Department of Environmental Quality
INL Oversight Program

ENVIRONMENTAL SURVEILLANCE PROGRAM QUARTERLY DATA REPORT

January - March, 2012

Boise Office
1410 N. Hilton
Boise, Idaho 83706
208-373-0428

Idaho Falls Office
900 N. Skyline, Suite B
Idaho Falls, Idaho 83402
208-528-2600

Table of Contents

Table of Acronyms v
Introduction 1
Air and Precipitation Monitoring Results 1
Environmental Radiation Monitoring Results 7
Water Monitoring 9
Terrestrial Monitoring Results 18
Quality Assurance 19

List of Tables

Table 1. Sampling locations and sample type. 3
Table 2. Range of gross alpha and gross beta concentrations for TSP filters, first quarter, 2012. 4
Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, first quarter, 2012. 4
Table 4. Tritium concentrations in air from atmospheric moisture, first quarter, 2012 5
Table 5. Tritium and Cesium-137 concentrations from precipitation, first quarter, 2012 5
Table 6. Annual radiochemical separation analysis data for TSP particulate filters collected during 2011. 6
Table 7. Summary of instrumentation at radiation monitoring stations. 8
Table 8. Average gamma exposure rates, first quarter, 2012, from HPIC network. 8
Table 9. Electret ionization chamber (EIC) cumulative average exposure rates, first quarter, 2012. 9
Table 10. Alpha, beta, and gamma concentrations for water samples, first quarter, 2012. 13
Table 11. Reported concentrations of plutonium isotopes in water samples, first quarter, 2012. 13
Table 12. Reported concentrations of uranium isotopes in water samples, first quarter, 2012. 13
Table 13. Reported concentrations of americium-241 in water samples, first quarter, 2012. 13
Table 14. Reported concentrations of strontium-90 in water samples, first quarter, 2012. 14
Table 15. Reported concentrations of technetium-99 in water samples, first quarter, 2012. 14
Table 16. Tritium concentrations for water samples, first quarter, 2012. 14
Table 17. Enriched tritium concentrations for water samples from first quarter, 2012. 15
Table 18. Reported metals concentrations in water samples, first quarter, 2012. 16
Table 19. Reported common ion concentrations in water samples, first quarter, 2012. 16
Table 20. Reported nutrient concentrations in water samples, first quarter, 2012. 17
Table 21. Gamma spectroscopy analysis data for milk samples, first quarter, 2012. 19
Table 22. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP, first quarter, 2012. 23
Table 23. Blank analysis results for gross alpha and beta in particulate air (TSP), first quarter, 2012. 24
Table 24. Blank analysis results for gamma spectroscopy for TSP particulate air filters, first quarter, 2012. 24
Table 25. Blank analysis results for tritium in water vapor from air samples, first quarter, 2012. 24
Table 26. Blank analysis results for 2011 TSP annual radiochemical composites of air filters. 25
Table 27. Radiological blank analysis in ground and surface water for samples, first quarter, 2012. 25
Table 28. Blank analysis results (µg/L) for metals in ground and surface water, first quarter, 2012. 26
Table 29. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water, first quarter, 2012. 26
Table 30. Duplicate radiological analysis results in pCi/L for ground and surface water, first quarter, 2012. 27
Table 31. Duplicate results for metals (µg/L) in ground water and/or surface water, first quarter, 2012. 28
Table 32. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water, first quarter, 2012. 28
Table 33. Electret ionization chamber irradiation results (categorized as spiked samples), first quarter, 2012. 29
Table 34. Air sampling field equipment service reliability (percent operational), first quarter, 2012. 29
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, 2012 30
Table B-1. Results for all electret locations, first quarter, 2012. 34
Table C-1. List of volatile organic compounds (VOCs) analyzed for water samples. 36

List of Figures

Figure 1. Air and radiation monitoring sites. 3
Figure 2. Facility monitoring locations, first quarter, 2012. 11
Figure 3. Up-gradient, facility, boundary and wastewater monitoring locations. first quarter, 2012. 12

Table of Acronyms

aCi/L	-	attocuries per liter
BEA	-	Battelle Energy Alliance, LLC
BLR		Big Lost River
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 (Gonzales-Stoller Surveillance, LLC)
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	-	milliRoentgen
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 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, 2012 (**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 2012 for TSP filters are presented in **Table 3**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

The elevated results for gross alpha, gross beta, and Be-7 for the Idaho Falls site are due to a malfunction in the mass flow meter in the TSP sampler that measures the total volume of air sampled. The reported volume of air was much lower than actually sampled which accounts for the increased gross alpha/beta and Be-7.

Annual composites of filters collected using TSP samplers are also analyzed using radiochemical separation techniques. Results from the annual composite analyses are typically presented in the following year's first quarter report. 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. For the 2011 annual composites, one analysis of field samples exceeded the MDC for ^{90}Sr. Three samples exceeded the MDC for ^{238}Pu. One sample exceeded the MDC for $^{239/240}Pu$. Two samples exceeded the MDC for ^{241}Am. Though minimally exceeding the MDC, the results are well under the specified regulatory limits and DEQ-INL OP's action levels.

Radioactive iodine samples are collected weekly. Samples are collected by drawing air through a canister filled with activated charcoal using a low-volume air pump. The activated charcoal contained in the canister traps the radioiodine by adsorption onto its porous surface. Each week, canisters are collected from all eleven air monitoring stations and analyzed together as a composite. 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. Atmospheric tritium was not measured above the minimum detectable concentration during the first quarter of 2012. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the first quarter of 2012. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the first quarter of 2012. 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.

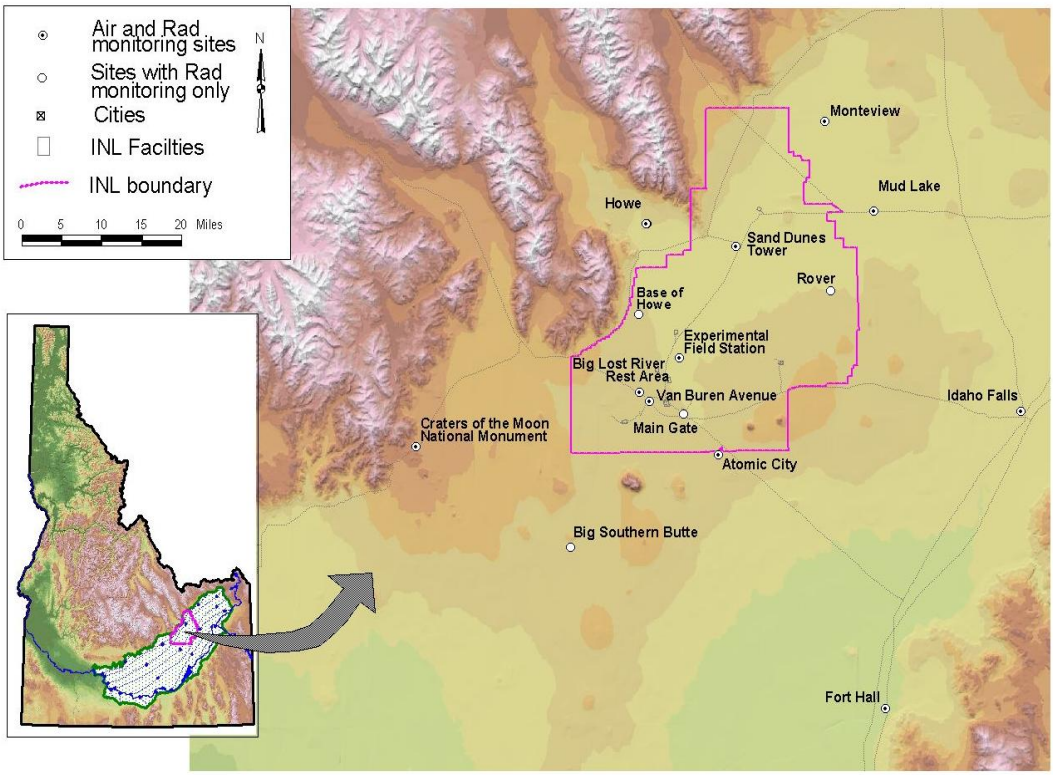

Figure 1. Air and radiation monitoring sites.

