Department of Environmental Quality
INL Oversight Program

ENVIRONMENTAL SURVEILLANCE PROGRAM QUARTERLY DATA REPORT

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aCi/L	-	attocuries per liter
BEA	-	Battelle Energy Alliance, LLC
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act
CFA	-	Central Facilities Area
CWI	-	CH2M-WG Idaho, LLC
DEQ-INL OP	-	The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program
DOE	-	U.S. Department of Energy
EIC	-	electret ionization chamber
EML	-	Environmental Monitoring Laboratory
EPA	-	Environmental Protection Agency
ESER	-	Environmental Surveillance Education and Research Program (SM Stoller)
ESP	-	Environmental Surveillance Program
ESRPA	-	Eastern Snake River Plain Aquifer
HPIC	-	high-pressure ion chamber
LLD	-	lower limit of detection
IBL	-	Idaho Bureau of Laboratories
INL	-	Idaho National Laboratory
INTEC	-	Idaho Nuclear Technology and Engineering Center
LSC	-	liquid scintillation counting
MFC	-	Materials and Fuels Complex
µg/L	-	micrograms per liter
mg/L	-	milligrams per liter
mrem	-	millirem or 1/1000th of a rem
mR/hr	-	milliRoentgen per hour
µR/hr	-	microRoentgen per hour
MCL	-	maximum contaminant level
MDA	-	minimum detectable activity
MDC	-	minimum detectable concentration
NIST	-	National Institute of Standards and Technology
nCi/L	-	nanocuries per liter
NOAA	-	National Oceanic and Atmospheric Administration
NRF	-	Naval Reactors Facility
pCi/g	-	picocuries per gram
pCi/L	-	picocuries per liter
pCi/m^3	-	picocuries per cubic meter
PCE	-	perchloroethene
QAPP	-	Quality Assurance Program Plan
QA/QC	-	Quality Assurance/Quality Control
RCRA	-	Resource Conservation and Recovery Act
RPD	-	relative percent difference
RWMC	-	Radioactive Waste Management Complex
RTC	-	Reactor Technology Complex
SD	-	standard deviation
SMCL	-	secondary maximum contaminant level
TAN	-	Test Area North
TCE	-	trichloroethene
TDS	-	total dissolved solids
TMI	-	Three Mile Island
TSP	-	total suspended particulate
TSS	-	total suspended solids
USGS	-	U.S. Geological Survey
VOC	-	volatile organic compound
WLAP	-	Wastewater Land Application Permit

Introduction

The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program's (DEQ-INL OP) Environmental Surveillance Program (ESP) is conducted at locations on the INL, on 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 data and programs. This program is also used to provide the citizens of Idaho with information that has been independently evaluated to enable them to reach informed conclusions about DOE activities in Idaho and potential impacts to public health and the environment.

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

Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the first quarter, 2009 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter, gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. The Fort Hall station uses identical instrumentation and sampling protocol as the ten stations operated by the ESP. The DEQ-INL OP reports the Fort Hall station data as an additional distant site.

Airborne particulate matter was sampled using high-volume total suspended particulate (TSP) air samplers. Weekly gross alpha and gross beta particulate radioactivity results for filters from the TSP samplers are presented in **Appendix A** and summarized as a range of results in **Table 2**.

Composites of filters collected using TSP samplers during the course of a calendar quarter are analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma spectroscopy results for the first quarter of 2009 for TSP filters are presented in **Table 3**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

Annual composites of filters collected using TSP samplers are also analyzed using radiochemical separation techniques. The samples are analyzed for Strontium-90, Plutonium-238, Plutonium-239/240, and Americium-241 (**Table 6**). Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons. DEQ-INL's action levels of 190 for Americium-241, 1900 for Strontium-90, 210 for Plutonium-238, and 200 for Plutonium-239/240 (in 1×10^{-6} pCi/m^3) 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 amounts require further investigation. All analyses of field samples exceeded the MDC for ^{90}Sr for 2008. One sample exceeded the MDC for ^{238}Pu and one for $^{239/240}Pu$; these two samples were reanalyzed by the vendor and deemed statistically valid. Though minimally exceeding the MDC, the results are well under the specified regulatory limits and DEQ-INL OP's action levels. Results from the annual composite analysis are typically presented in the following year's first quarter report.

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 within its sponge-like pores. Each week, canisters are collected from all eleven air monitoring stations and analyzed together as a composite. If Iodine-131 is detected in this grouping, the canisters are individually analyzed. No radioactive isotopes of iodine, specifically Iodine-131, were detected on the weekly charcoal cartridges used to collect this nuclide during the first quarter.

Atmospheric moisture was collected by drawing air through hygroscopic media at each of the 11 monitoring stations. This moisture was stripped from the hygroscopic media and analyzed to calculate the atmospheric tritium 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. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the first quarter of 2009. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were generally below minimum detectable concentration in precipitation collected during the first quarter of 2009. Tritium and Cesium-137 analysis results are presented in **Table 5**. 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. One location, Monteview had a tritium result above the analytical MDC but well within regulatory limits.

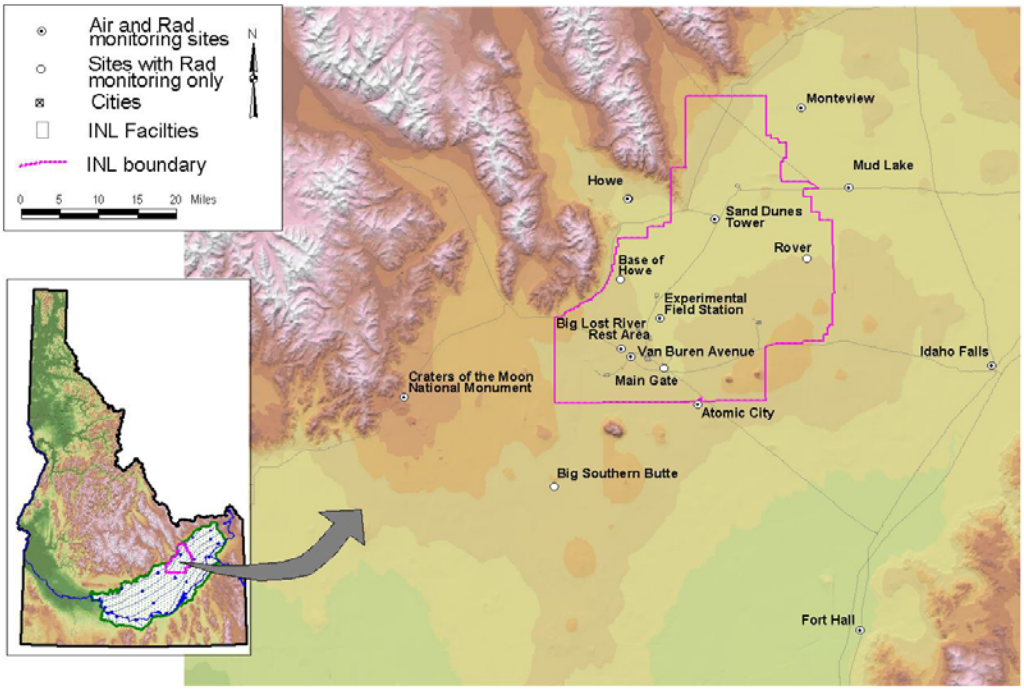

Figure 1. Air and radiation monitoring sites.

