

Department of Environmental Quality  
INL Oversight Program

**ENVIRONMENTAL SURVEILLANCE PROGRAM  
QUARTERLY DATA REPORT**

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# Table of Acronyms

aCi/L	-	attocuries per liter	RCRA	-	Resource Conservation and Recovery Act
BEA	-	Battelle Energy Alliance, LLC	RPD	-	relative percent difference
BLR	-	Big Lost River	RWMC	-	Radioactive Waste Management Complex
CERCLA	-	Comprehensive Environmental Response, Compensation and Liability Act	RTC	-	Reactor Technology Complex
CFA	-	Central Facilities Area	SD	-	standard deviation
CWI	-	CH2M-WG Idaho, LLC	SMCL	-	secondary maximum contaminant level
DEQ-INL OP	-	The State of Idaho, Department of Environmental Quality, Idaho National Laboratory Oversight Program	TAN	-	Test Area North
DOE	-	U.S. Department of Energy	TCE	-	trichloroethene
EIC	-	electret ionization chamber	TDS	-	total dissolved solids
EML	-	Environmental Monitoring Laboratory	TMI	-	Three Mile Island
EPA	-	Environmental Protection Agency	TSP	-	total suspended particulate
ESER	-	Environmental Surveillance, Education and Research Program	TSS	-	total suspended solids
ESP	-	Environmental Surveillance Program	USGS	-	U.S. Geological Survey
ESRPA	-	Eastern Snake River Plain Aquifer	VOC	-	volatile organic compound
GSS	-	Gonzales-Stoller Surveillance LLC	WLAP	-	Wastewater Land Application Permit
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 1/1000 <sup>th</sup> 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 <sup>3</sup>	-	picocuries per cubic meter			
PCE	-	perchloroethene			
QAPP	-	Quality Assurance Program Plan			
QA/QC	-	Quality Assurance/Quality Control			

## 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, near the boundaries of the INL, and at distant locations to the INL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

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

Results of the ESP are published using two distinct reporting formats: quarterly data reports and an annual ESP report. The annual ESP report is designed for a broad audience and summarizes the results of the ESP for the previous four quarters. The annual report's primary emphasis is to focus on trends, ascertain the impacts of DOE operations on the environment, and confirm the validity of DOE monitoring programs. This quarterly report is designed to document the results of the ESP on a quarterly basis and provide detailed data 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 second quarter, (**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 second 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.

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 second 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 measured above the minimum detectable concentration (MDC) during the second quarter of 2012 at Experimental Field Station. While the results are above MDC they are still well below regulatory limits. Average atmospheric tritium concentrations are presented in **Table 4**.

Precipitation samples were collected at six monitoring locations during the second 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 second 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.

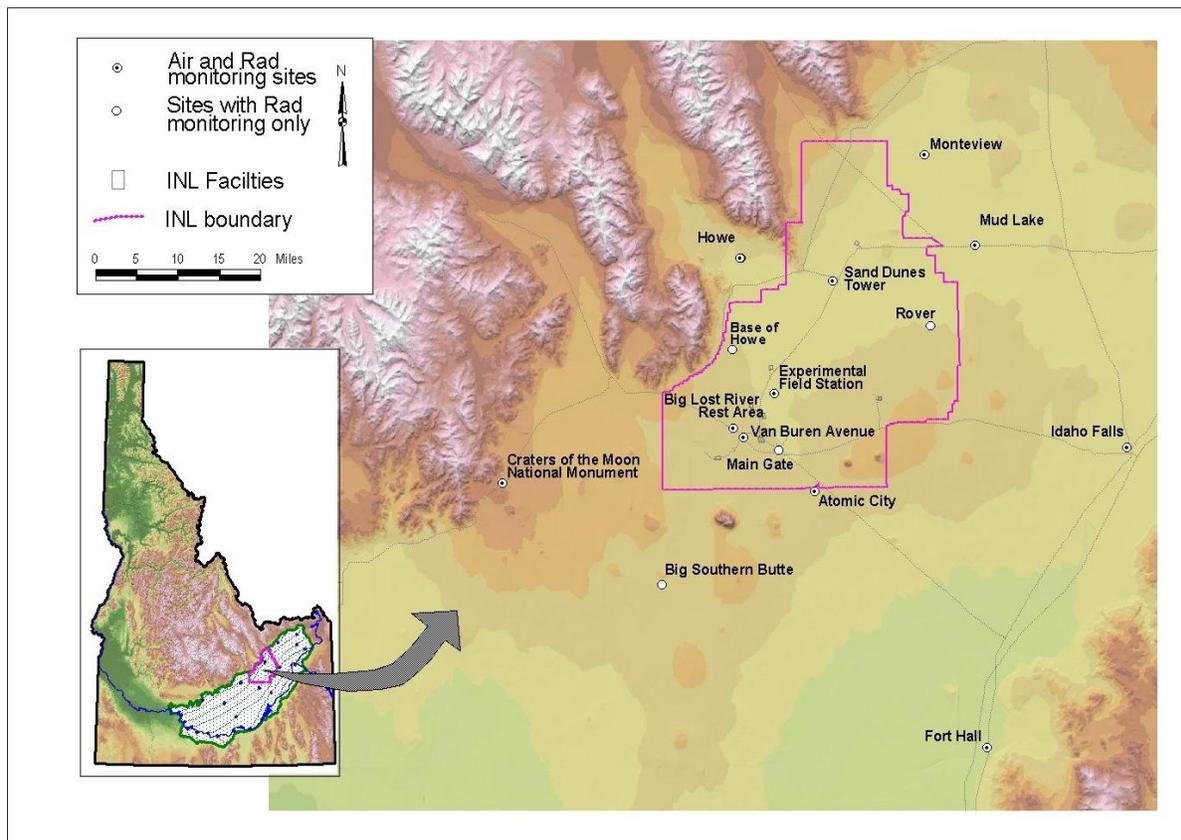


Figure 1. Air and radiation monitoring sites.

**Table 1. Sampling locations and sample type.**

Station Locations	Sample type <sup>1</sup>			
	TSP	Radioiodine	Water Vapor	Precipitation
<b>On-site Locations</b>				
Big Lost River Rest Area	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Experimental Field Station	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sand Dunes Tower	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Van Buren Avenue	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Boundary Locations</b>				
Atomic City	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Howe	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Monteview	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Mud Lake	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Distant Locations</b>				
Craters of the Moon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Fort Hall <sup>2</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Idaho Falls	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

<sup>1</sup>  Samples collected weekly;  Samples collected quarterly.

<sup>2</sup> TSP and radioiodine samples collected by Shoshone-Bannock Tribes.

**Table 2. Range of gross alpha and gross beta concentrations for TSP filters, second quarter, 2012.**

Station Location	Concentration					
	Gross Alpha			Gross Beta		
<b>On-Site Locations</b>						
Big Lost River Rest Area	0.5	-	1.6	18.4	-	36.3
Experimental Field Station	0.6	-	1.4	15.0	-	31.5
Sand Dunes Tower	0.4	-	1.3	14.5	-	33.2
Van Buren Avenue	0.2	-	1.1	15.3	-	31.1
<b>Boundary Locations</b>						
Atomic City	0.6	-	1.3	16.7	-	33.5
Howe	0.6	-	1.4	13.2	-	27.1
Monteview	0.5	-	1.5	18.1	-	35.3
Mud Lake	0.9	-	2.0	22.7	-	40.7
<b>Distant Locations</b>						
Craters of the Moon	0.4	-	0.9	12.1	-	22.1
Fort Hall <sup>1</sup>	0.5	-	1.6	11.2	-	23.9
Idaho Falls	0.9	-	1.9	19.5	-	38.9

<sup>1</sup> Operated by Shoshone-Bannock Tribes.

Note: Concentrations are expressed in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.

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

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
<b>On-site Locations</b>			
Big Lost River Rest Area	97.9	5.0	<MDC <sup>2</sup>
Experimental Field Station	75.4	4.1	<MDC
Sand Dunes Tower	66.5	3.5	<MDC
Van Buren Avenue	77.1	4.0	<MDC
<b>Boundary Locations</b>			
Atomic City	78.8	4.2	<MDC
Howe	72.8	3.8	<MDC
Monteview	100.5	5.1	<MDC
Mud Lake	103.6	5.5	<MDC
<b>Distant Locations</b>			
Craters of the Moon	74.7	3.9	<MDC
Fort Hall <sup>1</sup>	59.3	3.1	<MDC
Idaho Falls	105.5	5.4	<MDC

<sup>1</sup>Operated by Shoshone-Bannock Tribes.<sup>2</sup>MDC for Cs-137 typically (5-10)x10<sup>-5</sup> pCi/m<sup>3</sup>.Note: Concentrations are reported in 1 x 10<sup>-3</sup> pCi/m<sup>3</sup> with associated uncertainty (± 2 SD), and minimum detectable concentration (MDC).**Table 4. Tritium concentrations in air from atmospheric moisture, second quarter, 2012**

Station Location	Tritium		
	Concentration	± 2 SD	MDC
<b>On-site Locations</b>			
Big Lost River Rest Area	0.38	0.27	0.45
Experimental Field Station	0.75	0.25	0.41
Sand Dunes Tower	0.22	0.24	0.39
Van Buren Avenue	0.29	0.27	0.45
<b>Boundary Locations</b>			
Atomic City	0.09	0.27	0.45
Howe	0.16	0.27	0.44
Mud Lake	0.08	0.35	0.58
Monteview	0.25	0.33	0.55
<b>Distant Locations</b>			
Craters of the Moon	0.20	0.29	0.49
Fort Hall <sup>1</sup>	0.12	0.39	0.66
Idaho Falls	0.04	0.29	0.50

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

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

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
<b>On-site Locations</b>						
Big Lost River Rest Area	40	100	170	0.8	1.5	2.6
<b>Boundary Locations</b>						
Atomic City	40	100	170	0.2	1.4	2.4
Howe	30	100	170	1.3	1.7	2.8
Monteview	50	100	170	0.0	1.7	3.0
Mud Lake	60	100	170	0.0	1.8	3.1
<b>Distant Locations</b>						
Idaho Falls	60	100	170	0.0	2.0	3.5

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

## Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the second 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 6**).

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 7** lists the average radiation exposure rates measured by the HPICs for second quarter 2012. **Table 8** lists the EIC monitoring results for second quarter 2012. Overall exposure rates were within the expected historical range of values observed by DEQ-INL OP for background radiation. The HPIC at Rover experienced large uncertainties ( $\pm 2$  SD) due to the fact that it was recently changed out, along with all of the other HPICs, and has not yet had all of the new installation issues resolved resulting in occasional erratic readings. Its respective average was in the normal range and far below Oversight's HPIC action level of 28  $\mu$ R/hr.

**Table 6. Summary of instrumentation at radiation monitoring stations.**

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

<sup>1</sup> HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL OP.

**Table 7. Average gamma exposure rates, second quarter, 2012, from HPIC network.**

Station Location	Exposure Rate (µR/hr)	
	Quarterly Average	± 2 SD
<b>On-site Locations</b>		
Base of Howe	13.2	1.9
Big Lost River Rest Area	15.4	1.1
Main Gate	15.9	2.2
Rover	7.9	9.6
Sand Dunes Tower	13.8	0.6
<b>Boundary Locations</b>		
Atomic City	12.5	0.9
Big Southern Butte	14.9	2.5
Howe Met Tower	12.0	3.0
Monteview	13.2	0.7
Mud Lake/Terreton	14.9	0.8
<b>Distant Locations</b>		
Fort Hall <sup>1</sup>	13.9	0.8
Idaho Falls	13.4	1.7

<sup>1</sup> Operated by Shoshone-Bannock Tribes.

