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INEEL Oversight
Idaho's eyes on the INEEL

ENVIRONMENTAL SURVEILLANCE PROGRAM QUARTERLY DATA REPORT

July – September, 2001

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Table of Acronyms

ANL-W - Argonne National Laboratory West
BBWI - Bechtel BWXT Idaho, LLC
CERCLA - Comprehensive Environmental Response Compensation and Liability Act
CFA - Central Facilities Area
DOE - U.S. Department of Energy
EIC - electret ionization chamber
ESP - Environmental Surveillance Program
HPIC - high-pressurized ion chamber
LLD - lower limit of detection
INEEL - Idaho National Engineering & Environmental laboratory
MDA - minimum detectable activity
LSC - liquid scintillation counting
MDC - minimum detectable concentration
µg/L - micrograms per liter
mg/L - milligrams per liter
mR/hr - milliRoentgen per hour
MRV - minimum reportable value
NOAA - National Oceanic and Atmospheric Administration
NRF - Naval Reactor Facility
pCi/L - picocuries per liter
pCi/m^3 - picocuries per meter cubed
PM_{10} - particulate matter with aerodynamic diameter less than or equal to 10 micrometers
RCRA - Resource Conservation and Recovery Act
SD - standard deviation
TSP - total suspended particulate
USGS - U.S. Geological Survey

Air and Precipitation Monitoring Results

The Environmental Surveillance Program (ESP) operated ten air monitoring stations on and near the INEEL during the third quarter, 2001 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter (PM_{10}), gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. Because this station uses identical instrumentation and sampling protocol, the INEEL Oversight Program reports the data as an additional background site.

Weekly gross alpha and gross beta radioactivity results for the PM_{10} particulate air filters are presented in **Appendix A** and summarized in **Table 2**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity. Monthly averages for gross beta concentrations for each location are presented in **Figures 2** through **12**. The monthly averages are consistent with background values. Fluctuations in the monthly values are typical of observed seasonal variations.

In mid-January 2001, the ESP began investigating an alternative particulate air sampling method to potentially replace the existing PM_{10} samplers. Maintenance and location of replacement parts for the aging PM_{10} samplers have become difficult in recent years. Ten high-volume total suspended particulate (TSP) samplers were deployed at monitoring locations with PM_{10} samplers already deployed and maintained by the ESP. Data collected by the two sampling methods during 2001 will be compared to determine whether or not the TSP samplers are an appropriate replacement to the PM_{10} samplers.

Weekly gross alpha and gross beta radioactivity results for filters from the TSP samplers are presented in **Appendix B** and summarized in **Table 3**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity observed using PM_{10} samplers.

Composites of filters collected using PM_{10} samplers and 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 for PM_{10} filters are presented in **Table 4** and gamma spectroscopy results for TSP filters are presented in **Table 5**. The only reported gamma-emitting radionuclide was Beryllium-7, a naturally occurring, cosmogenic radionuclide. No radioactive isotopes of iodine, specifically Iodine-131, were detected on the weekly charcoal cartridges.

Atmospheric moisture samples were collected at eleven locations and analyzed for tritium. Atmospheric tritium concentrations were determined using tritium concentrations measured in the atmospheric moisture collected, the quantity of atmospheric moisture collected, and the volume of air sampled. Atmospheric tritium was detected at the Experimental Field Station during the third quarter, 2001. The average atmospheric tritium concentration observed at the Experimental Field Station was 11.0 ± 2.8 pCi/m^3, which is significantly less than the INEEL OP action level for atmospheric tritium of 792 pCi/m^3. All other values were below minimum detectable concentrations for tritium in atmospheric moisture collected during third quarter. Average atmospheric tritium concentrations are presented in **Table 6**.

Precipitation samples were collected at six monitoring locations. Precipitation samples are analyzed for tritium and gamma-emitting radionuclides. Tritium or gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during first quarter, 2001. Tritium and Cesium-137 analysis results are presented in **Table 7**. See QA/QC section for discussion of elevated

tritium results. Reported values are either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter.

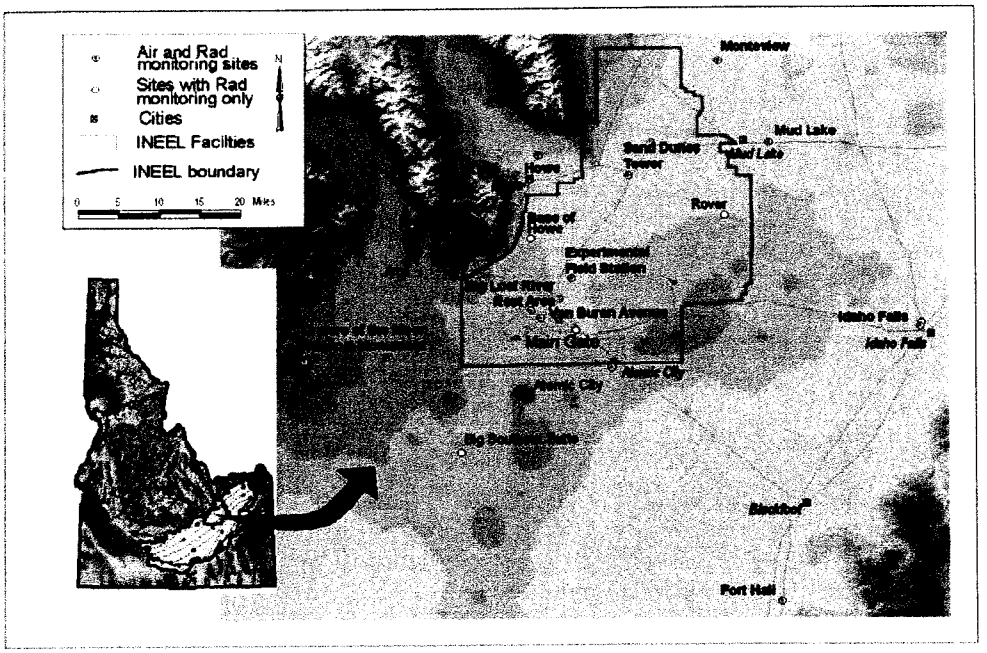

Figure 1. Air and radiation monitoring sites.

Table 1. Sampling locations and sample type.

Station Locations	Sample type				
	PM_{10}	TSP	Radioiodine	Water Vapor	Precipitation
On-site Locations					
Experimental Field Station	❑	❑	❑	■	
Big Lost River Rest Area	❑	❑	❑	■	■
Sand Dunes Tower	❑	❑	❑	■	
Van Buren Avenue	❑	❑	❑	■	
Boundary Locations					
Atomic City	❑	❑	❑	■	■
Howe	❑	❑	❑	■	■
Monteview	❑	❑	❑	■	■
Mud Lake	❑	❑	❑	■	■
Distant Locations					
Craters of the Moon	❑	❑	❑	■	
Fort Hall[1]	❑		❑	■	
Idaho Falls	❑	❑	❑	■	■

❑ Samples collected weekly.
■ Samples collected quarterly.
[1]Operated by Shoshone-Bannock Tribes.

Table 2. Range of alpha and beta concentrations for PM_{10} filters, third quarter, 2001.

Station Location	Concentration (10^{-3} pCi/m^3)	
	Gross Alpha	Gross Beta
On-Site Locations		
Big Lost River Rest Area	0.6 - 1.4	22.5 - 38.3
Experimental Field Station	0.6 - 1.6	22.3 - 40.7
Sand Dunes Tower	0.9 - 1.5	27.7 - 51.3
Van Buren Avenue	0.6 - 2.0	30.4 - 54.1
Boundary Locations		
Atomic City	0.5 - 1.6	18.6 - 33.9
Howe	0.5 - 1.8	19.0 - 44.8
Monteview	0.5 - 2.4	21.3 - 47.3
Mud Lake	0.6 - 1.7	24.5 - 41.4
Distant Locations		
Craters of the Moon	0.0 - 2.2	27.4 - 48.2
Fort Hall[1]	0.9 - 3.2	22.4 - 49.7
Idaho Falls	0.5 - 1.7	14.6 - 29.4

[1]Operated by Shoshone-Bannock Tribes.

Table 3. Range of alpha and beta concentrations for TSP filters, third quarter, 2001.

Station Location	Concentration (10^{-3} pCi/m^3)	
	Gross Alpha	Gross Beta
On-Site Locations		
Big Lost River Rest Area	0.8 - 2.0	19.9 - 35.7
Experimental Field Station	0.5 - 1.5	20.1 - 35.0
Sand Dunes Tower	0.5 - 1.6	23.1 - 38.1
Van Buren Avenue	0.6 - 1.6	19.8 - 33.6
Boundary Locations		
Atomic City	0.6 - 1.7	21.8 - 35.6
Howe	0.4 - 1.4	17.0 - 30.6
Monteview	0.4 - 1.2	15.2 - 25.3
Mud Lake	0.7 - 1.4	17.1 - 31.2
Distant Locations		
Craters of the Moon	0.3 - 2.1	14.5 - 43.5
Idaho Falls	0.8 - 1.6	17.2 - 33.0

Table 4. Gamma spectroscopy of PM_{10} filters, composite sample, third quarter, 2001.

Station Location	Naturally Occurring Radionuclide Beryllium-7 (10^{-3} pCi/m^3)		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	102	6	<MDC
Experimental Field Station	108	6	<MDC
Sand Dunes Tower	122	7	<MDC
Van Buren Avenue	159	9	<MDC
Van Buren Avenue[2]	158	9	<MDC
Boundary Locations			
Atomic City	109	6	<MDC
Howe	137	8	<MDC
Howe[2]	132	8	<MDC
Monteview	138	7	<MDC
Mud Lake	106	6	<MDC
Distant Locations			
Craters of the Moon	128	7	<MDC
Fort Hall[1]	128	7	<MDC
Idaho Falls	88	5	<MDC

[1]Operated by Shoshone-Bannock Tribes
[2] Laboratory split analysis or recount
<MDC – Value less than Minimum Detectable Concentration

Table 5. Gamma spectroscopy of TSP filters, composite sample, third quarter, 2001.

