/18/24 ¹	-0.50	U	1.35
07/18/24	07/25/24 ¹	1.27	U	0.98
07/25/24	08/01/24	-0.20	U	0.95
08/01/24	08/08/24	0.25	U	1.06
08/08/24	08/15/24 ²	0.13	U	1.07
08/15/24	08/22/24	0.91	U	1.01
08/22/24	08/29/24	-0.69	U	1.26
08/29/24	09/05/24	0.84	U	1.16
09/05/24	09/12/24	0.84	U	1.09
09/12/24	09/19/24 ³	2.53	U	1.00
09/19/24	09/26/24	0.50	U	1.44

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.

¹The batch eleven cartridges did not include samples for Howe due to mechanical failure.

²The batch of twelve cartridges was counted on 08/16/2024 due to road closure delaying collection from Craters of the Moon.

³The batch of eight cartridges collected and analyzed on 09/19/2024 did not include cartridges from Mud Lake, Sand Dunes, Howe, and Craters of the Moon due to mechanical failure.

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

Station Location	Start Date	Collection Date	Tritium		
			Concentration		1 SD
On-site Locations					
Big Lost River Rest Area	06/27/2024	07/25/2024	0.13	U	0.09
Big Lost River Rest Area	07/25/2024	08/15/2024	0.38	U	0.13
Big Lost River Rest Area	08/15/2024	09/05/2024	0.43	-	0.11
Big Lost River Rest Area	09/05/2024	09/26/2024	0.28	U	0.11
Big Lost River Rest Area Mean	06/27/2024	09/26/2024	0.29	U	0.11
Experimental Field Station	06/27/2024	08/01/2024	0.50	U	0.17
Experimental Field Station	08/01/2024	08/22/2024	0.19	U	0.19
Experimental Field Station	08/22/2024	09/26/2024	0.67	-	0.10
Experimental Field Station Mean	06/27/2024	09/26/2024	0.49	-	0.15
MFC ² Guard House	06/27/2024	07/25/2024	0.10	U	0.10
MFC Guard House	07/25/2024	08/15/2024	0.13	U	0.13
MFC Guard House	08/15/2024	09/05/2024	0.16	U	0.11
MFC Guard House	09/05/2024	09/26/2024	0.33	U	0.11
MFC Guard House Mean	06/27/2024	09/26/2024	0.17	U	0.11
Sand Dunes Tower	06/27/2024	07/25/2024	0.12	U	0.12
Sand Dunes Tower	07/25/2024	08/29/2024	0.06	U	0.12
Sand Dunes Tower	08/29/2024	09/12/2024	0.38	-	0.10
Sand Dunes Tower Mean	06/27/2024	09/12/2024	0.14	U	0.11
Van Buren Avenue	06/27/2024	08/01/2024	0.25	U	0.12
Van Buren Avenue	08/01/2024	09/05/2024	0.54	-	0.13
Van Buren Avenue	09/05/2024	09/26/2024	0.48	-	0.11
Van Buren Avenue Mean	06/27/2024	09/26/2024	0.41	-	0.12
Boundary Locations					
Atomic City	06/27/2024	08/01/2024	0.05	U	0.09
Atomic City	08/01/2024	08/15/2024	0.14	U	0.21
Atomic City	08/15/2024	09/12/2024	0.15	U	0.10
Atomic City	09/12/2024	09/26/2024	0.31	U	0.12
Atomic City Mean	06/27/2024	09/26/2024	0.13	U	0.12
Howe	07/25/2024	08/15/2024	0.34	U	0.14
Howe	08/15/2024	09/12/2024	0.20	U	0.10
Howe Mean	07/25/2024	09/12/2024	0.27	U	0.12
Mud Lake	06/27/2024	07/11/2024	0.30	U	0.15
Mud Lake	07/11/2024	07/25/2024	0.10	U	0.19
Mud Lake	07/25/2024	08/15/2024	0.14	U	0.14
Mud Lake	08/15/2024	08/29/2024	0.16	U	0.16
Mud Lake	08/29/2024	09/12/2024	0.13	U	0.13
Mud Lake Mean	06/27/2024	09/12/2024	0.16	U	0.15
Montevieu	06/27/2024	07/18/2024	0.29	U	0.15
Montevieu	07/18/2024	08/01/2024	0.08	U	0.17
Montevieu	08/01/2024	08/15/2024	0.08	U	0.16
Montevieu	08/15/2024	09/05/2024	0.27	U	0.14
Montevieu	09/05/2024	09/26/2024	0.13	U	0.09
Montevieu Mean	06/27/2024	09/26/2024	0.18	U	0.13
Distant Locations					
Craters of the Moon	06/27/2024	07/18/2024	0.33	-	0.09
Craters of the Moon	07/18/2024	08/15/2024	0.06	U	0.17
Craters of the Moon	08/15/2024	09/12/2024	0.19	U	0.09
Craters of the Moon Mean	06/27/2024	09/12/2024	0.18	U	0.12

Station Location	Start Date	Collection Date	Tritium		
			Concentration		1 SD
Fort Hall ¹	06/27/2024	07/18/2024	0.13	U	0.13
Fort Hall	07/18/2024	08/01/2024	-0.08	U	0.15
Fort Hall	08/01/2024	08/22/2024	0.07	U	0.22
Fort Hall	08/22/2024	09/12/2024	0.28	U	0.11
Fort Hall	09/12/2024	09/26/2024	0.40	U	0.13
Fort Hall Mean	06/27/2024	09/26/2024	0.15	U	0.15
Idaho Falls	06/27/2024	07/25/2024	0.08	U	0.08
Idaho Falls	07/25/2024	08/08/2024	0.22	U	0.22
Idaho Falls	08/08/2024	08/22/2024	0.08	U	0.23
Idaho Falls	08/22/2024	09/26/2024	0.18	U	0.12
Idaho Falls Mean	06/27/2024	09/26/2024	0.14	U	0.15

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.

¹ Station operated by Shoshone-Bannock Tribes.

² MFC – Materials and Fuels Complex (entrance).

Table 8. Tritium and gamma-emitting radionuclide concentrations from precipitation, third 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	06/27/2024	09-26-2024	20	U	30	1.7	U	0.8
Big Lost River Rest Area Mean	06/27/2024	09-26-2024	20	U	30	1.7	U	0.8
Boundary Locations								
Atomic City	06/27/2024	09/26/2024	60	U	30	0.1	U	0.6
Atomic City Mean	06/27/2024	09/26/2024	60	U	30	0.1	U	0.6
Howe	06/27/2024	08/23/2024	0	U	30	1.0	U	0.6
Howe	08/23/2024	09/26/2024	70	U	30	-0.5	U	0.9
Howe Mean	06/27/2024	09/26/2024	16	U	30	0.7	U	0.7
Mud Lake	06/27/2024	09/26/2024	20	U	30	0.1	U	0.8
Mud Lake Mean	06/27/2024	09/26/2024	20	U	30	0.1	U	0.8
Monteviu	06/27/2024	09/26/2024	-20	U	30	-0.3	U	0.6
Monteviu Mean	06/27/2024	09/26/2024	-20	U	30	-0.3	U	0.6
Distant Locations								
Idaho Falls	06/27/2024	09/26/2024	10	U	30	0.8	U	0.7
Idaho Falls Mean	06/27/2024	09/26/2024	10	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 14 environmental radiation stations during the third quarter of 2024 (**Figure 1**). To detect gamma radiation, each station is instrumented with triplicate electret ionization chambers (EIC), and 11 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 by 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 third quarter of 2024. **Table 11** lists the EIC monitoring results for the third 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	■	■
Howe Met Tower	■	■
Monteview	■	■
Mud Lake/Terreton	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall	■	■
Idaho Falls	■	■
Big Southern Butte ¹	■	■

¹ The Big Southern Butte location has been re-categorized from a Boundary to a Distant location starting in the 2nd quarter 2024.

Table 10. Average, median, and range of gamma exposure rates, third quarter 2024, from EcoGamma network.