**Table 8. Electret ionization chamber (EIC) cumulative average exposure rates, second quarter, 2012.**

Station Location	Exposure Rate ( $\mu\text{R/hr}$ )	
	Quarterly Average	$\pm 2 \text{ SD}$
<b>On-site Locations</b>		
Base of Howe	13.3	1.8
Big Lost River Rest Area	13.5	2.4
Experimental Field Station	14.9	1.8
Main Gate	14.1	1.9
Rover	13.6	0.6
Sand Dunes Tower	15.9	3.5
Van Buren Avenue	12.6	1.0
<b>Boundary Locations</b>		
Atomic City	11.3	0.6
Big Southern Butte	12.8	1.1
Howe Met Tower	10.8	1.7
Monteview	13.4	2.0
Mud Lake / Terreton	18.0	1.5
<b>Distant Locations</b>		
Craters of the Moon	11.9	3.5
Fort Hall <sup>1</sup>	12.2	2.0
Idaho Falls	12.4	3.4

<sup>1</sup> 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 second quarter of 2012, 4 up-gradient, 22 facility, 10 boundary, 17 distant, and 2 surface water locations were sampled. Of the 10 boundary locations, 5 are Westbay<sup>TM</sup> packer sampling systems, which allow water samples to be collected from discrete levels or zones within the well. These wells include USGS-103, USGS-105, USGS-108, Middle-2051, and USGS-132. Each well was only sampled from one zone. For 2012 some zones were renumbered, so zone depths and numbers might not match with previous reports. To account for this, only the well name and depth sampled will be reported. USGS-103 was sampled at a depth of 1258.0 feet below land surface (bls). USGS-105 was sampled at a depth of 1069.6 feet bls. USGS-108 was sampled at a depth of 887.7 feet

bls. Middle-2051 was sampled at a depth of 1021.0 feet bls. USGS-132 was sampled at a depth of 763.0 feet bls.

Most sites sampled by DEQ-INL OP 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 OP 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. Quantitative gamma analyses are conducted to identify and determine concentrations of gamma emitting radionuclides. 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.

Gross alpha radioactivity was detected at 1 up-gradient, 5 facility, 2 boundary, 2 distant, and 2 surface water locations. Concentrations observed at facility locations were in areas of known contamination and consistent with historical trends. All other locations with detectable results were within the range of concentrations observed for naturally-occurring radioactivity. The EPA maximum contaminant level (MCL) for alpha particles is 15 pCi/L.

Gross beta radioactivity was detected in each of the 5 areas (up-gradient, facility, boundary, distant, and surface water) sampled. Concentrations observed at facility locations were consistent with historical trends. Concentrations for up-gradient, boundary, distant, and surface water locations were within the range of concentrations observed for naturally-occurring radioactivity. The MCL for beta and gamma radioactivity is 4 mrem/year, equivalent to 8 pCi/L if the source is strontium-90; 900 pCi/L if technetium-99; 20,000 pCi/L if tritium; or 200 pCi/L if cesium-137. Man-made, gamma emitting radioactivity was not detected at any of the sampled locations. Results for gross alpha; gross beta; and man-made, gamma emitting cesium-137 are shown in **Table 9**.

Four sites were sampled for plutonium isotopes (**Table 10**). There were no detectable results for plutonium isotopes this quarter.

Seven sites were sampled for isotopes of uranium. All seven sample sites had detectable results for uranium-234, seven detectable results for uranium-238, and two detectable results for uranium-235 (**Table 11**). The isotopic ratios of results observed at five of the sample sites cannot be distinguished from background concentrations, which means the uranium found in the samples is likely to be naturally occurring. Analysis results for samples collected from TAN-28, and TAN-29 suggest uranium-238 at greater than natural background levels. Uranium related to historic waste disposal activities at Test Area North has previously been identified. Four sites were sampled for americium-241 this quarter. There were no detections (**Table 12**).

Four of fifteen samples analyzed for strontium-90 had detectable results this quarter (**Table 13**). All samples were from locations in areas of known contamination. All seven locations sampled for technetium-99 had detectable results this quarter (**Table 14**). All results were within the expected ranges of concentrations.

Using the standard analytical method, tritium was detected in eleven of twenty-two facility samples (**Table 15**). Detections are consistent with historic concentrations for these sites. There were four detectable concentrations found at westbay boundary locations, including USGS-103, USGS-105,



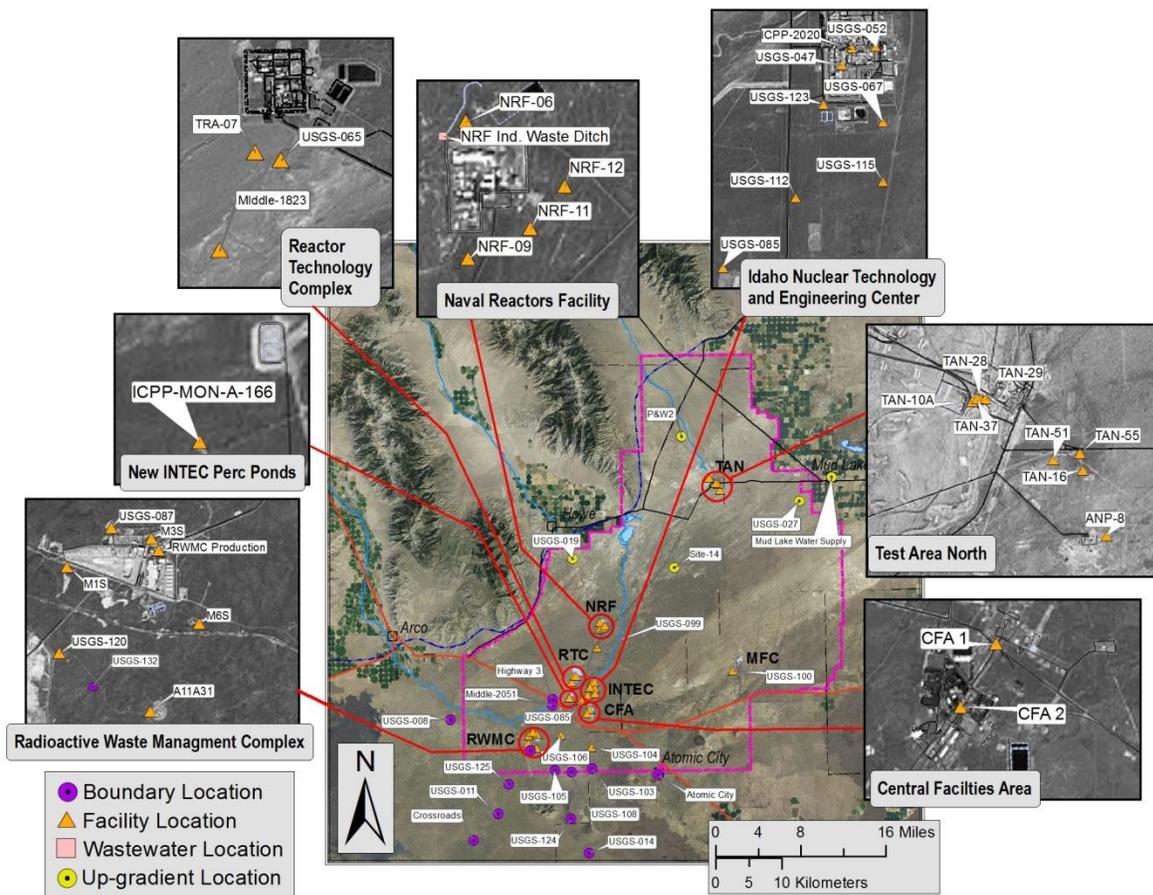


Figure 3. Up-gradient, facility, boundary and wastewater monitoring locations. second quarter, 2012.

**Table 9. Alpha, beta, and gamma concentrations for water samples, second quarter, 2012.**

Sample Location	Sample Date	Gross Alpha			Gross Beta			Man-made gamma-emitting radionuclide Cesium-137		
		Concentration <sup>1,2</sup>		± 2 SD	Concentration <sup>1,2</sup>		± 2 SD	Concentration <sup>1,2</sup>		± 2 SD
<b>Up-gradient</b>										
Mud Lake Water Supply	5/9/2012	-0.4	U	0.7	3.1		0.9	0.0	U	1.3
Mud Lake Water Supply	6/27/2012	0.2	UJ	0.8	2.6	J	0.8	0.1	U	1.5
P&W-2	4/17/2012	1.6		0.9	0.4	U	0.8	-0.2	U	1.6
USGS-019	4/17/2012	0.5	U	1.0	1.6		0.9	0.0	U	2.1
USGS-027	4/17/2012	1.0	U	1.2	6.8		1.1	0.1	U	1.6
<b>Facility</b>										
A11A31	5/9/2012	0.3	U	1.0	4.4		0.9	0.2	U	2.0
ANP-8	5/15/2012	0.5	U	1.0	4.7		1.0	0.6	U	1.5
CFA 1	4/18/2012	1.2	U	1.1	6.9		1.1	1.4	U	2.2
ICPP-MON-A-166	4/3/2012	1.9		0.9	2.5		0.9	0.2	U	1.4
M1S	5/8/2012	-0.6	U	0.7	3.3		0.8	0.0	U	1.3
M3S	5/8/2012	1.0	U	1.1	4.2		0.9	1.0	U	1.7
M6S	5/9/2012	2.0		1.1	4.1		0.9	-0.9	U	2.2
NRF-06	5/16/2012	2.5	U	5.0	5.6	U	3.8	2.2	U	1.8
NRF-09	5/17/2012	-1.2	U	1.3	4.9		1.0	-0.3	U	2.6
NRF-11	5/16/2012	0.1	U	1.4	3.7		1.0	-0.7	U	1.7
NRF-12	5/16/2012	0.1	U	1.4	3.7		1.0	-1.0	U	1.8
TAN-16	5/15/2012	4.6		1.3	13.0		1.1	-0.5	U	1.4
TAN-28	4/11/2012	13.6		3.9	557		9	-0.3	U	2.2
TAN-29	4/11/2012	3.3		2.1	67.3		3.3	1.8	U	2.2
TAN-37	4/11/2012	-1.3	U	2.9	703		10	2.6	U	1.8
TAN-51	5/15/2012	1.5	U	1.1	3.8		0.9	0.2	U	1.5
TAN-55	5/15/2012	1.5	U	1.3	4.3		0.9	0.6	U	1.3
USGS-065	4/12/2012	1.3	U	1.3	3.2		1.0	-0.1	U	1.6
USGS-085	4/3/2012	0.6	U	1.1	8.9		1.1	-0.2	U	1.7
USGS-087	4/19/2012	0.2	U	1.1	1.7		1.0	-1.0	U	1.8
USGS-099	5/17/2012	-0.2	U	1.2	3.4		0.9	-0.6	U	2.2
USGS-100	4/10/2012	0.4	U	1.0	3.5		0.9	1.2	U	1.8
<b>Boundary</b>										
Atomic City	4/23/2012	0.6	U	0.8	2.5		0.9	0.3	U	1.4
Crossroads	4/23/2012	1.4		1.0	1.0	U	0.9	2.4	U	1.7
USGS-008	4/10/2012	0.6	U	1.0	2.1		0.9	-0.7	U	1.5
USGS-011	4/16/2012	0.7	U	0.9	1.9		0.8	0.0	U	1.6
USGS-103	6/25/2012	0.5	U	0.9	3.7		0.9	0.0	U	2.2

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

Table 9.continued.