Station Location	Naturally Occurring Radionuclide Beryllium-7 (10^{-3} pCi/m^{-3} ± 2 SD)		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	115	6	<MDC
Big Lost River Rest Area[1]	115	6	<MDC
Experimental Field Station	117	6	<MDC
Experimental field Station[1]	113	6	<MDC
Sand Dunes Tower	110	6	<MDC
Van Buren Avenue	118	6	<MDC
Boundary Locations			
Atomic City	116	6	<MDC
Howe	98	5	<MDC
Monteview	103	6	<MDC
Mud Lake	102	5	<MDC
Distant Locations			
Craters of the Moon	124	7	<MDC
Idaho Falls	109	6	<MDC

[1] Laboratory split, analysis or recount.
<MDC – Value less than Minimum Detectable Concentration

Table 6. Tritium concentrations from atmospheric moisture, third quarter, 2001.

Station Location	Tritium concentration (pCi/m^3)		
	Concentration	± 2 SD	MDC[1]
On-site Locations			
Experimental Field Station	11.00	2.80	7.17
Big Lost River Rest Area	6.37	2.40	8.10
Sand Dunes Tower	1.53	1.57	5.10
Van Buren Avenue	4.24	1.87	7.09
Boundary Locations			
Atomic City	-1.36	2.40	6.90
Howe	0.00	2.02	4.96
Monteview	-0.31	2.67	9.51
Mud Lake	-0.86	2.71	9.01
Distant Locations			
Craters of the Moon	0.73	2.71	7.77
Fort Hall	0.20	2.87	8.29
Idaho Falls	-0.19	1.39	4.39

[1] MDC – Minimum Detectable Concentration

Table 7. Tritium and Cesium-137 concentrations from precipitation, third quarter, 2001.

Station Location	Tritium (pCi/L)			Cesium-137 (pCi/L)		
	Concentration	± 2 SD	MDC[1]	Concentration	± 2 SD	MDC[1]
On-site Locations						
Big Lost River Rest Area	400 J	100	140	-0.1	2.4	4.1
Big Lost River Rest Area[2]	310 J	100	150	-0.3	1.7	3.0
Big Lost River Rest Area[4]	30	90	150	NP[3]		
Boundary Locations						
Atomic City	60 J	90	150	2.6	1.8	2.8
Howe	220 J	90	150	0.4	1.6	2.7
Howe[2]	70 J	90	150	NP[3]		
Howe[4]	10	90	150	NP[3]		
Monteview	100 J	90	150	-0.9	1.6	3.0
Monteview[2]	-20 J	90	150	NP[3]		
Monteview[4]	70	90	150	NP[3]		
Mud Lake	120 J	90	140	0.2	1.8	3.0
Distant Locations						
Idaho Falls	-20 J	90	160	-1.1	2.6	4.5

[1] MDC – Minimum Detectable Concentration
[2] Laboratory split analysis, recount, or re-evaporation.
[3] Analysis not performed.
[4] Re-distilled and recounted sample
J = Estimated value, due to potential tritium cross-contamination, see QA/QC section for discussion.

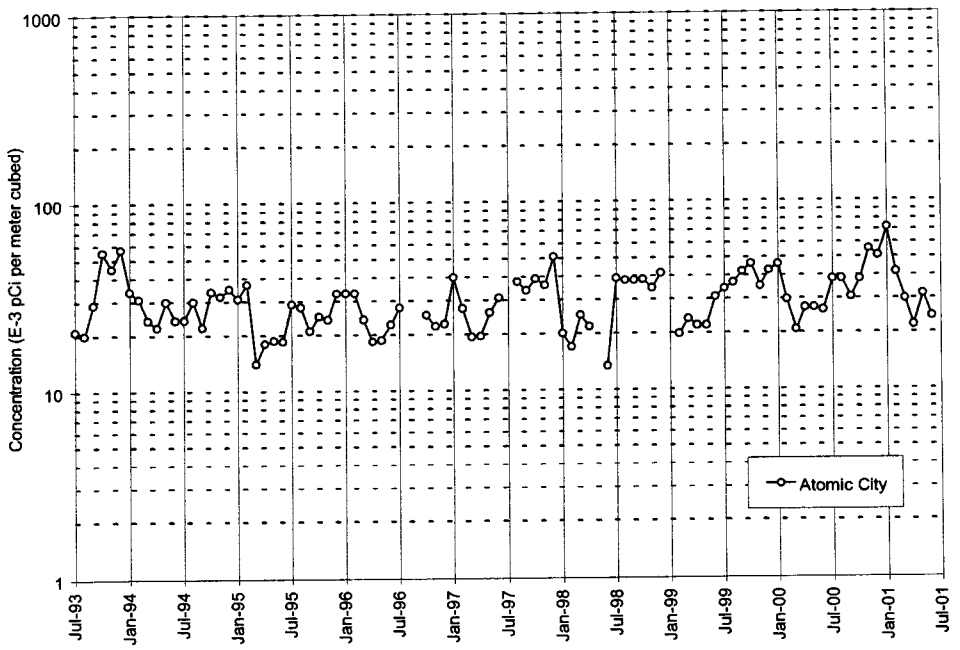

Figure 2. Monthly average gross beta results for PM_{10} sampler at Atomic City.

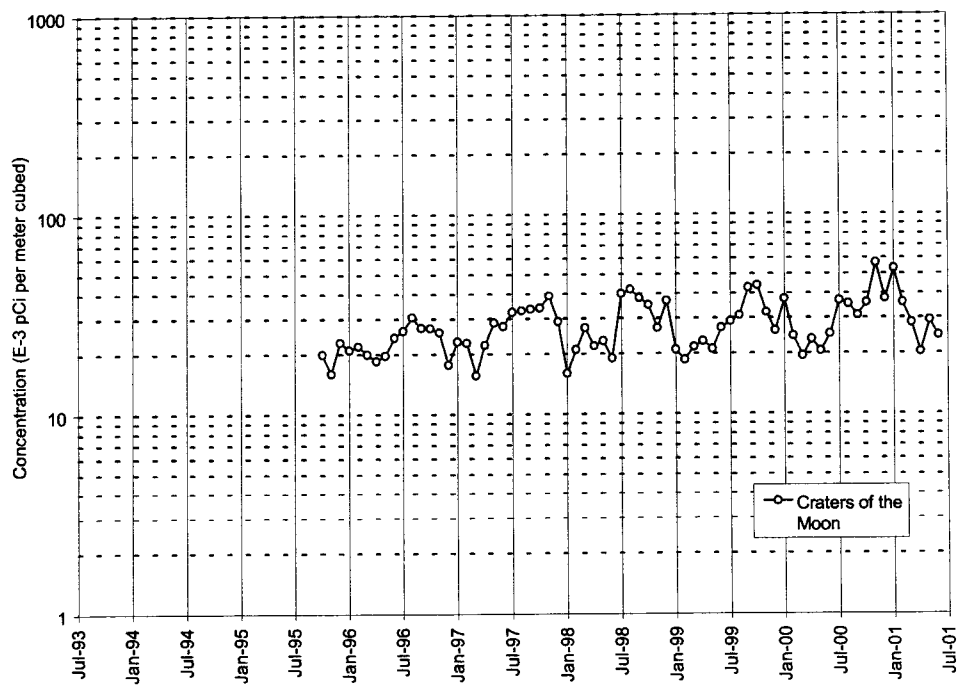

Figure 3. Monthly average gross beta results for PM_{10} sampler at Craters of the Moon.

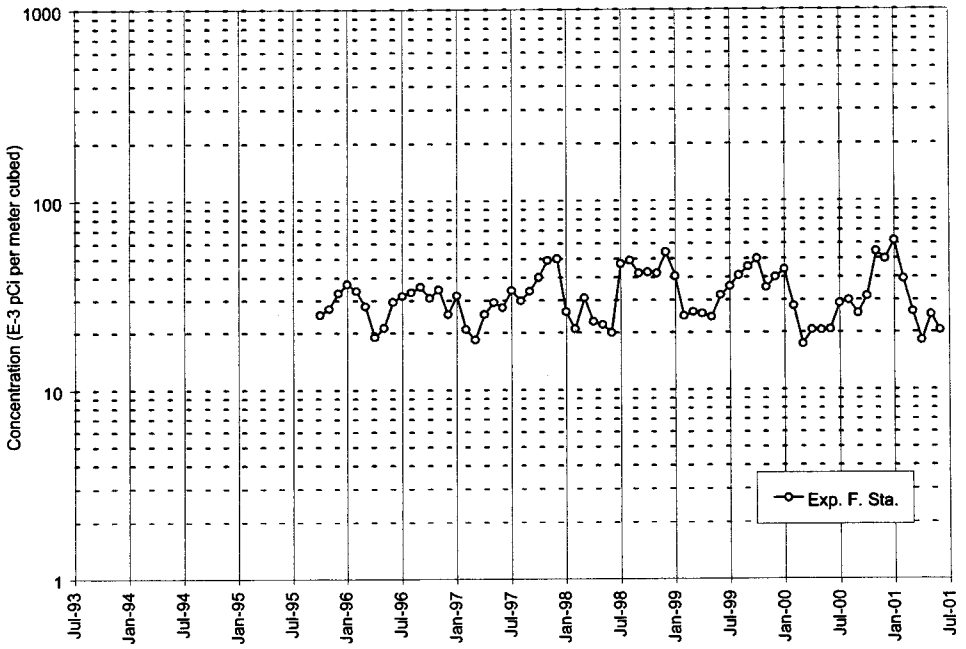

Figure 4. Monthly average gross beta results for PM_{10} sampler at Experimental Field Station.

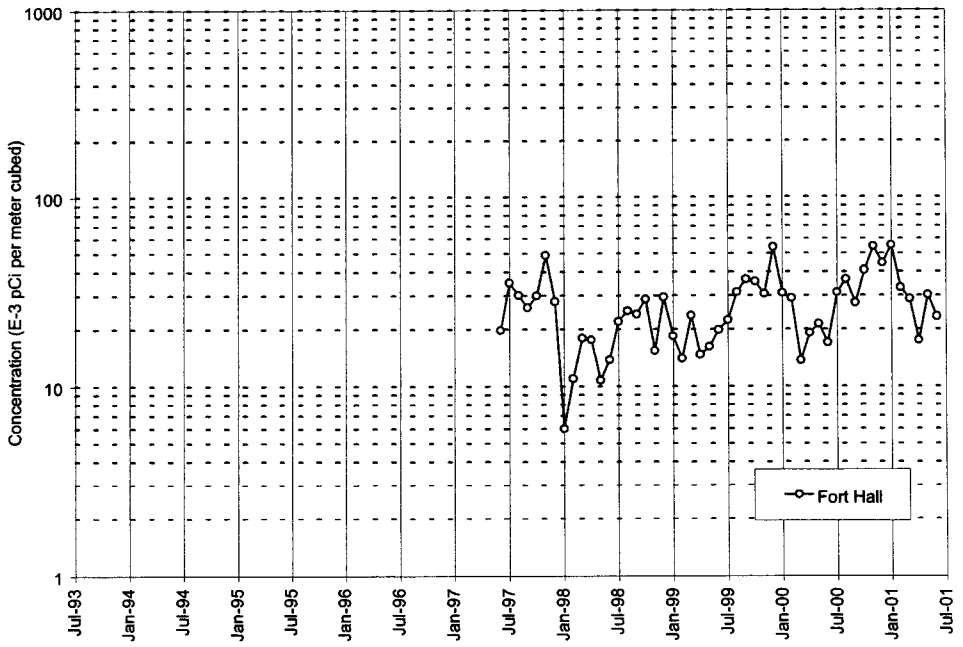

Figure 5. Monthly average gross beta results for PM_{10} sampler at Fort Hall.