Station Location	Exposure Rate (µR/hr)			
	Quarterly Average*	1 SD	Median	Range**
On-site Locations				
Base of Howe ¹	13.7	0.6	13.7	10.4 - 18.3
Big Lost River Rest Area ²	14.5	0.6	14.5	12.5 – 18.0
Rover ³	14.8	0.6	14.8	10.6 – 20.1
Sand Dunes Tower ⁴	14.1	0.6	14.0	10.8 – 18.9
Boundary Locations				
Atomic City ⁵	13.1	1.1	13.3	10.2 – 20.0
Howe Met. Tower ⁶	13.0	0.6	12.9	10.9 – 20.1
Montevieu ⁷	12.4	0.6	12.4	9.2 – 16.4
Mud Lake / Terreton ⁸	13.0	0.6	13.0	10.7 – 17.0
Distant Locations				
Fort Hall ⁹	12.5	0.5	12.5	9.4 – 16.4
Idaho Falls ¹⁰	NS	NS	NS	NS
Big Southern Butte ¹¹	14.1	0.5	14.1	12.0 – 20.2

*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.

¹ Missing data intermittently due to mechanical or transmission error between 8/6 – 8/8/24.

² Missing data intermittently due to mechanical or transmission error between 7/4 – 8/4/24.

³ Missing data intermittently due to mechanical or transmission error between 8/6 – 8/8/24.

⁴ Instrument was removed from field for re-calibration from 8/19 - 8/27/24. This data was removed from the dataset during that time span.

⁵ Instrument mechanical malfunction between 7/1 – 7/29/24. That data was removed from the dataset.

⁶ No data from the EcoGamma at this location for 7/9 – 7/11/24 and 8/28 – 9/9/24.

⁷ Instrument was removed from field for re-calibration from 8/27 – 9/24/24. This data was removed from the dataset during that time span.

⁸ No data from the EcoGamma at this location between 7/22 – 8/20/24.

⁹ Instrument was removed from field for re-calibration from 8/27 - 8/28/24. This data was removed from the dataset during that time span.

¹⁰ Instrument mechanical malfunction during the entire quarter. The data was not used.

¹¹ No data due to mechanical or transmission error between 7/1 – 9/24/24 for the primary EcoGamma but the duplicate (DUP) detector was functional, so this data is from the DUP EcoGamma which only showed some missing data intermittently due to mechanical or transmission error between 7/4 – 7/11/24.

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

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average ¹	1 SD
On-Site Locations		
Base of Howe	12.6	0.3
Big Lost River Rest Area	17.0, 15.9	-
Experimental Field Station	16.8	0.1
Rover	13.6	1.7
Sand Dunes Tower	13.3	1.7
Van Buren Avenue	13.5	1.0
Boundary Locations		
Atomic City	11.7	0.8
Howe Met. Tower	11.9	2.2
Monteview	13.6	2.2
Mud Lake/ Terreton	14.9, 11.3	-
Distant Locations		
Craters of the Moon	15.8	0.9
Fort Hall	14.5	2.6
Idaho Falls	11.4	0.6
Big Southern Butte	12.0	1.0

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 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, 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

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.

radioactivity are detected in gross measurements, additional samples will be collected and analyzed for specific radionuclides.

During the third quarter of 2024, DEQ-INL OP sampled groundwater from the aquifer at 13 distant locations. **Table 12** lists the sample date, co-sampler, well depth, and analyses requested for the locations sampled this quarter. Analytical results are reported in **Tables 14 through 19** and summarized below. The results of low-level tritium analyses for 16 samples collected in the second quarter, along with 10 samples collected in the third quarter of 2024, are reported in **Table 16** and discussed 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 MCL. 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.

Gross alpha radioactivity was detected at four locations this quarter (**Table 14**). Distant well MV-51 had the highest gross alpha concentration of 2.1 ± 0.5 pCi/L, which is within the background and historical ranges for this well. The EPA maximum contaminant level (MCL) for alpha particles is 15 pCi/L. All distant locations sampled this quarter resulted in detections of gross beta radioactivity, with the highest concentrations measured at MV-54 (8.6 ± 0.6 pCi/L). This is at the top of the background range for gross beta, but consistent with previous results for this well. All other distant well detections were within the known background ranges.

Manmade gamma-emitting radionuclides

Manmade gamma-emitting cesium-137 (^{137}Cs) was not detected at any of the distant locations sampled this quarter. Results for ^{137}Cs are reported in **Table 14**.

Tritium

No tritium detections were measured at any of the distant well locations sampled this quarter (**Table 15**) using the standard analytical method, which typically has an MDC of 110 to 190 pCi/L.

Six facility location and 10 boundary location samples from the second quarter and 10 distant location samples from third quarter (2024) were analyzed by the low-level tritium method, with results reported in **Table 16**. The highest concentrations detected were 620 ± 5 pCi/L at USGS-131A (812 ft bgs) and 546 ± 4 pCi/L at USGS-131A (616 ft bgs). The results are consistent with the historical ranges of these wells. All reported concentrations for the distant wells are within the background range (≤ 33 pCi/L) and all tritium concentrations reported in this quarter are well below the drinking water MCL of 20,000 pCi/L. A backlog of five samples for low-level tritium analysis remains.

Common ions, trace metals, and nutrients

All locations were sampled for chloride, sulfate, alkalinity, chromium, and dissolved nutrients (nitrate-plus-nitrite) (**Tables 17, 18 and 19**).

All analytes tested at distant wells were within background ranges, with the exception of several sulfate, sodium, and nitrate-plus-nitrite results. Sulfate concentrations were above background concentrations for wells MV-02A (51.4 mg/L), MV-14 (57.6 mg/L), MV-26 (43.1 mg/L), MV-31 (61.2 mg/L), MV-41B (53.2 mg/L), MV-51 (65.9 mg/L), MV-54 (78.0 mg/L), and MV-65 (58.3 mg/L). Sodium concentrations were above background concentrations for MV-65 (33.0 mg/L). Nitrate-plus-nitrite concentrations were above background concentrations for MV-54 (5.7 mg/L). All results are consistent with historical trends. Elevated sulfate, sodium, and nitrate-plus-nitrite at distant locations are likely associated with agricultural practices in the Magic Valley.

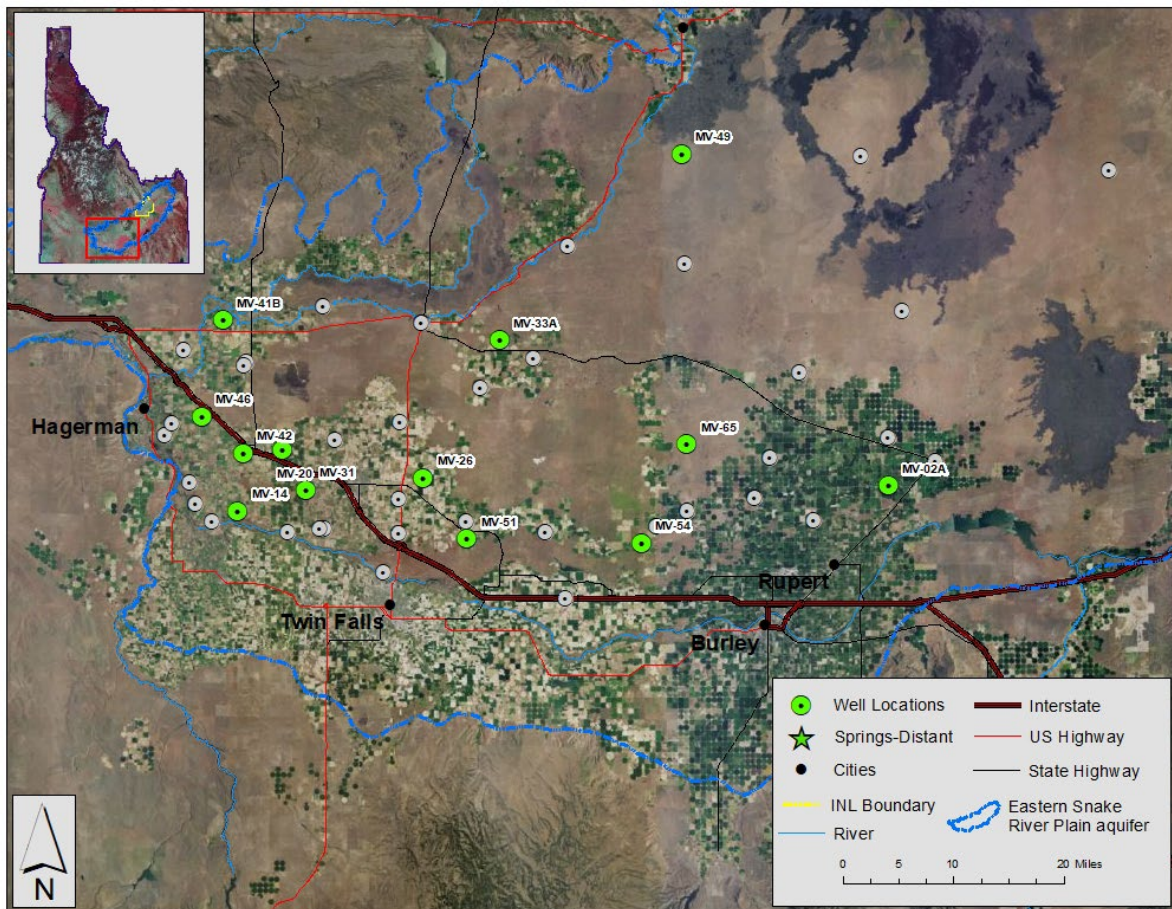


Figure 2. Distant and Surface Water monitoring locations.