Table 1. Sampling locations and sample type.

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

[1] □ Samples collected weekly; ■ Samples collected quarterly.
[2] TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

Table 2. Range of gross alpha and gross beta concentrations for TSP filters, first quarter, 2009. Concentrations are reported in 1x 10^{-3} pCi/m^3.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.0	-	2.6	20.0	-	115.9
Experimental Field Station	0.0	-	1.3	17.4	-	71.9
Sand Dunes Tower	0.0	-	1.3	16.2	-	72.5
Van Buren Avenue	0.0	-	1.6	17.2	-	67.5
Boundary Locations						
Atomic City	0.2	-	2.3	16.6	-	85.8
Howe	0.0	-	1.3	13.9	-	69.3
Monteview	0.0	-	0.7	7.2	-	32.5
Mud Lake	0.0	-	1.8	16.7	-	63.6
Distant Locations						
Craters of the Moon	0.0	-	1.1	14.0	-	56.2
Fort Hall[1]	0.0	-	1.6	12.6	-	51.0
Idaho Falls	0.0	-	2.5	18.7	-	106.0

[1]Operated by Shoshone-Bannock Tribes.

Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, first quarter, 2009. Concentrations are reported in 1 x 10^{-3} pCi/m^3 with associated uncertainty (± 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	104.9	5.5	<MDC[2]
Experimental Field Station	71.5	3.8	<MDC
Sand Dunes Tower	70.2	3.7	<MDC
Van Buren Avenue	75.8	4.0	<MDC
Boundary Locations			
Atomic City	80.1	4.3	<MDC
Howe	76.8	4.2	<MDC
Monteview	36.5	2.2	<MDC
Mud Lake	69.3	3.7	<MDC
Distant Locations			
Craters of the Moon	70.4	3.7	<MDC
Fort Hall[1]	61.9	3.4	<MDC
Idaho Falls	101.3	5.3	<MDC

[1]Operated by Shoshone-Bannock Tribes.
[2]MDC for Cs-137 typically (5-10)x10^{-5} pCi/m^3.

Table 4. Tritium concentrations in air from atmospheric moisture, first quarter, 2009. Concentrations are reported in pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.08	0.20	0.34
Experimental Field Station	0.09	0.21	0.35
Sand Dunes Tower	0.06	0.19	0.32
Van Buren Avenue	0.10	0.22	0.29
Boundary Locations			
Atomic City	0.08	0.19	0.32
Howe	0.03	0.17	0.29
Mud Lake[2]	0.04	0.06	0.10
Monteview	0.04	0.21	0.36
Distant Locations			
Craters of the Moon	0.02	0.19	0.32
Fort Hall[1]	0.06	0.26	0.43
Idaho Falls	0.03	0.23	0.39

[1]Operated by Shoshone-Bannock Tribes.
[2]Only one sample collected due to sampler failure.

Table 5. Tritium and Cesium-137 concentrations from precipitation, first quarter, 2009. Concentrations are reported in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	40	80	140	0.0	1.4	2.5
Boundary Locations						
Atomic City	40	80	140	0.0	2.2	3.8
Howe	80	90	140	0.0	1.4	2.5
Monteview	190	100	160	0.9	1.5	2.4
Mud Lake	40	80	140	0.0	1.4	2.5
Distant Locations						
Idaho Falls	10	80	140	0.8	1.6	2.7

Table 6. Annual radiochemical separation analysis data for TSP particulate filters collected during 2008. Concentrations[1] are reported in 1 x 10^{-6} pCi/m^3 with associated uncertainty (± 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar year.

Station Location	Sr^{90}			Pu^{238}			$Pu^{239/240}$			Am^{241}		
	Value	± 2SD	MDC	Value	±2SD	MDC	Value	± 2SD	MDC	Value	±2SD	MDC
On-site Locations												
Rest Area	45.2	13.8	13.9	1.8	1.7	1.7	0.1	1.1	2.6	1.0	1.2	1.6
EFS[3]	22.3	10.4	13.3	0.2	0.8	1.6	0.0	0.6	1.6	0.0	0.8	2.1
Sand Dunes	50.9	14.2	13.1	0.0	0.8	1.9	0.3	0.8	1.4	0.3	1.0	1.9
Van Buren	39.7	13.3	14.8	0.2	0.6	1.4	0.6	0.7	0.5	1.0	1.7	2.5
Boundary Locations												
Atomic City	36.4	12.8	15.0	0.5	1.2	2.0	0.3	0.5	0.7	0.0	0.9	2.4
Howe	21.5	11.5	16.0	0.0	0.6	2.1	0.2	0.5	1.2	0.0	0.8	1.7
Monteview	47.4	13.9	14.2	0.6	1.3	2.2	0.4	0.8	1.2	0.6	1.3	2.2
Mudlake	37.0	15.9	20.3	0.0	1.6	3.5	0.0	1.1	1.3	0.0	1.3	2.7
Distant Locations												
Craters of Moon	30.3	10.5	11.8	0.6	1.7	2.9	0.0	0.3	1.6	0.4	1.6	2.9
Fort Hall[2]	42.6	13.2	13.8	0.0	0.8	2.2	0.3	0.6	0.8	0.0	1.2	2.5
Idaho Falls	40.7	14.2	16.4	0.0	0.7	1.9	0.5	0.7	0.6	1.0	1.3	1.8

[1] Measurable quantities of these radionuclides are expected in the environment due to historic above-ground testing of nuclear weapons. DEQ-INL OP's action levels of 190 for americium-241, 1900 for strontium-90, 210 for plutonium-238, and 200 for plutonium-239/240 (in 1 x 10^{-6} pCi/m^3) 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] Experimental Field Station.

Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the first quarter of 2009 (**Figure 1**). To detect gamma radiation, each station is instrumented with an electret ionization chamber (EIC), and 10 of the stations also have high-pressure ion chambers (HPIC) (**Table 7**). The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall equipped with an EIC and HPIC both of which belong to the DEQ-INL OP. The DEQ-INL OP reports these results.