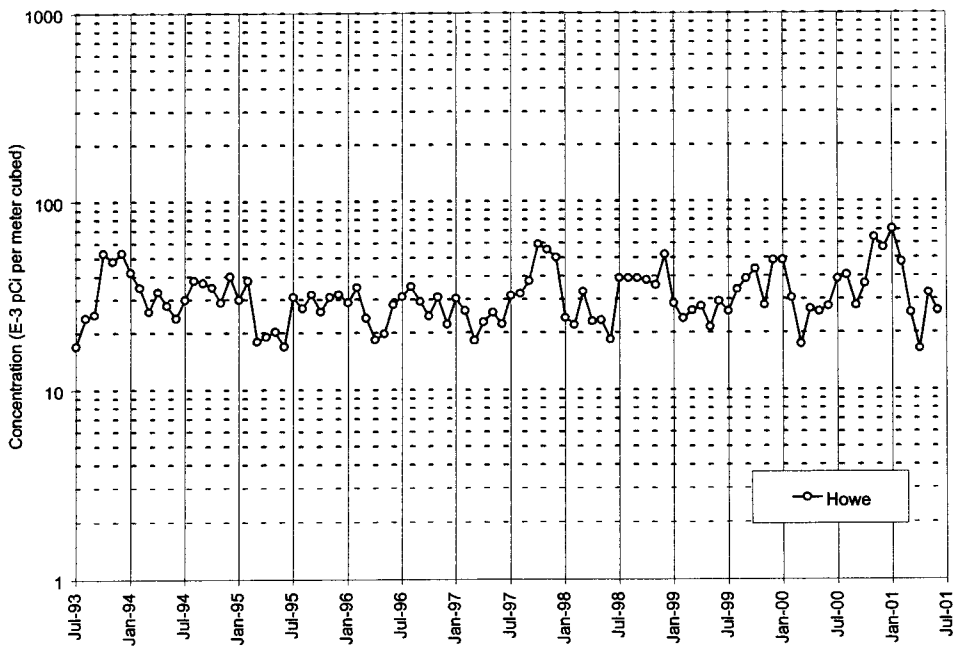

Figure 6. Monthly average gross beta results for PM_{10} sampler at Howe.

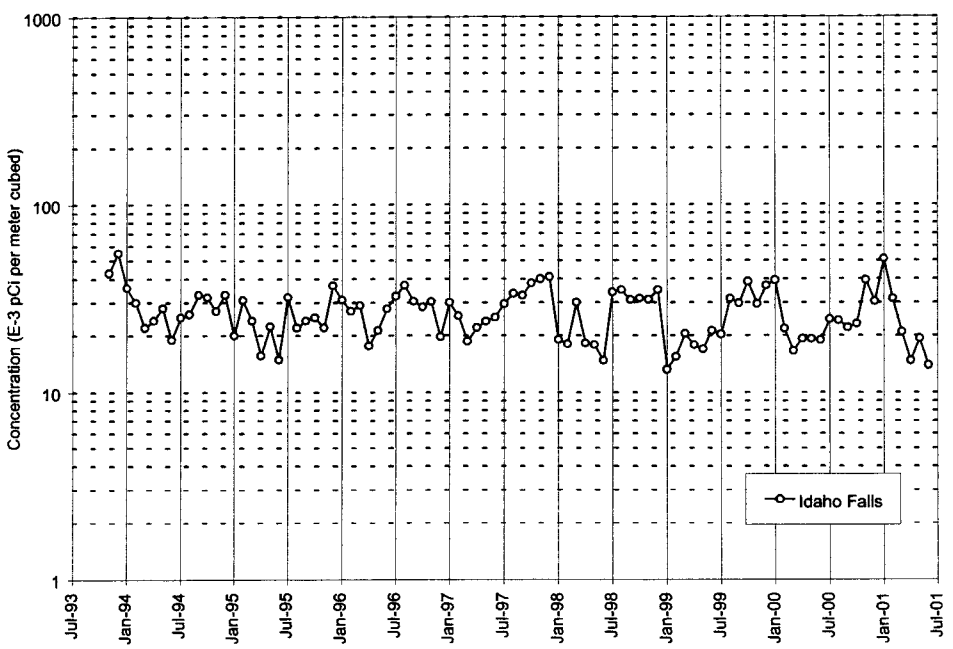

Figure 7. Monthly average gross beta results for PM_{10} sampler at Idaho Falls.

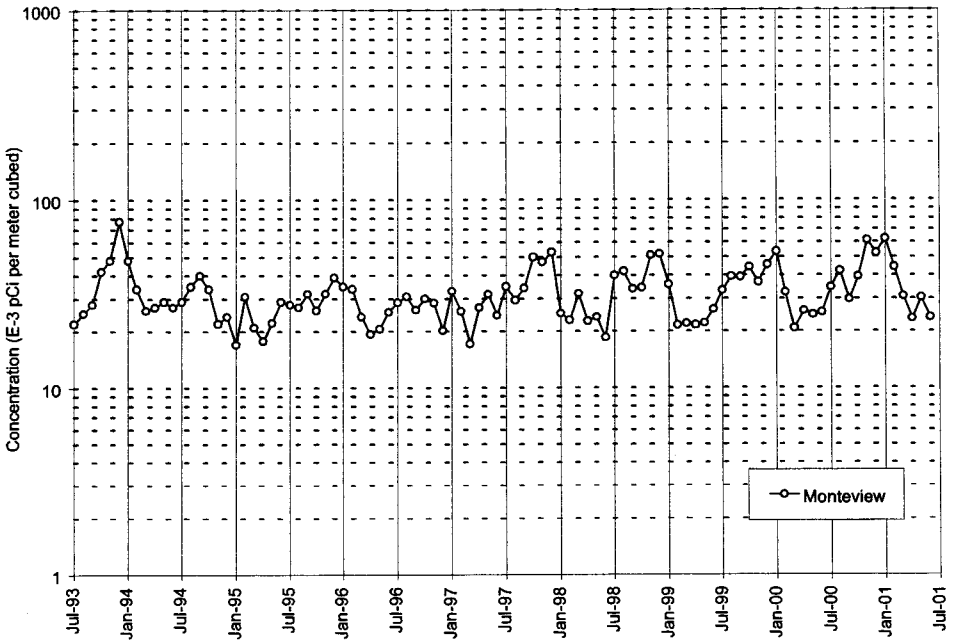

Figure 8. Monthly average gross beta results for PM_{10} sampler at Monteview.

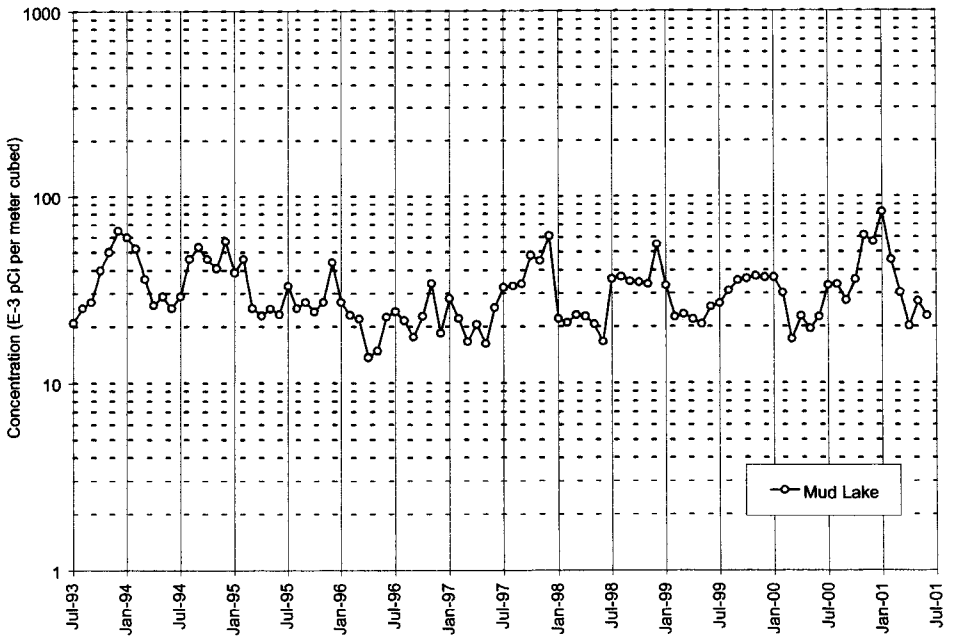

Figure 9. Monthly average gross beta results for PM_{10} sampler at Mud Lake.

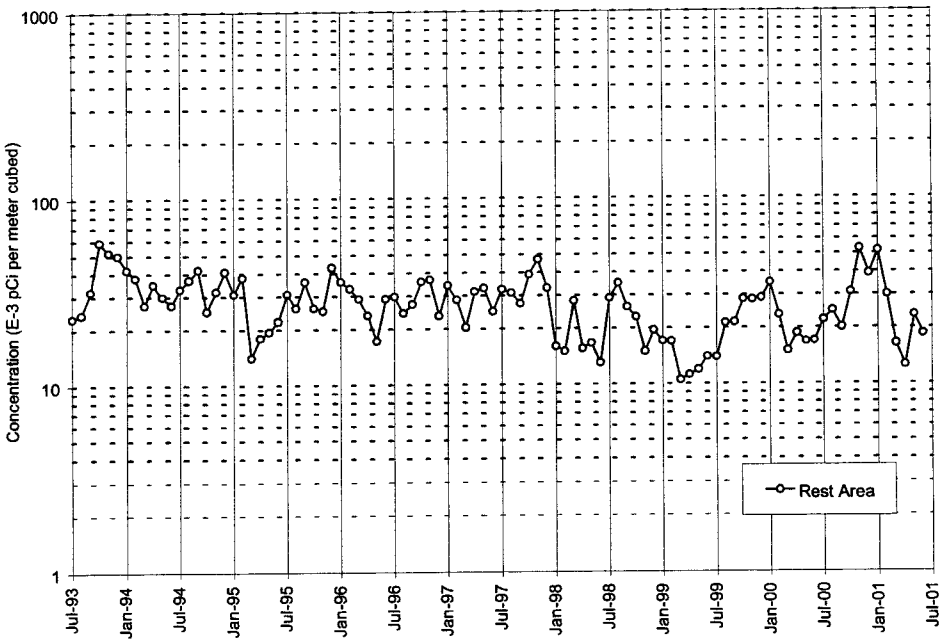

Figure 10. Monthly average gross beta results for PM_{10} sampler at Rest Area.