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, 2012.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.3	-	1.1	10.3	-	42.9
Experimental Field Station	0.3	-	1.1	9.6	-	41.1
Sand Dunes Tower	0.3	-	1.0	8.7	-	37.0
Van Buren Avenue	0.2	-	1.0	10.2	-	43.2
Boundary Locations						
Atomic City	0.3	-	0.9	9.7	-	41.7
Howe	0.3	-	1.0	9.4	-	37.5
Monteview	0.5	-	1.7	12.6	-	47.9
Mud Lake	0.7	-	1.9	13.8	-	76.4
Distant Locations						
Craters of the Moon	0.1	-	0.6	7.3	-	33.2
Fort Hall[1]	0.2	-	1.2	8.7	-	28.4
Idaho Falls	0.4	-	3.0 J[2]	14.1	-	125.1 J[2]

[1]Operated by Shoshone-Bannock Tribes.
[2]J = estimated value - mass flow meter malfunction in the TSP sampler resulted in an incorrect (high) concentration for gross alpha, gross beta, and Be-7.
Note: Concentrations are expressed in 1 x 10^{-3} pCi/m^3.

Table 3. Gamma spectroscopy analysis data for TSP filters, composite samples, first quarter, 2012.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	49.2	2.8	<MDC[2]
Experimental Field Station	46.1	2.6	<MDC
Sand Dunes Tower	44.5	2.4	<MDC
Van Buren Avenue	52.5	2.8	<MDC
Boundary Locations			
Atomic City	50.5	2.7	<MDC
Howe	48.0	2.6	<MDC
Monteview	61.5	3.3	<MDC
Mud Lake	70.2	3.7	<MDC
Distant Locations			
Craters of the Moon	42.8	2.5	<MDC
Fort Hall[1]	38.6	2.2	<MDC
Idaho Falls	87.3 J[3]	4.6 J[3]	<MDC

[1]Operated by Shoshone-Bannock Tribes.
[2]MDC for Cs-137 typically (5-10)x10^{-5} pCi/m^3.
[3]J = estimated value - mass flow meter malfunction in the TSP sampler resulted in an incorrect (high) concentration for gross alpha, gross beta, and Be-7.
Note: 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.

Table 4. Tritium concentrations in air from atmospheric moisture, first quarter, 2012

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.18	0.19	0.30
Experimental Field Station	0.14	0.11	0.17
Sand Dunes Tower	0.17	0.18	0.30
Van Buren Avenue	0.17	0.19	0.32
Boundary Locations			
Atomic City	0.11	0.12	0.20
Howe	0.13	0.18	0.30
Mud Lake	0.08	0.19	0.33
Monteview	0.15	0.18	0.30
Distant Locations			
Craters of the Moon	0.19	0.19	0.31
Fort Hall[1]	0.19	0.21	0.35
Idaho Falls	0.19	0.22	0.37

[1]Operated by Shoshone-Bannock Tribes.
Note: Concentrations are reported in pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Table 5. Tritium and Cesium-137 concentrations from precipitation, first quarter, 2012.

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	0.0	70	130	0.5	2.0	3.5
Boundary Locations						
Atomic City	0.0	70	130	0.0	1.4	2.5
Howe	30	80	130	0.5	1.7	2.9
Monteview	0.0	70	130	0.0	1.6	2.7
Mud Lake	0.0	70	130	0.7	2.1	3.4
Distant Locations						
Idaho Falls	0.0	70	130	0.0	1.9	3.2

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

Table 6. Annual radiochemical separation analysis data for TSP particulate filters collected during 2011.

Station Location	Sr^{90}			Pu^{238}			$Pu^{239/240}$			Am^{241}		
	Value[1]	± 2SD	MDC	Value[1]	±2SD	MDC	Value[1]	± 2SD	MDC	Value[1]	±2SD	MDC
On-Site Locations												
Rest Area	2.0	3.6	6.0	0.7	2.4	4.4	2.3	1.5	1.5	0.0	1.8	3.6
EFS[3]	0.0	4.8	8.4	1.7	2.3	3.8	0.1	1.8	3.6	2.3	1.9	2.8
Sand Dunes	2.6	2.9	4.8	2.2	1.6	2.2	0.0	2.1	4.9	1.5	1.2	1.8
Van Buren	3.9	3.5	5.7	3.5	2.4	3.3	0.0	1.3	3.4	0.5	1.4	2.6
Boundary Locations												
Atomic City	10.0	3.8	6.0	4.2	2.7	3.6	0.0	1.8	3.8	6.4	2.7	2.8
Howe	1.1	4.8	8.3	3.3	2.5	3.8	1.8	1.4	2.0	1.1	1.4	2.3
Monteview	0.7	4.6	7.8	1.4	2.5	4.3	0.0	1.8	3.9	0.6	1.9	3.5
Mud Lake	0.0	5.2	8.8	0.0	2.3	4.6	1.2	1.3	2.0	1.9	2.2	3.7
Distant Locations												
Craters of Moon	0.0	3.6	6.4	3.0	2.4	3.4	1.7	1.8	2.9	2.8	1.7	1.9
Fort Hall[2]	0.0	4.9	8.5	2.9	2.4	3.6	0.0	1.5	3.3	1.8	1.5	2.2
Idaho Falls	0.0	6.4	11.2	4.1	2.5	3.4	1.9	1.6	2.4	1.8	1.6	2.3

Note: Concentrations 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.

[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 2012 (**Figure 1**). To detect gamma radiation, each station is instrumented with an electret ionization chamber (EIC), and 11 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/gamma-radiation-measurements.aspx

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 40 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 2012. **Table 9** lists the EIC monitoring results for first quarter 2012. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation. HPICs at Base of Howe and Rover experienced large uncertainties (± 2 SD) due to the fact that both were recently changed out, along with all of the other HPICs, and had not yet had all of the new installation issues resolved resulting in occasional erratic readings. Their respective averages were in the normal range and far below Oversight's HPIC action level of 28 μR/hr.

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	■	■
Experimental Field Station		■
Main Gate	■	■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
Boundary Locations		
Atomic City	■	■
Big Southern Butte	■	■
Howe Met Tower	■	■
Monteview	■	■
Mud Lake/Terreton	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall[1]	■	■
Idaho Falls	■	■

[1] HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

Table 8. Average gamma exposure rates, first quarter, 2012, from HPIC network.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	13.8	9.7
Big Lost River Rest Area	15.4	1.1
Main Gate[1]	15.8	1.3
Rover	11.8	11.0
Sand Dunes Tower	13.6	1.0
Boundary Locations		
Atomic City	13.1	0.9
Big Southern Butte	13.2	4.8
Howe Met Tower	12.6	1.0
Monteview	12.9	1.9
Mud Lake/Terreton	14.9	1.3
Distant Locations		
Fort Hall[1]	13.6	1.0
Idaho Falls	13.3	1.0

[1] Operated by Shoshone-Bannock Tribes.

Table 9. Electret ionization chamber (EIC) cumulative average exposure rates, first quarter, 2012.