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made gamma-emitting radionuclide Cesium-137				
		Concentration <sup>1,2</sup>	± 2 SD	Concentration <sup>1,2</sup>	± 2 SD	Concentration <sup>1,2</sup>	± 2 SD			
<b>Boundary (cont'd)</b>										
USGS-105	6/28/2012	1.3	U	0.9	2.2		0.8	-0.5	U	2.3
USGS-108	6/26/2012	0.6	U	1.0	2.6		0.9	0.0	U	3.0
USGS-124	4/16/2012	1.7		0.9	1.1	U	0.9	0.3	U	1.6
Middle-2051	6/20/2012	0.7	U	1.0	2.1		0.9	-0.8	U	1.9
USGS-132	6/19/2012	0.6	U	0.9	3.1		0.8	0.4	U	2.7
<b>Distant</b>										
Alpheus Spring	5/7/2012	0.5	U	1.6	8.6		1.2	-0.4	U	1.9
Bill Jones Hatchery	5/7/2012	0.1	U	0.8	3.3		0.9	-0.6	U	1.6
Bill Jones Hatchery	6/26/2012	0.4	U	0.8	3.3		0.8	-0.1	U	1.9
Clear Spring	5/7/2012	1.5	U	1.1	4.0		0.9	0.7	U	1.5
Minidoka Water Supply	5/7/2012	0.0	U	0.9	3.5		0.9	0.0	U	1.6
Minidoka Water Supply	6/25/2012	-0.3	UJ	1.0	3.2	J	0.9	0.9	U	2.1
MV-02A	6/25/2012	0.1	U	1.3	5.4		1.0	-1.4	U	1.8
MV-14	6/26/2012	1.2	U	1.2	4.5	J	0.9	1.0	U	2.1
MV-20	6/26/2012	1.0	U	1.1	3.8	J	0.9	-0.1	U	1.3
MV-23	6/25/2012	-0.7	UJ	1.5	6.6	J	1.1	0.0	U	1.4
MV-26	6/25/2012	0.1	U	1.1	3.1	J	0.9	0.1	U	1.4
MV-40	6/25/2012	0.3	UJ	0.9	2.1	J	0.8	-0.1	U	1.5
MV-42	6/26/2012	-0.3	U	0.9	4.4		0.9	0.9	U	2.1
MV-46	6/26/2012	0.7	U	0.9	3.9	J	0.8	-1.4	U	1.8
MV-47	6/26/2012	0.2	U	1.0	3.9	J	0.9	0.1	U	1.5
MV-49	6/25/2012	2.8		1.3	3.0	J	0.9	-0.3	U	1.5
MV-51	6/26/2012	3.1	J	1.8	6.0	J	1.1	0.0	U	1.3
MV-54	6/25/2012	-0.4	UJ	1.5	7.1	J	1.1	0.5	U	1.4
Shoshone Water Supply	5/7/2012	2.1		1.1	3.1		0.9	-0.8	U	2.0
<b>Surface water</b>										
BLR @ EFS	5/3/2012	2.6		1.1	3.2		0.9	0.6	U	1.5
BLR @ INL Diversion	4/19/2012	1.3		0.8	0.6	U	0.8	-1.1	U	1.6

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

**Table 10. Reported concentrations of plutonium isotopes in water samples, second quarter, 2012.**

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240			Plutonium-241		
		Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>										
A11A31	5/9/2012	-0.012	U	0.018	0.008	U	0.018	NR	-	-
M1S	5/8/2012	-0.002	U	0.022	0.002	U	0.021	NR	-	-
M3S	5/8/2012	-0.002	U	0.021	0	U	0.021	NR	-	-
M6S	5/9/2012	0.005	U	0.019	0.005	U	0.019	NR	-	-

<sup>1</sup> Concentrations expressed in pCi/L.

<sup>2</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected, NR = analysis not requested.

**Table 11. Reported concentrations of uranium isotopes in water samples, second quarter, 2012.**

Sample Location	Sample Date	Uranium-234			Uranium-235			Uranium-238		
		Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD	Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>										
A11A31	5/9/2012	1.26		0.33	0.099		0.081	0.78		0.24
M1S	5/8/2012	0.54		0.17	-0.004	U	0.044	0.54		0.17
M3S	5/8/2012	1.49		0.36	0.001	U	0.048	0.70		0.21
M6S	5/9/2012	1.04		0.27	0.022	U	0.046	0.47		0.17
TAN-28	4/11/2012	10.1		1.9	0.27		0.17	1.42		0.40
TAN-29	4/11/2012	4.40		0.98	0.11	U	0.11	0.57		0.24
TAN-37	4/11/2012	0.44		0.19	0.046	U	0.070	0.121		0.096

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 12. Reported concentrations of americium-241 in water samples, second quarter, 2012.**

Sample Location	Sample Date	Americium-241		
		Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>				
A11A31	5/9/2012	-0.022	U	0.017
M1S	5/8/2012	-0.002	U	0.028
M3S	5/8/2012	0.020	U	0.036
M6S	5/9/2012	-0.011	U	0.018

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 13. Reported concentrations of strontium-90 in water samples, second quarter, 2012.**

Sample Location	Sample Date	Strontium-90		
		Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>				
A11A31	5/9/2012	0.01	U	0.24
CFA 1	4/18/2012	0.26	U	0.27
M1S	5/8/2012	0.20	U	0.28
M3S	5/8/2012	0.02	U	0.23
M6S	5/9/2012	0.20	U	0.29
NRF-06	5/16/2012	0.04	U	0.25
NRF-09	5/17/2012	0.11	U	0.25
NRF-11	5/16/2012	0.10	U	0.26
NRF-12	5/16/2012	-0.01	U	0.25
TAN-28	4/11/2012	226		53
TAN-29	4/11/2012	27.1		6.4
TAN-37	4/11/2012	261		61
USGS-085	4/3/2012	2.80		0.75
USGS-087	4/19/2012	0.10	U	0.22
USGS-099	5/17/2012	0.05	U	0.25

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 14. Reported concentrations of technetium-99 in water samples, second quarter, 2012.**

Sample Location	Sample Date	Technetium-99		
		Concentration <sup>1,2</sup>		± 2SD
<b>Facility</b>				
A11A31 (dissolved)	5/9/2012	0.7		0.1
CFA 1 (dissolved)	4/18/2012	9.1		0.3
M1S (dissolved)	5/8/2012	0.5		0.1
M3S (dissolved)	5/8/2012	1.3		0.2
M6S (dissolved)	5/9/2012	0.7		0.1
USGS-085 (dissolved)	4/3/2012	1.7		0.2
USGS-087 (dissolved)	4/19/2012	1.7		0.1

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 15. Tritium concentrations for water samples, second quarter, 2012.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		± 2SD
<b>Up-gradient</b>				
Mud Lake Water Supply	5/9/2012	0	U	80
Mud Lake Water Supply	6/27/2012	-160	U	100
P&W-2	4/17/2012	-40	U	100
USGS-019	4/17/2012	-20	U	100
USGS-027	4/17/2012	-80	U	100
<b>Facility</b>				
A11A31	5/9/2012	30	U	100
ANP-8	5/15/2012	130	U	90
CFA 1	4/18/2012	4380		200
ICPP-MON-A-166	4/3/2012	80	U	160
M1S	5/8/2012	-110	U	100
M3S	5/8/2012	840		110
M6S	5/9/2012	-30	U	100
NRF-06	5/16/2012	50	U	80
NRF-09	5/17/2012	-40	U	100
NRF-11	5/16/2012	-70	U	100
NRF-12	5/16/2012	-90	U	100
TAN-16	5/15/2012	200		90
TAN-28	4/11/2012	1790		140
TAN-29	4/11/2012	1520		130
TAN-37	4/11/2012	1050		120
TAN-51	5/15/2012	460		100
TAN-55	5/15/2012	720		110
USGS-065	4/12/2012	3370		180
USGS-085	4/3/2012	1500		130
USGS-087	4/19/2012	620		100
USGS-099	5/17/2012	-50	U	100
USGS-100	4/10/2012	-50	U	100
<b>Boundary</b>				
Atomic City	4/23/2012	-70	U	100
Crossroads	4/23/2012	-30	U	100
USGS-008	4/10/2012	10	U	100
USGS-011	4/16/2012	20	U	100
USGS-103	6/25/2012	270		90
USGS-105	6/28/2012	180		90
USGS-108	6/26/2012	70	U	80
USGS-124	4/16/2012	50	U	100
Middle-2051	6/20/2012	290		90
USGS-132	6/19/2012	220		90
<b>Distant</b>				
Alpheus Spring	5/7/2012	-140	U	100
Bill Jones Hatchery	5/7/2012	-50	U	100
Bill Jones Hatchery	6/26/2012	10	U	80
Clear Spring	5/7/2012	20	U	80
Minidoka Water Supply	5/7/2012	-20	U	80
Minidoka Water Supply	6/25/2012	-70	U	100
MV-02A	6/25/2012	10	U	80

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 15. continued.**

Sample Location	Sample Date	Tritium		
		Concentration <sup>1,2</sup>		± 2SD
<b>Distant (cont'd)</b>				
MV-14	6/26/2012	40	U	80
MV-20	6/26/2012	50	U	80
MV-23	6/25/2012	-50	U	100
MV-26	6/25/2012	10	U	80
MV-40	6/25/2012	-40	U	100
MV-42	6/26/2012	-30	U	80
MV-46	6/26/2012	30	U	80
MV-47	6/26/2012	20	U	80
MV-49	6/25/2012	0	U	70
MV-51	6/26/2012	-10	U	100
MV-54	6/25/2012	-60	U	100
Shoshone Water Supply	5/7/2012	0	U	80
<b>Surface water</b>				
BLR @ EFS	5/3/2012	-20	U	100
BLR @ INL Diversion	4/19/2012	10	U	100

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 16. Enriched tritium concentrations for water samples from second quarter, 2012.**

Sample Location	Sample Date	Enriched Tritium		
		Concentration <sup>1,2</sup>		± 2 SD
<b>Upgradient</b>				
Mud Lake Water Supply	11/18/2011	-1	U	6
P&W-2	10/20/2011	0	U	5
P&W-2	4/17/2012	1	U	5
Site-14	10/13/2011	-2	U	5
<b>Facility</b>				
A11A31	11/9/2011	140		9
ICPP-MON-A-166	4/3/2012	88		8
M1S	11/8/2011	-3	U	5
M6S	11/9/2011	69		9
<b>Boundary</b>				
Atomic City	4/23/2012	3	U	5
Crossroads	4/23/2012	9		6
Highway 3	10/18/2011	94		7
USGS-014	10/19/2011	6	U	6
USGS-124	4/16/2012	32		6
USGS-125	10/18/2011	48		8
<b>Distant</b>				
Alpheus Spring	11/14/2011	10		6
Bill Jones Hatchery	11/14/2011	8	U	6
Clear Spring	11/14/2011	2	U	5
Minidoka Water Supply	11/14/2011	2	U	5
Shoshone Water Supply	11/14/2011	19		7
<b>Surface Water</b>				
Birch Creek	10/17/2011	8	U	5
BLR @ INL Diversion	4/19/2012	14		6

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected

<sup>2</sup> Concentrations expressed in pCi/L.