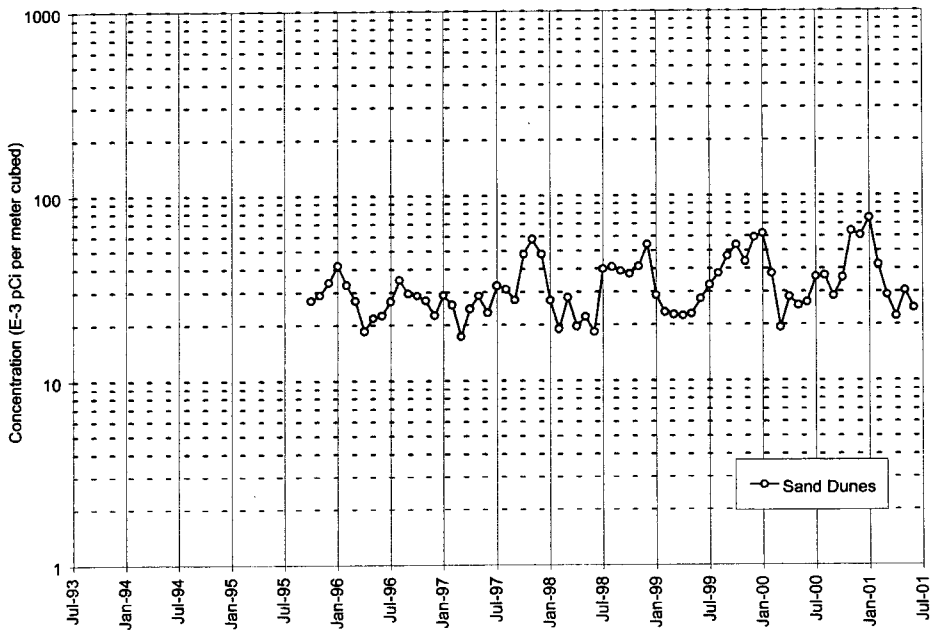

Figure 11. Monthly average gross beta results for PM_{10} sampler at Sand Dunes.

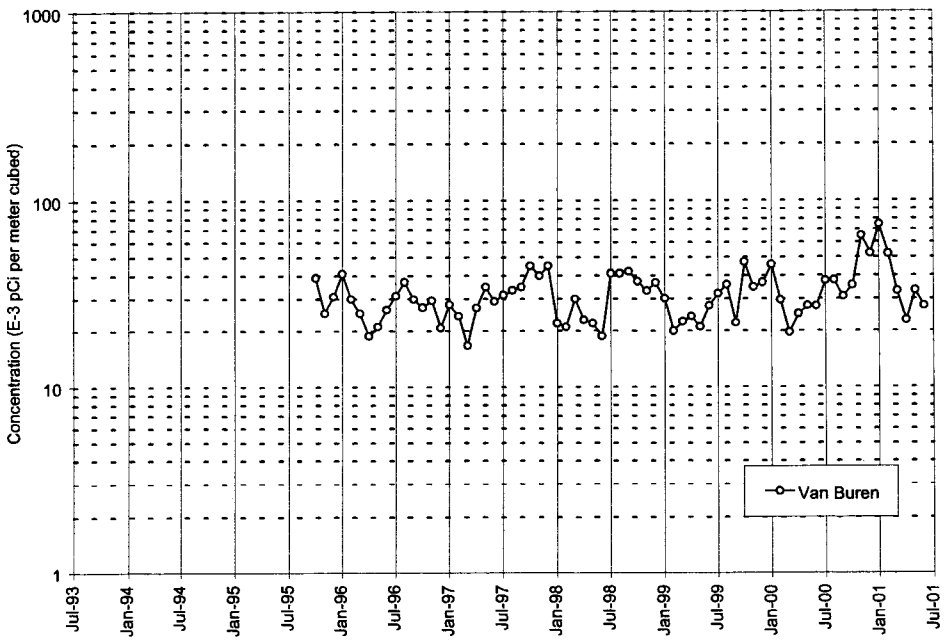

Figure 12. Monthly average gross beta results for PM_{10} sampler at Van Buren.

Environmental Radiation Monitoring Results

The Environmental Surveillance Program operated 14 environmental radiation stations during the third quarter of 2001 (**Figure 1**). Each of these stations is instrumented with an electret ionization chamber (EIC), and 11 of the stations also have high-pressure ion chambers (HPIC) (**Table 8**). The Shoshone-Bannock Tribes operate an environmental radiation station at Fort Hall. The Oversight Program reports these results.

HPICs are capable of real-time measurements, and therefore can detect small changes in radiation levels over time. The EICs are a passive integrating system designed to make field measurements of gamma-radiation for the quarter and provide a cumulative total of environmental gamma radiation exposure as well.

Table 9 lists the average radiation exposure rates measured by the HPICs for the quarter. Exposure rates were within the expected range of values for historical background radiation.

Table 10 lists the EIC monitoring results for third quarter, 2001. As shown in **Figure 13**, exposure-rate trends observed using the EICs seem to correlate very well with the quarterly HPIC data. EICs are expected to demonstrate greater response, typically 20%, due to differences in construction materials which correlate to greater sensitivity to low-energy gamma and x-ray photons.

Table 8. Summary of instrumentation at radiation monitoring stations.

Station Location	Instrument Type		Co-located with air monitoring site?
	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	✔	✔	✔
Monteview	✔	✔	✔
Mud Lake	✔	✔	✔
Distant Locations			
Craters of the Moon		✔	✔
Fort Hall[1]	✔	✔	✔
Idaho Falls	✔	✔	✔

[1] Operated by Shoshone-Bannock Tribes

Table 9 Average gamma exposure rates for third quarter 2001, from high-pressure ion chamber (HPIC) network.

Station Location	Exposure Rate (μR/hr)	
	Quarterly Average	± 2 SD
On-site Locations		
Base of Howe	12.5	0.6
Big Lost River Rest Area	13.1	0.7
Main Gate	13.6	0.8
Rover	13.4	0.7
Sand Dunes Tower	12.9	0.6
Boundary Locations		
Atomic City	12.7	0.8
Big Southern Butte	13.6	0.7
Howe	12.2	0.7
Monteview	11.8	0.7
Mud Lake	12.1	0.7
Distant Locations		
Fort Hall[1]	10.5	0.5
Idaho Falls	12.5	1.3

[1] Operated by Shoshone-Bannock Tribes

Table 10. Electret Ionization chamber (EIC) cumulative average exposure results for third quarter, 2001.

Station Location	Exposure Rate (µR/hr)	
	Total	± 2 SD
On-site Locations		
Base of Howe	20.7	2.0
Big Lost River Rest Area	17.8	1.9
Experimental Field Station	21.0	2.5
Main Gate	24.1	2.1
Rover	20.1	2.0
Sand Dunes Tower	19.9	2.4
Van Buren Avenue	27.5	2.8
Boundary Locations		
Atomic City	16.6	1.9
Big Southern Butte	17.9	1.9
Howe	16.3	1.9
Monteview	16.3	1.9
Mud Lake	15.7	1.9
Distant Locations		
Craters of the Moon	15.7	2.2
Fort Hall	22.8	2.1
Idaho Falls	14.6	1.8

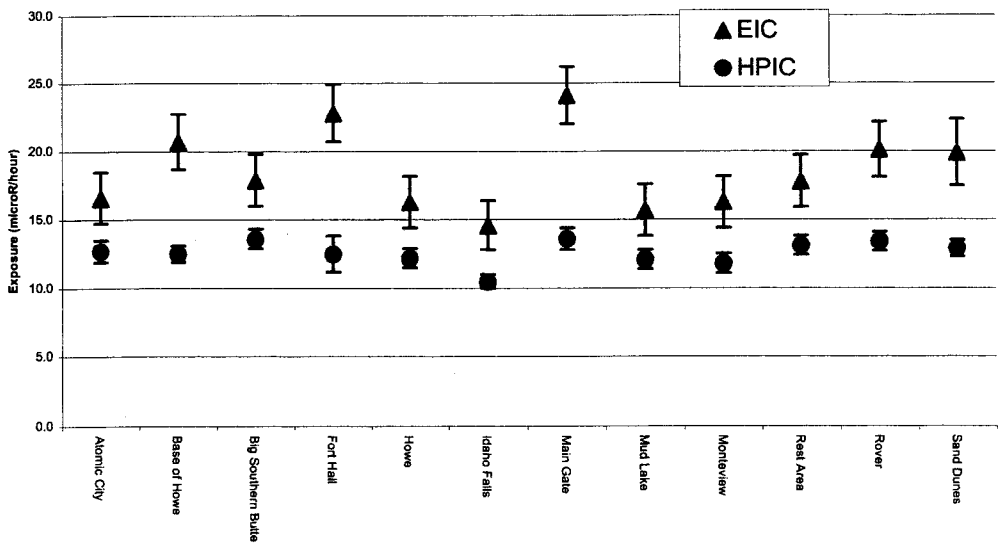

Figure 13. Comparison results of environmental HPIC and EIC results, with error bars representing two standard deviations above the mean shown, third quarter, 2001.