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	14.4	3.1
Big Lost River Rest Area	12.9	3.4
Experimental Field Station	14.0	3.3
Main Gate	13.8	3.5
Rover	15.7	1.9
Sand Dunes Tower	13.7	1.9
Van Buren Avenue	15.1	3.7
Boundary Locations		
Atomic City	10.2	1.1
Big Southern Butte	10.9	0.9
Howe Met Tower	11.5	2.7
Monteview	10.5	0.7
Mud Lake / Terreton	10.6	2.0
Distant Locations		
Craters of the Moon	8.3	0.5
Fort Hall[1]	13.0	1.4
Idaho Falls	9.7	1.1

[1] 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. 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 2012 four facility locations were sampled (**Figure 2**). Results are reported in this section, along with backlogged enriched tritium analyses.

Most sites sampled by DEQ-INL are sampled with another agency or organization. Samples are collected at about the same time using the same collection equipment as the other agency or organization (co-sampled). DEQ-INL verifies work by these agencies monitoring on behalf of DOE by comparing results from co-sampled sites.

Gross alpha and gross beta analyses are conducted as a screening tool for alpha and beta emitting radionuclides potentially released from INL operations. Selected sites are sampled for the man-made, alpha emitting isotopes of plutonium, uranium, americium, and neptunium; and beta emitting radionuclides, technetium-99 and strontium-90, based on historic INL contamination. In the event of suspect or unexpected levels of gross radioactivity, additional samples may also be analyzed for other specific radionuclides.

All facility locations sampled this quarter showed detectable concentrations of gross alpha radioactivity. These detections are below the EPA maximum contaminant level (MCL) for alpha particles (15 pCi/L) and are located in an area of known contamination. Gross beta radioactivity was detected at each of the facility locations sampled, and are located in an area of known contamination. The derived MCL for beta radioactivity is 8 pCi/L if the source of the radioactivity is strontium-90; 900 pCi/L if technetium-99; or 20,000 pCi/L if tritium. Man-made, gamma emitting cesium-137 was not detected at any of the sample locations. Results for gross alpha, gross beta, and man-made, gamma emitting radioactivity are shown in **Table 10**.

Each facility site was sampled for plutonium isotopes (**Table 11**). There were no detectable results for plutonium isotopes this quarter.

Isotopes of uranium were also sampled at each facility site. There were detectable results for uranium-234 and uranium-238, however, the results for uranium-235 were non-detectable (**Table 12**). The ratio of results observed cannot be distinguished from background concentrations, which means the uranium found in the sample is likely to be naturally occurring. There were no detectable results for americium-241 (**Table 13**).

Each facility location sampled was analyzed for strontium-90 and all showed detectable results, but were within the expected range of concentrations for each location (**Table 14**). All locations were sampled for technetium-99 and all had detectable results, but were within the expected range of concentrations (**Table 1 5**) for each location.

Using the standard analytical method, tritium was detected in each facility sample (**Table 16**). 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 17**). Eleven samples were analyzed this quarter for enriched tritium, all of which were from 3rd and 4th quarter 2011 (**Figure 3**). Enriched tritium results for all four boundary wells analyzed this quarter were collected from Westbay™ packer sampling systems, which allow water samples to be collected from discrete levels within the well. The associated sample depths are listed along with the results in **Table 17**. All sample results for up-gradient and distant wells were within the expected range of concentrations due to natural sources and levels remaining after the atomic bomb testing era. Sample results for facility and boundary locations however, show concentrations consistent with historic INL waste disposal practices.

The facility samples were also analyzed for metals, common ions, and nutrients. Results for metals, common ions, and nutrients are displayed in **Tables 18, 19, and 20** respectively. All results were consistent with historical values found at the facility location.