**Table 17. Reported metals concentrations in water samples, second quarter, 2012.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>															
		Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc								
<b>Up-gradient</b>																	
Mud Lake Water Supply (dissolved)	6/27/2012	9.7		20		5.3		710		20		14		<10	U	<5	U
P&W-2 (dissolved)	4/17/2012	<5	U	45	J	<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	U
USGS-019 (dissolved)	4/17/2012	<5	U	77	J	<5	U	18		<5.0	U	<2.0	U	<10	U	<5	U
USGS-027 (dissolved)	4/17/2012	<5	U	81	J	5.3		11		<5.0	U	2.6	J	<10	U	<5	U
<b>Facility</b>																	
A11A31 (total)	5/9/2012	<5	U	35		13		60	J	<5.0	UJ	<2.0	U	<10	U	280	
CFA 1 (dissolved)	4/18/2012	<5	U	88	J	9.4		<10	U	<5.0	U	<2.0	U	<10	U	<5	U
ICPP-MON-A-166 (total)	4/3/2012	<5	U	50		5.2		38		<5.0	U	23		<10	U	<5	U
M1S (total)	5/8/2012	<5	U	22		32		21	J	<5.0	UJ	<2.0	U	<10	U	<5	U
M3S (total)	5/8/2012	<5	U	44		13		69	J	<5.0	UJ	<2.0	U	<10	U	<5	U
M6S (total)	5/9/2012	<5	U	30		21		1700	J	<5.0	UJ	4.4		<10	U	<5	U
NRF-06 (total)	5/16/2012	<5	U	150		40		38	J	<5.0	UJ	<2.0	U	<10	U	<5	U
NRF-09 (total)	5/17/2012	<5	U	140		11		<10	UJ	<5.0	UJ	<2.0	U	<10	U	<5	U
NRF-11 (total)	5/16/2012	<5	U	150		14		12	J	<5.0	UJ	<2.0	U	<10	U	<5	U
NRF-12 (total)	5/16/2012	<5	U	140		11		72	J	<5.0	UJ	<2.0	U	<10	U	<5	U
USGS-065 (total)	4/12/2012	<5	U	46	J	77		10		<5.0	U	<2.0	U	<10	U	<5	U
USGS-085 (dissolved)	4/3/2012	<5	U	86		21		<10	U	<5.0	U	<2.0	U	<10	U	<5	U
USGS-087 (dissolved)	4/19/2012	<5	U	26	J	6.9		<10	U	<5.0	U	5.7	J	<10	U	11	
USGS-099 (total)	5/17/2012	<5	U	100		5.8		19	J	<5.0	UJ	<2.0	U	<10	U	<5	U
USGS-100 (dissolved)	4/10/2012	<5	U	35		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	5	
<b>Boundary</b>																	
Atomic City (dissolved)	4/23/2012	<5	U	35	J	<5	U	<10	U	<5.0	U	<2.0	U	<10	U	49	
Crossroads (dissolved)	4/23/2012	<5	U	32	J	<5	U	<10	U	<5.0	U	<2.0	U	<10	U	110	
USGS-008 (dissolved)	4/10/2012	<5	U	77		<5	U	13		<5.0	U	<2.0	U	<10	U	<5	U

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

<sup>2</sup> Concentrations are expressed in µg/L. Samples are filtered unless otherwise indicated.

**Table 17. continued.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>															
		Arsenic		Barium		Chromium		Iron		Lead		Manganese		Selenium		Zinc	
<b>Boundary (cont'd)</b>																	
USGS-011 (dissolved)	4/16/2012	<5	U	51	J	<5	U	14		<5.0	U	<2.0	U	<10	U	<5	U
USGS-103 (dissolved)	6/25/2012	<5	U	46		6.2		<10	U	<5.0	U	<2.0	U	<10	U	100	J
USGS-105 (dissolved)	6/28/2012	<5	U	35		7.8		<10	U	<5.0	U	2.0		<10	U	39	
USGS-108 (dissolved)	6/26/2012	<5	U	43		6.4		<10	U	<5.0	U	<2.0	U	<10	U	18	J
USGS-124 (dissolved)	4/16/2012	<5	U	30	J	5.8		35		<5.0	U	12	J	<10	U	<5	U
Middle-2051 (dissolved)	6/20/2012	<5	U	40		6.7		<10	U	<5.0	U	9.7		<10	U	150	
USGS-132 (dissolved)	6/19/2012	<5	U	42		8.4		<10	U	<5.0	U	<2.0	U	<10	U	79	
<b>Distant</b>																	
Bill Jones Hatchery (dissolved)	6/26/2012	<5	U	21		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	UJ
Minidoka Water Supply (dissolved)	6/25/2012	<5	U	36		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	17	J
MV-02A (dissolved)	6/25/2012	<5	U	66		<5	U	14		<5.0	U	<2.0	U	<10	U	54	J
MV-14 (dissolved)	6/26/2012	<5	U	47		<5	U	12		<5.0	U	<2.0	U	<10	U	5.7	J
MV-20 (dissolved)	6/26/2012	<5	U	22		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	UJ
MV-23 (dissolved)	6/25/2012	<5	U	97		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	25	J
MV-26 (dissolved)	6/25/2012	<5	U	28		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	UJ
MV-40 (dissolved)	6/25/2012	<5	U	17		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	UJ
MV-42 (dissolved)	6/26/2012	<5	U	26		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	14	J
MV-46 (dissolved)	6/26/2012	<5	U	17		<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	UJ
MV-47 (dissolved)	6/26/2012	<5	U	19		<5	U	11		<5.0	U	<2.0	U	<10	U	18	J
MV-49 (dissolved)	6/25/2012	<5	U	62		<5	U	27		<5.0	U	<2.0	U	<10	U	270	J
MV-51 (dissolved)	6/26/2012	<5	U	65		<5	U	29		<5.0	U	2.4		<10	U	83	J
MV-54 (dissolved)	6/25/2012	<5	U	100		<5	U	11		<5.0	U	<2.0	U	<10	U	120	J
<b>Surface water</b>																	
BLR @ EFS (dissolved)	5/3/2012	<5	U	84		<5	U	<10	UJ	<5.0	UJ	<2.0	U	<10	U	<5	U
BLR @ INL Diversion (dissolved)	4/19/2012	<5	U	90	J	<5	U	<10	U	<5.0	U	<2.0	U	<10	U	<5	U

<sup>1</sup> Data qualifiers: U = non-detection , J = estimate, R = rejected, . A “<” indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations are expressed in µg/L. Samples are filtered unless otherwise indicated.

**Table 18. Reported common ion concentrations in water samples, second quarter, 2012.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>											
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Silica	Alkalinity <sup>3</sup>	TDS <sup>4</sup>	TSS <sup>5</sup>	
<b>Up-gradient</b>													
Mud Lake Water Supply*	6/27/2012	8.3	2.5	30	4.9	0.500	5.66	7.66	NR	-	89.0	NR	NR
P&W-2*	4/17/2012	41	16	7.0	1.3	0.227	9.99	22.2	NR	-	145	NR	NR
USGS-019*	4/17/2012	46	18	9.8	1.4	<0.200	U	14.1	22.6	NR	-	162	NR
USGS-027*	4/17/2012	51	19	28	6.0	0.616	49.7	39.4	NR	-	152	NR	NR
<b>Facility</b>													
A11A31	5/9/2012	37	17	25	4.0	0.220	28.7	45.0	NR	-	136	NR	NR
CFA 1*	4/18/2012	61	18	22	3.4	<0.200	U	79.0	28.9	NR	-	132	NR
ICPP-MON-A-166	4/3/2012	33	12	9.4	2.6	0.296	8.95	18.1	NR	-	127	NR	NR
M1S	5/8/2012	28	12	12	2.6	0.248	15.2	22.2	NR	-	99	NR	NR
M3S	5/8/2012	46	15	8.6	2.7	<0.200	U	16.9	25.7	NR	-	98	NR
M6S	5/9/2012	37	18	14	3.3	<0.200	U	27.6	51.3	NR	-	104	NR
NRF-06	5/16/2012	160	41	190	6.6	<0.200	U	580	94.3	NR	-	173	NR
NRF-09	5/17/2012	77	24	20	2.6	<0.200	U	51.4	40.4	NR	-	201	NR
NRF-11	5/16/2012	75	23	20	2.6	<0.200	U	54.5	40.2	NR	-	199	NR
NRF-12	5/16/2012	72	23	18	2.5	<0.200	U	45.3	38.6	NR	-	199	NR
USGS-065	4/12/2012	86	20	15	3.4	<0.200	U	19.8	162	NR	-	128	NR
USGS-085*	4/3/2012	55	15	11	2.5	<0.200	U	15.2	40.5	NR	-	162	NR
USGS-087*	4/19/2012	37	14	11	3.0	0.205	17.8	24.6	NR	-	127	NR	NR
USGS-099	5/17/2012	64	22	16	1.9	<0.200	U	23.3	27.2	NR	-	204	NR
USGS-100*	4/10/2012	36	12	16	3.2	0.700	16.8	15.8	NR	-	133	NR	NR
<b>Boundary</b>													
Atomic City*	4/23/2012	35	14	17	3.4	0.585	18.0	17.0	NR	-	135	NR	NR
Crossroads*	4/23/2012	39	14	7.5	2.2	<0.200	U	9.66	21.0	NR	-	141	NR

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. \* = samples are filtered for calcium, magnesium, sodium and potassium. A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

<sup>3</sup> As CaCO<sub>3</sub>

<sup>4</sup> Total Dissolved Solids

<sup>5</sup> Total Suspended Solids

**Table 18. Continued.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>																					
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Silica	Alkalinity <sup>3</sup>	TDS <sup>4</sup>	TSS <sup>5</sup>											
<b>Boundary (cont'd)</b>																							
USGS-008*	4/10/2012	45		15		6.8		1.8		<0.200	U	8.16		21.7		NR	-	156		NR	-	NR	-
USGS-011*	4/16/2012	41		14		8.3		2.3		<0.200	U	14.6		23.6		NR	-	140		NR	-	NR	-
USGS-103*	6/25/2012	40		15		8.8		2.5		<0.200	U	16.8		24.1		NR	-	141		NR	-	NR	-
USGS-105*	6/28/2012	38		14		11		2.9		0.204		14.2		24.6		NR	-	141		NR	-	NR	-
USGS-108*	6/26/2012	44		18		8.5		2.3		<0.200	U	19.7		26.5		NR	-	150		NR	-	NR	-
USGS-124*	4/16/2012	40		16		10		2.4		0.378		16.3		22.9		NR	-	140		NR	-	NR	-
Middle-2051*	6/20/2012	38		18		7.8		2.5		<0.200	U	13.6		24.3		NR	-	146		NR	-	NR	-
USGS-132*	6/19/2012	38		15		10		2.6		0.204		12.6		26.5		NR	-	142		NR	-	NR	-
<b>Distant</b>																							
Bill Jones Hatchery*	6/26/2012	30		16		16		3.5		0.404		12.8		27.5		NR	-	135		NR	-	NR	-
Minidoka Water Supply*	6/25/2012	46		16		21		3.5		0.599		37.5		43.9		NR	-	138		NR	-	NR	-
MV-02A*	6/25/2012	51		20		32		5.9		0.477		50.0		52.5		NR	-	165		NR	-	NR	-
MV-14*	6/26/2012	54		22		30		4.5		0.473		49.5		59.3		NR	-	162		NR	-	NR	-
MV-20*	6/26/2012	35		18		21		3.6		0.435		18.8		36.6		NR	-	146		NR	-	NR	-
MV-23*	6/25/2012	72		21		27		5.7		0.207		37.0		60.8		NR	-	210		NR	-	NR	-
MV-26*	6/25/2012	41		16		22		3.8		0.570		32.7		42.5		NR	-	135		NR	-	NR	-
MV-40*	6/25/2012	29		14		15		3.3		0.437		11.4		24.5		NR	-	128		NR	-	NR	-
MV-42*	6/26/2012	38		20		21		3.8		0.428		19.4		36.3		NR	-	158		NR	-	NR	-
MV-46*	6/26/2012	27		13		14		3.2		0.392		9.56		22.3		NR	-	120		NR	-	NR	-
MV-47*	6/26/2012	32		15		17		3.4		0.566		17.6		32.2		NR	-	130		NR	-	NR	-
MV-49*	6/25/2012	50		15		7.8		2.2		<0.200	U	4.44		18.8		NR	-	176		NR	-	NR	-
MV-51*	6/26/2012	57		24		40		5.8		0.420		51.4		63.9		NR	-	196		NR	-	NR	-
MV-54*	6/25/2012	71		28		44		6.9		0.339		69.4		78.4		NR	-	206		NR	-	NR	-
<b>Surface water</b>																							
BLR @ EFS*	5/3/2012	41		9.9		5.6		1.3		<0.200	U	3.10		17.9		NR	-	131		NR	-	NR	-
BLR @ INL Diversion*	4/19/2012	40		9.7		5.6		1.2		0.235		3.19		17.8		NR	-	128		NR	-	NR	-

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. \* = samples are filtered for calcium, magnesium, sodium and potassium. A "<" indicates a result below the Minimum Detectable Concentration. NR= analysis not requested.