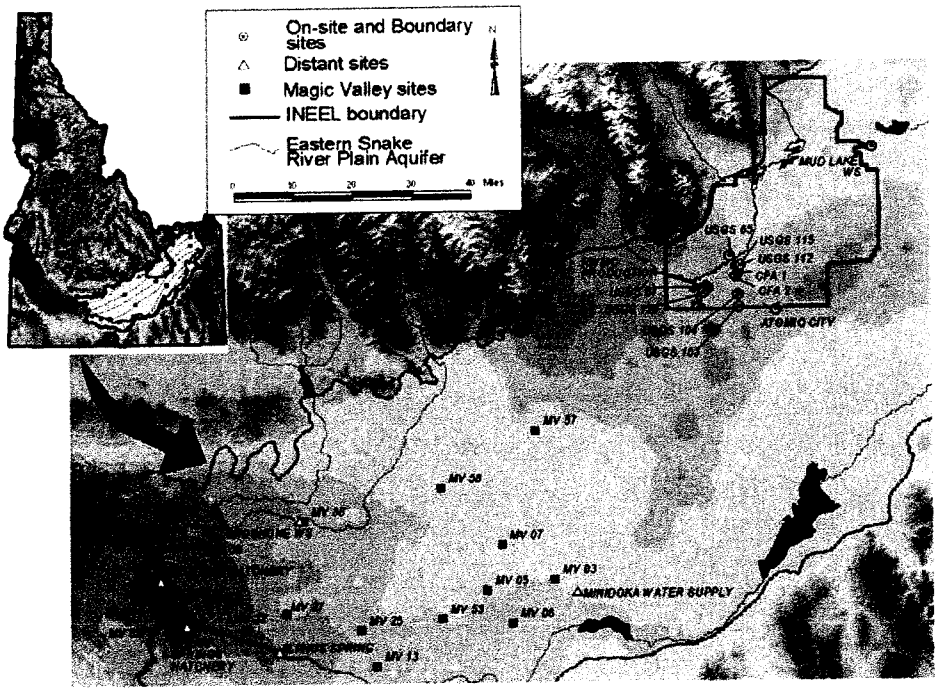

Figure 14. Water monitoring locations.

Water Monitoring Results

Surveillance Water Sampling Program

Gross alpha, gross beta, and gamma spectroscopy results for samples collected during the third quarter of 2001 are presented in **Table 11.** Surveillance water monitoring sites are shown in **Figure 14.** A total of 32 surveillance water locations were sampled; 12 on and near the INEEL boundary, and 20 sites offsite and distant from the INEEL (four distant locations and 16 Magic Valley sites) with duplicate samples collected at four sites.

Gross alpha radioactivity was detected in the samples from three sites distant from the INEEL during the third quarter. The detections ranged from 3.3 ± 1.6 to 4.9 ± 2.3 pCi/L. Occasional detections for gross alpha radioactivity are expected for Snake River Plain Aquifer sites due to naturally occurring uranium and thorium-isotopes in the ground.

Gross beta radioactivity was detected in samples from 9 of 12 onsite and boundary sample locations and in 19 of 20 distant monitoring sites. Concentrations for one INEEL monitoring site, USGS 112, yielded gross beta activity indicative of INEEL contamination (49.8 ± 2 pCi/L). Gross beta analyses are conducted as a screening tool for beta-emitting radionuclides that were released due to INEEL operations, such as strontium-90 and technitium-99. Additional samples for these two radionuclides were collected at

on-site locations, USGS 112 and USGS 115, during the third quarter. Samples were also analyzed by gamma-spectroscopy, with no samples yielding detections for any man-made radionuclides.

Tritium was detected in samples from eight locations on the INEEL. Concentrations were highest for a sample from USGS-65, at over half the 20,000 pCi/L drinking water standard. This site has typically returned the highest tritium concentration of sites monitored by INEEL OP. The remaining INEEL sites with detectable tritium; USGS 112, USGS 115, CFA 1, CFA 2, USGS 87, RWMC Production, and USGS 104 returned concentrations ranging from 1000 ± 110 to 12780 ± 250 pCi/L. Final analyses for samples from all remaining sites were less than the tritium detection level of approximately 160 pCi/L. Tritium levels greater than the standard MDC of about 160 pCi/L are indicative of INEEL contamination. No tritium concentrations exceeded the drinking water MCL of 20,000 pCi/L. Results for tritium analyses are presented in **Table 12**.

Initial results returned detectable concentrations for samples from a number of sites that historically have not yielded tritium "hits." These detections ranged as high as 490 ± 100 pCi/L, nearly 15 times the most recent tritium result for this site. Samples for sites that have historically not yielded tritium detections were redistilled and reanalyzed. There were no detections in these reanalyzed samples. See QA/QC section of discussion of elevated tritium results.

Water samples that do not exceed the tritium MDC using the standard methods (160 pCi/L) are routinely reanalyzed using an electrolytic enrichment method with a much lower MDC (10 - 14 pCi/L). Enriched tritium analyses were not conducted during the third quarter due to quality assurance problems.

Results for common ion, nutrient, and trace metal analyses of samples collected during the third quarter, 2001, are presented in **Tables 13** and **14.** Concentrations of total nitrate plus nitrite exceeded the typical background levels of 1-2 mg/L for three sites, but were well below the drinking water MCL of 10 mg/L. These three sites are INEEL wells that also show tritium levels indicative of INEEL waste disposal impacts (CFA 1, CFA 2, and USGS 112). Results for nitrate analyses were rejected by IBL due to a mistake in sample preservation.

Results for dissolved trace metal analyses were within typical background ranges for all constituents with the exception of chromium. The chromium concentration in the sample from USGS 65, in the central part of the INEEL south of TRA, exceeded the drinking water MCL of 100 μg/L. Other locations also show chromium concentrations that exceeded background concentrations (2 - 3 μg/L), which may indicate an INEEL groundwater impact.

Results for barium, although not exceeding background levels for all of the Eastern Snake River Plain Aquifer, do show a trend indicative of INEEL contamination for wells USGS 112, USGS 115, and CFA 2. While zinc is identified as a constituent in INEEL wastewaters, this dissolved metal can also be leached from monitoring well components, and tends to be higher for wells with submersible pumps.

Results for technetium-99 analysis for second quarter 2001 are presented in **Table 15.** Concentrations observed for samples from USGS 112 are related to INEEL waste disposal. Filtered samples were also collected for technetium-99 analysis by ISU-EML. ISU-EML uses an ion-selective filter by EMPORE and subsequent liquid-scintillation counting to analyze for dissolved technetium-99. These results are presented in **Table 16**. The ion-selective filtration, liquid scintillation method used by ISU EML results in a detection level of about 0.5 pCi/L, as compared to a detection level of about 4-5 pCi/L by Paragon, the subcontract laboratory. Technetium-99 results ranged from less than detection to 41 ± 10 pCi/L for USGS 112 analyzed by the standard means, and from 2.8 ± 0.3 to 32.8 ± 0.6 pCi/L for the dissolved method.

Samples were collected for strontium-90 (**Table 17**), with results of 0 ± 0.31 and 15.5 ± 2.9 pCi/L for wells USGS 115 and USGS 112. Strontium-90 and technetium-99 are both present at these wells due to historic INEEL waste disposal.

Table 11. Alpha, beta, and gamma concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Gross Alpha (pCi/L)		Gross Beta (pCi/L)		Man-made gamma-emitting radionuclide[2]	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Onsite and Boundary							
Atomic City	08/15	2.4 U	1.6	3	0.8	< MDC	
CFA 1	07/23	0.3 U	2.1	4.9	1.0	< MDC	
CFA 2	07/23	0.1 U	2.0	1.6	0.9	< MDC	
Mud Lake Water Supply	08/15	0.0 U	0.6	0.5 U	0.6	< MDC	
Mud Lake Water Supply [1]	08/15	-0.1 U	1.3	1.7	0.8	73 ± 43[4]	
(Average of lab splits)		0.0 U	0.7	1.1	0.5	<MDC	
RWMC Production	07/12	1.7 U	1.4	1.0 U	0.9	< MDC	
USGS-65	07/18	1.7 U	1.9	2.3	0.9	< MDC	
USGS-65[1]	07/18	0.1 U	2.2	2.7	0.9	< MDC	
(Average of lab splits)		0.9 U	1.4	2.5	0.6	< MDC	
USGS-87	07/12	2.6 U	2.0	3.1	0.9	< MDC	
USGS-87 [3]	07/12	--	--	--	--	< MDC	
(Average of lab recount)						< MDC	
USGS-103	07/18	1.5 U	1.6	2.4	0.8	< MDC	
USGS-104	07/18	-1.7 U	1.8	0.7 U	0.8	< MDC	
USGS-112	07/23	1.4 U	2.0	49.8	2.0	< MDC	
USGS-115	07/23	-0.9 U	1.4	3.5	0.9	< MDC	
USGS-115 (dup)	07/23	-2.4 U	1.9	3.8	0.9	< MDC	
USGS-120	07/12	-1.3 U	2.1	1.6	1.0	< MDC	

Table 11 continued. Alpha, beta, and gamma concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Gross Alpha (pCi/L)		Gross Beta (pCi/L)		Man-made gamma-emitting radionuclide[2]	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Offsite and Distant							
Alpheus Spring	08/14	1.5 U	1.9	4.0	1.0	< MDC	
Alpheus Spring [1]	08/14	0.2 U	1.8	3.2	1.0	< MDC	
(Average of lab splits)		0.8 U	1.3	3.6	0.7	< MDC	
Bill Jones Hatchery	08/14	-0.3 U	1.9	2.9	0.9	< MDC	
Bill Jones Hatchery (dup)	08/14	2.3 U	1.4	1.8	0.8	< MDC	
Clear Spring	08/14	3.3	1.6	2.4	0.8	< MDC	
Shoshone Water Supply	08/14	2.3 U	1.7	1.7	1.0	< MDC	
MV-03	07/24	1.7 U	1.6	2.7	0.8	< MDC	
MV-03[1]	07/24	0.6 U	1.4	1.4	0.9	< MDC	
(Average of lab splits)		1.1 U	0.7	2.0	0.6	< MDC	
MV-44 (dup of MV-03)	07/24	1.5 U	1.7	1.7	0.9	< MDC	
MV-05	07/24	4.9	2.3	3.9	1.0	< MDC	
MV-06	07/24	1.5 U	2.1	3.8	1.0	< MDC	
MV-06[1]	07/24	2.3 U	2.2	2.9	1.0	< MDC	
(Average of lab splits)		1.9 U	1.5	3.3	0.7	< MDC	
MV-07	06/26	1.1 U	1.4	1.8	0.8	< MDC	
MV-13	07/24	3.7	1.8	5.0	1.0	73	± 44[4]
MV-17	07/25	0.3 U	1.4	1.8	0.8	< MDC	
MV-25	07/26	0.5 U	2.9	6.2	1.2	< MDC	
MV-27	07/26	0.8 U	1.8	3.5	1.1	< MDC	
MV-32	07/25	1.6 U	2.2	4.7	1.0	< MDC	
MV-36	07/24	2.3 U	1.7	1.5	0.8	< MDC	
MV-38	07/25	3.0 U	1.8	1.6	0.9	< MDC	
MV-38[1]	07/25	1.1 U	1.9	1.6	0.8	< MDC	
(Average of lab splits)		2.0 U	1.3	1.6	0.6	< MDC	
MV-42	07/25	1.4 U	1.8	1.5	0.9	< MDC	
MV-53	07/24	2.2 U	2.1	5.8	1.1	< MDC	
MV-60 (dup of MV-53)	07/24	1.1 U	2.6	5.0	1.1	< MDC	
MV-55	06/26	1.4 U	1.5	2.9	0.9	< MDC	
MV-57	06/05	1.1 U	1.4	0.8 U	0.8	< MDC	
MV-58	06/05	1.1 U	1.2	1.6	0.8	< MDC	

[1] Laboratory split, recount, or re-evaporation.
[2] No man-made gamma emitters were detected.
[3] Sample recounted for gamma-emitting radionuclides only.
[4] Naturally occurring potassium-40 exceeded the MDC for this sample, no other gamma emitters were detected.
Data qualifiers: U=non-detect, J =estimate, R=rejected.