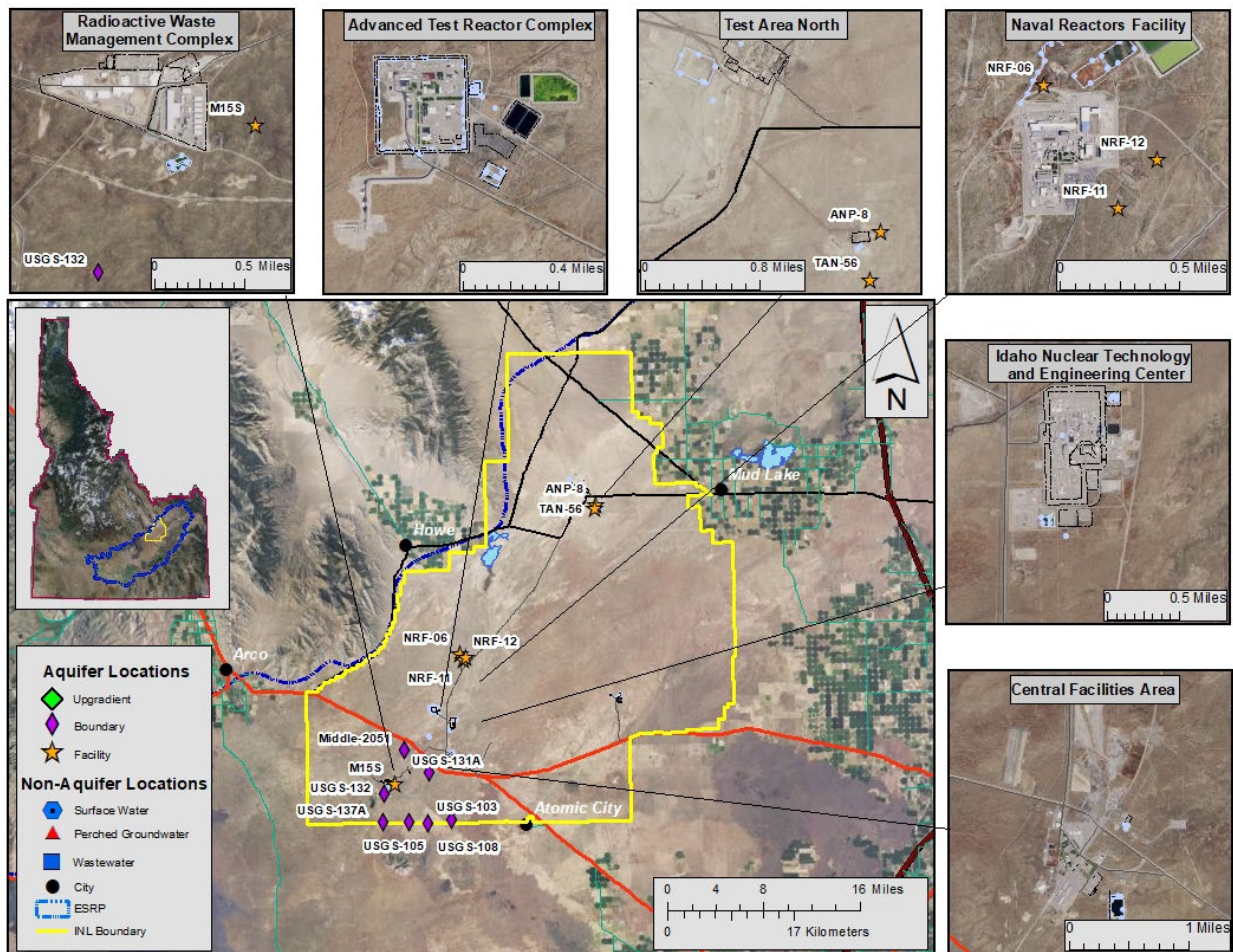


Figure 3. Up-gradient, facility, boundary, perched groundwater, and wastewater monitoring locations.

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

Sample Location	Date Sampled	Co-sampler	Well Depth (ft bgs)	Analyses*
Aquifer Samples				
Distant				
MV-02A	7/16/2024	None	205	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-14	7/16/2024	None	n/a	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-20	7/16/2024	None	200	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-26	7/17/2024	None	n/a	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-31	7/17/2024	None	230	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-33A	7/16/2024	None	350	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-41B	7/16/2024	None	305	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-42	7/16/2024	None	165	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-46	7/16/2024	None	n/a	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-49	7/23/2024	None	426	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-51	7/17/2024	None	250	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-54	7/17/2024	None	380	α, β, γ, ³ H, Cl-, SO ₄ ²⁻ , alk, Cr, NO ₃ +NO ₂
MV-65	8/13/2024	IDWR	711	α, β, γ, ³ H, com. ions, alk, 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; ¹²⁹I = Iodine-129; Pu iso. = plutonium isotopes ²³⁸Pu, ^{239/240} Pu; U iso. = uranium isotopes ²³⁴U, ²³⁵U, ²³⁸U; Cl = chloride; SO₄²⁻ = sulfate; alk = alkalinity; Cr = chromium; com. ions = Ca²⁺, Mg²⁺, Na⁺, K⁺, Cl⁻, SO₄²⁻, alkalinity; trace metals (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).

n/a = well depth not available.

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	---
Plutonium-239/240	0	---
Americium-241	0	---
Non-radiological Constituents		
<i>Common Ions (mg/L)</i>		
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*
<i>Trace Metals (µg/L)</i>		
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*
<i>Nutrients (mg/L)</i>		
Nitrate plus nitrite	<0.04 – 3.59 ^b	10 for NO ₃ ⁻ , 1 for NO ₂ ⁻
Phosphorus	<0.01 – 0.02 ^d	---
<i>Volatile Organic Compounds (µg/L)</i>		
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	---

¹Sources for background ranges are ^aDEQ data compiled from distant, boundary, and surface water sites from 1993-2018.

^bBartholomay and Hall, 2016 (DOE/ID-22237); ^cKnobel and others, 1992; ^dKnobel and others, 1999 (DOE/ID-22164); ^eCecil and others, 2003 (DOE/ID-22186); ^fMCL is for total trihalomethanes.

²Maximum 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) for water samples, third quarter, 2024.

Sample Location	Sample Date	Gross Alpha			Gross Beta			Cesium-137*		
		Concentration		1 SD	Concentration		1 SD	Concentration		1 SD
Aquifer Samples										
Distant										
MV-02A	7/16/2024	0.9	U	0.4	6.3	-	0.5	0.8	U	0.6
MV-14	7/16/2024	1.9	-	0.5	5.4	-	0.5	0.2	U	0.6
MV-20	7/16/2024	0.5	U	0.3	2.7	-	0.4	-0.1	U	0.6
MV-26	7/17/2024	1.1	U	0.4	3.8	-	0.4	1.4	U	0.7
MV-31	7/17/2024	1.2	U	0.4	3.7	-	0.4	0.6	U	0.6
MV-33A	7/16/2024	0.6	U	0.3	4.4	-	0.4	-0.6	U	0.7
MV-41B	7/16/2024	0.8	U	0.5	4.2	-	0.5	0.7	U	0.5
MV-42	7/16/2024	1.4	-	0.4	4.9	-	0.5	0.9	U	0.8
MV-46	7/16/2024	1.1	-	0.3	3.5	-	0.4	1.0	U	0.7
MV-49	7/23/2024	1.3	U	0.5	4.1	-	0.4	0.5	U	0.5
MV-51	7/17/2024	2.1	-	0.5	8.4	-	0.5	0.4	U	0.8
MV-54	7/17/2024	0.5	U	0.5	8.6	-	0.6	0.4	U	0.7
MV-65	8/13/2024	0.9	U	0.4	4.4	-	0.4	-0.1	U	0.6

Data qualifiers: U = undetected, J = estimate, R = rejected, "+" or "-" after a J means that the estimated result is biased high or low, respectively. were larger due to high dissolved/suspended solids requiring a smaller aliquot for analysis.