<sup>2</sup> Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

<sup>3</sup> As CaCO<sub>3</sub>

<sup>4</sup> Total Dissolved Solids

<sup>5</sup> Total Suspended Solids

**Table 19. Reported nutrient concentrations in water samples, second quarter, 2012.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>									
		Nitrite + Nitrate		Phosphorus		Nitrite		Total Kjeldahl Nitrogen		Ammonia	
<b>Up-gradient</b>											
Mud Lake Water Supply	6/27/2012	0.023		0.034		NR	-	NR	-	NR	-
P&W-2	4/17/2012	0.36		0.018		NR	-	NR	-	NR	-
USGS-019	4/17/2012	0.97		0.011		NR	-	NR	-	NR	-
USGS-027	4/17/2012	2.60		0.018		NR	-	NR	-	NR	-
<b>Facility</b>											
A11A31	5/9/2012	0.87		0.020		NR	-	NR	-	0.011	J
CFA 1	4/18/2012	2.60		0.024		NR	-	NR	-	NR	-
ICPP-MON-A-166	4/3/2012	0.26		0.029		NR	-	NR	-	0.011	
M1S	5/8/2012	0.93		0.026		NR	-	NR	-	0.012	J
M3S	5/8/2012	0.83		0.024		NR	-	NR	-	<0.010	U
M6S	5/9/2012	1.10		0.032		NR	-	NR	-	0.013	J
NRF-06	5/16/2012	1.90		0.082		NR	-	NR	-	0.012	J
NRF-09	5/17/2012	2.50		0.031		NR	-	NR	-	0.014	J
NRF-11	5/16/2012	2.00		0.031		NR	-	NR	-	0.016	J
NRF-12	5/16/2012	1.90		0.031		NR	-	NR	-	0.011	J
USGS-065	4/12/2012	1.50		0.026		NR	-	NR	-	<0.010	U
USGS-085	4/3/2012	1.10		0.030		NR	-	NR	-	NR	-
USGS-087	4/19/2012	0.69		0.014		NR	-	NR	-	NR	-
USGS-099	5/17/2012	1.70		0.028		NR	-	NR	-	0.015	J
USGS-100	4/10/2012	2.00		0.022		NR	-	NR	-	NR	-
<b>Boundary</b>											
Atomic City	4/23/2012	1.5		0.022		NR	-	NR	-	<0.010	U
Crossroads	4/23/2012	0.75		0.022		NR	-	NR	-	NR	-
USGS-008	4/10/2012	0.96		0.019		NR	-	NR	-	NR	-
USGS-011	4/16/2012	0.68		0.021		NR	-	NR	-	NR	-
USGS-103	6/25/2012	0.79		0.023		NR	-	NR	-	NR	-
USGS-105	6/28/2012	0.74		0.027		NR	-	NR	-	NR	-
USGS-108	6/26/2012	0.97		0.021		NR	-	NR	-	NR	-
USGS-124	4/16/2012	0.83		0.019		NR	-	NR	-	NR	-
Middle-2051	6/20/2012	0.90		0.020		NR	-	NR	-	NR	-
USGS-132	6/19/2012	0.76		0.028		NR	-	NR	-	NR	-
<b>Distant</b>											
Bill Jones Hatchery	6/26/2012	1.20		0.026		NR	-	NR	-	NR	-
Minidoka Water Supply	6/25/2012	1.10		0.021		NR	-	NR	-	NR	-
MV-02A	6/25/2012	<0.01	U	0.025		NR	-	NR	-	NR	-
MV-14	6/26/2012	<0.01	U	0.027		NR	-	NR	-	NR	-

<sup>1</sup> Data qualifiers: U = non-detection , J = estimate, R = rejected, NR = analysis not requested,

<sup>2</sup> Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

**Table 19. continued.**

Sample Location	Sample Date	Concentration <sup>1,2</sup>									
		Nitrite + Nitrate		Phosphorus		Nitrite		Total Kjeldahl Nitrogen		Ammonia	
<b>Distant (cont'd)</b>											
MV-20	6/26/2012	2.00		0.030		NR	-	NR	-	NR	-
MV-23	6/25/2012	4.80		0.048		NR	-	NR	-	NR	-
MV-26	6/25/2012	1.00		0.023		NR	-	NR	-	NR	-
MV-40	6/25/2012	0.90		0.029		NR	-	NR	-	NR	-
MV-42	6/26/2012	2.10		0.037		NR	-	NR	-	NR	-
MV-46	6/26/2012	0.68		0.023		NR	-	NR	-	NR	-
MV-47	6/26/2012	0.81		0.025		NR	-	NR	-	NR	-
MV-49	6/25/2012	1.70		0.054		NR	-	NR	-	NR	-
MV-51	6/26/2012	2.50		0.061		NR	-	NR	-	NR	-
MV-54	6/25/2012	5.10		0.041		NR	-	NR	-	NR	-
<b>Surface water</b>											
BLR @ EFS	5/3/2012	0.110		0.012		NR	-	NR	-	NR	-
BLR @ INL Diversion	4/19/2012	<0.010	U	0.0063		NR	-	NR	-	NR	-

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected, NR = analysis not requested,

<sup>2</sup> Concentrations expressed in mg/L. Samples are filtered unless otherwise noted.

**Table 20. Reported VOC concentrations in water samples, second quarter, 2012.**

Sample Location	Sample Date	Concentrations <sup>1,2</sup>						
		1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl chloride
A11A31	5/9/2012	<0.5	1.6	<0.5	<0.5	<0.5	0.9	<0.5
M3S	5/8/2012	<0.5	2.6	<0.5	<0.5	<0.5	1.0	<0.5
M6S	5/9/2012	<0.5	1.2	<0.5	<0.5	<0.5	0.6	<0.5
ANP-08	5/15/2012	<0.5	<0.5	0.5	0.5	0.6 J	7.6	<0.5
TAN-16	5/15/2012	<0.5	<0.5	1.2	0.5	3.5 J	37.7	<0.5
TAN-28	4/11/2012	0.88	<0.5	57	94	6.4	490	5.4
TAN-29	4/11/2012	<0.5	<0.5	26	150	1.3	70	8.9
TAN-37	4/11/2012	<0.5	<0.5	1.1	95	<0.5	1.7	<0.5
TAN-51	5/15/2012	<0.5	<0.5	3.2	1.3	9.4 J	88	<0.5
TAN-55	5/15/2012	<0.5	<0.5	4.0	1.3	8.0 J	94	<0.5

<sup>1</sup> Data qualifiers: J= estimate, R= rejected. <DL = less than detection limit.

<sup>2</sup> Concentrations expressed in µg/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 second 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. Results for analyses of milk samples are presented in **Table 21**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131 was not detected in any sample

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

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40		Man-made gamma-emitting radionuclide Iodine-131 <sup>1</sup>	
		Concentration <sup>3</sup>	± 2 SD	Concentration <sup>3</sup>	± 2 SD
<b>Monitoring Samples</b>					
Howe/Nelson-Ricks Creamery	04/03/2012	1129	98	<MDC	
	05/01/2012	1585	107	<MDC	
	06/05/2012	1571	111	<MDC	
Mud Lake/Nelson-Ricks Creamery	04/02/2012	1393	116	<MDC	
	04/24/2012	1460	116	<MDC	
	06/05/2012	1365	111	<MDC	
Gooding/Glanbia	04/02/2012	1428	115	<MDC	
	05/02/2012	1442	115	<MDC	
	06/02/2012	1521	122	<MDC	
Riverside	04/08/2012	1598	121	<MDC	
	05/06/2012	1744	129	<MDC	
	06/10/2012	1875	134	<MDC	
<b>Verification Samples<sup>2</sup></b>					
Dietrich	04/03/2012	1390	99	<MDC	
Howe	04/04/2012	1505	104	<MDC	
Rupert	05/01/2012	1596	123	<MDC	
Idaho Falls	05/01/2012	1396	112	<MDC	
Howe	06/05/2012	1469	117	<MDC	
Dietrich	06/05/2012	1457	105	<MDC	

<sup>1</sup> <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).

<sup>2</sup> DEQ-INL OP samples collected by the off-site INL environmental surveillance contractor.

<sup>3</sup> 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 second 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 second quarter of 2012, the DEQ-INL OP submitted 103 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 second 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 analyses results for radiological and non-radiological analytes in ground and surface water are presented in **Table 26**, **Table 27**, and **Table 28**.

There were six anomalies noticed during the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL OP for the second quarter of 2012. The first two anomalies included detections for Barium and Manganese in a blank sample. This has been a recurring problem the past few quarters and has been linked to the deionized water used to generate the samples (**Table 27**). As a precaution, all samples analyzed on the same day as the blank sample were flagged with a “J” and qualified as an estimate. A new batch of DI water was generated and used for the other two blanks submitted this quarter. Other anomalies include detectable concentrations for Total Alkalinity in two of the three blank analyses of common ions (**Table 28**). The minimum detectable concentration limit for alkalinity is 1.0 mg/L, one sample reported a concentration of 1.0 mg/L and one sample was measured at 2.0 mg/L. With results for alkalinity ranging from 89 to 210 mg/L (**Table 18**), significantly above the blank values of 1.0 - 2.0 mg/L, no qualifiers or flags will be attached with alkalinity results analyzed on the same day as these blank samples. A blank sample showed a detection for nitrate that was measured at the detection level; no samples will be qualified. The last anomaly includes a detection for ammonia in a blank sample. All ammonia samples analyzed on the same day as the blank and that resulted in a detectable concentration were flagged with a “J” and qualified as an estimate. Also of note, Gross Alpha analyses on 07/23/12 were (J) flagged by the ISU-EML lab because a Gross Alpha blank exceeded the MDC.