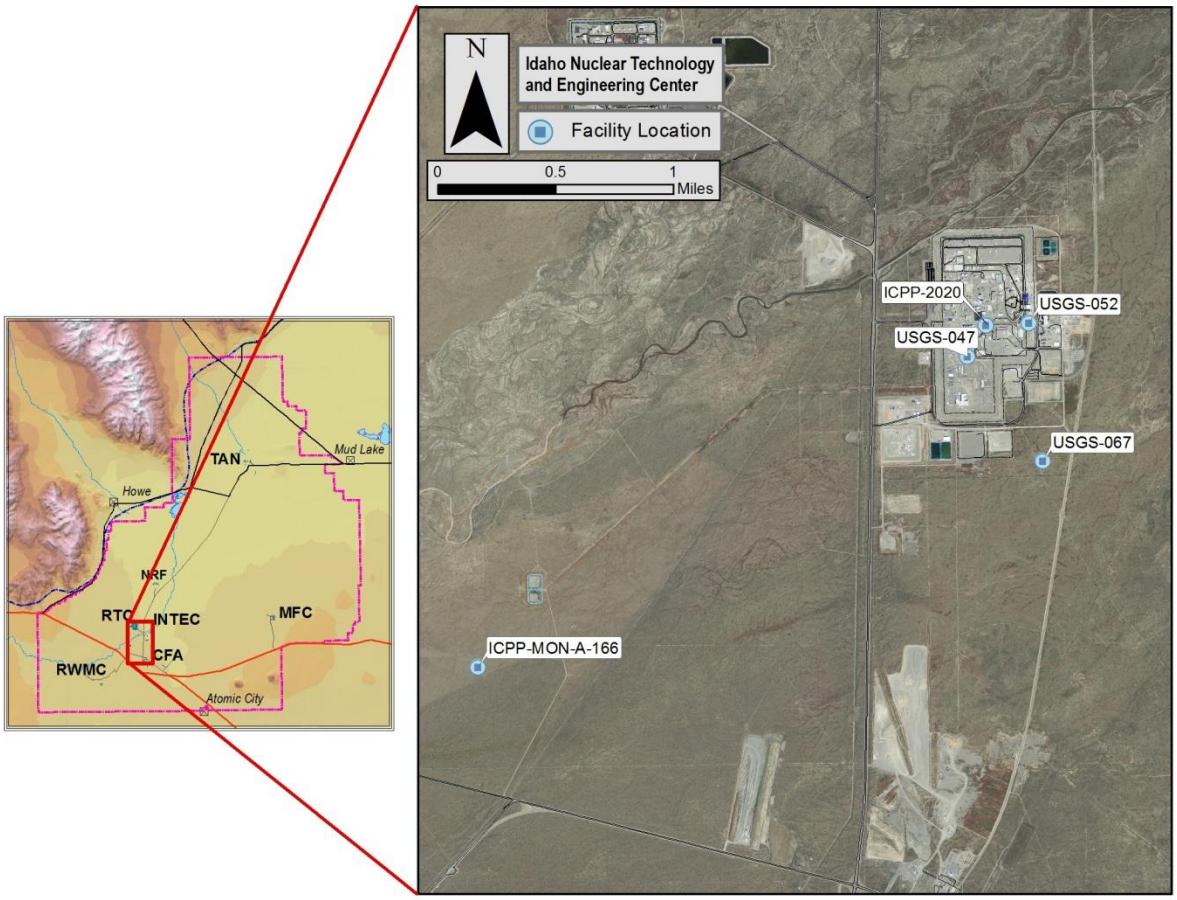

Figure 2. **Facility monitoring locations, first quarter, 2012.**

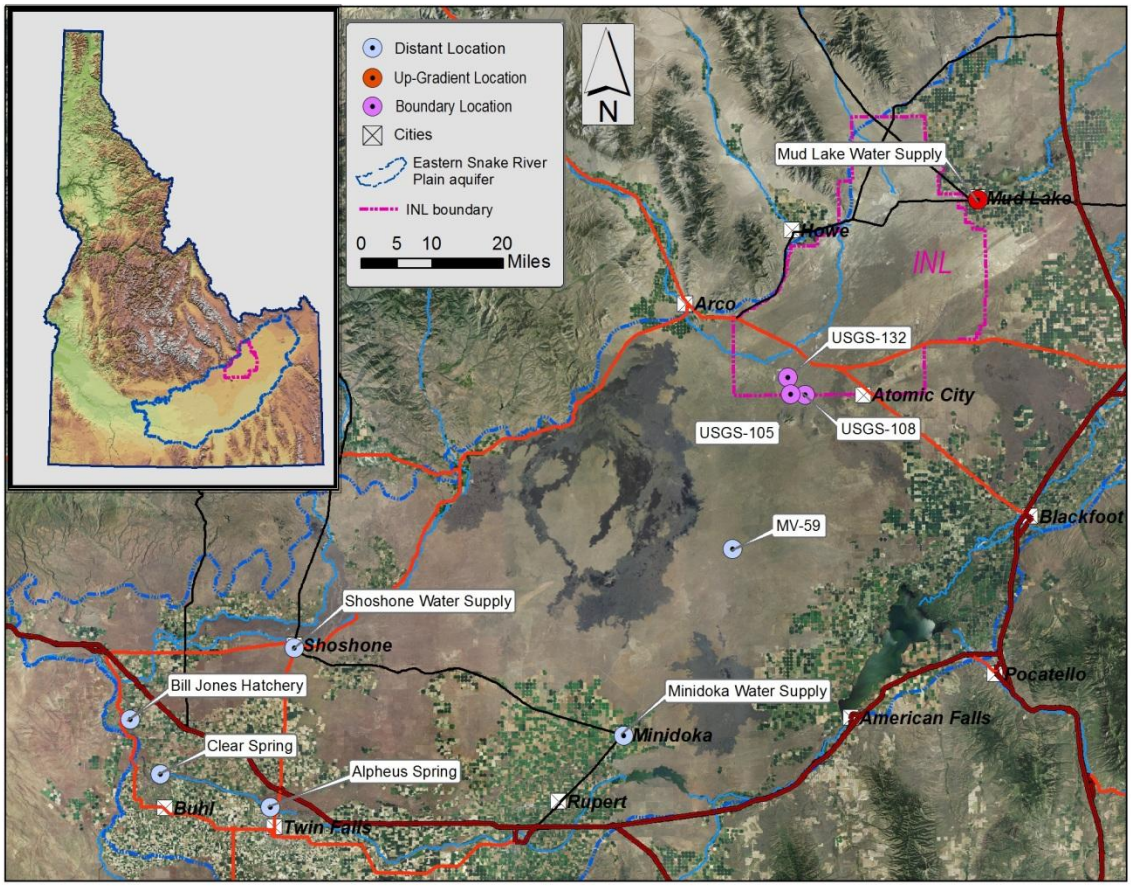

Figure 3. Up-gradient, facility, boundary and wastewater monitoring locations. first quarter, 2012.

Table 10. Alpha, beta, and gamma concentrations for water samples, first quarter, 2012.

Sample Location	Sample Date	Gross Alpha			Gross Beta			Man-made gamma-emitting radionuclide Cesium-137		
		Concentration[1,2]		± 2 SD	Concentration		± 2 SD	Concentration		± 2 SD
Facility										
ICPP-2020	3/20/2012	2.7		1.3	117.2		2.6	0.3	U	2.0
USGS-047	3/20/2012	2.8		1.2	49.7		1.8	2.6	U	2.2
USGS-052	3/19/2012	3.3	J	1.2	183.2		3.1	-0.2	U	1.6
USGS-067	3/19/2012	3.5	J	1.3	96.8		2.4	0.0	U	1.5

[1] Data qualifiers: U= non-detection, J= estimate, R= rejected.

[2] Concentrations expressed in pCi/L.

Table 11. Reported concentrations of plutonium isotopes in water samples, first quarter, 2012.

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240		
		Concentration[1,2]		± 2SD	Concentration		± 2SD
Facility							
ICPP-2020	3/20/2012	0.003	U	0.013	0.004	U	0.013
USGS-047	3/20/2012	0.004	U	0.016	0.011	U	0.018
USGS-052	3/19/2012	0.003	U	0.019	0.001	U	0.019
USGS-067	3/19/2012	-0.004	U	0.019	-0.006	U	0.019

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

Table 12. Reported concentrations of uranium isotopes in water samples, first quarter, 2012.

Sample Location	Sample Date	Uranium-234			Uranium-235			Uranium-238		
		Concentration[1,2]		± 2SD	Concentration[1,2]		± 2SD	Concentration[1,2]		± 2SD
Facility										
ICPP-2020	3/20/2012	1.77		0.43	0.011	U	0.055	0.68		0.22
USGS-047	3/20/2012	1.29		0.38	0.095	U	0.093	0.63		0.24
USGS-052	3/19/2012	1.48		0.45	0.071	U	0.095	0.82		0.30
USGS-067	3/19/2012	1.56		0.37	0.043	U	0.052	0.68		0.21

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

Table 13. Reported concentrations of americium-241 in water samples, first quarter, 2012.

Sample Location	Sample Date	Americium-241		
		Concentration[1,2]		± 2SD
Facility				
ICPP-2020	3/20/2012	-0.015	U	0.020
USGS-047	3/20/2012	-0.017	U	0.022
USGS-052	3/19/2012	-0.016	U	0.018
USGS-067	3/19/2012	-0.019	U	0.028

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

Table 14. Reported concentrations of strontium-90 in water samples, first quarter, 2012.

Sample Location	Sample Date	Strontium-90		
		Concentration[1,2]		± 2SD
Facility				
ICPP-2020	3/20/2012	11.5		2.8
USGS-047	3/20/2012	13.4		3.3
USGS-052	3/19/2012	4.3		1.1
USGS-067	3/19/2012	13.3		3.2

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

Table 15. Reported concentrations of technetium-99 in water samples, first quarter, 2012.

Sample Location	Sample Date	Technetium-99		
		Concentration[1,2]		± 2SD
Facility				
ICPP-2020	3/20/2012	225.0		1.4
USGS-047	3/20/2012	2.3		0.2
USGS-052	3/19/2012	408.3		1.9
USGS-067	3/19/2012	160.0		1.2

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

Table 16. Tritium concentrations for water samples, first quarter, 2012.

Sample Location	Sample Date	Tritium		
		Concentration[1,2]		± 2 SD
Facility				
ICPP-2020	3/20/2012	2020		150
USGS-047	3/20/2012	330		90
USGS-052	3/19/2012	780		110
USGS-067	3/19/2012	3390		160

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

Table 17. Enriched tritium concentrations for water samples from first quarter, 2012.

Sample Location	Sample Date	Enriched Tritium		
		Concentration[1,2]		± 2 SD
Up-gradient				
Mud Lake Water Supply	9/19/2011	2	U	6
Facility				
ICPP-MON-A-166	10/3/2011	106		9
Boundary*				
USGS-105 (Zone 5)	6/22/2011	172		12
USGS-108 (Zone 5)	6/20/2011	58		9
USGS-108 (Zone 3)	6/16/2011	60		9
USGS-132 (Zone 6)	6/27/2011	133		11
Distant				
Clear Spring	8/17/2011	2	U	9
Minidoka Water Supply	8/17/2011	3	U	9
MV-59	6/6/2011	1	U	4
Shoshone Water Supply	5/23/2011	22		7
Shoshone Water Supply	8/17/2011	16		6

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

[2] Concentrations expressed in pCi/L.

*USGS-105 (Zone 5) = 726 ft below land surface (bls); USGS-108 (Zone 5) = 662 ft bls; USGS-108 (Zone 3) = 1269 ft bls; and USGS-132 (Zone 6) = 636 ft bls.

Table 18. Reported metals concentrations in water samples, first quarter, 2012.