*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.

Table 15. Tritium concentrations (pCi/L) for water samples, third quarter, 2024.

Sample Location	Sample Date	Tritium		
		Concentration		1 SD
Aquifer Samples				
Distant				
MV-02A	7/16/2024	7	U	30
MV-14	7/16/2024	-37	U	30
MV-20	7/16/2024	-7	U	30
MV-26	7/17/2024	30	U	30
MV-31	7/17/2024	-3	U	30
MV-33A	7/16/2024	20	U	30
MV-41B	7/16/2024	-3	U	30
MV-42	7/16/2024	5	U	20
MV-46	7/16/2024	-10	U	30
MV-49	7/23/2024	-20	U	30
MV-51	7/17/2024	10	U	30
MV-54	7/17/2024	57	U	30
MV-65	8/13/2024	-14	U	25

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 samples collected and analyzed using the electrolytic enrichment method, third quarter, 2024.

Sample Location	Sample Date	Tritium		
		Concentration		1 SD
Aquifer Samples				
Distant				
MV-02A	7/16/2024	4	U	2
MV-20	7/16/2024	5	U	2
MV-26	7/17/2024	8	-	1
MV-31	7/17/2024	8	-	2
MV-33A	7/16/2024	9	-	2
MV-42	7/16/2024	3	U	2
MV-46	7/16/2024	7	-	2
MV-51	7/17/2024	12	-	2
MV-54	7/17/2024	12	-	2
MV-65	8/13/2024	3	U	2
Facility				
Naval Reactors Facility				
NRF-06	5/20/2024	13	-	2
NRF-11	5/22/2024	10	-	2
NRF-12	5/22/2024	13	-	2
Test Area North				
ANP-8	6/03/2024	44	-	2
TAN-56	6/24/2024	-2	U	2
Radioactive Waste Management Complex				
M15S	5/13/2024	41	-	2
Boundary				
Middle-2051 (749 ft bgs)	6/26/2024	135	-	3
Middle-2051 (1091 ft bgs)	6/26/2024	96	-	3
USGS-103 (1258 ft bgs)	6/27/2024	118	-	2
USGS-105 (952 ft bgs)	6/18/2024	126	-	3
USGS-105 (1072 ft bgs)	6/18/2024	128	-	3
USGS-108 (1172 ft bgs)	6/20/2024	30	-	2
USGS-131A (616 ft bgs)	6/25/2024	546	-	4
USGS-131A (812 ft bgs)	6/25/2024	620	-	5
USGS-132 (765 ft bgs)	6/13/2024	123	-	3
USGS-137A (747 ft bgs)	6/17/2024	70	-	3

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. Common ion concentrations (mg/L) in water samples, third quarter, 2024.

Sample Location	Sample Date	Calcium*	Magnesium*	Sodium*	Potassium*	Fluoride	Chloride	Sulfate	Alkalinity†
Aquifer Samples									
Distant									
MV-02A	7/16/2024	-	-	-	-	-	43.8 ¹	51.4	168
MV-14	7/16/2024	-	-	-	-	-	42.5 ¹	57.6	163
MV-20	7/16/2024	-	-	-	-	-	18.0	36.4	143
MV-26	7/17/2024	-	-	-	-	-	29.4	43.1	140
MV-31	7/17/2024	-	-	-	-	-	45.5 ²	61.2	168
MV-33A	7/16/2024	-	-	-	-	-	7.86	20.6	125
MV-41B	7/16/2024	-	-	-	-	-	26.6	53.2	245
MV-42	7/16/2024	-	-	-	-	-	18.6	36.6	158
MV-46	7/16/2024	-	-	-	-	-	8.53	21.7	121
MV-49	7/23/2024	-	-	-	-	-	4.96	19.6	188
MV-51	7/17/2024	-	-	-	-	-	44.7 ¹	65.9	199
MV-54	7/17/2024	-	-	-	-	-	61.5 ²	78.0 ²	208
MV-65	8/13/2024	51	20	33	4.5	-	49.3 ¹	58.3	159

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.

†As CaCO₃.

"-" = not analyzed.

Note 1. Lab indicated that a 1:2 dilution of this sample was required for this analyte.

Note 2. Lab indicated that a 1:5 dilution of this sample was required for this analyte.

Table 18. Dissolved metals concentrations (µg/L) in water samples, third quarter, 2024.

Sample Location	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
Aquifer Samples									
Distant									
MV-02A	7/16/2024	-	-	1.6	-	-	-	-	-
MV-14	7/16/2024	-	-	2.4	-	-	-	-	-
MV-20	7/16/2024	-	-	3.4	-	-	-	-	-
MV-26	7/17/2024	-	-	2.4	-	-	-	-	-
MV-31	7/17/2024	-	-	2.3	-	-	-	-	-
MV-33A	7/16/2024	-	-	3.8	-	-	-	-	-
MV-41B	7/16/2024	-	-	1.2	-	-	-	-	-
MV-42	7/16/2024	-	-	3.3	-	-	-	-	-
MV-46	7/16/2024	-	-	4.0	-	-	-	-	-
MV-49	7/23/2024	-	-	1.2	-	-	-	-	-
MV-51	7/17/2024	-	-	1.6	-	-	-	-	-
MV-54	7/17/2024	-	-	2.2	-	-	-	-	-
MV-65	8/13/2024	-	-	2.0	-	-	-	-	-

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.

Table 19. Dissolved nutrient concentrations (mg/L) in water samples, third quarter, 2024.

Sample Location	Sample Date	Nitrate + Nitrite*		Total Phosphorus	
Aquifer Samples					
Distant					
MV-02A	7/16/2024	1.3	-	-	-
MV-14	7/16/2024	2.5 ¹	-	-	-
MV-20	7/16/2024	2.3 ¹	-	-	-
MV-26	7/17/2024	1.2	-	-	-
MV-31	7/17/2024	2.5 ¹	-	-	-
MV-33A	7/16/2024	0.70	-	-	-
MV-41B	7/16/2024	3.4 ¹	-	-	-
MV-42	7/16/2024	2.7 ²	-	-	-
MV-46	7/16/2024	0.74	-	-	-
MV-49	7/23/2024	1.4	-	-	-
MV-51	7/17/2024	3.0 ¹	-	-	-
MV-54	7/17/2024	5.7 ³	-	-	-
MV-65	8/13/2024	2.3 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.

*As N.

"-" = not analyzed.

Note 1. Lab indicated that a 1:2 dilution of this sample was required for this analyte.

Note 2. Lab indicated that a 1:4 dilution of this sample was required for this analyte.

Note 3. Lab indicated that a 1:5 dilution of this sample was required for this analyte.

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 third 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. Twelve 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 on a monthly basis. Results for analyses of milk samples are presented in **Table 20**. ^{40}K was detected in all samples within the expected range of concentration. ^{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 20. Gamma spectroscopy analysis data for milk samples, third 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	07/16/24	1397	60	1.3	U	1.3
Gooding	08/21/24	1294	54	-0.2	U	1.0
Gooding	09/18/24	1345	55	-0.6	U	0.9
Monteview	07/16/24	1446	59	0.5	U	1.4
Monteview	08/26/24	1354	55	1.9	U	1.1
Monteview	09/17/24	1358	57	0.2	U	1.3
Ucon	07/06/24	1469	59	0.2	U	0.8
Ucon	08/10/24	1540	61	0.1	U	0.8
Ucon	09/07/24	1556	62	0.6	U	1.2
Verification Samples¹						
Terreton	07/15/24	1212	55	-0.4	U	0.7
Rigby	08/19/24	1306	59	0.7	U	1.3
Minidoka	09/17/24	1345	55	-0.5	U	0.9

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 third 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 third quarter of 2024, DEQ-INL OP and contracted laboratories performed 92 QC analyses on various radiological and non-radiological samples. (**Table 21**).

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 third quarter of 2024 are presented in **Table 22**. The blank filter gross alpha result was equal to or greater than 3 SD for the weeks of 8/15 – 8/22/24 and 8/22 – 8/29/24. Associated field sample gross alpha results for those weeks are qualified as biased-high estimates (J+). The blank filter gross beta result was equal to or greater than 3 SD for the weeks of 6/27 – 7/3, 8/15 – 8/22/24, and 8/22 – 8/29/24. Associated

field sample gross beta results for those weeks are significantly higher than the blank exceedances and are therefore not qualified.