HPICs 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 HPICs at each location are radioed to DEQ-INL OP and presented graphically via the worldwide web at http://www.deq.idaho.gov/inl_oversight/monitoring/piconline.cfm

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 an additional 41 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 8** lists the average radiation exposure rates measured by the HPICs for first quarter 2009. **Table 9** lists the EIC monitoring results for first quarter 2009. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation.

Table 7. Summary of instrumentation at radiation monitoring stations.

Station Location	Instrument Type	
	HPIC	EIC
On-site Locations		
Base of Howe	■	■
Big Lost River Rest Area[1]		■
Experimental Field Station		■
Main Gate	■	■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
Boundary Locations		
Atomic City	■	■
Big Southern Butte	■	■
Howe	■	■
Monteview	■	■
Mud Lake	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall[2]	■	■
Idaho Falls	■	■

[1] HPIC Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed.
[2] HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

Table 8. Average gamma exposure rates for first quarter, 2009, from HPIC network.

	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	12.7	3.4
Big Lost River Rest Area[1]	NA	NA
Main Gate	12.8	1.5
Rover	12.9	1.5
Sand Dunes Tower	13.1	1.5
Boundary Locations		
Atomic City	10.7	2.2
Big Southern Butte	10.4	1.7
Howe	13.4	4.0
Monteview	11.5	1.5
Mud Lake	11.8	1.3
Distant Locations		
Fort Hall[2]	14.0	1.8
Idaho Falls	10.5	1.5

[1] Sampling at Big Lost River Rest Area was suspended due to construction and has not been re-deployed.
[2] Operated by Shoshone-Bannock Tribes.

Table 9. Electret ionization chamber (EIC) cumulative average exposure rates for first quarter, 2009.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe[1]	8.7	2.6
Big Lost River Rest Area	10.3	0.8
Experimental Field Station	12.5	3.5
Main Gate	14.0	2.4
Rover[1]	13.6	3.9
Sand Dunes Tower	11.3	4.8
Van Buren Avenue	11.8	2.4
Boundary Locations		
Atomic City	11.1	1.9
Big Southern Butte[1]	12.7	0.7
Howe	9.6	3.9
Monteview	10.6	1.4
Mud Lake	11.4	1.9
Distant Locations		
Craters of the Moon	9.4	1.5
Fort Hall[2]	12.1	4.2
Idaho Falls	9.9	2.1

[1] Left out for two quarters due to impassable roads. Reported value is the average of 4th quarter 2008 and 1st quarter 2009.
[2] Station operated by Shoshone-Bannock Tribes.

Water Monitoring

Water monitoring sites are sampled for the purposes of examining trends of INL contaminants and other general ground water quality indicators and for verifying DOE monitoring results. Sites sampled include ground water locations (wells and springs), surface water locations (streams), and selected wastewater sites. Sample sites have been selected to aid in identifying INL impacts on the Eastern Snake River Plain Aquifer (ESRPA), and are categorized as up-gradient, facility, boundary, distant, surface water, and waste water, (**Figure 2 and Figure 3**). Up-gradient locations are not impacted by INL operations and are considered representative of background ground water quality conditions. Facility sites are sample locations on the INL near facilities, in areas of known contamination, or wells selected to illustrate trends for specific INL contaminants or indicators of ground water quality. Boundary locations are on or near the perimeter of the INL and are down-gradient of potential sources of INL contamination. Distant locations are monitored to provide trends in water quality down-gradient of the INL and include wells and springs used for irrigation, public water supply, livestock, domestic, and industrial purposes. During the first quarter of 2009 no locations were sampled. However results are reported in the section for backlogged enriched tritium analyses.

Selected water samples with tritium concentrations not measurable using the standard method (typically a MDC of 130 pCi/L) were analyzed using an electrolytic enrichment method with a much lower MDC of 10 to 14 pCi/L (**Table 10**). All sample results were within the expected range of concentrations due to natural sources and levels remaining after the atomic bomb testing era.

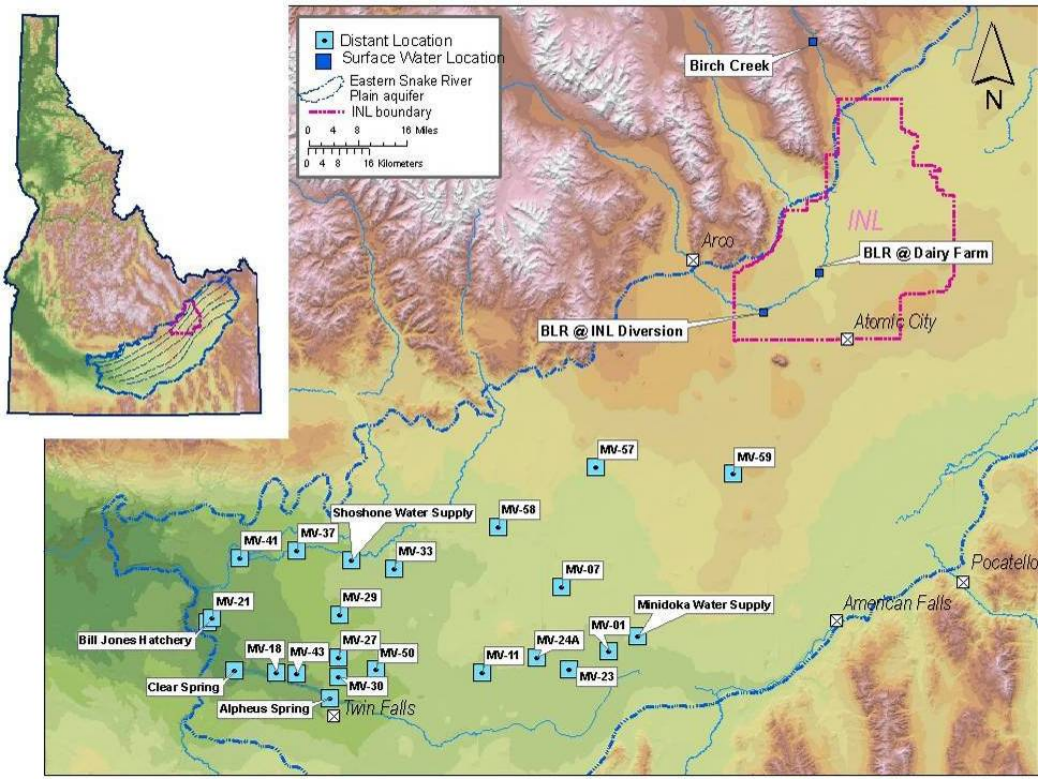

Figure 2. Distant sampling locations for first quarter, 2009.