## 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<sub>1</sub> = first sample result

R<sub>2</sub> = 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. Paired measurements that have an absolute difference between

the two sample results of no more than three times the pooled error for these measurements are considered to be in agreement. 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 29**, **Table 30**, **Table 31**, and **Table 32** for radiological analyses, and non-radiological analyses.

Four duplicate comparisons failed DEQ-INL criteria for the second quarter of 2012. The field duplicate collected at MV-54 for Gross Beta analysis failed the 3 sigma test with an absolute difference between the results (2.8) being higher than the 3 sigma value (2.1). All samples analyzed in the same batch as MV-54 and its duplicate will be flagged with a (J) and qualified as an estimate. A field duplicate collected at A11A31 for both iron and lead failed comparison criteria at the same site. The RPD between the two samples was found to be 24% for iron and 28% for lead; a RPD over a 20% difference is not in control. Samples that were analyzed with this field duplicate will be flagged with a (J) and will be qualified as estimates. Lastly, a field duplicate for zinc collected at MV-54 failed comparison criteria. The RPD between the two samples was found out of control with a value of 40%. Samples that were analyzed for zinc with this field duplicate will be flagged with a (J) and qualified as estimates.

## 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  $100 \pm 25$  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 second quarter 2012, no field matrices were spiked to assess the influence of the sample media on laboratory performance. However, several spiked samples were created using de-ionized water and submitted to analytical laboratories for analyses. These non-radiological constituents were used to assess ground water analyte recovery rates and the results are presented in **Table 33**, **Table 34**, and **Table 35**.

Spiked samples for VOC analyses, specifically tetrachloroethylene, and vinyl chloride either exceeded or did not achieve recovery limits (**Table 35**). All results for tetrachloroethylene analyzed with the spiked sample, and which exceeded the IDL were flagged with a (J) and qualified as an estimate. There were no detections for vinyl chloride in samples analyzed with the spiked sample during this quarter so no results were rejected.

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 (EICs) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of near 30 mR and two additional higher and lower exposures, ranging from 15 to 60 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement agrees within 3-standard deviations or 25% relative difference when compared to the known irradiated quantity. The irradiation results for second quarter 2012 are presented in **Table 36**. Real-time pressure correction is used to calculate the net exposure measured by these EIC control sets. All spiked samples passed the DEQ-INL OP criteria.

Other than the previously discussed VOC spikes, 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 second quarter of 2012.

### **Analytical QA/QC Assessment**

Other than those listed above, no issues involving sample chain of custody, sample holding times, and the analysis of blank, duplicate, and spiked samples were observed during the second 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 second 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 second 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 second quarter of 2012 the radioiodine pumps at Craters of the Moon and Sand Dunes sampling sites were replaced. TSP blowers were also replaced during the second quarter at the Van Buren and Sand Dunes sampling sites. Service reliability for air sampling equipment for the second quarter of 2012 is summarized in **Table 37**.

### **Conclusion**

All data collected for the second 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, second quarter, 2012.**

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected <sup>1</sup>	Analyzing Lab <sup>2</sup>
<b>AIR</b>								
<b>Particulate</b>	4 inch filter	Gross alpha	143	13	0	0	0	ISU-EML
		Gross beta	143	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
<b>Water Vapor</b>	Desiccant column	Tritium	34	2	0	0	0	ISU-EML
<b>Gaseous</b>	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
<b>Precipitation</b>	Poly bottle	Tritium	6	0	0	0	0	ISU-EML
		Gamma emitters	6	0	0	0	0	ISU-EML
<b>WATER</b>								
<b>Groundwater &amp; Surface Water</b>	Grab or composite	Gross alpha	58	3	4	0	0	ISU-EML
		Gross beta	58	3	4	0	0	ISU-EML
		Gamma emitters	58	3	4	0	0	ISU-EML
		Tritium	58	3	4	0	0	ISU-EML
		Enriched tritium	21	2	1	0	0	ISU-EML
		Technetium-99	7	0	1	0	0	ISU-EML
		Radiochemical	30	0	7	0	0	ISU Sub
		Metals	45	3	3	2	0	IBL
		Common Ions	45	3	3	2	0	IBL
		Nutrients	45	3	3	2	0	IBL
		Volatile Organics	10	0	1	1	0	IBL Sub
<b>TERRESTRIAL</b>								
<b>Milk</b>	Grab or composite	Gamma emitters	18	0	0	0	0	ISU-EML
<b>Soil</b>	<i>in situ</i>	Gamma emitters	0	0	0	0	0	DEQ-INL OP
	Grab – “puck”	Gamma emitters	0	0	0	0	0	ISU-EML
<b>RADIATION</b>								
<b>Ambient</b>	EICs	Gamma Radiation	55	0	0	9	0	DEQ-INL OP
	HPICs	Gamma Radiation	12	NA	NA	NA	NA	DEQ-INL OP
<b>Total Analyses</b>			<b>876</b>	<b>52</b>	<b>35</b>	<b>16</b>	<b>0</b>	
<b>Total of QC Analyses (blanks, duplicates, and spikes)</b>			<b>103</b>					
<b>Percentage of QC analyses of Total Test analyses<sup>3</sup></b>			<b>11.8%</b>					
<b>Percentage of usable data<sup>4</sup></b>			<b>100%</b>					

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

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> 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), second quarter, 2012.**

Collection Period		Corrected volume (m <sup>3</sup> ) <sup>1</sup>	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
03/29/12	04/05/12	2008	0.0	0.1	0.2	0.4
04/05/12	04/12/12	2008	-0.1	0.1	0.2	0.4
04/12/12	04/19/12	2008	0.0	0.1	0.0	0.5
04/19/12	04/26/12	2008	0.0	0.1	0.2	0.4
04/26/12	05/03/12	2008	-0.1	0.1	-0.2	0.4
05/03/12	05/10/12	2008	0.0	0.1	0.1	0.4
05/10/12	05/17/12	2008	0.0	0.1	-0.1	0.4
05/17/12	05/24/12	2008	-0.1	0.1	-0.3	0.4
05/24/12	05/31/12	2008	0.1	0.1	0.2	0.4
05/31/12	06/07/12	2008	0.2	0.1	0.6	0.4
06/07/12	06/14/12	2008	0.2	0.1	-0.2	0.4
06/14/12	06/21/12	2008	0.2	0.1	0.2	0.5
06/21/12	06/28/12	2008	0.1	0.1	0.0	0.5

Note: Concentrations and associated uncertainties (±2 SD) are expressed in 1 x 10<sup>-3</sup> pCi/m<sup>3</sup>.

<sup>1</sup> 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, second quarter, 2012.**

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration <sup>1</sup>	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
07/13/12	13	31	51	19	36	59	11	10	16
Analysis Date	Cesium-134			Cesium-137					
	Concentration <sup>1</sup>	± 2 SD	MDC	Concentration	± 2 SD	MDC			
07/13/12	0	5	8	2	4	7			

Note: Concentrations are expressed in 1 x 10<sup>-5</sup> pCi/m<sup>3</sup> with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

<sup>1</sup> 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, second quarter, 2012.**

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP122ZTR01	05/16/12	05/16/12	07/23/12	0.02	0.10	0.17
OP122ZTR02	07/17/12	07/18/12	07/23/12	0.01	0.10	0.17

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

**Table 26. Radiological blank analysis in ground and surface water for samples, second quarter, 2012.**

Sample Number	Sample Date	Concentration	± 2 SD	MDC	Within Blank Criteria?
<b>Gross Alpha</b>					
121W206	4/12/2012	-0.3	0.2	0.4	yes
121W420	5/17/2012	-0.2	0.3	0.5	yes
121W515	6/26/2012	-0.4	0.2	0.5	yes
<b>Gross Beta</b>					
121W206	4/12/2012	-0.5	0.6	1.1	yes
121W420	5/17/2012	0.5	0.6	0.9	yes
121W515	6/26/2012	0.1	0.6	1.0	yes
<b>Cesium-137</b>					
121W206	4/12/2012	-0.1	1.7	2.9	yes
121W420	5/17/2012	0.7	1.6	2.6	yes
121W515	6/26/2012	0.5	1.5	2.5	yes
<b>Tritium</b>					
121W207	4/12/2012	10	100	170	yes
121W421	5/17/2012	-10	100	170	yes
121W516	6/26/2012	90	80	130	yes
<b>Enriched Tritium</b>					
121W137	3/20/2012	27*	6	8	yes
121W207	4/12/2012	19*	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 27. Blank analysis results (µg/L) for metals in ground and surface water, second quarter, 2012.**

Sample Number	Sample Date	Arsenic	Barium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
121W209	4/12/2012	<5	3.3	<5	<10	<5	24	<10	<5
121W423	5/17/2012	<5	<2	<5	10	<5	<2	<10	<5
121W518	6/26/2012	<5	<2	<5	<10	<5	<2	<10	<5

**Table 28. Blank analysis results (mg/L) for common ions and nutrients in ground and surface water, second quarter, 2012.**

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus	Ammonia
121W210,209,208	4/12/2012	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	1.0	0.01	<0.005	<0.01
121W424,423,422	5/17/2012	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	<1.0	<0.01	<0.005	0.02
121W519,518,517	6/26/2012	<0.1	<0.1	<0.1	<0.1	<0.2	<0.4	<0.8	2.0	<0.01	<0.005	-

**Table 29. Duplicate radiological analysis results in pCi/L for ground and surface water, second quarter, 2012.**

Analysis/ Sample Location	Original Sample Number	Concentration	±2 SD	Duplicate Sample Number	Concentration	±2 SD	R <sub>1</sub> -R <sub>2</sub>	3(s <sub>1</sub> <sup>2</sup> +s <sub>2</sub> <sup>2</sup> ) <sup>1/2</sup>	Within Criteria? <sup>1</sup>
<b>Gross Alpha</b>									
A11A31	121W319	0.3	1.0	121W330	0.3	1.0	0.0	2.1	yes
ICPP-MON-A-166	121W191	1.9	0.9	121W307	0.1	0.9	1.8	1.9	yes
Alpheus Spring	121W376	0.5	1.6	121W378	0.8	1.4	0.3	3.2	yes
MV-54	121W545	-0.4	1.5	121W500	0.3	1.1	0.7	2.8	yes
<b>Gross Beta</b>									
A11A31	121W319	4.4	0.9	121W330	4.4	0.9	0.0	1.9	yes
ICPP-MON-A-166	121W191	2.5	0.9	121W307	2.7	0.8	0.2	1.8	yes
Alpheus Spring	121W376	8.6	1.2	121W378	6.9	1.1	1.7	2.3	yes
MV-54	121W545	7.1	1.1	121W500	4.3	0.9	2.8	2.1	no
<b>Gamma Spectroscopy Cesium-137</b>									
A11A31	121W319	0.2	2.0	121W330	-0.3	1.4	0.5	3.7	yes
ICPP-MON-A-166	121W191	0.2	1.4	121W307	0.8	1.7	0.6	3.3	yes
Alpheus Spring	121W376	-0.4	1.9	121W378	-0.3	1.9	0.1	4.0	yes
MV-54	121W545	0.5	1.4	121W500	1.8	2.6	1.3	4.4	yes
<b>Tritium</b>									
A11A31	121W319	30	100	121W330	60	100	30	212	yes
ICPP-MON-A-166	121W191	80	160	121W307	20	100	60	283	yes
Alpheus Spring	121W376	-140	100	121W378	40	100	180	212	yes
MV-54	121W545	-60	100	121W500	-10	70	50	183	yes
<b>Enriched Tritium</b>									
Minidoka Water Supply	111W708	2	5	111W710	2	6	0	12	yes
<b>Strontium-90</b>									
A11A31	121W322	0.01	0.24	121W333	0.05	0.24	0.04	0.51	yes
<b>Technetium-99</b>									
A11A31	121W323	0.7	0.1	121W334	0.8	0.1	0.1	0.2	yes
<b>Plutonium-238</b>									
A11A31	121W321	-0.012	0.018	121W332	0	0.022	0.01	0.04	yes
<b>Plutonium-239/240</b>									
A11A31	121W321	0.008	0.018	121W332	0.012	0.022	0.004	0.04	yes
<b>Uranium-234</b>									
A11A31	121W325	1.26	0.33	121W336	1.35	0.33	0.09	0.70	yes
<b>Uranium-235</b>									
A11A31	121W325	0.099	0.081	121W336	0.020	0.049	0.079	0.14	yes
<b>Uranium-238</b>									
A11A31	121W325	0.78	0.24	121W336	0.52	0.18	0.26	0.45	yes
<b>Americium-241</b>									
A11A31	121W320	-0.022	0.017	121W331	-0.023	0.020	0.001	0.04	yes