Blank sample results for selected gamma emitters in air from 47-mm TSP filter quarterly composites and 8x10-inch monthly composites from third quarter 2024 are presented in **Table 23**. Blank sample results for radiochemical analysis of 8x10-inch TSP filter quarterly composites from second quarter 2024 are presented in **Table 24**. All blank results for composites met acceptance criteria.

Method blank and control sample analysis results used to assess data quality for tritium in water vapor in air are presented in **Table 25**. 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 results for tritium method blanks and control samples met acceptance criteria.

Blank sample results for radiological constituents in water are presented in **Table 26**. Blank sample results for metals in water are presented in **Table 27**. Blank sample results for common ions and nutrients in water are presented in **Table 28**. All blank sample results for water met acceptance criteria for third 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 29**. Duplicate sample results for radiochemical analysis of 8x10-inch TSP filter quarterly composites from second quarter 2024, from

the Idaho Falls monitoring location, are presented in **Table 30**. All TSP filter duplicate sample results met acceptance criteria for the third quarter of 2024.

Duplicate results for quarterly average EcoGamma readings from the Big Southern Butte monitoring location are presented in **Table 31**. These duplicate sample results met acceptance criteria, although the primary EcoGamma produced useful data only from 9/24 to 9/30/24.

Duplicate results for radiological analyses in groundwater and surface water are presented in **Table 32**. Duplicate results for metals, common ions and nutrients in groundwater are presented in **Tables 33** and **34**. The low-level tritium results from the ANP-8 duplicate sample pair did not meet acceptance criteria. The associated TAN-56 sample result remained qualified as non-detected (U). All other duplicate water sample results met acceptance criteria for the third 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 third quarter 2024 are presented in **Table 35**. 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 of Low Level Sample Results

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

For radiological results, the minimum detectable concentration (MDC) is no longer used as the criterion above which the result is considered a positive detection. The following criteria are 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), are 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 third quarter of 2024 which significantly affected data quality. The ratio of total QC analyses to total field sample analyses of 14.0% 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 third 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 third quarter of 2024 is well above the acceptable value of 90% for the DEQ-INL OP ESP and is summarized in **Table 21**. The overall data completeness (usable results divided by the total number of field sample results expected) of 98.5% 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 third quarter of 2024 is summarized in **Table 35**. Mechanical failures in the 47-mm TSP filter samplers resulted in no data for one or more weeks at Craters of the Moon, Howe, Mud Lake, and Sand Dunes.

Conclusion

⁷ Idaho National Laboratory Site Environmental Surveillance Program Report, Third Quarter 2023, INL/RPT-24-77413, p. 3

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.

¹⁰The 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.

¹¹IBL 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.

All data collected for the third 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 98.3% 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 21. Summary of analyses performed in the third 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	147	13	0	0	0	ISU-EML
		Gross beta	147	13	0	0	0	ISU-EML
		Gamma emitters	12	1	0	0	0	ISU-EML
	8x10-inch filter	Gamma emitters	36	3	3	0	0	ISU-EML
		Radiochemical ⁶ :						
		Sr-90	12	1	1	0	0	ISU-Sub
		Pu-238, 239/240	12	1	1	0	0	ISU-Sub
Am-241	12	1	1	0	0	ISU-Sub		
Water Vapor	Desiccant column	Tritium	45	8 ⁸	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	7	0	0	0	0	ISU-EML
		Gamma emitters	7	0	0	0	0	ISU-EML
Water								
Ground water, perched ground water, waste pond effluent, and surface water	Grab or composite	Gross alpha	13	2	2	0	0	ISU-EML
		Gross beta	13	2	2	0	0	ISU-EML
		Gamma emitters	13	2	2	0	0	ISU-EML
		Tritium	13	2	2	0	0	ISU-EML
		Low-level tritium	26	3	4	0	0	ISU-EML
		Radiochemical ⁷ :						
		Sr-90	0	0	0	0	0	ISU-Sub
		Tc-99	0	0	0	0	0	ISU-Sub
		U-234, 235,238	0	0	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	13	2	2	0	0	IBL
		Common Ions	13	2	2	0	0	IBL
		Nutrients	13	2	2	0	0	IBL
Volatile Organics	0	0	0	0	0	IBL		
Terrestrial								
Milk	Grab or composite	Gamma emitters	12	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	66	0	0	9	0	DEQ-INL OP
	EcoGamma	Gamma Radiation	10	NA	1	0	0	DEQ-INL OP
Total analyses performed			655	58	25	9	0	
Total QC analyses performed (blanks, duplicates, and spikes)			92					
Ratio of total QC analyses to total sample analyses³			14.0%					
Data usability⁴, percent			100.0%					
Data completeness⁵, percent			98.3%					

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.

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

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

⁸ Method blanks and control samples are included here.

Table 22. Blank analysis results for gross alpha and beta in 47-mm particulate air (TSP) filters, third quarter, 2024.

Collection Period		Corrected volume (m ³) ¹	Gross alpha			Gross beta		
Start	Stop		Value		3 SD	Value		3 SD
06/27/24	07/03/24	571	0.0	U	0.3	0.9	-	0.6
07/03/24	07/11/24	571	-0.3	U	0.3	0.0	U	0.9
07/11/24	07/18/24	571	-0.2	U	0.6	0.3	U	0.9
07/18/24	07/25/24	571	-0.2	U	0.6	-0.5	U	0.9
07/25/24	08/01/24	571	0.0	U	0.3	0.0	U	0.9
08/01/24	08/08/24	571	-0.1	U	0.3	0.3	U	0.9
08/08/24	08/15/24	571	-0.2	U	0.6	0.2	U	0.9
08/15/24	08/22/24	571	0.3	-	0.3	1.0	-	0.9
08/22/24	08/29/24	571	0.5	-	0.3	0.9	-	0.9
08/29/24	09/05/24	571	0.0	U	0.3	-0.3	U	0.9
09/05/24	09/12/24	571	0.0	U	0.3	0.0	U	0.9
09/12/24	09/19/24	571	-0.2	U	0.3	-0.2	U	0.9
09/19/24	09/26/24	571	-0.1	U	0.3	0.4	U	0.9

Concentration values and associated uncertainty (3 SD) are expressed in 1 x 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 23. Blank results for gamma spectrometry analysis of monthly composites of 8x10-inch TSP air filters, and quarterly composites of 47- mm TSP air filters, third 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															
Jul	-18	U	57	-48	U	159	3	U	21	1	U	9	1	U	12
Aug	26	U	57	-14	U	147	-10	U	15	1	U	6	5	U	6
Sep	-4	U	51	-7	U	147	-3	U	18	3	U	6	3	U	9
Quarterly composite² of 47-mm TSP air filters															
3rd Qtr.	44	U	105	126	U	258	4	U	33	10	U	15	7	U	15

Concentrations (Conc) are expressed in 1 x 10⁻⁵ 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 24. Blank results for radiochemical analysis of 8x10-inch TSP air filters, quarterly composite samples, from second quarter, 2024.

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
2Q 24 Blank	0.21	U	0.51	0.03	U	0.12	0.02	U	0.06	-0.06	U	0.15

Concentrations are expressed in 1×10^{-5} 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.

¹ These 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 25. Method blank and control sample analysis results for tritium in water vapor from air samples, third quarter, 2024.

Sample Number	Start Date	Collection Date	Analysis Date	Tritium		
				Concentration		3 SD
Method Blanks						
OP243ZTR01	08/06/24	08/09/24	08/19/24	0.02	U	0.06
OP243ZTR02	08/13/24	08/16/24	08/28/24	-0.02	U	0.06
OP243ZTR03	09/04/24	09/10/24	10/05/24	0.03	U	0.06
OP243ZTR04	09/16/24	09/23/24	10/05/24	0.04	U	0.06
Control Samples						
Distilled Retail	07/08/24	07/08/24	08/09/24	0.04	U	0.09
Distilled Retail	10/02/24	10/02/24	10/09/24	0.00	U	0.06
Refrigerator	07/01/24	10/02/24	10/09/24	0.02	U	0.09
Sink	07/01/24	10/02/24	10/05/24	0.05	U	0.06

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.

Table 26. Blank analysis results (pCi/L) for radiological constituents in water, third quarter, 2024.