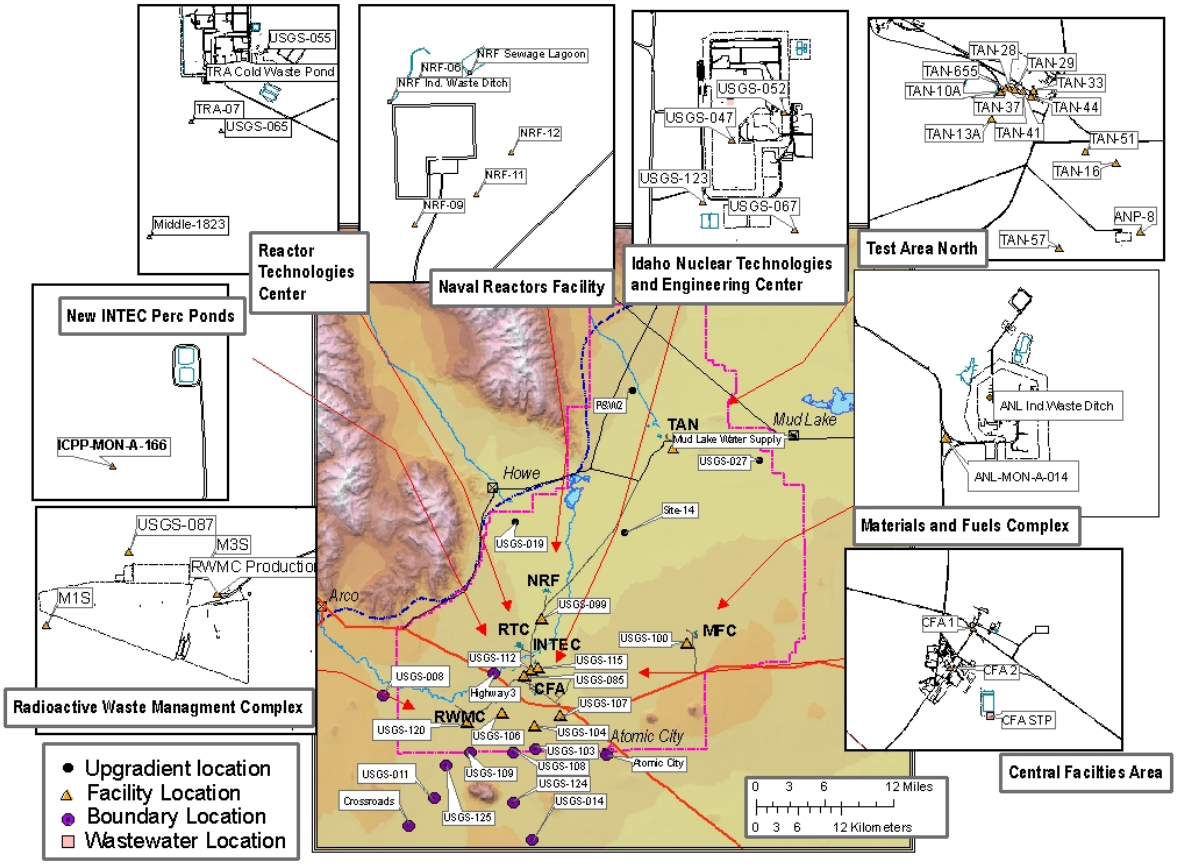

Figure 3. Up-gradient, facility, boundary and wastewater monitoring locations.

Table 10. Tritium concentrations for water samples, first quarter, 2009.

Sample Location	Sample Date	Tritium		
		Concentration[1,2]		± 2 SD
Mud Lake Water supply	11/19/2008	0	U	7
MV-43	6/18/2008	30		7
Mud Lake Water supply	8/19/2008	1	U	6
Birch Creek	10/22/2008	9	U	8
Site-14	10/23/2008	9	U	6
USGS-014	10/21/2008	6	U	7
USGS-120	10/9/2008	112		11
USGS-125	10/21/2008	53		9
Alpheus Spring	11/18/2008	18		8
Atomic City	11/19/2008	4	U	6
Bill Jones Hatchery	11/18/2008	7	U	7
Clear Spring	11/18/2008	1	U	7
Minidoka Water Supply	11/18/2008	8	U	7
Shoshone Water Supply	11/18/2008	22		7

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected
[2] Concentrations expressed in pCi/L.

Terrestrial Monitoring Results

The ESP conducts terrestrial (soil and milk) monitoring and verification to provide an indication as to the long-term deposition and migration of contaminants in the environment, and to provide independent verification of DOE's analytical measurement of terrestrial variables.

DEQ-INL monitors long-term radiological conditions via soil sampling as well as field instrumentation capable of identifying and measuring quantities of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides some insight to transport, deposition, and accumulation of radioactive material in the environment as a result of INL operations as well as historical above ground testing of nuclear weapons. No in-situ gamma spectroscopic measurements were performed, nor were any soil samples physically collected during the first calendar quarter of 2009.

DEQ-INL monitors milk for naturally occurring potassium-40 and man-made iodine-131. DEQ-INL collects milk samples on a monthly basis. Ft. Hall is a small operation that needed to suspend sampling at the end of January and will resume in the 4th quarter of 2009. Results for analyses of milk samples are presented in **Table 11**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131 was not detected.

Table 11. Gamma spectroscopy analysis data for milk samples, first quarter, 2009.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40		Man-made gamma-emitting radionuclide Iodine-131[1]
		Concentration[3]	± 2 SD	
Monitoring Samples				
Howe/Nelson-Ricks Creamery	01/09/2009	1432	112	<MDC
	02/03/2009	1438	99	<MDC
	03/03/2009	1370	109	<MDC
Mud Lake/Nelson-Ricks Creamery	01/09/2009	1457	109	<MDC
	02/03/2009	1425	111	<MDC
	02/28/2009	1497	102	<MDC
Gooding/Glanbia	01/06/2009	1469	101	<MDC
	02/03/2009	1407	106	<MDC
	03/03/2009	1352	104	<MDC
Fort Hall	01/12/2009	1224	97	<MDC
Riverside	03/11/2009	1509	114	<MDC
Verification Samples[2]				
Dietrich	01/06/2009	1470	113	<MDC
Idaho Falls	01/06/2009	1527	104	<MDC
Moreland	02/03/2009	1507	103	<MDC
Terreton	02/03/2009	1512	115	<MDC
Rupert	03/03/2009	1412	107	<MDC
Idaho Falls	03/03/2009	1505	103	<MDC

[1] <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).
[2] DEQ-INL samples collected by the off-site INL environmental surveillance contractor.
[3] Concentrations are expressed in pCi/L.