Sample Location	Sample Date	Concentration[1,2]																					
		Arsenic		Barium		Beryllium		Cadmium		Chromium		Iron		Lead		Manganese		Mercury		Selenium		Zinc	
Facility																							
ICPP-2020	3/20/2012	<5	U	110		-	NR	-	NR	78		600		<5	U	12	J	-	NR	<10	U	<5	U
USGS-047	3/20/2012	<5	U	68		-	NR	-	NR	18		1200		<5	U	40	J	-	NR	<10	U	15	
USGS-052	3/19/2012	<5	U	83		-	NR	-	NR	6		<10	U	<5	U	<2	U	-	NR	<10	U	<5	U
USGS-067	3/19/2012	<5	U	120		-	NR	-	NR	6.4		32		<5	U	<2	U	-	NR	<10	U	8.4	

[1] Data qualifiers: U = non-detection , J = estimate, R = rejected,. A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

[2] Concentrations are expressed in µg/L. Samples are not filtered unless otherwise indicated.

Table 19. Reported common ion concentrations in water samples, first quarter, 2012.

Sample Location	Sample Date	Concentration[1,2]																			
		Calcium		Magnesium		Sodium		Potassium		Fluoride		Chloride		Sulfate		Silica		Alkalinity[3]		TDS[4]		TSS[5]	
Facility																							
ICPP-2020	3/20/2012	54		15		18		2.8		0.237		46.6		37		-	NR	140		-	NR	-	NR
USGS-047	3/20/2012	50		14		8.9		2		0.218		16.1		23.6		-	NR	154		-	NR	-	NR
USGS-052	3/19/2012	45		13		11		2.5		0.225		21.6		25.5		-	NR	147		250		<5	U
USGS-067	3/19/2012	50		14		23		3.3		0.265		48.9		29.1		-	NR	135		-	NR	-	NR

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

[2] Concentrations expressed in mg/L. Samples are not filtered unless otherwise noted.

[3] As $CaCO_3$.

[4] Total Dissolved Solids.

[5] Total Suspended Solids.

Table 20. Reported nutrient concentrations in water samples, first quarter, 2012.

Sample Location	Sample Date	Concentration[1,2]							
		Nitrite + Nitrate		Phosphorus		Total Kjeldahl Nitrogen		Ammonia as N	
Facility									
ICPP-2020	3/20/2012	3.9		0.034		-	NR	<0.01	U
USGS-047	3/20/2012	1.1		0.038		-	NR	<0.01	U
USGS-052	3/19/2012	2.2		0.030		0.11		-	NR
USGS-067	3/19/2012	5.5		0.030		-	NR	<0.01	U

[1] Data qualifiers: U = non-detection , J = estimate, R = rejected, NR = analysis not requested,
[2] Concentrations expressed in mg/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.

Soil

DEQ-INL OP 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 2012.

Milk

DEQ-INL OP monitors milk for naturally occurring potassium-40 and man-made iodine-131. DEQ-INL OP collects milk samples on a monthly basis. Riverside is a small operation that needed to suspend sampling for the months of January and February. They were able to resume milk sampling in March. Results for analyses of milk samples are presented in **Table 21**. Naturally occurring potassium-40 was detected in all samples within the expected range, except for the March sample from Howe which showed an unusually low potassium-40 result. A recount was performed on this sample and the results of the second analysis agreed with results from the first. The lab then checked the results using raw spectral data and found that the results were comparable to past spectral results with only the potassium-40 being lower. Iodine-131 was not detected in any sample.

Table 21. Gamma spectroscopy analysis data for milk samples, first quarter, 2012.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40		Man-made gamma-emitting radionuclide Iodine-131[1]	
		Concentration[3]	± 2 SD	Concentration[3]	± 2 SD
Monitoring Samples					
Howe/Nelson-Ricks Creamery	01/02/2012	1354	101	<MDC	
	02/01/2012	1088	90	<MDC	
	03/06/2012	597	83	<MDC	
Mud Lake/Nelson-Ricks Creamery	12/28/2012	1437	121	<MDC	
	01/31/2012	1362	116	<MDC	
	03/05/2012	1597	111	<MDC	
Gooding/Glanbia	01/05/2012	1653	131	<MDC	
	02/07/2012	1626	113	<MDC	
	03/05/2012	1341	109	<MDC	
Riverside	03/11/2012	1519	123	<MDC	
Verification Samples[2]					
Rupert	01/03/2012	1689	116	<MDC	
Idaho Falls	01/03/2012	1586	127	<MDC	
Dietrich	02/07/2012	1321	108	<MDC	
Howe	02/07/2012	1340	115	<MDC	
Rupert	03/06/2012	1640	114	<MDC	
Idaho Falls	03/06/2012	1402	112	<MDC	

[1] <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).
[2] DEQ-INL OP 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 to ensure precise, accurate, representative, and reliable results, and to maximize data usability.

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the first quarter of 2012 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 2012, the DEQ-INL OP submitted 65 QC samples for various radiological and non-radiological analyses (**Table 22**).

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 2012 are presented in **Table 23**.

Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 24**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 25**. Blank analysis results for radiochemical separation analyses for TSP particulate filters collected during 2011 are presented in **Table 26.** Blank analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 27**, **Table 28**, and **Table 29**.

There were a few anomalies observed from the assessment of field blank water samples as measured by the analytical laboratories used by DEQ-INL OP for the first quarter of 2012. The first includes a detection of of Gross Alpha of 4.2 pCi/L. There were two samples analyzed on the same day as the blank sample (4/25/12) with both showing a detection of Gross Alpha. Both samples analyzed on the same day as the blank sample will be flagged with a "J" and qualified as an estimate. Next, Barium was detected at 4 ug/L. There were four samples analyzed on the same day as the blank sample (4/2/12) and all of the samples detected Barium. Concentrations were consistent with historical levels with the results ranging from 68 – 120 ug/L which is significantly above the blank value of 4 ug/L. No qualifiers or flags will be attached with any of the barium results. The same blank sample also detected Manganese at 25 ug/L. There were four samples analyzed on the same day as the blank sample (4/2/12), with two of the four samples detecting manganese. Both samples showing detection will be flagged with a "J" and qualified as an estimate, the other two samples were non-detections and will not be flagged. Other anomalies noticed include enriched tritium results above the MDC. The reported concentrations remain an acceptable measure of "background" tritium in DI water so they remain in control **(Table 27)**.

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.

DEQ-INL OP also uses standard radiological counting error (expressed as one standard deviation) to compare results for radiological analyses. Comparison tests that have an absolute difference in the two sample results of no more than three times the pooled error (or "3 sigma") for these measurements are considered acceptable. This is accomplished using the following equation:

$$/ R_1 - R_2 / \leq 3(S_1^2 + S_2^2)^{1/2}$$

Where:

R_1 = First sample value.

R_2 = Second sample value.

S_1 = Counting error (one standard deviation) associated with the laboratory measurement of the first sample.

S_2 = Counting error (one standard deviation) associated with the laboratory measurement of the second sample.

Duplicate results for ground and surface water are presented in **Table 30**, **Table 31**, and **Table 32** for radiological analyses, and non-radiological analyses.

No analyses failed the duplicate criteria for the first quarter of 2012.

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.

Spiked samples were not used during the first quarter of 2012.

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 2012 are presented in **Table 33**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets.

There were no anomalies observed from the assessment of spiked samples as measured by DEQ-INL OP or the analytical laboratories used by DEQ-INL OP for the first quarter of 2012.

Analytical QA/QC Assessment

Aside from the field blank detections of gross alpha, barium and manganese, no other issues involving sample chain of custody, sample holding times, analysis of blank, duplicate, and spiked samples were observed during the first quarter of 2012, 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 2012.

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 2012 met the minimum criteria of the DEQ-INL OP ESP and is summarized in **Table 22**.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. During the first quarter of 2012, the radioiodine pump at Craters of the Moon was replaced. Service reliability for air sampling equipment for the first quarter of 2012 is summarized in **Table 33**.

All of the HPICs were changed out with new units resulting in several instances of erratic readings and thus large uncertainties (± 2 SD), notably Base of Howe and Rover. All of the HPICs have now settled in and are now registering historically normal and consistent readings.