Sample Number	Sample Date	Blank Type	Concentration		3 SD	Within Blank Criteria?
Gross Alpha						
241W521	07/16/24	Field	-0.1	U	0.3	Yes
241W526	07/23/24	Field	0.2	U	0.3	Yes
Gross Beta						
241W521	07/16/24	Field	0.8	U	0.9	Yes
241W526	07/23/24	Field	0.4	U	0.9	Yes
Cesium-137						
241W521	07/16/24	Field	-0.2	U	1.8	Yes
241W526	07/23/24	Field	1.1	U	1.8	Yes
Tritium (standard method)						
241W522	07/16/24	Field	-10	U	90	Yes
241W527	07/23/24	Field	-30	U	90	Yes
Tritium (enriched method)						
241W265	05/14/24	Field	-1	U	6	Yes
241W393	06/27/24	Field	-3	U	6	Yes
241W452	06/20/24	Field	1	U	6	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 27. Blank analysis results (µg/L) for metals in water, third quarter, 2024.

Sample Number	Sample Date	Blank Type	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
241W524	07/16/24	Field	-	-	<1.0	-	-	-	-	-
241W529	07/23/24	Field	-	-	<1.0	-	-	-	-	-

Table 28. Blank analysis results (mg/L) for common ions and nutrients in water, third quarter, 2024.

Sample Number	Sample Date	Blank Type	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Alkalinity [†]	NO ₃ +NO ₂ [*]	Total Phosphorus
241W523,525	07/16/24	Field	-	-	-	-	-	<0.4	<0.8	<1.0	<0.01	-
241W528,530	07/23/24	Field	-	-	-	-	-	<0.4	<0.8	<1.0	<0.01	-

[†] As CaCO₃.

^{*} As N.

Table 29. Duplicate sample results for gamma emitters from monthly composited 8x10-inch TSP air filters, third 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?
July 2024										
⁷ Be	Idaho Falls	223.9	6.6	Idaho Falls Dup	189.3	5.9	17	34.6	26.6	Yes
¹⁰⁶ Ru/ ¹⁰⁶ Rh		-0.48 U	0.62		-0.68 U	0.58	-34	0.20	2.55	Yes
¹²⁵ Sb		0.12 U	0.11		0.02 U	0.08	143	0.10	0.41	Yes
¹³⁴ Cs		0.05 U	0.04		0.02 U	0.03	86	0.03	0.15	Yes
¹³⁷ Cs		0.09 U	0.04		0.06 U	0.03	40	0.03	0.15	Yes
August 2024										
⁷ Be	Idaho Falls	150.8	4.4	Idaho Falls Dup	133.2	4.1	12	17.6	18.0	Yes
¹⁰⁶ Ru/ ¹⁰⁶ Rh		-0.45 U	0.38		-0.19 U	0.27	81	0.26	1.40	Yes
¹²⁵ Sb		-0.05 U	0.07		-0.04 U	0.05	22	0.01	0.26	Yes
¹³⁴ Cs		0.04 U	0.03		0.02 U	0.02	57	0.02	0.11	Yes
¹³⁷ Cs		0.03 U	0.03		-0.01 U	0.02	400	0.04	0.11	Yes
September 2024										
⁷ Be	Idaho Falls	138.1	4.7	Idaho Falls Dup	138.5	4.7	0.3	0.4	19.9	Yes
¹⁰⁶ Ru/ ¹⁰⁶ Rh		0.44 U	0.47		0.10 U	0.39	126	0.34	1.83	Yes
¹²⁵ Sb		0.07 U	0.05		0.04 U	0.06	55	0.03	0.23	Yes
¹³⁴ Cs		0.01 U	0.02		0.01 U	0.02	0	0.00	0.08	Yes
¹³⁷ Cs		0.04 U	0.02		0.02 U	0.03	67	0.02	0.11	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 30. Duplicate sample results for radiochemical analyses of composited 8x10 inch TSP air filters from the second quarter of 2024.

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	3.07	0.31	Idaho Falls Dup	2.80	0.30	9	0.27	1.29	Yes
²³⁸ Pu		0.10 U	0.05		0.01 U	0.03	164	0.09	0.17	Yes
²³⁹ Pu/ ²⁴⁰ Pu		0.04 U	0.02		0.02 U	0.03	67	0.02	0.11	Yes
²⁴¹ Am		-0.01 U	0.04		0.03 U	0.05	-400	0.04	0.19	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 31. Duplicate results for quarterly average EcoGamma readings (µR/hr) for the third 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 9/24-9/30/24	12.1	0.5	Big Southern Butte DUP ¹ 9/24-9/30/24	14.0	0.5	-15	1.9	2.1	Yes

RPD = relative percent difference.

¹ No data for the primary EcoGamma due to mechanical or transmission errors from 7/1 – 9/24/24. The primary EcoGamma data from 9/24 – 9/30/24 is compared to the DUP EcoGamma data from 9/24-9/30/24.

Table 32. Duplicate sample results (pCi/L) for radiological constituents in groundwater and/or surface water, third 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										
MV-42	241W456	1.4	0.4	241W461	0.3	0.3	129	1.1	1.5	Yes
MV-65	241W531	0.9	0.4	241W536	1.0	0.4	-11	0.1	1.7	Yes
Gross Beta										
MV-42	241W456	4.9	0.5	241W461	3.5	0.4	33	1.4	1.9	Yes
MV-65	241W531	4.4	0.4	241W536	5.0	0.5	-13	0.6	1.9	Yes
Cesium-137										
MV-42	241W456	0.9	0.8	241W461	-0.4	0.6	520	1.3	3.0	Yes
MV-65	241W531	-0.1	0.6	241W536	0.7	0.5	-267	0.8	2.3	Yes
Tritium (standard method)										
MV-42	241W457	5	20	241W462	0	30	200	10	108	Yes
MV-65	241W532	-10	20	241W537	-20	20	-67	10	86	Yes
Tritium (low-level method)										
NRF-12	241W332	13	2	241W339	11	2	17	2	8	Yes
ANP-8	241W350	44	2	241W356	32	2	32	12	8	No
MV-42	241W457	3	2	241W462	4	2	-29	1	8	Yes
MV-65	241W532	3	2	241W537	3	2	0	0	8	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 33. Duplicate results for metals (µg/L) in groundwater, third quarter, 2024.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
MV-42	241W459	07/16/24	-	-	3.3	-	-	-	-	-
MV-42	241W464	07/16/24	-	-	3.3	-	-	-	-	-
RPD (%)			-	-	0.0	-	-	-	-	-
MV-65	241W534	08/13/24	-	-	2.0	-	-	-	-	-
MV-65	241W539	08/13/24	-	-	1.9	-	-	-	-	-
RPD (%)			-	-	5.1	-	-	-	-	-

RPD = relative percent difference.

Table 34. Duplicate sample results for common ions and nutrients (mg/L) in groundwater, third quarter, 2024.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Total Alkalinity [†]	Total Nitrogen	Total Phosphorus
MV-42	241W458, 460	07/16/24	-	-	-	-	18.6	36.6	158	2.7	-
MV-42	241W463, 465	07/16/24	-	-	-	-	18.6	36.6	156	2.7	-
RPD (%)			-	-	-	-	0.0	0.0	1.3	0.0	-
MV-65	241W533, 534, 535	08/13/24	51	20	33	4.5	49.3	58.3	159	2.3	-
MV-65	241W538, 539, 540	08/13/24	51	20	32	4.5	48.7	58.4	161	2.3	-
RPD (%)			0.0	0.0	3.1	0.0	1.2	-0.2	-1.2	0.0	-

RPD = relative percent difference.

[†] As CaCO₃.

Table 35. ISU-EML electret ionization chamber (EIC) irradiation results (categorized as spiked samples), third quarter, 2024.