Quality Assurance

The measurement of any physical quantity is subject to inaccuracy from errors that may be introduced during sample collection, measurement, calibration, and the reading and reporting of results. While all of these inaccuracies cannot be quantified with certainty for each analytical result, a quality assurance program can evaluate the overall quality of a data set and possibly identify and address errors or inaccuracies.

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the first quarter of 2009 for the DEQ-INL OP's ESP. It also summarizes the quality control (QC) samples (spikes, blanks, and duplicates) submitted to the Idaho Bureau of Laboratories-Boise (IBL) for non-radiological analyses and to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses during the quarter. All analyses and QC measures at the analytical laboratories used by the ESP are performed in accordance with approved written procedures maintained by each respective analytical laboratory. Sample collection is performed in accordance with written procedures maintained by the DEQ-INL OP.

Analytical results for blanks, duplicates, and spikes are used to assess the precision, accuracy, and representativeness of results from analyzing laboratories. During the first quarter of 2009, the DEQ-INL OP submitted 41 QC samples for various radiological and non-radiological analyses (**Table 12**).

Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or immeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a "zero" result when no contaminant is expected to be present or an acceptable measure of "background," and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the first quarter of 2009 are presented in **Table 13**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 14**. Blank analysis results for radiochemical separation analyses for TSP particulate filters collected during 2008 are presented in **Table 15**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 16**. Blank analyses results for enriched tritium in ground and surface water are presented in **Table 17**.

No anomalies were observed from the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL OP for the first quarter of 2009.

Duplicate Samples

Duplicate samples are collected in a manner such that the samples are thought to be essentially identical in composition and are used to assess analytical precision. The difference between the original sample and the duplicate sample is expressed as a relative percent difference (RPD):

$RPD = (R_1-R_2)/((R_1+R_2)/2)*100$
R_1 = first sample result
R_2 = second sample result

and is used to measure a laboratory's ability to reproduce consistent results. A relative percent difference is acceptable at ± 20 percent. For radiological analyses, the standard deviation of the differences can be

used as an indicator of the overall precision of the data set. Duplicate results for ground and surface water are presented in **Table 18,** for enriched tritium analyses.

No anomalies were observed from the assessment of field duplicate samples as measured by the analytical laboratories used by DEQ-INL OP for the first quarter of 2009.

Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added in order to assess the bias a laboratory may have in accurately measuring these analytes. To determine agreement after laboratory analysis, DEQ-INL OP calculates the ratio of the spike concentration determined from the laboratory measurement to the known spike concentration in the sample. This result is known as percent recovery (%R) and the acceptable range used by DEQ-INL OP is 100 ± 25 percent. Additionally, all results were qualified as "estimates (J)" if the associated quality control spike sample had a recovery of 50-74% or 126-150%, provided that each result was greater than the instrument detection limit (IDL). All results were qualified as "rejected (R)" if the associated quality control spike sample had a recovery of <50% or >150%, provided each result was also greater than the IDL.

During first quarter 2009, no field matrices were spiked to assess the influence of the sample media on laboratory performance. Neither was any spiked samples created using de-ionized water.

DEQ-INL OP also prepares additional "spike-like" quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL OP irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and two additional 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 agrees within 25 percent of the known irradiated quantity. The irradiation results for first quarter 2009 are presented in **Table 19**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets.

One EIC response was outside the acceptable range and was rejected. The other two EIC spikes irradiated in the same batch were in good agreement (within 10%) of the known value. It was concluded that the failed spike is probably the result of user mishandling of the electret media. Therefore the test data were not qualified as a result of this single rejected result.

Analytical QA/QC Assessment

Other than the previously mentioned spike failure, no issues involving sample chain of custody, sample holding times, and the analysis of blank, duplicate, and spiked samples were observed during the first quarter of 2009, which significantly affected data quality. Methodologies and data reports issued by the contracting laboratories generally conformed to the requirements of DEQ-INL OP during the first quarter of 2009.

Data usability is the measure of data that is not rejected compared to the amount that was expected to be obtained. The overall data usability rate for the first quarter of 2009 met the minimum criteria of the DEQ-INL OP ESP and is summarized in **Table 12**.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. The TSP blower motor failed and was replaced at Howe resulting in an invalid sample. The TSP sampler failed and was replaced at Rest Area resulting in two weeks of invalid samples. The TSP sampler at Idaho Falls was running

below desired volume for one week's sample and was recalibrated. The TSP sampler at Monteview was not restarted after the filter change resulting in a non-sample "NS" for one week. Service reliability for air sampling equipment for the first quarter of 2009 is summarized in **Table 20**.

Conclusion

All data collected for the first quarter of 2009, have been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data has been verified and deemed complete meeting the requirements and data quality objectives established by DEQ-INL OP.

Table 12. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP for first quarter, 2009.

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected[1]	Analyzing Lab[2]
AIR								
Particulate	4 inch filter	Gross alpha	138	13	0	0	0	ISU-EML
		Gross beta	138	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	44	1	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	30	2	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	6	0	0	0	0	ISU-EML
		Gamma emitters	6	0	0	0	0	ISU-EML
WATER								
Groundwater & Surface Water	Grab or composite	Gross alpha	0	0	0	0	0	ISU-EML
		Gross beta	0	0	0	0	0	ISU-EML
		Gamma emitters	0	0	0	0	0	ISU-EML
		Tritium	0	0	0	0	0	ISU-EML
		Enriched tritium	14	1	1	0	0	ISU-EML
		Technetium-99	0	0	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
		Metals	0	0	0	0	0	IBL
		Common Ions	0	0	0	0	0	IBL
		Nutrients	0	0	0	0	0	IBL
		Volatile Organics	0	0	0	0	0	IBL
TERRESTRIAL								
Milk	Grab or composite	Gamma emitters	17	0	0	0	0	ISU-EML
Soil	*in situ*	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	56	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	11	NA	NA	NA	NA	DEQ-INL OP
Total Test Analyses			**484**	31	1	9	0	
Total of QC Analyses (blanks, duplicates, and spikes)			**41**					
Percentage of QC analyses of total Test analyses[3]			**8.5**					
Percentage of usable data[4]			**100%**					

[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] Analyzing quality control samples at a rate of approximately 5 to 10 percent of the total number of test analyses performed for the year is deemed appropriate for the DEQ-INL OP ESP.
[4] Data usability rate [total analyses – rejected data]/[total analyses] of 90 percent or higher is acceptable for the DEQ-INL OP ESP.