Table 12 Tritium concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Tritium (pCi/L)	
		Concentration	± 2 SD
Onsite and Boundary			
Atomic City	08/15	40 UJ	90
CFA 1	07/23	9760 J	220
CFA 1[1]	07/23	9920 J	220
(Average of lab splits)		9840 J	157
CFA 2	07/23	8580 J	210
Mud Lake Water Supply[2]	08/15	30 UJ	90
(laboratory split)		180 R	90
RWMC Production	07/12	1420 J	120
USGS-65	07/18	12780 J	250
USGS-87	07/12	1000 J	110
USGS-103[2]	07/18	40 U	90
(laboratory redistillation)		170 R	90
USGS-104	07/18	1260 J	110
USGS-112	07/23	5690 J	180
USGS-115	07/23	2260 J	130
USGS-115[1] (dup)	07/23	2300 J	130
USGS-115[1] (dup)	07/23	2250 J	130
(Average of lab splits)		2275 J	92
USGS-120	07/12	70 UJ	90
MV-03	07/24	120 J	90
(laboratory redistillation)		50 U	90
(Average primary and redistillation)		85 UJ	70
MV-44[1](dup of MV-03)	07/24	0 UJ	90
(laboratory redistillation)		80 U	90
MV-44 (dup of MV-03)	07/24	60 UJ	90
(laboratory redistillation)		40 U	90
(Average of splits and redistillations)		45 UJ	45
MV-05	07/24	50 UJ	90
(laboratory redistillation)		30 U	90
(Average primary and redistillation)		40 UJ	64
MV-06[2]	07/24	270 R	100
(laboratory redistillation)		10 U	90
MV-07[2]	06/26	320 R	90
(laboratory redistillation)		10 U	90
MV-13	07/24	260 R	100
(laboratory redistillation)		-10 U	90
MV-17	07/25	130 UJ	90
(laboratory redistillation)		40 U	90
(Average primary and redistillation)		85 UJ	64

Table 12 continued. Tritium concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Tritium (pCi/L)	
		Concentration	± 2 SD
MV-25	07/26	90 UJ	90
(laboratory redistillation)		50 U	90
(Average primary and redistillation)		70 UJ	64
MV-27	07/26	-40 UJ	90
(laboratory redistillation)		10 U	90
(Average primary and redistillation)		-15 UJ	64
MV-32[2]	07/25	420 R	100
(laboratory redistillation)		0 U	90
MV-36[2]	07/24	490 R	100
(laboratory redistillation)		50 U	90
MV-38	07/25	40 UJ	90
(laboratory redistillation)		40 U	90
(Average primary and redistillation)		40 UJ	64
MV-42	07/25	120 UJ	90
(laboratory redistillation)		40 U	90
MV-42	07/25	130 UJ	90
(laboratory redistillation)		100 U	90
(Average of splits and redistillations)		98 J	45
MV-53[2]	07/24	250 R	100
(laboratory redistillation)		100 U	90
MV-60 (dup of MV-53)	07/24	70 UJ	90
(laboratory redistillation)		60 U	90
(Average primary and redistillation)		65 UJ	64
MV-55[1]	06/26	0.02 J	90
(laboratory redistillation)		-10 U	90
(Average primary and redistillation)		5 U	64
MV-57[2]	06/05	240 R	90
(laboratory redistillation)		60 U	90
MV-57[2]	06/05	180 R	90
(laboratory redistillation)		20 U	90
(Average of redistillations)		40 U	64
MV-58	06/05	70 UJ	90
(laboratory redistillation)	06/05	40 U	90
(Average primary and redistillation)		55 U	64

Table 12 continued. Tritium concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Tritium (pCi/L)	
		Concentration	± 2 SD
Offsite and Distant			
Alpheus Spring	08/14	20 UJ	90
Bill Jones Hatchery	08/14	-30 UJ	90
Bill Jones Hatchery(dup)	08/14	20 UJ	90
Clear Spring	08/14	40 UJ	90
Shoshone Water Supply	08/14	60 UJ	90

[1] Laboratory split, recount, or re-distillation.
[2] Laboratory split was rejected; rejected results are not included in the averaged result
Data qualifiers: U=non-detect, J =estimate, R=rejected.

Table 13. Total common ions and nutrient concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Concentration (mg/L)[1]										
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity[2]	Total Nitrate + Nitrite[3]		Total Phosphorus[4]
Onsite and Boundary												
Atomic City	08/15	35.5	14.1	17	3.1	0.67	16.3	16.9	136	1.28		0.01
CFA-1	07/23	69	21.5	32	3.9	0.26	119	33.3	123	3.56		0.015
CFA-2	07/23	69.1	23.7	23	3.7	0.26	103	43.5	128	3.3		0.014
Mud Lake Water Supply	08/15	9.2	2.8	31	4.8	0.64	3.9	8.1	92	<0.005	U	0.038
RWMC Production	07/12	43.4	15.7	8.8	2.5	0.29	16.4	27	142	0.85		0.015
USGS-65	07/18	82.5	18.6	15	2.8	0.27	17.1	158	127	---	R	0.013
USGS-85	07/12	38.3	14.3	10.6	2.8	0.3	13.9	26	135	0.807		0.021
USGS-103	07/18	36	14.9	13.2	2.7	0.44	15.3	24.1	137	0.788		0.02
USGS-104	07/18	34.1	13.7	8.8	2.4	0.27	12.3	20.3	124	0.806		0.024
USGS-112	07/23	61.5	17	48	3.9	0.33	104	29.8	145	3.38		0.024
USGS-115	07/23	40.8	13.1	14	2.9	0.34	37.9	22.4	110	---	R	0.013
USGS-115 (dup)	07/23	41.2	13.2	14	3	0.37	37.8	22.5	110	1.37		0.012
USGS-120	07/12	32.4	18	28	3.5	0.37	18	40.1	154	0.753		0.025
Offsite and Distant												
Alpheus Spring	08/14	57.3	20.4	35	6.2	0.46 J	39.6	56.4	185	2.01		0.016
Bill Jones Hatchery	08/14	31.6	16.6	18	3.7	0.5 J	10	24.5	141	0.974		0.015
Bill Jones Hatchery(dup)	08/14	31.7	16.6	17	3.7	0.53 J	9.8	24.5	141	0.966		0.015
Clear Spring	08/14	44.8	19.9	24	4	0.69 J	31	45.2	147	1.4		0.017
Shoshone Water Supply	08/14	45.5	15.2	15	2.8	0.37 J	5	16.6	175	1.36		0.033

[1] A "<" indicates a result below the Minimum Reportable Value
[2] As $CaCO_3$
[3] Dissolved nitrate + nitrite as N
[4] Dissolved phosphorus as P
Data qualifiers: U=non-detect, J =estimate, R=rejected.

Table 14. Dissolved trace metal concentrations for surveillance water monitoring samples, third quarter, 2001.

Sample Location	Sample Date 2001	Concentration (μg/L)[1]				
		Barium	Chromium	Lead	Manganese	Zinc
Onsite and Boundary						
Atomic City	08/15	32	<2 U	<5 U	<1 U	18
CFA-1	07/23	18	<2 U	<5 U	36	<2 U
CFA-2	07/23	96	12	<5 U	<1 U	<2 U
Mud Lake Water Supply	08/15	72	10	<5 U	1	6
RWMC Production	07/12	37	14	<5 U	<1 U	5
USGS-65	07/18	48	140	<5 U	<1 U	380
USGS-85	07/12	29	13	<5 U	1	11
USGS-103	07/18	45	6	<5 U	<1 U	208
USGS-104	07/18	31	7	<5 U	<1 U	183
USGS-112	07/23	158	4	<5 U	<1 U	160
USGS-115	07/23	59	6	<5 U	<1 U	483
USGS-115 (dup)	07/23	40	7	<5 U	<1 U	<2 U
USGS-120	07/12	59	7	<5 U	<1 U	487
Offsite and Distant						
Alpheus Spring	08/14	76	<2 U	<5 U	<1 U	<2 U
Bill Jones Hatchery	08/14	20	3	<5 U	<1 U	<2 U
Bill Jones Hatchery (dup)	08/14	19	3	<5 U	<1 U	<2 U
Clear Spring	08/14	33	<2 U	<5 U	<1 U	<2 U
Shoshone Water Supply	08/14	38	<2 U	<5 U	<1 U	7

[1]A"<"indicates a result below the Minimum Reportable Value (MRP).
Data qualifiers: U=non-detect, J =estimate, R=rejected.

Table 15. Technetium-99 for surveillance water monitoring samples, third quarter, 2001.

Location	Sample Date 2001	Technetium 99 ($pCiL^{-1}$)	
		Concentration	± 2 SD
USGS-112	07/23	41.0	10
USGS-115	07/23	4.9 U	4.3
Data qualifiers: U=non-detect, J =estimate, R=rejected.			

Table 16. Dissolved technetium-99 for surveillance water monitoring samples, third quarter, 2001.

Location	Sample Date 2001	Technetium-99 ($pCiL^{-1}$)	
		Concentration	± 2 SD
USGS-112	07/23	32.8	0.6
USGS-115	07/23	2.8	0.3
Data qualifiers: U=non-detect, J =estimate, R=rejected.			