Electret #	Exposure Received		Net Measured Exposure ¹		%R	Within Spec?
	(mR)	Uncertainty (1 SD, mR)	(mR)	Uncertainty (1 SD, mR)		
SMD503	40.1	1.4	41.6	1.2	103.7%	Yes
SMV261	40.1	1.4	37.1	1.4	92.5%	Yes
SMV134	40.1	1.4	44.7	1.3	111.5%	Yes
Triplicate AVG:					102.6%	Yes
SMV163	30.0	1.1	30.8	1.3	102.7%	Yes
SMV138	30.0	1.1	32.5	1.3	108.3%	Yes
SMV273	30.0	1.1	27.6	1.4	92.0%	Yes
Triplicate AVG:					101.0%	Yes
SMV184	20.0	0.7	18.7	1.4	93.5%	Yes
SMV015	20.0	0.7	22.2	1.4	111.0%	Yes
SMV179	20.0	0.7	18.0	1.3	90.0%	Yes
Triplicate AVG:					98.2%	Yes

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

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

Table 36. Air sampling field equipment service reliability (percent operational), third 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
MFC Guard House	100%	100%	100%	100%	NC ¹
Sand Dunes Tower	92%	100%	100%	100%	NC ¹
Van Buren Avenue	92%	100%	100%	100%	NC ¹
Boundary Locations					
Atomic City	100%	100%	100%	100%	100%
Howe	85%	100%	100%	85%	100%
Monteview	100%	100%	100%	100%	100%
Mud Lake	92%	100%	100%	100%	100%
Distant Locations²					
Craters of the Moon	92%	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 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, third 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	06/27/24	07/03/24 ¹	1.2	0.2	19.4	0.7
	07/03/24	07/11/24 ¹	1.5	0.2	29.2	0.7
	07/11/24	07/18/24	2.3	0.3	39.6	0.9
	07/18/24	07/25/24	2.3	0.3	36.6	0.8
	07/25/24	08/01/24	3.5	0.4	34.2	1.0
	08/01/24	08/08/24	3.7	0.4	46.4	1.1
	08/08/24	08/15/24	1.7	0.3	33.1	0.9
	08/15/24	08/22/24	1.5 J+ ³	0.2	27.0	0.7
	08/22/24	08/29/24	1.1 J+ ³	0.2	24.1	0.7
	08/29/24	09/05/24	2.6	0.3	32.2	0.8
	09/05/24	09/12/24	2.2	0.3	37.6	0.8
	09/12/24	09/19/24	0.9	0.2	20.9	0.6
	09/19/24	09/26/24	1.0	0.2	32.6	0.7
Experimental Field Station	06/27/24	07/03/24	1.4	0.2	16.6	0.6
	07/03/24	07/11/24	1.5	0.2	27.7	0.6
	07/11/24	07/18/24	2.3	0.3	38.0	0.8
	07/18/24	07/25/24	1.7	0.3	35.9	0.8
	07/25/24	08/01/24	3.4	0.4	29.0	0.9
	08/01/24	08/08/24	2.1	0.3	26.0	0.7
	08/08/24	08/15/24	1.7	0.3	23.7	0.7
	08/15/24	08/22/24	1.7 J+ ³	0.2	25.0	0.7
	08/22/24	08/29/24	1.4 J+ ³	0.2	22.9	0.6
	08/29/24	09/05/24	2.5	0.3	26.9	0.7
	09/05/24	09/12/24	1.8	0.2	35.8	0.8
	09/12/24	09/19/24	1.2	0.2	18.7	0.6
	09/19/24	09/26/24	1.4	0.2	30.2	0.7
MFC Guard House	06/27/24	07/03/24	1.1	0.2	19.0	0.7
	07/03/24	07/11/24	1.5	0.2	28.1	0.7
	07/11/24	07/18/24	2.3	0.3	36.3	0.8
	07/18/24	07/25/24	1.9	0.3	36.4	0.8
	07/25/24	08/01/24	3.4	0.4	30.2	0.9
	08/01/24	08/08/24	2.3	0.3	32.5	0.8
	08/08/24	08/15/24	1.5	0.2	25.1	0.7
	08/15/24	08/22/24	1.2 J+ ³	0.2	23.9	0.6
	08/22/24	08/29/24	1.3 J+ ³	0.2	21.8	0.6
	08/29/24	09/05/24	2.1	0.2	28.3	0.7
	09/05/24	09/12/24	2.1	0.2	35.3	0.8
	09/12/24	09/19/24	0.8	0.2	18.0	0.6
	09/19/24	09/26/24	1.1	0.2	32.4	0.8

Sand Dunes Tower	06/27/24	07/03/24	1.0	0.3	23.8	0.8
	07/03/24	07/11/24	1.6	0.3	37.4	0.8
	07/11/24	07/18/24	3.0 J⁴	0.4	56.1 J⁴	1.2
	07/18/24	07/25/24	2.9	0.4	52.1	1.1
	07/25/24	08/01/24	5.3	0.6	43.9	1.4
	08/01/24	08/08/24	2.2 J⁴	0.3	34.5 J⁴	0.8
	08/08/24	08/15/24	1.4 J⁴	0.2	25.3 J⁴	0.7
	08/15/24	08/22/24	1.2 J⁺³	0.2	25.0	0.6
	08/22/24	08/29/24	1.9 J⁺³	0.2	25.0	0.6
	08/29/24	09/05/24	1.9	0.2	23.2	0.7
	09/05/24	09/12/24	3.0 J⁵	0.3	41.9 J⁵	1.0
	09/12/24	09/19/24	NS⁶	NS⁶	NS⁶	NS⁶
	09/19/24	09/26/24	1.3	0.2	33.0	0.8
Van Buren Avenue	06/27/24	07/03/24	1.2	0.2	18.8	0.6
	07/03/24	07/11/24	1.7	0.2	28.5	0.7
	07/11/24	07/18/24	2.6	0.3	37.5	0.8
	07/18/24	07/25/24	1.8	0.3	36.8	0.8
	07/25/24	08/01/24	5.0	0.4	30.3	0.8
	08/01/24	08/08/24	2.8	0.3	33.1	0.8
	08/08/24	08/15/24	1.8	0.3	27.4	0.7
	08/15/24	08/22/24	1.7 J⁺³	0.2	25.4	0.7
	08/22/24	08/29/24	1.3 J⁺³	0.2	23.0	0.6
	08/29/24	09/05/24	NS⁶	NS⁶	NS⁶	NS⁶
	09/05/24	09/12/24	2.5	0.3	41.6	0.9
	09/12/24	09/19/24	1.7 J⁴	0.3	23.9 J⁴	0.7
	09/19/24	09/26/24	1.2 J⁴	0.2	28.0 J⁴	0.7
Boundary Locations						
Atomic City	06/27/24	07/03/24	3.0	0.3	21.9	0.7
	07/03/24	07/11/24	3.5	0.3	32.9	0.7
	07/11/24	07/18/24	4.7 J⁴	0.4	49.7 J⁴	1.1
	07/18/24	07/25/24	4.3 J⁴	0.4	39.6 J⁴	0.8
	07/25/24	08/01/24	3.3 J⁴	0.3	22.8 J⁴	0.7
	08/01/24	08/08/24	3.4 J⁴	0.3	36.1 J⁴	0.8
	08/08/24	08/15/24	3.0	0.3	26.4	0.7
	08/15/24	08/22/24	2.2 J⁺³	0.2	27.5	0.7
	08/22/24	08/29/24	2.6 J⁺³	0.3	23.9	0.6
	08/29/24	09/05/24	3.0	0.3	27.6	0.7
	09/05/24	09/12/24	3.2	0.3	38.0	0.8
	09/12/24	09/19/24	0.4	0.2	17.5	0.6
	09/19/24	09/26/24	2.9	0.3	33.3	0.8

Howe	06/27/24	07/03/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	07/03/24	07/11/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	07/11/24	07/18/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	07/18/24	07/25/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	07/25/24	08/01/24	2.8	0.4	25.0	0.8
	08/01/24	08/08/24	2.2	0.3	30.1	0.8
	08/08/24	08/15/24	1.6	0.3	23.7	0.7
	08/15/24	08/22/24	1.3 J+³	0.2	23.4	0.6
	08/22/24	08/29/24	1.7 J+³	0.2	23.5	0.6
	08/29/24	09/05/24	2.2	0.2	25.0	0.7
	09/05/24	09/12/24	1.4 J⁵	0.3	34.2 J⁵	0.9
	09/12/24	09/19/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	09/19/24	09/26/24	1.3	0.2	30.3	0.8
Monteviu	06/27/24	07/03/24	0.7	0.2	16.3	0.6
	07/03/24	07/11/24	1.1	0.2	25.6	0.6
	07/11/24	07/18/24	2.0	0.3	35.6	0.8
	07/18/24	07/25/24	1.5	0.3	32.2	0.8
	07/25/24	08/01/24	2.4	0.3	24.8	0.7
	08/01/24	08/08/24	2.0	0.3	29.4	0.7
	08/08/24	08/15/24	1.4	0.2	26.0	0.7
	08/15/24	08/22/24	0.9 J+³	0.2	23.1	0.6
	08/22/24	08/29/24	1.7 J+³	0.2	23.4	0.6
	08/29/24	09/05/24	1.2	0.2	23.7	0.6
	09/05/24	09/12/24	1.8	0.2	34.9	0.7
	09/12/24	09/19/24	0.4	0.2	16.0	0.6
	09/19/24	09/26/24	1.3	0.2	29.5	0.7
Mud Lake	06/27/24	07/03/24	1.4	0.2	16.9	0.6
	07/03/24	07/11/24	0.7	0.2	24.7	0.6
	07/11/24	07/18/24	1.6	0.2	37.8	0.8
	07/18/24	07/25/24	1.4	0.2	33.1	0.7
	07/25/24	08/01/24	3.0	0.3	23.5	0.8
	08/01/24	08/08/24	1.4	0.2	29.2	0.7
	08/08/24	08/15/24	1.1	0.2	23.0	0.6
	08/15/24	08/22/24	1.3 J+³	0.2	23.2	0.6
	08/22/24	08/29/24	1.2 J+³	0.2	23.1	0.6
	08/29/24	09/05/24	1.2	0.2	24.1	0.7
	09/05/24	09/12/24	1.9 J⁵	0.4	40.9 J⁵	1.2
	09/12/24	09/19/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	09/19/24	09/26/24	1.1	0.2	29.3	0.7