Table 13. Blank analysis results for gross alpha and beta in particulate air (TSP) for the first quarter, 2009.

Collection Period		Corrected volume (m^3) [1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
12/31/08	1/08/09	1616	-0.1	0.2	0.3	0.3
1/08/09	1/15/09	1616	-0.5	0.3	-0.6	0.4
1/15/09	1/22/09	1616	-0.5	0.2	-0.1	0.3
1/22/09	1/29/09	1616	-0.2	0.2	-0.2	0.4
1/29/09	2/05/09	1616	0.0	0.2	-0.2	0.3
2/05/09	2/12/09	1616	-0.1	0.2	-0.1	0.3
2/12/09	2/19/09	1616	-0.2	0.2	0.1	0.3
2/19/09	2/26/09	1616	0.1	0.2	0.1	0.3
2/26/09	3/05/09	1616	0.1	0.2	-0.1	0.3
3/05/09	3/12/09	1616	-0.1	0.1	0.0	0.3
3/12/09	3/19/09	1616	0.0	0.1	-0.3	0.3
3/19/09	3/26/09	1616	-0.1	0.2	0.1	0.3
3/26/09	4/02/09	1616	-0.1	0.2	-0.2	0.3

Note: Concentrations and associated uncertainties (±2 SD) are expressed in 1 x 10^{-3} pCi/m^3.
[1] A volume equal to the average of the 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 14. Blank analysis results for gamma spectroscopy for TSP particulate air filters for the first quarter, 2009.

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
4/16/09	23	31	51	-7	25	45	-5	8	15

Analysis Date	Cesium-134			Cesium-137		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC
4/16/09	1	4	7	1	3	5

Note: Concentrations are expressed in 1 x 10^{-5} pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).
[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 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 actually passed through the blank filters.

Table 15. Blank analysis results for 2008 TSP annual radiochemical composites of air filters.

Location	^{90}Sr			^{238}Pu			$^{239}Pu/^{240}Pu$			^{241}Am		
	Value[1]	±2SD	MDC	Value[1]	±2SD	MDC	Value[1]	±2SD	MDC	Value[1]	±2SD	MDC
Blank	0.33	0.82	1.43	0.04	0.11	0.19	0.00	0.10	0.06	-0.01	0.08	0.18

[1] Values and uncertainties (±2SD) are expressed in 10^{-5} pCi/m^3. The ±2SD uncertainty values are total propagated uncertainty (TPU), which includes counting and other analytical uncertainties.

Table 16. Blank analysis results for tritium in water vapor from air samples for the first quarter, 2009.

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP091ZTR01	2/23/09	2/25/09	4/17/09	-0.09	0.10	0.17
OP091ZTR02	4/08/09	4/10/09	5/06/09	-0.04	0.09	0.15

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

Table 17. Radiological blank analysis in ground and surface water for samples for first quarter, 2009.

Sample Number	Sample Date	Concentration	± 2 SD	MDC	Within Blank Criteria?
Enriched Tritium					
081W476	10/22/2009	28	7	11	Yes

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

Table 18. Duplicate radiological analysis results in pCi/L for ground and surface water, first quarter, 2009.

Analysis/ Sample Location	Original Sample Number	Concentration	±2 SD	Duplicate Sample Number	Concentration	±2 SD	$/R_1-R_2/$	$3(s_1^2+s_2^2)^{1/2}$	Within Criteria?[1]
Enriched Tritium									
USGS-014	081W509	6	7	081W611	10	6	4	14	yes

[1] $/R_1-R_2/ \leq 3(s_1^2+s_2^2)^{1/2}$

Table 19. Electret ionization chamber irradiation results (categorized as spiked samples) for first quarter, 2009.

Electret #	Exposure Received		Net Measured Exposure[1]		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	40	2.0	39.0	1.4	97.5
Spike 1	40	2.0	37.8	1.4	94.5
Spike 1	40	2.0	41.5	1.3	103.7
Spike 2	30	1.5	56.9	1.4	189.8
Spike 2	30	1.5	32.1	1.3	106.9
Spike 2	30	1.5	31.0	1.4	103.2
Spike 3	25	1.3	26.3	1.4	105.0
Spike 3	25	1.3	23.4	1.4	93.7
Spike 3	25	1.3	25.3	1.4	101.3

Note: A percent recovery (%R) of 100 ± 25 is considered acceptable.
[1] Net measured exposure estimate includes a correction for atmospheric pressure.

Table 20. Air sampling field equipment service reliability (percent operational) for first quarter, 2009.

Station Locations	Sample Type			
	TSP	Radioiodine	Atmospheric Moisture	Precipitation
Onsite Locations				
Big Lost River Rest Area	85 %	100 %	100 %	100 %
Experimental Field Station	100 %	100 %	100 %	NC[1]
Sand Dunes Tower	100 %	100 %	100 %	NC[1]
Van Buren Avenue	100 %	100 %	100 %	NC[1]
Boundary Locations				
Atomic City	100 %	100 %	100 %	100 %
Howe	92 %	100 %	100 %	100 %
Monteview	92 %	100 %	100 %	100 %
Mud Lake	100 %	100 %	100 %	100 %
Distant Locations				
Craters of the Moon	100 %	100 %	100 %	NC[1]
Idaho Falls	92 %	100 %	100 %	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

Appendix A

Table A-1. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2009.

Sample location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Rest Area	12/31/08	01/08/09	0.8	0.3	43.1	1.4
	01/08/09	01/15/09	0.1	0.3	29.0	1.3
	01/15/09	01/22/09	0.0	0.3	45.4	1.6
	01/22/09	01/29/09	2.6	0.5	115.9	2.6
	01/29/09	02/05/09	1.3	0.3	81.6	2.1
	02/05/09	02/12/09	0.8	0.3	51.6	1.8
	02/12/09	02/19/09	0.5	0.3	45.5	1.6
	02/19/09	02/26/09	NS[1]	NS[1]	NS[1]	NS[1]
	02/26/09	03/05/09	NS[1]	NS[1]	NS[1]	NS[1]
	03/05/09	03/12/09	0.5	0.2	21.9	1.1
	03/12/09	03/19/09	0.9	0.2	31.7	1.2
	03/19/09	03/26/09	0.6	0.2	20.0	1.0
	03/26/09	04/02/09	0.5	0.3	20.4	1.0
Experimental Field Station	12/31/08	01/08/09	0.3	0.2	25.5	1.0
	01/08/09	01/15/09	0.0	0.3	19.1	1.0
	01/15/09	01/22/09	0.5	0.3	71.9	1.9
	01/22/09	01/29/09	1.3	0.3	35.6	1.3
	01/29/09	02/05/09	1.0	0.3	61.1	1.7
	02/05/09	02/12/09	0.2	0.2	30.5	1.2
	02/12/09	02/19/09	0.4	0.2	33.2	1.3
	02/19/09	02/26/09	1.0	0.3	46.0	1.5
	02/26/09	03/05/09	0.5	0.2	23.9	1.1
	03/05/09	03/12/09	0.4	0.2	18.2	1.0
	03/12/09	03/19/09	1.0	0.3	29.4	1.2
	03/19/09	03/26/09	0.4	0.2	17.4	1.0
	03/26/09	04/02/09	0.5	0.3	18.0	1.0

[1] Sampler not operating.