Table 17. Strontium-90 for surveillance water monitoring samples, third quarter, 2001.

Location	Sample Date 2001	Strontium-90 ($pCiL^{-1}$)	
		Concentration	± 2 SD
USGS-112	07/23	15.5	2.9
USGS-115	07/23	0.0 U	0.31
Data qualifiers: U=non-detect, J =estimate, R=rejected.			

Verification Water Monitoring Program

During the third quarter of 2001 the INEEL Oversight Program sampled 4 groundwater and 3 wastewater locations on the INEEL, **Figure 15**. Radiological results are shown in **Tables 18-22** and the non-radiological data are in **Tables 23-26**. These data are collected primarily to compare results with the co-sampling agencies at the INEEL (i.e., BBWI and the monitoring groups at ANL-W and NRF) so only a brief synopsis follows. Results of the comparisons are reported in the INEEL Oversight Program annual report.

None of the samples collected this quarter contained detectable levels of Americium-241, Cesium-137, plutonium isotopes, or Strontium-90. Five of the tritium analyses had to be qualified as estimates or rejected due to suspected tritium contamination at the laboratory. See QA/QC section for discussion.

Carbon tetrachloride was detected in one of the wells near the RWMC. Elevated chromium concentrations were reported in samples from wells near NRF and RWMC, but the concentrations were below the drinking water standard of 100 µg/L.

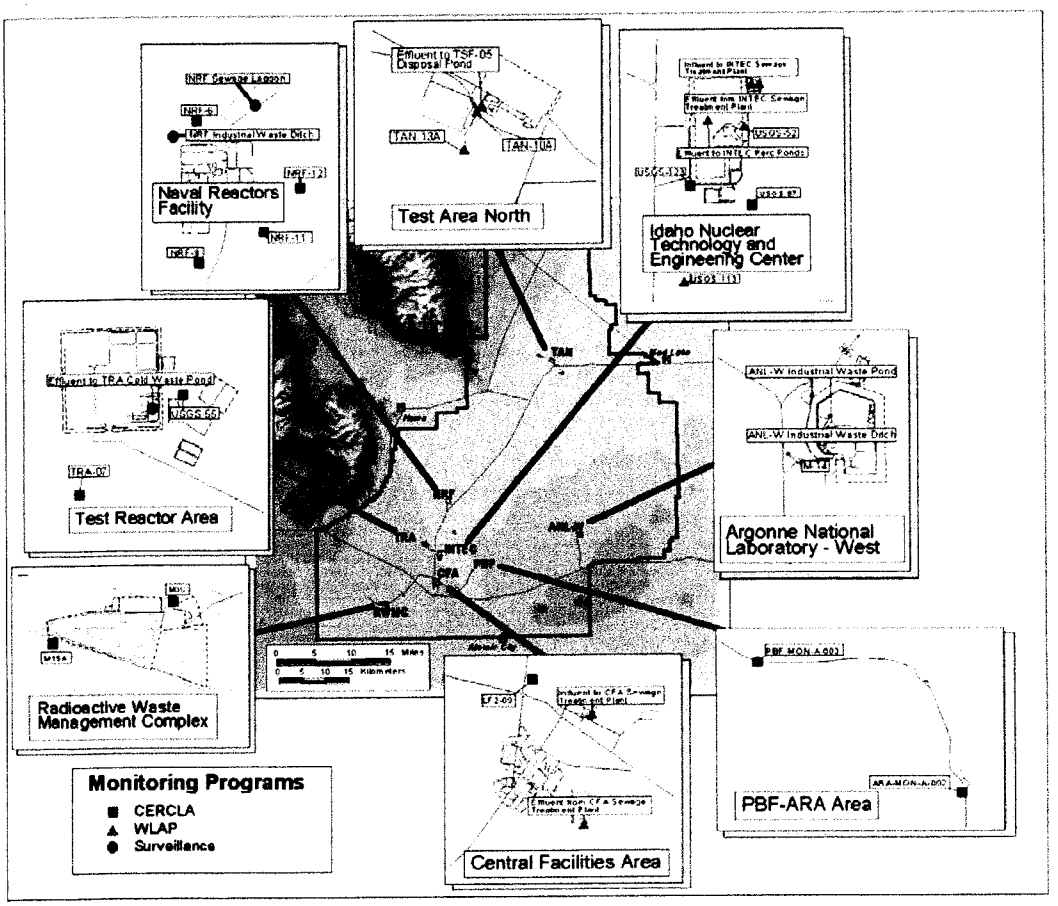

Figure 15. Water verification sites

Table 18. Reported concentrations of Americium-241 in water verification monitoring samples, third quarter, 2001. Samples were not filtered.

Sample Location	Sample Date 2001	Americium-241 (pCi/L)	
		Concentration	±2 SD
Groundwater			
M1S	09/25	0.035 U	0.061
M3S	09/25	-0.062 U	0.062

Data qualifiers: U=non-detect, J=estimate, R=rejected.

Table 19. Reported concentrations of Strontium-90 in water verification monitoring samples, third quarter, 2001. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date 2001	Strontium-90 (pCi/L)	
		Concentration	± 2 SD
Groundwater			
NRF-11 (dissolved)	08/08	-0.19 U	0.29
NRF-12 (dissolved)	08/08	-0.05 U	0.29
M1S	09/25	0.10 U	0.30
M3S	09/25	-0.16 U	0.29
Wastewater			
NRF Industrial Waste Ditch	08/30	0.03 U	0.36
NRF Sewage Lagoon	08/30	0.08 U	0.38

Data qualifiers: U=non-detect, J=estimate, R=rejected.

Table 20. Reported concentrations of total Plutonium 238, Plutonium-239/240, and Plutonium-241 in verification water monitoring samples, third quarter, 2001. Samples were not filtered.

Sample Location	Sample Date 2001	Plutonium-238 (pCiL)		Plutonium-239/240 (pCiL)		Plutonium-241 (pCiL)	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
M1S	09/25	0.009 U	0.047	-0.007 U	0.04	3.1 U	7.1
M3S	09/25	-0.016 U	0.048	0.00 U	0.048	3.5 U	7.2

Data qualifiers: U=non-detect, J=estimate, R=rejected.

Table 21. Reported activity of gross alpha, gross beta, and Cesium-137 in verification water monitoring samples, third quarter 2001. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date 2001	Gross alpha (pCi/L)		Gross Beta (pCi/L)		Man-made, gamma-emitting radionuclide Cesium-137 (pCi/L)	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
NRF-11 (dissolved)	08/08	3.9	2.3	1.4	0.9	2.2 U	1.9
NRF-12 (dissolved)	08/08	2.2	1.4	1.1 U	0.8	0.3 U	1.5
NRF-12[1] (dissolved)	08/08	2.2 U	2.2	1.9	0.9	1.1 U	1.8
Wastewater							
TRA Cold Waste Pond	08/07	1.6 U	2.4	8.3	1.2	-0.1 U	1.5
NRF Industrial Waste Ditch	08/30	NR		NR		-0.2 U	1.6
NRF Sewage Lagoon	08/30	NR		NR		-0.5 U	1.3

[1] Laboratory split analysis, recount, or re-evaporation.
NR=not requested
Data qualifiers: U=non-detect, J=estimate, R=rejected.

Table 22. Reported concentrations of total tritium in verification water monitoring samples, third quarter, 2001. Samples were not filtered.

Sample Location	Sample Date 2001	Tritium (pCi/L)	
		Concentration	± 2 SD
Groundwater			
NRF-11	08/08	260 J	90
NRF-11[1]	08/08	200	90
NRF-12	08/08	140 J	90
NRF-12[1]	08/08	210	90
Wastewater			
NRF Industrial Waste Ditch	08/30	100 UJ	90
NRF Industrial Waste Ditch[1]	08/30	220 R	90
NRF Industrial Waste Ditch[1]	08/30	80 U	90
NRF Sewage Lagoon	08/30	180 R	90
NRF Sewage Lagoon[1]	08/30	80 U	90

[1] Laboratory split analysis, recount, or re-evaporation.
Data qualifiers: U=non-detect, J=estimate, R=rejected.

Table 23. Reported concentrations of common ions for the verification water monitoring samples, third quarter, 2001. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date 2001	Concentration (mg/L)[1]						
		Total Alkalinity[4]	Chloride	Fluoride	Silica	Sulfate	TDS[2]	TSS[3]
Groundwater								
NRF-11 (dissolved)	08/08	199	35.1	0.31	22.9	35.8	364	NR
NRF-12 (dissolved)	08/08	202	41.8	0.25	22	41.5	371	NR
M1S	09/25	97	13.2	0.39	34.7	20.7	179	1
M3S	09/25	142	12.1	0.42	20.8	25.7	219	2
Wastewater								
NRF Industrial Waste Ditch	07/10	207	17408	<1.6 U	18.6	72.8	30100	6
NRF Sewage Lagoon	07/10	604	142	0.64	52.7	112	1350	608
TRA Cold Waste Pond	08/07	124	27.1	0.48	56.7	398	816 J	<1 U
NRF Industrial Waste Ditch	09/19	187	17320	0.46	17.4	44.2	28650	6

[1] A :"<" indicates a result below the Minimum Reportable Value
[2] total dissolved solids
[3] total suspended solids
[4] $CaCO_3$
NR=not requested
Data qualifiers: U=non-detect, J=estimate, R=rejected.

Table 24. Reported nutrient concentrations for the verification water monitoring samples, third quarter 2001. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date 2001	Concentration (mg/L)[1]				
		Ammonia (as Nitrogen)	Total Kjeldahl Nitrogen	Nitrite as Nitrogen	Nitrite + Nitrate (as Nitrogen)	Phosphorus
Groundwater						
NRF-11	08/08	NR	<0.05 U	<0.005 U[2]	1.81	0.026
NRF-12	08/08	NR	<0.05 U	<0.005 U[2]	1.7	0.026
M1S	09/25	NR	NR	NR	0.823	0.019
M3S	09/25	NR	NR	NR	1.06	0.019
Wastewater						
NRF Ind. Waste Ditch	07/10	NR	2.82	NR	0.048	0.81
NRF Sewage Lagoon	07/10	NR	29.8	NR	0.039	6.99
TRA Cold Waste Pond	08/07	0.005	0.1	NR	2.64	1.58
NRF Ind. Waste Ditch	09/19	NR	2.25	NR	0.029	0.648

[1] A "<" indicates a result below the Minimum Reportable Value.
[2] Dissolved
Data qualifiers: U=non-detect, J=estimate, R=rejected.
NR=analysis not requested.