<sup>1</sup>/|R<sub>1</sub>-R<sub>2</sub>| ≤ 3(s<sub>1</sub><sup>2</sup>+s<sub>2</sub><sup>2</sup>)<sup>1/2</sup>

**Table 30. Duplicate results for metals (µg/L) in ground water and/or surface water, second quarter, 2012.**

Sample Location	Sample Number	Sample Date	Arsenic	Barium	Cadmium	Chromium	Iron	Lead	Manganese	Selenium	Zinc
A11A31 (total)	121W327	5/9/2012	<5	35	-	13	60	5	<2	<10	280
A11A31 (total)	121W338	5/9/2012	<5	34	-	14	76	6.6	<2	<10	300
<b>RPD</b>			<b>0</b>	<b>3</b>	<b>0</b>	<b>-7</b>	<b>-24</b>	<b>-28</b>	<b>0</b>	<b>0</b>	<b>-7</b>
ICPP-MON-A-166 (total)	121W194	4/3/2012	<5	50	-	5.2	38	<5	23	<10	<5
ICPP-MON-A-166 (total)	121W310	4/3/2012	<5	49	-	5	40	<5	23	<10	<5
<b>RPD</b>			<b>0</b>	<b>2</b>	<b>0</b>	<b>3.9</b>	<b>-5.1</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>
MV-54 (dissolved)	121W548	6/25/2012	<5	100	-	<5	11	<5	<2	<10	120
MV-28 (dissolved) @ MV-54	121W503	6/25/2012	<5	100	-	<5	10	<5	<2	<10	180
<b>RPD</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>9.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-40.0</b>

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

**Table 31. Duplicate results for common ions and nutrients (mg/L) in ground water and/or surface water, second quarter, 2012.**

Sample Location	Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity	Total Nitrogen	Total Phosphorus
A11A31	121W327,326	5/9/2012	37	17	25	4	0.22	28.7	45	136	0.87	0.02
A11A31	121W338,337	5/9/2012	37	17	27	4	0.217	28.8	44.8	137	0.87	0.021
<b>RPD</b>			<b>0.0</b>	<b>0.0</b>	<b>-8</b>	<b>0.0</b>	<b>5.4</b>	<b>-0.3</b>	<b>0.4</b>	<b>-0.7</b>	<b>0.0</b>	<b>-4.9</b>
ICPP-MON-A-166	121W194,193	4/3/2012	33	12	9.4	2.6	0.296	8.95	18.1	127	0.26	0.029
ICPP-MON-A-166	121W310,309	4/3/2012	34	12	9.4	2.6	0.263	8.84	18.2	126	0.25	0.029
<b>RPD</b>			<b>-3</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>11.8</b>	<b>1.2</b>	<b>-0.6</b>	<b>0.8</b>	<b>3.9</b>	<b>0</b>
MV-54*	121W548,547	6/25/2012	71	28	44	6.9	0.339	69.4	78.4	206	5.1	0.041
MV-28* @ MV-54	121W503,502	6/25/2012	70	28	46	7.1	0.329	79	88.2	208	5.1	0.04
<b>RPD</b>			<b>1</b>	<b>0</b>	<b>-4.4</b>	<b>-3</b>	<b>3.0</b>	<b>-12.9</b>	<b>-11.8</b>	<b>-1.0</b>	<b>0.0</b>	<b>2</b>

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

**Table 32. Duplicate results for VOCs (in µg/L) in groundwater and/or surface water, second quarter, 2012.**

Sample Location	Sample Date	Sample Number	Concentrations						
			1,1-Dichloroethene	Carbon tetrachloride	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethylene (PERC)	Trichloroethylene	Vinyl chloride
A11A31	5/9/2012	121W329	<0.5	1.6	<0.5	<0.5	<0.5	0.9	<0.5
A11A31	5/9/2012	121W340	<0.5	1.5	<0.5	<0.5	<0.5	0.9	<0.5
RPD			<b>0</b>	<b>6.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Table 33. De-ionized water spike results (in µg/L) and percent recovery for metals in ground and surface water for the second quarter, 2012.**

Spike Sample Number	Sample Date	Barium			Chromium			Lead			Manganese			Zinc		
		spike	result	%R <sup>1</sup>	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
121W204	4/17/2012	134	130	<b>97</b>	19.2	19	<b>99</b>	5.91	5.8	<b>98</b>	5.96	6.2	<b>104</b>	106	100	<b>94</b>
121W441	5/16/2012	43.5	43	<b>99</b>	6.23	6.2	<b>100</b>	7.53	7.6	<b>101</b>	7.59	7.8	<b>103</b>	34.2	33	<b>97</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 34. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2012.**

Spike Sample Number	Sample Date	Calcium			Magnesium			Sodium			Potassium			Fluoride		
		spike	result	%R <sup>1</sup>	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
121W204,203	4/17/2012	24.3	24	<b>99</b>	9.63	9.3	<b>97</b>	21.7	22	<b>101</b>	1.31	1.3	<b>99</b>	1.99	1.94	<b>98</b>
121W441,440	5/16/2012	7.86	8.3	<b>106</b>	3.12	3.1	<b>99</b>	7.01	7.3	<b>104</b>	1.66	1.7	<b>102</b>	1.44	1.47	<b>102</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 34. continued. De-ionized water spike results (in mg/L) and percent recovery for common ions and nutrients in ground and surface water for the second quarter, 2012.**

Spike Sample Number	Sample Date	Chloride			Sulfate			Total Alkalinity as CaCO <sub>3</sub>			Total Nitrogen			Total Phosphorus		
		spike	result	%R <sup>1</sup>	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
121W204,203	4/17/2012	62.8	64.8	<b>103</b>	28.3	27.3	<b>97</b>	117	115	<b>98</b>	1.71	1.7	<b>99</b>	0.0118	0.01	<b>85</b>
121W441,440	5/16/2012	48.9	57.8	<b>118</b>	39.9	41.4	<b>104</b>	43.1	43	<b>100</b>	3.15	3.1	<b>98</b>	0.0234	0.021	<b>90</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 35. De-ionized water spike results (in µg/L) and percent recovery for VOCs in ground and surface water for the second quarter, 2012.**

Spike Sample Number	Sample Date	Carbon Tetrachloride			Styrene			Tetrachloroethylene			Trichloroethylene			Vinyl Chloride		
		spike	result	%R <sup>1</sup>	spike	result	%R	spike	result	%R	spike	result	%R	spike	result	%R
121W443	5/16/2012	12.5	10.2	<b>82</b>	9.34	7.5	<b>80</b>	8.44	4.9	<b>58</b>	8.72	8.7	<b>100</b>	10.8	23.8	<b>220</b>

<sup>1</sup>A percent recovery of 100 ± 25 is considered acceptable and is recorded as %R.

**Table 36. Electret ionization chamber irradiation results (categorized as spiked samples), second quarter, 2012.**

Electret #	Exposure Received		Net Measured Exposure <sup>1</sup>		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	
Spike 1	49.0	2.5	48.9	1.4	99.8%
Spike 1	49.0	2.5	51.1	1.2	104.3%
Spike 1	49.0	2.5	51.1	1.3	104.4%
Spike 2	30.0	1.5	30.4	1.4	101.4%
Spike 2	30.0	1.5	27.6	1.4	91.9%
Spike 2	30.0	1.5	27.4	1.4	91.3%
Spike 3	25.1	1.3	25.0	1.3	99.8%
Spike 3	25.1	1.3	27.4	1.4	109.4%
Spike 3	25.1	1.3	25.8	1.3	103.0%

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

<sup>1</sup> Net measured exposure estimate includes a correction for atmospheric pressure.

**Table 37. Air sampling field equipment service reliability (percent operational), second quarter, 2012.**

Station Locations	Sample Type			
	TSP	Radioiodine	Atmospheric Moisture	Precipitation
<b>Onsite Locations</b>				
Big Lost River Rest Area	100 %	100 %	100 %	100 %
Experimental Field Station	100 %	100 %	100 %	NC <sup>1</sup>
Sand Dunes Tower	92 %	92 %	100 %	NC <sup>1</sup>
Van Buren Avenue	92 %	100 %	100 %	NC <sup>1</sup>
<b>Boundary Locations</b>				
Atomic City	100 %	100 %	100 %	100 %
Howe	100 %	100 %	100 %	100 %
Monteview	100 %	100 %	100 %	100 %
Mud Lake	100 %	100 %	100 %	100 %
<b>Distant Locations</b>				
Craters of the Moon	100 %	92 %	100 %	NC <sup>1</sup>
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.

<sup>1</sup>NC = sample not collected at this location.

## Appendix A

**Table A-1. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2012.**

Sample location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>On-site Locations</b>						
<b>Rest Area</b>	03/29/12	04/05/12	0.7	0.2	18.4	0.9
	04/05/12	04/12/12	1.0	0.2	27.0	1.1
	04/12/12	04/19/12	0.5	0.2	18.9	1.0
	04/19/12	04/26/12	1.0	0.2	28.3	1.1
	04/26/12	05/03/12	0.9	0.2	21.7	1.0
	05/03/12	05/10/12	1.1	0.2	25.7	1.1
	05/10/12	05/17/12	1.6	0.3	36.3	1.3
	05/17/12	05/24/12	0.9	0.2	24.6	1.1
	05/24/12	05/31/12	1.0	0.2	21.7	1.0
	05/31/12	06/07/12	1.2	0.2	22.6	1.0
	06/07/12	06/14/12	0.7	0.2	21.6	1.0
	06/14/12	06/21/12	1.1	0.2	25.9	1.1
	06/21/12	06/28/12	1.6	0.3	29.5	1.2
<b>Experimental Field Station</b>	03/29/12	04/05/12	0.6	0.2	16.0	0.9
	04/05/12	04/12/12	0.7	0.2	23.2	1.1
	04/12/12	04/19/12	0.6	0.2	15.0	0.9
	04/19/12	04/26/12	0.8	0.2	24.7	1.1
	04/26/12	05/03/12	0.7	0.2	17.6	1.0
	05/03/12	05/10/12	1.2	0.2	23.8	1.1
	05/10/12	05/17/12	1.4	0.3	31.5	1.2
	05/17/12	05/24/12	0.8	0.2	20.2	1.0
	05/24/12	05/31/12	0.7	0.2	17.7	1.0
	05/31/12	06/07/12	0.8	0.2	18.9	1.0
	06/07/12	06/14/12	0.6	0.2	20.1	1.0
	06/14/12	06/21/12	0.6	0.2	21.1	1.0
	06/21/12	06/28/12	1.1	0.2	24.0	1.1