Conclusion

All data collected for the first quarter of 2012, 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 22. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL OP ESP, first quarter, 2012.

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	143	13	0	0	2	ISU-EML
		Gross beta	143	13	0	0	2	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	44	4	0	0	0	ISU Sub
Water Vapor	Desiccant column	Tritium	28	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	4	1	1	0	0	ISU-EML
		Gross beta	4	1	1	0	0	ISU-EML
		Gamma emitters	4	1	1	0	0	ISU-EML
		Tritium	4	1	1	0	0	ISU-EML
		Enriched tritium	11	4	0	0	0	ISU-EML
		Technetium-99	4	0	1	0	0	ISU-EML
		Radiochemical	16	0	4	0	0	ISU Sub
		Metals	4	1	1	0	0	IBL
		Common Ions	4	1	1	0	0	IBL
		Nutrients	4	1	1	0	0	IBL
		Volatile Organics	0	0	0	0	0	IBL
TERRESTRIAL								
Milk	Grab or composite	Gamma emitters	16	0	0	0	0	ISU-EML
Soil	*in situ*	Gamma emitters	0	0	0	0	0	ISU-EML
	Grab – "puck"	Gamma emitters	0	0	0	0	0	ISU-EML
RADIATION								
Ambient	EICs	Gamma Radiation	55	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	12	NA	NA	NA	NA	DEQ-INL OP
Total Analyses			**536**	**44**	**12**	**9**	**4**	
Total of QC Analyses (blanks, duplicates, and spikes)			**65**					
Percentage of QC analyses of Total Test analyses[3]			**12.1%**					
Percentage of usable data[4]			**99.3%**					

[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] 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 23. Blank analysis results for gross alpha and beta in particulate air (TSP), first quarter, 2012.

Collection Period		Corrected volume (m^3) [1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
12/29/2011	01/05/2012	2019	0.0	0.1	0.0	0.4
01/05/2012	01/12/2012	2019	0.0	0.1	0.3	0.4
01/12/2012	01/19/2012	2019	0.0	0.1	0.1	0.4
01/19/2012	01/26/2012	2019	0.0	0.1	0.0	0.4
01/26/2012	02/02/2012	2019	0.0	0.1	0.0	0.4
02/02/2012	02/09/2012	2019	0.0	0.1	0.0	0.5
02/09/2012	02/16/2012	2019	-0.1	0.1	-0.2	0.4
02/16/2012	02/23/2012	2019	0.0	0.1	0.6	0.4
02/23/2012	03/01/2012	2019	0.0	0.1	-0.6	0.4
03/01/2012	03/08/2012	2019	0.0	0.1	0.2	0.4
03/08/2012	03/15/2012	2019	0.0	0.1	0.2	0.4
03/15/2012	03/22/2012	2019	-0.1	0.1	0.0	0.4
03/22/2012	03/29/2012	2019	-0.1	0.1	0.0	0.4

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 24. Blank analysis results for gamma spectroscopy for TSP particulate air filters, first quarter, 2012.

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
04/23/2012	-2	39	66	7	42	71	-7	10	18

Analysis Date	Cesium-134			Cesium-137		
	Concentration[1]	± 2 SD	MDC	Concentration	± 2 SD	MDC
04/23/2012	1	5	8	0	5	8

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 25. Blank analysis results for tritium in water vapor from air samples, first quarter, 2012.

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP121ZTR01	03/20/2012	03/21/2012	04/03/2012	-0.01	0.07	0.12
OP121ZTR02	04/10/2012	04/11/2012	04/17/2012	0.00	0.10	0.16

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

Table 26. Blank analysis results for 2011 TSP annual radiochemical composites of air filters.

Location	^{90}Sr			^{238}Pu			$^{239}Pu/^{240}Pu$			^{241}Am		
	Value[1]	± 2 SD	MDC	Value[1]	± 2 SD	MDC	Value[1]	± 2 SD	MDC	Value[1]	± 2 SD	MDC
Blank	0.96	0.64	1.02	0.35	0.25	0.35	0.07	0.12	0.21	0.26	0.39	0.67
Note: Concentrations are expressed in 1 x 10^{-5} pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).												

Table 27. Radiological blank analysis in ground and surface water for samples, first quarter, 2012.

Sample Number	Sample Date	Concentration	± 2 SD	MDC	Within Blank Criteria?
Gross Alpha					
121W136	3/20/2012	4.2	0.6	0.4	No
Gross Beta					
121W136	3/20/2012	0.0	0.6	1.0	Yes
Cesium-137					
121W136	3/20/2012	-0.2	1.7	2.9	Yes
Tritium					
121W137	3/20/2012	100	100	170	Yes
Enriched Tritium					
111W514	10/13/2011	19*	6	9	Yes
111W524	10/17/2011	25*	7	11	Yes
111W453	6/20/2011	26*	7	10	Yes
111W519	11/9/2011	23*	6	9	Yes

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

*Note: Reflects typical concentrations found in DI water.

Table 28. Blank analysis results (µg/L) for metals in ground and surface water, first quarter, 2012.

Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
121W139	3/20/2012	<5	**4**	<5	<10	<5	**25**	<10	<5

Table 29. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water, first quarter, 2012.

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus	Ammonia as N
121W139,138,190	3/20/2012	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1	<0.01	<0.005	<0.01

Table 30. Duplicate radiological analysis results in pCi/L for ground and surface water, first quarter, 2012.

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]
Gross Alpha									
USGS-067	121W170	3.5	1.3	121W180	1.9	1.1	1.6	2.6	Yes
Gross Beta									
USGS-067	121W170	96.8	2.4	121W180	101.8	2.4	5	5.1	Yes
Gamma Spectroscopy Cesium-137									
USGS-067	121W170	0	1.5	121W180	0.3	2.5	0.3	4.4	Yes
Tritium									
USGS-067	121W175	3390	160	121W185	3220	160	170	339	Yes
Strontium-90									
USGS-067	121W173	13.3	3.2	121W183	13.5	3.4	0.2	7.00	Yes
Technetium-99									
USGS-067	121W174	160	1.2	121W184	161.5	1.2	1.5	2.55	Yes
Plutonium-238									
USGS-067	121W172	-0.004	0.019	121W182	-0.009	0.031	0.01	0.05	Yes
Plutonium-239/240									
USGS-067	121W172	-0.006	0.019	121W182	-0.006	0.031	0.00	0.05	Yes
Uranium-234									
USGS-067	121W176	1.56	0.37	121W186	1.52	0.39	0.04	0.81	Yes
Uranium-235									
USGS-067	121W176	0.043	0.052	121W186	0.030	0.061	0.01	0.12	Yes
Uranium-238									
USGS-067	121W176	0.68	0.21	121W186	0.80	0.26	0.12	0.50	Yes
Americium-241									
USGS-067	121W171	-0.019	0.028	121W181	-0.018	0.019	0.00	0.05	Yes

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

Table 31. Duplicate results for metals (µg/L) in ground water and/or surface water, first quarter, 2012.

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
USGS-067	121W178	3/19/2012	<5	120	6.4	32	<5	<2	<10	8.4
USGS-067	121W188	3/19/2012	<5	120	6.4	32	<5	<2	<10	8.9
RPD			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-6**

Relative Percent Difference (RPD) = (R1-R2) / ((R1+ R2)/2)*100.

Table 32. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water, first quarter, 2012.

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus	Ammonia as N
USGS-067	121W178,177	3/19/2012	50	14	23	3.3	0.265	48.9	29.1	135	5.5	0.03	<0.01
USGS-067	121W188,187	3/19/2012	50	13	22	3.2	0.281	48.4	29	134	5.6	0.031	<0.01
RPD			**0**	**7.4**	**4.4**	**3.1**	**-5.9**	**1.0**	**0.3**	**0.7**	**-1.8**	**-3.3**	**0**

Relative Percent Difference (RPD) = (R1-R2) / ((R1+ R2)/2)*100.