Distant Locations						
Craters of the Moon						
	06/27/24	07/03/24	1.0	0.2	18.7	0.6
	07/03/24	07/11/24	0.8	0.2	26.2	0.6
	07/11/24	07/18/24	2.0	0.3	38.5	0.8
	07/18/24	07/25/24	1.6	0.3	33.3	0.8
	07/25/24	08/01/24	2.6	0.3	23.3	0.7
	08/01/24	08/08/24	2.4	0.3	33.2	0.8
	08/08/24	08/16/24	1.9 J⁷	0.2	26.1 J⁷	0.6
	08/15/24	08/22/24	1.1 J⁺³	0.2	22.8	0.7
	08/22/24	08/29/24	1.9 J⁺³	0.2	21.8	0.6
	08/29/24	09/05/24	2.5	0.3	26.7	0.8
	09/05/24	09/12/24	1.8 J⁵	0.3	38.6 J⁵	1.1
	09/12/24	09/19/24	NS ⁶	NS ⁶	NS ⁶	NS ⁶
	09/19/24	09/26/24	1.7	0.2	25.6	0.7
Fort Hall²						
	06/27/24	07/03/24	0.8	0.2	18.0	0.6
	07/03/24	07/11/24	1.1	0.2	26.2	0.6
	07/11/24	07/18/24	1.8	0.3	36.3	0.8
	07/18/24	07/25/24	1.5	0.3	33.7	0.8
	07/25/24	08/01/24	2.6	0.3	28.2	0.9
	08/01/24	08/08/24	1.7	0.2	30.5	0.7
	08/08/24	08/15/24	1.3	0.2	25.9	0.7
	08/15/24	08/22/24	1.1 J⁺³	0.2	22.9	0.6
	08/22/24	08/29/24	1.2 J⁺³	0.2	20.5	0.6
	08/29/24	09/05/24	2.1	0.2	26.6	0.7
	09/05/24	09/12/24	1.5	0.2	32.8	0.8
	09/12/24	09/19/24	0.7	0.2	17.8	0.6
	09/19/24	09/26/24	1.1	0.2	28.1	0.7
Idaho Falls						
	06/27/24	07/03/24	1.0	0.2	16.1	0.6
	07/03/24	07/11/24	1.0	0.2	27.1	0.6
	07/11/24	07/18/24	1.3	0.2	36.7	0.8
	07/18/24	07/25/24	1.3	0.2	34.1	0.8
	07/25/24	08/01/24	1.9	0.3	25.1	0.8
	08/01/24	08/08/24	1.6	0.2	30.6	0.7
	08/08/24	08/15/24	1.4	0.2	24.5	0.6
	08/15/24	08/22/24	1.4 J⁺³	0.2	23.2	0.6
	08/22/24	08/29/24	1.4 J⁺³	0.2	21.9	0.6
	08/29/24	09/05/24	1.2	0.2	25.9	0.7
	09/05/24	09/12/24	1.5	0.2	35.2	0.7
	09/12/24	09/19/24	0.6	0.2	17.8	0.5
	09/19/24	09/26/24	1.0	0.2	30.0	0.7

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

¹Sampler ran for 6 days 06/27 - 07/03/2024. Sampler ran for 8 days 07/03 – 07/11/2024.

²Operated by Shoshone-Bannock Tribes.

³The blank filter gross alpha result was greater than or equal to 3 SD for the weeks of 08/15 – 08/22/2024 and 08/22 – 08/29/2024. Associated gross alpha results for those weeks are qualified as biased-high estimates (J+).

⁴Volume is an estimate due to mechanical failure. The result is a usable estimate (J).

⁵Volume is less than expected due to mechanical failure but is considered to be a usable estimate. The result is a usable estimate (J).

⁶NS - No sample due to mechanical failure.

⁷Sampler ran for 8 days 08/08 – 08/16/2024 due to unsafe conditions reaching the sample.

Appendix B

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

Sample Location	Net Corrected Exposure Rate ($\mu\text{R/hr}$) ¹	1 SD ($\mu\text{R/hr}$)
On-Site Locations		
Big Lost River Rest Area	17.0, 15.9	-
Van Buren Avenue	13.5	1.0
Experimental Field Station	16.8	0.1
Main Gate	12.7	2.3
Sand Dunes Tower	13.3	1.7
MP276 -20	15.1, 15.9	-
MP274 -20	12.2	2.1
MP272 -20	10.5	1.8
MP270 -20	14.6	0.4
MP268 -20	13.9	1.4
MP266 -20	13.5	0.7
MP264 -20	13.8	2.0
MP270 -20/26	18.4	0.9
MP268 -20/26	12.7	1.2
MP266 -20/26	13.3	1.7
MP263 -20/26	NS ²	NS ²
MP261 -20/26	13.1	1.5
MP259 -20/26	13.0	1.1
MP256 -20/26	9.4	0.9
MFC (EBR II)	13.3	2.1
EBR I	12.1	1.2
RWMC	15.9	1.2
CFA	15.1	1.0
CITRC (PBF)	19.0, 17.4	1.5
INTEC	18.1	1.3
ATR (TRA)	12.5	1.5
NRF	14.3	1.0
TAN/SMC	11.7	1.5
MP39-33	11.3	1.4
MP37-33	12.1	2.6
MP35-33	12.2	1.2
MP33-33	11.9, 13.2	-
MP31-33	11.4	2.4
MP29-33	13.3	2.4
MP27-33	15.4	1.0
MP25-33	11.8	0.5
MP23-33	12.9, 13.2	-
Base of Howe	12.6	0.3
Rover	13.6	1.7
T4 North	15.8	0.5
T4 South	10.6, 11.1	-
Boundary Locations		
Atomic City	11.7	0.8
Mud Lake/ Terreton	14.9, 11.3	-
Montevue	13.6	2.2
Howe Met. Tower	11.9	2.2
MP282 -20	13.2	1.5

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

Sample Location	Net Corrected Exposure Rate ($\mu\text{R/hr}$) ¹	1 SD ($\mu\text{R/hr}$)
MP280 -20	14.5	1.3
MP278 -20	14.9	1.8
Mud Lake Bank of Commerce	15.9	1.1
MP43-33	14.0	1.4
MP41-33	14.0	2.4
MP21-33	10.4	0.4
MP19-33	12.5	1.6
MP14-33	11.5	1.0
MP11-33	12.1	2.6
MP06-33	11.3, 8.2	-
MP03-33	14.9	1.0
Distant Locations		
Arco	12.9	0.5
Craters of the Moon	15.8	0.9
Taber	12.3	1.4
Blackfoot	11.3	0.3
Fort Hall	14.5	2.6
Idaho Falls	11.4	0.6
Hamer	16.7	2.1
Sugar City	16.2	0.3
Roberts	14.6	1.8
Big Southern Butte	12.0	1.0

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.

²NS = No sample. EICs and mile post were missing from this location at quarterly change-out.

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		15		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	--				
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,

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.

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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 (^{239}Pu) and beta-emitter (^{90}Sr) 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 EPA 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 $\mu\text{g/L}$ (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 1.0×10^4 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 $\mu\text{R/yr}$ 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