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2009.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Sand Dunes	12/31/08	01/08/09	0.6	0.2	38.2	1.3
	01/08/09	01/15/09	0.1	0.3	23.0	1.1
	01/15/09	01/22/09	0.0	0.2	46.4	1.5
	01/22/09	01/29/09	1.3	0.3	72.5	1.9
	01/29/09	02/05/09	1.0	0.3	71.9	1.9
	02/05/09	02/12/09	0.5	0.3	43.4	1.5
	02/12/09	02/19/09	0.4	0.2	36.8	1.4
	02/19/09	02/26/09	0.8	0.2	48.3	1.6
	02/26/09	03/05/09	0.4	0.2	24.7	1.1
	03/05/09	03/12/09	0.3	0.2	17.3	1.0
	03/12/09	03/19/09	0.9	0.3	28.5	1.2
	03/19/09	03/26/09	0.5	0.2	17.7	1.0
	03/26/09	04/02/09	0.4	0.3	16.2	1.0
Van Buren	12/31/08	01/08/09	0.6	0.2	28.6	1.1
	01/08/09	01/15/09	0.0	0.3	19.1	1.0
	01/15/09	01/22/09	1.6	0.5	57.1	2.1
	01/22/09	01/29/09	1.3	0.4	67.5	1.9
	01/29/09	02/05/09	1.2	0.3	43.8	1.5
	02/05/09	02/12/09	0.7	0.3	29.9	1.2
	02/12/09	02/19/09	0.7	0.3	30.6	1.2
	02/19/09	02/26/09	0.9	0.2	36.2	1.3
	02/26/09	03/05/09	0.6	0.2	22.7	1.1
	03/05/09	03/12/09	0.8	0.2	19.4	1.0
	03/12/09	03/19/09	1.2	0.3	32.4	1.3
	03/19/09	03/26/09	0.9	0.3	20.2	1.0
	03/26/09	04/02/09	0.6	0.3	17.2	1.0
Atomic City	12/31/08	01/08/09	0.5	0.2	28.8	1.1
	01/08/09	01/15/09	0.0	0.3	19.5	1.0
	01/15/09	01/22/09	0.6	0.3	67.7	1.8
	01/22/09	01/29/09	2.3	0.4	85.8	2.0
	01/29/09	02/05/09	1.2	0.3	65.2	1.8
	02/05/09	02/12/09	0.4	0.2	33.9	1.3
	02/12/09	02/19/09	0.5	0.3	35.3	1.3
	02/19/09	02/26/09	1.0	0.3	39.9	1.4
	02/26/09	03/05/09	0.3	0.2	22.5	1.1
	03/05/09	03/12/09	0.4	0.2	21.4	1.1
	03/12/09	03/19/09	0.9	0.3	33.9	1.3
	03/19/09	03/26/09	0.9	0.3	21.8	1.1
	03/26/09	04/02/09	0.2	0.3	16.6	1.0

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2009.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Howe	12/31/08	01/08/09	1.0	0.4	23.1	1.3
	01/08/09	01/15/09	NS[1]	NS[1]	NS[1]	NS[1]
	01/15/09	01/22/09	0.0	0.3	37.8	1.5
	01/22/09	01/29/09	1.2	0.3	69.3	1.8
	01/29/09	02/05/09	0.9	0.3	46.6	1.5
	02/05/09	02/12/09	0.6	0.2	36.0	1.3
	02/12/09	02/19/09	0.1	0.2	31.9	1.2
	02/19/09	02/26/09	0.7	0.2	41.2	1.4
	02/26/09	03/05/09	0.7	0.2	23.8	1.1
	03/05/09	03/12/09	0.6	0.2	16.1	0.9
	03/12/09	03/19/09	1.3	0.4	37.7	1.9
	03/19/09	03/26/09	0.6	0.2	15.3	0.9
	03/26/09	04/02/09	0.5	0.3	13.9	0.8
Monteview						
	12/31/08	01/08/09	0.1	0.2	12.7	0.7
	01/08/09	01/15/09	0.0	0.3	7.8	0.7
	01/15/09	01/22/09	NS[1]	NS[1]	NS[1]	NS[1]
	01/22/09	01/29/09	0.5	0.3	32.5	1.5
	01/29/09	02/05/09	0.7	0.2	23.5	1.1
	02/05/09	02/12/09	0.3	0.2	18.6	1.0
	02/12/09	02/19/09	0.1	0.2	12.1	0.8
	02/19/09	02/26/09	0.2	0.2	17.5	0.9
	02/26/09	03/05/09	0.2	0.2	10.6	0.8
	03/05/09	03/12/09	0.3	0.2	7.6	0.7
	03/12/09	03/19/09	0.4	0.2	13.5	0.8
	03/19/09	03/26/09	0.2	0.2	8.7	0.7
	03/26/09	04/02/09	0.3	0.2	7.2	0.6
Mud Lake	12/31/08	01/08/09	0.6	0.2	34.8	1.3
	01/08/09	01/15/09	0.0	0.3	17.5	1.0
	01/15/09	01/22/09	0.0	0.2	38.8	1.7
	01/22/09	01/29/09	1.8	0.4	63.6	2.2
	01/29/09	02/05/09	0.9	0.3	53.6	1.7
	02/05/09	02/12/09	0.5	0.3	41.2	1.5
	02/12/09	02/19/09	0.2	0.2	30.3	1.3
	02/19/09	02/26/09	0.9	0.3	40.2	1.5
	02/26/09	03/05/09	0.4	0.2	23.7	1.1
	03/05/09	03/12/09	0.6	0.2	16.7	1.0
	03/12/09	03/19/09	1.0	0.3	26.7	1.2
	03/19/09	03/26/09	0.5	0.2	19.5	1.0
	03/26/09	04/02/09	0.2	0.3	17.7	1.0

[1] NS - Insufficient sample collected due to sampler failure.