Table 33. Electret ionization chamber irradiation results (categorized as spiked samples), first quarter, 2012.

Electret #	Exposure Received		Net Measured Exposure[1]		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	45.0	2.3	46.1	1.3	102.5%
Spike 1	45.0	2.3	48.2	1.3	107.0%
Spike 1	45.0	2.3	44.1	1.3	98.1%
Spike 2	30.0	1.5	32.1	1.3	107.0%
Spike 2	30.0	1.5	32.5	1.3	108.3%
Spike 2	30.0	1.5	32.5	1.3	108.3%
Spike 3	22.0	1.1	22.2	1.3	100.7%
Spike 3	22.0	1.1	22.5	1.3	102.1%
Spike 3	22.0	1.1	24.0	1.3	108.9%

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

Table 34. Air sampling field equipment service reliability (percent operational), first quarter, 2012.

Station Locations	Sample Type			
	TSP	Radioiodine	Atmospheric Moisture	Precipitation
Onsite Locations				
Big Lost River Rest Area	100 %	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	100 %	100 %	100 %	100 %
Monteview	100 %	100 %	100 %	100 %
Mud Lake	100 %	100 %	100 %	100 %
Distant Locations				
Craters of the Moon	100 %	92 %	100 %	NC[1]
Idaho Falls	100 %	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, 2012.

Sample location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
On-site Locations						
Rest Area	12/29/11	01/05/12	0.7	0.2	25.2	1.1
	01/05/12	01/12/12	0.9	0.2	42.9	1.4
	01/12/12	01/19/12	0.7	0.2	27.2	1.1
	01/19/12	01/26/12	0.3	0.1	10.3	0.8
	01/26/12	02/02/12	0.5	0.2	26.9	1.1
	02/02/12	02/09/12	0.7	0.2	40.4	1.3
	02/09/12	02/16/12	0.9	0.2	39.1	1.3
	02/16/12	02/23/12	0.3	0.2	18.2	0.9
	02/23/12	03/01/12	0.3	0.1	10.3	0.8
	03/01/12	03/08/12	0.5	0.2	15.7	0.9
	03/08/12	03/15/12	1.1	0.2	25.4	1.1
	03/15/12	03/22/12	0.5	0.2	12.7	0.8
	03/22/12	03/29/12	0.8	0.2	23.2	1.0
Experimental Field Station	12/29/11	01/05/12	0.8	0.2	25.5	1.1
	01/05/12	01/12/12	1.1	0.2	41.1	1.4
	01/12/12	01/19/12	0.6	0.2	23.4	1.1
	01/19/12	01/26/12	0.3	0.1	9.7	0.8
	01/26/12	02/02/12	0.5	0.2	25.2	1.1
	02/02/12	02/09/12	0.7	0.2	35.1	1.3
	02/09/12	02/16/12	0.5	0.2	32.6	1.2
	02/16/12	02/23/12	0.3	0.2	15.2	0.9
	02/23/12	03/01/12	0.5	0.2	9.6	0.8
	03/01/12	03/08/12	0.4	0.2	13.9	0.9
	03/08/12	03/15/12	0.8	0.2	22.6	1.1
	03/15/12	03/22/12	0.3	0.2	11.0	0.8
	03/22/12	03/29/12	0.5	0.2	19.1	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, 2012.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Sand Dunes	12/29/11	01/05/12	0.7	0.2	24.0	1.0
	01/05/12	01/12/12	1.0	0.2	37.0	1.2
	01/12/12	01/19/12	0.5	0.2	22.9	1.0
	01/19/12	01/26/12	0.3	0.1	9.6	0.7
	01/26/12	02/02/12	0.6	0.2	26.4	1.1
	02/02/12	02/09/12	0.7	0.2	35.9	1.2
	02/09/12	02/16/12	0.7	0.2	36.0	1.2
	02/16/12	02/23/12	0.4	0.2	16.1	0.9
	02/23/12	03/01/12	0.4	0.1	10.6	0.8
	03/01/12	03/08/12	0.4	0.2	13.9	0.8
	03/08/12	03/15/12	0.8	0.2	21.9	1.0
	03/15/12	03/22/12	0.5	0.2	8.7	0.7
	03/22/12	03/29/12	0.7	0.2	18.7	0.9
Van Buren	12/29/11	01/05/12	0.8	0.2	27.7	1.1
	01/05/12	01/12/12	0.9	0.2	43.2	1.4
	01/12/12	01/19/12	0.6	0.2	25.0	1.1
	01/19/12	01/26/12	0.3	0.2	10.2	0.8
	01/26/12	02/02/12	0.7	0.2	27.5	1.1
	02/02/12	02/09/12	1.0	0.2	39.1	1.3
	02/09/12	02/16/12	0.9	0.2	39.5	1.3
	02/16/12	02/23/12	0.2	0.2	17.9	0.9
	02/23/12	03/01/12	0.3	0.1	10.4	0.8
	03/01/12	03/08/12	0.6	0.2	13.7	0.8
	03/08/12	03/15/12	0.7	0.2	22.5	1.0
	03/15/12	03/22/12	0.5	0.2	11.4	0.8
	03/22/12	03/29/12	0.9	0.3	20.8	1.2
Boundary Locations						
Atomic City	12/29/11	01/05/12	0.4	0.2	25.7	1.1
	01/05/12	01/12/12	0.9	0.2	40.9	1.3
	01/12/12	01/19/12	0.5	0.2	24.9	1.0
	01/19/12	01/26/12	0.4	0.2	10.3	0.8
	01/26/12	02/02/12	0.5	0.2	24.0	1.0
	02/02/12	02/09/12	0.8	0.2	41.7	1.3
	02/09/12	02/16/12	0.6	0.2	31.9	1.2
	02/16/12	02/23/12	0.3	0.2	17.7	0.9
	02/23/12	03/01/12	0.3	0.1	9.7	0.7
	03/01/12	03/08/12	0.5	0.2	15.1	0.9
	03/08/12	03/15/12	0.9	0.2	21.8	1.0
	03/15/12	03/22/12	0.4	0.2	12.1	0.8
	03/22/12	03/29/12	0.7	0.2	20.8	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, 2012.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Howe	12/29/11	01/05/12	0.7	0.2	22.7	1.1
	01/05/12	01/12/12	1.0	0.2	32.3	1.1
	01/12/12	01/19/12	0.7	0.2	21.7	1.0
	01/19/12	01/26/12	0.3	0.2	9.6	0.8
	01/26/12	02/02/12	0.6	0.2	26.0	1.1
	02/02/12	02/09/12	1.0	0.2	37.5	1.3
	02/09/12	02/16/12	1.0	0.2	37.3	1.3
	02/16/12	02/23/12	0.4	0.2	16.0	0.9
	02/23/12	03/01/12	0.4	0.2	10.5	0.8
	03/01/12	03/08/12	0.4	0.2	14.1	0.9
	03/08/12	03/15/12	1.0	0.2	18.7	1.0
	03/15/12	03/22/12	0.5	0.2	9.4	0.8
	03/22/12	03/29/12	0.5	0.2	18.3	1.0
Monteview	12/29/11	01/05/12	1.7	0.3	30.1	1.2
	01/05/12	01/12/12	1.3	0.3	47.9	1.5
	01/12/12	01/19/12	1.1	0.2	26.8	1.1
	01/19/12	01/26/12	0.7	0.2	12.6	0.8
	01/26/12	02/02/12	0.9	0.2	36.3	1.3
	02/02/12	02/09/12	0.8	0.2	37.2	1.3
	02/09/12	02/16/12	1.1	0.2	47.7	1.5
	02/16/12	02/23/12	0.5	0.3	28.1	1.5
	02/23/12	03/01/12	R[1]	R[1]	R[1]	R[1]
	03/01/12	03/08/12	0.7	0.2	16.3	0.9
	03/08/12	03/15/12	1.7	0.3	38.2	1.3
	03/15/12	03/22/12	0.6	0.2	12.6	0.9
	03/22/12	03/29/12	0.9	0.2	20.9	1.0
Mud Lake	12/29/11	01/05/12	1.3	0.3	32.7	1.4
	01/05/12	01/12/12	1.9	0.3	76.4	2.0
	01/12/12	01/19/12	1.5	0.3	33.9	1.2
	01/19/12	01/26/12	0.8	0.2	18.2	0.9
	01/26/12	02/02/12	0.9	0.2	35.8	1.3
	02/02/12	02/09/12	1.1	0.2	55.0	1.5
	02/09/12	02/16/12	1.3	0.2	56.6	1.6
	02/16/12	02/23/12	1.4	0.3	22.6	1.0
	02/23/12	03/01/12	1.3	0.2	14.3	0.9
	03/01/12	03/08/12	0.7	0.2	21.6	1.0
	03/08/12	03/15/12	1.6	0.3	29.2	1.1
	03/15/12	03/22/12	0.7	0.2	13.8	0.9
	03/22/12	03/29/12	1.2	0.3	22.3	1.1