**Table A-1 continued. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2012.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Sand Dunes</b>	03/29/12	04/05/12	0.6	0.2	16.1	0.9
	04/05/12	04/12/12	0.6	0.2	22.3	1.0
	04/12/12	04/19/12	0.5	0.2	15.0	0.9
	04/19/12	04/26/12	1.0	0.2	22.0	1.0
	04/26/12	05/03/12	0.7	0.2	17.7	0.9
	05/03/12	05/10/12	1.1	0.3	19.1	1.2
	05/10/12	05/17/12	1.3	0.4	33.2	2.0
	05/17/12	05/24/12	0.5	0.2	19.7	0.9
	05/24/12	05/31/12	0.4	0.2	14.5	0.8
	05/31/12	06/07/12	0.7	0.2	14.7	0.8
	06/07/12	06/14/12	0.5	0.2	15.6	0.9
	06/14/12	06/21/12	0.6	0.2	19.6	0.9
	06/21/12	06/28/12	1.0	0.2	20.4	1.0
<b>Van Buren</b>	03/29/12	04/05/12	1.1	0.2	16.0	0.9
	04/05/12	04/12/12	1.0	0.3	24.6	1.2
	04/12/12	04/19/12	0.2	0.3	15.3	1.6
	04/19/12	04/26/12	0.9	0.2	27.1	1.1
	04/26/12	05/03/12	0.7	0.2	19.9	1.0
	05/03/12	05/10/12	1.0	0.2	27.0	1.1
	05/10/12	05/17/12	1.0	0.2	31.1	1.2
	05/17/12	05/24/12	0.8	0.2	22.0	1.0
	05/24/12	05/31/12	0.6	0.2	18.0	0.9
	05/31/12	06/07/12	0.8	0.2	20.5	1.0
	06/07/12	06/14/12	0.6	0.2	18.9	1.0
	06/14/12	06/21/12	0.6	0.2	22.9	1.0
	06/21/12	06/28/12	1.0	0.2	23.8	1.0
<b>Boundary Locations</b>						
<b>Atomic City</b>	03/29/12	04/05/12	0.9	0.2	17.3	0.9
	04/05/12	04/12/12	0.8	0.2	24.8	1.0
	04/12/12	04/19/12	0.6	0.2	16.7	0.9
	04/19/12	04/26/12	0.9	0.2	26.8	1.1
	04/26/12	05/03/12	0.6	0.2	22.4	1.0
	05/03/12	05/10/12	1.1	0.2	24.3	1.0
	05/10/12	05/17/12	1.2	0.2	33.5	1.2
	05/17/12	05/24/12	0.8	0.2	22.3	1.0
	05/24/12	05/31/12	0.6	0.2	19.9	1.0
	05/31/12	06/07/12	0.9	0.2	20.1	1.0
	06/07/12	06/14/12	0.6	0.2	19.6	1.0
	06/14/12	06/21/12	0.7	0.2	23.5	1.0
	06/21/12	06/28/12	1.3	0.2	28.7	1.1

**Table A-1 continued. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2012.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Howe</b>	03/29/12	04/05/12	1.2	0.2	14.2	0.9
	04/05/12	04/12/12	1.1	0.2	21.5	1.0
	04/12/12	04/19/12	0.7	0.2	13.2	0.9
	04/19/12	04/26/12	1.1	0.3	22.7	1.2
	04/26/12	05/03/12	0.9	0.2	16.5	1.0
	05/03/12	05/10/12	0.9	0.2	19.5	1.0
	05/10/12	05/17/12	1.4	0.3	27.1	1.2
	05/17/12	05/24/12	0.9	0.3	18.2	1.3
	05/24/12	05/31/12	0.6	0.2	17.4	1.0
	05/31/12	06/07/12	0.8	0.2	16.8	0.9
	06/07/12	06/14/12	0.6	0.2	16.9	0.9
	06/14/12	06/21/12	0.8	0.2	19.3	1.0
	06/21/12	06/28/12	1.1	0.2	21.6	1.0
<b>Montevieu</b>	03/29/12	04/05/12	0.8	0.2	18.4	1.0
	04/05/12	04/12/12	1.5	0.3	31.4	1.2
	04/12/12	04/19/12	0.7	0.2	18.4	1.0
	04/19/12	04/26/12	1.5	0.3	28.3	1.2
	04/26/12	05/03/12	0.8	0.2	19.5	1.0
	05/03/12	05/10/12	1.2	0.2	26.1	1.1
	05/10/12	05/17/12	1.5	0.3	35.3	1.3
	05/17/12	05/24/12	1.0	0.2	25.1	1.1
	05/24/12	05/31/12	0.5	0.2	18.1	1.0
	05/31/12	06/07/12	0.8	0.2	21.9	1.0
	06/07/12	06/14/12	0.6	0.2	21.4	1.0
	06/14/12	06/21/12	0.9	0.2	25.1	1.1
	06/21/12	06/28/12	1.3	0.2	29.6	1.2
<b>Mud Lake</b>	03/29/12	04/05/12	1.5	0.3	22.7	1.2
	04/05/12	04/12/12	1.2	0.2	28.8	1.1
	04/12/12	04/19/12	0.9	0.2	23.7	1.1
	04/19/12	04/26/12	1.2	0.2	25.9	1.2
	04/26/12	05/03/12	1.3	0.3	23.1	1.1
	05/03/12	05/10/12	1.4	0.2	33.4	1.2
	05/10/12	05/17/12	1.7	0.3	40.4	1.3
	05/17/12	05/24/12	1.9	0.4	40.7	1.6
	05/24/12	05/31/12	0.9	0.2	25.6	1.1
	05/31/12	06/07/12	1.1	0.2	26.2	1.1
	06/07/12	06/14/12	1.3	0.2	26.7	1.1
	06/14/12	06/21/12	1.3	0.3	28.0	1.2
	06/21/12	06/28/12	2.0	0.4	39.3	1.7

**Table A-1 continued. Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2012.**

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Distant Locations</b>						
<b>Craters</b>	03/29/12	04/05/12	0.5	0.2	12.1	0.9
	04/05/12	04/12/12	0.8	0.2	22.1	1.1
	04/12/12	04/19/12	0.4	0.2	13.0	0.9
	04/19/12	04/26/12	0.6	0.2	20.5	1.1
	04/26/12	05/03/12	0.8	0.2	17.0	1.0
	05/03/12	05/10/12	0.8	0.2	22.0	1.1
	05/10/12	05/17/12	0.9	0.2	18.0	1.0
	05/17/12	05/24/12	0.5	0.2	16.9	1.0
	05/24/12	05/31/12	0.4	0.2	16.8	1.0
	05/31/12	06/07/12	0.6	0.2	14.8	0.9
	06/07/12	06/14/12	0.7	0.2	19.0	1.0
	06/14/12	06/21/12	0.9	0.2	20.4	1.0
	06/21/12	06/28/12	0.6	0.2	15.1	0.9
<b>Fort Hall<sup>1</sup></b>	03/29/12	04/05/12	1.0	0.2	11.2	0.8
	04/05/12	04/12/12	1.6	0.3	15.7	0.9
	04/12/12	04/19/12	0.7	0.2	12.0	0.8
	04/19/12	04/26/12	1.5	0.3	17.9	1.0
	04/26/12	05/03/12	0.5	0.2	13.0	0.8
	05/03/12	05/10/12	1.1	0.2	18.8	1.0
	05/10/12	05/17/12	1.3	0.2	23.9	1.1
	05/17/12	05/24/12	1.5	0.3	18.6	1.0
	05/24/12	05/31/12	0.6	0.2	15.9	0.9
	05/31/12	06/07/12	0.7	0.2	15.6	0.9
	06/07/12	06/14/12	0.7	0.2	14.0	0.9
	06/14/12	06/21/12	0.7	0.2	16.3	0.9
	06/21/12	06/28/12	1.0	0.2	18.8	1.0
<b>Idaho Falls</b>	03/29/12	04/05/12	1.3	0.3	19.5	1.2
	04/05/12	04/12/12	1.4	0.3	29.7	1.2
	04/12/12	04/19/12	0.9	0.2	20.1	1.0
	04/19/12	04/26/12	1.3	0.3	30.8	1.3
	04/26/12	05/03/12	1.4	0.3	21.6	1.1
	05/03/12	05/10/12	1.7	0.3	32.4	1.3
	05/10/12	05/17/12	1.5	0.3	38.9	1.4
	05/17/12	05/24/12	1.9	0.3	29.0	1.2
	05/24/12	05/31/12	0.9	0.2	24.3	1.1
	05/31/12	06/07/12	1.3	0.3	26.1	1.1
	06/07/12	06/14/12	1.0	0.2	22.6	1.1
	06/14/12	06/21/12	1.4	0.3	26.5	1.2
	06/21/12	06/28/12	1.9	0.3	32.0	1.3

<sup>1</sup> Operated by Shoshone-Bannock Tribes.

## Appendix B

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

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R}/\text{h}$ )	$\pm 2$ SD ( $\mu\text{R}/\text{h}$ )
Arco	12.1	0.8
Craters	11.9	3.5
Rest Area	13.5	2.4
Van Buren	12.6	1.0
EFS	14.9	1.8
Main Gate	14.1	1.9
Atomic City	11.3	0.6
Taber	15.0	2.2
Blackfoot	12.9	2.7
Ft. Hall <sup>1</sup>	12.2	2.0
Idaho Falls	12.4	3.4
Mud Lake/Terreton	18.0	1.5
Monteview	13.4	2.0
Sand Dunes	15.9	3.5
Howe Met. Tower	10.8	1.7
MP276 -20	15.5	1.0
MP274 -20	11.2	2.4
MP272 -20	13.2	2.1
MP270 -20	13.0	2.3
MP268 -20	14.3	1.8
MP266 -20	10.6	1.5
MP264 -20	11.5	2.1
MP270 -20/26	15.1	3.7
MP268 -20/26	15.7	3.6
MP266 -20/26	14.1	2.8
MP263 -20/26	14.3	0.2
MP261 -20/26	11.8	2.9
MP259 -20/26	12.5	3.2
MFC (EBR II)	14.8	2.2
EBR I	12.7	2.9
RWMC	13.0	3.1
CFA	14.3	2.4
CITRC (PBF)	16.5	1.6

<sup>1</sup>Station operated by Shoshone-Bannock Tribes.

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

Sample Location	Net Corrected Exposure Rate ( $\mu\text{R/h}$ )	$\pm 2$ SD ( $\mu\text{R/h}$ )
INTEC (ICPPI)	17.9	0.4
ATR (TRA)	16.0	2.6
NRF	14.8	1.5
TAN	13.3	2.2
Mud Lake Bank of Commerce	13.9	3.3
MP43-33	14.4	1.0
MP41-33	15.6	3.1
MP39-33	14.4	3.0
MP37-33	11.7	1.1
MP35-33	11.7	1.2
MP33-33	12.0	0.1
MP31-33	14.4	3.9
MP29-33	12.0	2.7
MP27-33	15.1	2.7
MP25-33	13.8	2.8
MP23-33 <sup>1</sup>	10.8	2.5
Base of Howe	13.3	1.8
Rover	13.6	0.6
Hamer	15.6	1.2
Sugar City	18.1	2.3
Roberts	15.3	0.9
Big Southern Butte	12.8	1.1

## 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