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2009.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Distant Locations						
Craters	12/31/08	01/08/09	0.4	0.2	16.6	0.9
	01/08/09	01/15/09	0.0	0.3	15.5	1.0
	01/15/09	01/22/09	0.1	0.3	30.5	1.2
	01/22/09	01/29/09	1.1	0.4	56.2	2.0
	01/29/09	02/05/09	0.4	0.2	33.2	1.3
	02/05/09	02/12/09	0.5	0.2	22.1	1.1
	02/12/09	02/19/09	0.3	0.2	20.9	1.0
	02/19/09	02/26/09	0.6	0.2	22.9	1.1
	02/26/09	03/05/09	0.3	0.2	18.2	1.0
	03/05/09	03/12/09	0.4	0.2	17.4	1.0
	03/12/09	03/19/09	1.0	0.3	28.2	1.2
	03/19/09	03/26/09	0.5	0.2	14.5	0.9
	03/26/09	04/02/09	0.4	0.3	14.0	0.9
Fort Hall[1]	12/31/08	01/08/09	0.5	0.2	20.4	1.0
	01/08/09	01/15/09	0.0	0.3	12.7	0.9
	01/15/09	01/22/09	1.6	0.4	45.6	1.5
	01/22/09	01/29/09	1.1	0.3	51.0	1.6
	01/29/09	02/05/09	1.3	0.3	37.8	1.4
	02/05/09	02/12/09	0.5	0.2	18.4	1.0
	02/12/09	02/19/09	0.8	0.3	18.6	1.0
	02/19/09	02/26/09	0.9	0.2	26.5	1.2
	02/26/09	03/05/09	1.0	0.3	15.7	0.9
	03/05/09	03/12/09	0.5	0.2	12.6	0.8
	03/12/09	03/19/09	1.3	0.3	20.3	1.0
	03/19/09	03/26/09	1.1	0.3	13.5	0.9
	03/26/09	04/02/09	0.5	0.3	14.6	0.9
Idaho Falls	12/31/08	01/08/09	0.8	0.3	38.3	1.3
	01/08/09	01/15/09	0.0	0.3	22.1	1.1
	01/15/09	01/22/09	NS[2]	NS[2]	NS[2]	NS[2]
	01/22/09	01/29/09	2.5	0.5	106.0	2.7
	01/29/09	02/05/09	1.6	0.4	71.2	2.1
	02/05/09	02/12/09	0.7	0.3	45.0	1.7
	02/12/09	02/19/09	0.5	0.3	34.0	1.4
	02/19/09	02/26/09	0.9	0.3	50.6	1.8
	02/26/09	03/05/09	0.8	0.3	30.1	1.3
	03/05/09	03/12/09	0.8	0.3	23.2	1.2
	03/12/09	03/19/09	1.4	0.3	35.6	1.4
	03/19/09	03/26/09	1.1	0.3	22.3	1.1
	03/26/09	04/02/09	0.8	0.3	18.7	1.1

[1] Operated by Shosone-Bannack Tribe

[2] Insufficient Sample Volume

Appendix B

Table B-1. Results for all electret locations, first quarter, 2009.

Sample Location	Net Corrected Exposure Rate (µR/h)	± 2 SD (µR/h)
Arco	10.4	1.5
Craters	9.3	1.5
Rest Area	10.3	0.8
Van Buren	11.8	2.4
EFS	12.5	3.5
Main Gate	14.0	2.4
Atomic City	11.1	1.9
Taber	9.0	1.4
Blackfoot	10.7	4.5
Ft. Hall	12.1	4.2
Idaho Falls	9.9	2.1
Mud Lake/ Terreton	11.4	1.9
Monteview	10.6	1.4
Sand Dunes	11.3	4.8
Howe	9.6	3.9
Howe Met. Tower	11.3	0.9
MP276 -20	12.2	3.7
MP274 -20	10.2	3.7
MP272 -20	8.9	3.7
MP270 -20	8.3	3.7
MP268 -20	9.3	3.7
MP266 -20	12.0	3.7
MP264 -20	10.5	3.7
MP270 -20/26	13.2	3.7
MP268 -20/26	13.8	3.7
MP266 -20/26	11.7	3.7
MP263 -20/26	9.7	3.7
MP261 -20/26	8.9	3.7
MP259 -20/26	8.5	3.7
MFC (EBR II)	10.8	2.8
EBR I	12.8	0.7
RWMC	11.4	4.0
CFA	14.6	2.3
CITRC (PBF)	10.0	3.1

Table B-1 continued. Results for all electret locations, first quarter, 2009.

Sample Location	Net Corrected Exposure Rate (µR/h)	± 2 SD (µR/h)
INTEC (ICPPI)	14.6	2.8
ATR (TRA)	15.3	2.5
NRF	12.6	2.6
TAN	14.6	4.3
Mud Lake Bank of Commerce	12.9	1.2
MP43-33	13.8	5.0
MP41-33	12.0	5.0
MP39-33	14.1	5.0
MP37-33	15.0	5.0
MP35-33	14.4	5.0
MP33-33	14.4	5.0
MP31-33	18.3	5.0
MP29-33	8.4	5.0
MP27-33	14.5	5.0
MP25-33	13.5	5.0
MP23-33	11.0	5.0
Base of Howe[1]	8.7	2.6
Rover[1]	13.6	3.9
Hamer	13.3	1.1
Sugar City	16.0	2.5
Roberts	11.9	1.8
Big Southern Butte[1]	12.7	4.1

[1] Left out for two quarters due to impassable roads. Reported value is the average of 4th quarter 2008 and 1st quarter 2009.

Appendix C

Table C-1. List of volatile organic compounds (VOCs) analyzed for water samples. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	Minimum detectable concentrations (MDC) (expressed in µg/L)
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
1,4-Dichlorobenzene	0.5
1,2-Dichlorobenzene	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
Ethylbenzene	0.5
Methylene Chloride	0.5
Styrene	0.5
Tetrachloroethylene (PERC)	0.5
Toluene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethylene	0.5
Vinyl chloride	0.5
Xylenes (total)	0.5
Bromodichloromethane	0.5
Dibromochloromethane	0.5
Bromoform	0.5
Chloroform	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	0.5
tert-Butylbenzene	0.5
Chloroethane	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5

Table C.1 continued. List of volatile organic compounds (VOCs) analyzed for water samples. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	Minimum detectable concentrations (MDC) (expressed in µg/L)
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	1.0
1,2-Dibromoethane (EDB)	0.5
Dibromomethane	0.5
1,3-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	0.5
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Tert Butyl Ether (MTBE)	1.0
Naphthalene	1.0
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	1.25
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	0.5
1,3,5-Trimethylbenzene	0.5