[1]R – Results rejected due to insufficient sample volume.

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, 2012.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Distant Locations						
Craters	12/29/11	01/05/12	0.3	0.2	19.9	1.0
	01/05/12	01/12/12	0.3	0.2	30.9	1.2
	01/12/12	01/19/12	0.4	0.2	17.8	1.0
	01/19/12	01/26/12	R[2]	R[2]	R[2]	R[2]
	01/26/12	02/02/12	0.5	0.2	20.4	1.0
	02/02/12	02/09/12	0.6	0.2	33.2	1.3
	02/09/12	02/16/12	0.5	0.2	28.5	1.2
	02/16/12	02/23/12	0.1	0.2	12.5	0.9
	02/23/12	03/01/12	0.4	0.2	8.7	0.8
	03/01/12	03/08/12	0.4	0.2	11.6	0.8
	03/08/12	03/15/12	0.6	0.2	17.5	1.0
	03/15/12	03/22/12	0.2	0.1	7.3	0.7
	03/22/12	03/29/12	0.6	0.2	15.2	0.9
Fort Hall[1]	12/29/11	01/05/12	0.8	0.2	17.9	0.9
	01/05/12	01/12/12	1.0	0.2	19.7	1.0
	01/12/12	01/19/12	1.0	0.2	17.2	0.9
	01/19/12	01/26/12	0.2	0.1	8.7	0.7
	01/26/12	02/02/12	0.4	0.2	15.4	0.9
	02/02/12	02/09/12	1.2	0.2	28.4	1.1
	02/09/12	02/16/12	0.8	0.2	22.2	1.0
	02/16/12	02/23/12	0.3	0.2	11.6	0.8
	02/23/12	03/01/12	0.4	0.2	9.4	0.8
	03/01/12	03/08/12	0.4	0.2	11.0	0.8
	03/08/12	03/15/12	1.2	0.2	17.9	0.9
	03/15/12	03/22/12	0.3	0.2	10.9	0.8
	03/22/12	03/29/12	0.6	0.2	16.5	0.9
Idaho Falls	12/29/11	01/05/12	1.1 J[3]	0.2 J[3]	41.4 J[3]	1.4 J[3]
	01/05/12	01/12/12	3.0 J[3]	0.6 J[3]	125.1 J[3]	3.4 J[3]
	01/12/12	01/19/12	2.6 J[3]	0.5 J[3]	59.9 J[3]	2.1 J[3]
	01/19/12	01/26/12	0.4 J[3]	0.2 J[3]	16.3 J[3]	0.9 J[3]
	01/26/12	02/02/12	1.4 J[3]	0.3 J[3]	60.9 J[3]	1.9 J[3]
	02/02/12	02/09/12	1.7 J[3]	0.3 J[3]	75.8 J[3]	2.0 J[3]
	02/09/12	02/16/12[4]	1.9 J[3]	0.4 J[3]	89.7 J[3]	2.4 J[3]
	02/16/12	02/23/12	0.8	0.3	24.6	1.2
	02/23/12	03/01/12	0.4	0.2	14.1	0.9
	03/01/12	03/08/12	0.7	0.2	18.1	1.0
	03/08/12	03/15/12	1.4	0.3	34.3	1.3
	03/15/12	03/22/12	0.6	0.2	15.9	0.9
	03/22/12	03/29/12	1.0	0.2	25.4	1.1

[1] Operated by Shoshone Bannock Tribes.
[2] R – Results rejected due to insufficient sample volume.
[3] J = estimate value - mass flow meter malfunction in the TSP sampler resulting in an incorrect (high) concentration for gross alpha, gross beta, and Be-7.
[4] 2/16/2012 – TSP sampler replaced at Idaho Falls station.

Appendix B

Table B-1. Results for all electret locations, first quarter, 2012.

Sample Location	Net Corrected Exposure Rate (µR/h)	± 2 SD (µR/h)
Arco	14.5	0.7
Craters	8.3	0.5
Rest Area	12.9	3.4
Van Buren	15.1	3.7
EFS	14.0	3.3
Main Gate	13.8	3.5
Atomic City	10.2	1.1
Taber	13.4	3.1
Blackfoot	10.6	1.6
Ft. Hall[1]	13.0	1.4
Idaho Falls	9.7	1.1
Mud Lake/Terreton	10.6	2.0
Monteview	10.5	0.7
Sand Dunes	13.7	1.9
Howe Met. Tower	11.5	2.7
MP276 -20	12.1	2.2
MP274 -20	9.4	2.4
MP272 -20	11.5	3.3
MP270 -20	11.6	1.3
MP268 -20	12.6	2.9
MP266 -20	13.6	2.8
MP264 -20	12.6	0.5
MP270 -20/26	12.8	2.3
MP268 -20/26	12.5	3.6
MP266 -20/26	12.9	3.3
MP263 -20/26[2]	12.5(J)	4.2 (J)
MP261 -20/26	13.0	3.9
MP259 -20/26	12.2	3.6
MFC (EBR II)	14.3	2.9
EBR I	12.6	2.8
RWMC	11.3	2.0
CFA	14.4	1.8
CITRC (PBF)	12.5	2.5

[1]Station operated by Shoshone-Bannock Tribes.
[2]The reported result is the mean of the results from three individual electrets placed at each location. The “J” qualifier (estimate) indicates that the individual results did not meet DEQ-INL OP agreement criteria.

Table B-1 continued. Results for all electret locations, first quarter, 2012.

Sample Location	Net Corrected Exposure Rate (µR/h)	± 2 SD (µR/h)
INTEC (ICPPI)	14.6	1.7
ATR (TRA)	15.5	0.8
NRF	14.4	1.4
TAN	13.1	2.6
Mud Lake Bank of Commerce	14.0	2.3
MP43-33	11.6	3.3
MP41-33	16.3	3.0
MP39-33	13.5	2.8
MP37-33	12.0	1.8
MP35-33	12.0	2.9
MP33-33	12.8	3.4
MP31-33	14.4	2.6
MP29-33	12.2	3.2
MP27-33	14.7	1.9
MP25-33	11.6	2.7
MP23-33[1]	13.3(J)	4.9 (J)
Base of Howe	14.4	3.1
Rover	15.7	1.9
Hamer[1]	13.6(J)	4.2 (J)
Sugar City	17.8	1.6
Roberts	11.3	1.4
Big Southern Butte	10.9	0.9

[1]The reported result is the mean of the results from three individual electrets placed at each location. The "J" qualifier (estimate) indicates that the individual results did not meet DEQ-INL OP agreement criteria.

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