Table 25. Reported metals concentrations for the verification water monitoring samples, third quarter 2001. Samples were not filtered.

Sample Location	Sample Date 2001	Concentration[1]											
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)
Groundwater													
NRF-11	08/08	68.6	21.2	18	2.3	<10 U	120	<1 U	<1 U	16	<5 U	<10 U	50
NRF-12	08/08	72.7	22.4	21	2.3	<10 U	136	<1 U	<1 U	16	<5 U	<10 U	60
M1S	09/25	26.5	11.7	11.6	2.5	<10 U	22	<1 U	<1 U	31	<5 U	10	30
M3S	09/25	43.8	15.3	8.4	2.5	<10 U	41	<1 U	<1 U	14	<5 U	<10 U	220
Wastewater													
NRF Ind. Waste Ditch	07/10	1710	536	9000	58	<25 U	3650	<1 U	<1 U	<105 U	<50 U	<100 U	100
NRF Sewage Lagoon	07/10	11.8	2.2	425	21	<10 U	52	<1 U	<1 U	12	<5 U	30	1680
TRA Cold Waste Pond	08/07	130	49.7	24	10.2	<10 U	114	<1 U	<1 U	8	<5 U	<10 U	30
NRF Ind. Waste Ditch	09/19	1670	518	8000	57	<25 U	3600	<1 U	<1 U	<100 U	<50 U	<100 U	190

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

Table 25 continued. Reported metals concentrations for the verification water monitoring samples, third quarter 2001. Samples were not filtered.

Sample Location	Sample Date 2001	Concentration[1]										
		Lead (µg/L)	Manganese (µg/L)	Thallium (µg/L)	Nickel (µg/L)	Silver (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Antimony (µg/L)	Aluminum (µg/L)	Selenium (µg/L)	Mercury (µg/L)
Groundwater												
NRF-11	8/08	<5 U	1	<1.5 U	6	<1 U	<100 U	<5 U	<5 U	<50 U	<5 U	<0.5 U
NRF-12	8/08	<5 U	1	<1.5 U	8	<1 U	<100 U	5	<5 U	<50 U	<5 U	<0.5 U
M1S	9/25	<5 U	<1 U	<1.5 UJ	<5 U	<1 U	<100 U	15	<5 U	60	<10 U	<0.5 U
M3S	9/25	<5 U	3	<1.5 UJ	<5 U	<1 U	<100 U	7	<5 U	190	<10 U	<0.5 U
Wastewater												
NRF Ind. Waste Ditch	07/10	<5 U	360	<7.5 U	<50 U	<2 U	<105 U	80	<10 U	100	<50 U	<0.5 U
NRF Sewage Lagoon	07/10	<5 U	46	<7.5 U	7	2	<100 U	190	10	896	<10 U	<0.5 U
TRA Cold Waste Pond	08/07	<5 U	<1 U	<1.5 U	<5 U	<1 U	<100 U	9	<5 U	<50 U	<5 U	<0.5 U
NRF Ind. Waste Ditch	09/19	<5 U	410	<7.5 U	<50 U	<2 U	<100 U	58	<25 U	100	<50 U	<0.5 U

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

Table 26. Reported concentrations of volatile organic compounds (VOCs) for the verification water monitoring samples, third quarter, 2001. Samples were not filtered.

Analyte	Concentration (µg/L)	
	M1S (9/25/01)	M3S (9/25/01)
Benzene	<0.5 U	<0.5 U
Bromobenzene	<0.5 U	<0.5 U
Bromochloromoethane	<0.5 U	<0.5 U
Bromodichloromethane	<0.5 U	<0.5 U
Bromoform	<0.5 U	<0.5 U
Bromomethane	<0.5 U	<0.5 U
n-Butylbenzene	<0.5 U	<0.5 U
sec-Butylbenzene	<0.5 U	<0.5 U
tert-Butylbenzene	<0.5 U	<0.5 U
Carbon tetrachloride	<0.5 U	1.25
Chlorobenzene	<0.5 U	<0.5 U
Chloroethane	<0.5 U	<0.5 U
Chloroform	<0.5 U	<0.5 U
Chloromethane	<0.5 U	<0.5 U
2-Chlorotoluene	<0.5 U	<0.5 U
4-Chlorotoluene	<0.5 U	<0.5 U
Dibromochloromethane	<0.5 U	<0.5 U
1,2-Dibromo-3-chloropropane	<0.5 U	<0.5 U
Dibromomethane	<0.5 U	<0.5 U
1,2-Dibromoethane	<0.5 U	<0.5 U
1,2-Dichlorobenzene	<0.5 U	<0.5 U
1,3-Dichlorobenzene	<0.5 U	<0.5 U
1,4-Dichlorobenzene	<0.5 U	<0.5 U
Dichlorodifluoromethane	<0.5 U	<0.5 U
1,1-Dichloroethane	<0.5 U	<0.5 U
1,2-Dichloroethane	<0.5 U	<0.5 U
1,1-Dichloroethene	<0.5 U	<0.5 U
cis-1,2-Dichloroethene	<0.5 U	<0.5 U
trans-1,2-Dichloroethene	<0.5 U	<0.5 U
1,2-Dichloropropane	<0.5 U	<0.5 U
1,3-Dichloropropane	<0.5 U	<0.5 U
2,2-Dichloropropane	<0.5 U	<0.5 U
1,1-Dichloropropene	<0.5 U	<0.5 U
cis-1,3-dichloropropene	<0.5 U	<0.5 U
trans-1,3-Dichloropropene	<0.5 U	<0.5 U
Ethylbenzene	<0.5 U	<0.5 U

Table 26 continued. Reported concentrations of volatile organic compounds (VOCs) for the verification water monitoring samples, third quarter, 2001. Samples were not filtered.

Analyte	Concentration (µg/L)	
	M1S (9/25/01)	M1S (9/25/01)
Hexachlorobutadiene	<0.5 U	<0.5 U
Isopropylbenzene	<0.5 U	<0.5 U
p-Isopropyltoluene	<0.5 U	<0.5 U
Methylene chloride	<0.5 U	<0.5 U
Naphthalene	<0.5 U	<0.5 U
n-Propylbenzene	<0.5 U	<0.5 U
Styrene	<0.5 U	<0.5 U
1,1,1,2-Tetrachloroethane	<0.5 U	<0.5 U
1,1,2,2-Tetrachloroethane	<0.5 U	<0.5 U
Tetrachloroethene	<0.5 U	<0.5 U
Toluene	<0.5 U	<0.5 U
1,2,3-Trichlorobenzene	<0.5 U	<0.5 U
1,2,4-Trichlorobenzene	<0.5 U	<0.5 U
1,1,1-Trichloroethane	<0.5 U	<0.5 U
1,1,2-Trichloroethane	<0.5 U	<0.5 U
Trichloroethene	<0.5 U	<0.5 U
Trichlorofluoromethane	<0.5 U	<0.5 U
1,2,3-Tricholopropane	<0.5 U	<0.5 U
1,2,4-Trimethylbenzene	<0.5 U	<0.5 U
1,3,5-Trimethylbenzene	<0.5 U	<0.5 U
Vinyl chloride	<0.5 U	<0.5 U
Xylenes (total)	<0.5 U	<0.5 U

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

Terrestrial Monitoring Results

The ESP conducts terrestrial sampling as an extension of air pathway monitoring, because the long-term deposition and migration of contaminants in the environment may lead to human exposure or environmental detriment. INEEL OP collects soil samples and milk samples as part of the ESP.

Results for analyses of milk samples, which are collected monthly, are presented in **Table 27**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131, a man-made radionuclide, was not detected.

No soil samples were taken during the first quarter of 2001.

Table 27. Gamma spectroscopy for milk samples, third quarter, 2001.

Sample Location	Sample Date 2001	Naturally occurring gamma-emitting radionuclide Potassium-40 (pCi/L)		Man-made gamma-emitting radionuclide Iodine-131
		Concentration	± 2 SD	
Blackfoot/Snake River Cheese	07/10	1445	119	<MDC
	08/07	1487	95	<MDC
	08/07	1509	96	<MDC
	09/11	1557	97	<MDC
	09/11	1577	99	<MDC
Howe/Nelson-Ricks Creamery	07/11	1407	117	<MDC
	08/07	1499	94	<MDC
	09/11	1588	120	<MDC
Mud Lake/Nelson Ricks Creamery	07/10	1691	122	<MDC
	08/07	1346	103	<MDC
	09/11	1483	94	<MDC
Rupert-Minidoka/Kraft	07/10	1552	117	<MDC
	08/07	1490	110	<MDC
	09/11	1577	99	<MDC
Gooding/Glanbia	07/10	1605	101	<MDC
	08/07	1500	95	<MDC
	09/11	1619	122	<MDC
Pocatello/Meadowgold	07/10	1524	97	<MDC
	07/10	1570	99	<MDC
	08/07	1417	107	<MDC
	09/11	1453	109	<MDC
Callister[2]	08/07	1388	105	<MDC
Hall[2]	08/07	1454	93	<MDC
	09/04	1461	93	<MDC
Reeds[2]	09/04	1358	104	<MDC

SD – Standard deviation
<MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131)
[1] Laboratory split analysis or recount.
[2] Split samples taken by the off-site INEEL environmental surveillance contractor.

Quality Assurance/Quality Control

This section summarizes the quality assurance/quality control (QA/QC) samples (spikes, blanks, and duplicate), and regular samples submitted to the Idaho Bureau of Laboratories –Boise (IBL) for nonradiological analyses and to Idaho State University's Environmental Monitoring Laboratory (EML) for radiological analyses during the third calendar quarter of 2001. All analyses and QA measures in the analytical laboratories 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 INEEL Oversight Program.

The measurement of any physical quantity is subject to uncertainty from errors that may be introduced during sample collection, measurement, calibration, and the reading and reporting of results. While the sum of these inaccuracies cannot be quantified 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.

Analytical results for spikes, duplicates, and blanks are used to assess the precision, accuracy and representativeness of results from analyzing laboratories. During the third quarter of 2001 the INEEL OP submitted 82 QA/QC samples for various radiological and nonradiological analyses (**Table 28**).

Blank samples consist of matrices that have negligible, acceptably low, or unmeasurable 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, 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 are presented in **Figures 16, 17** and **18**. Blank sample results for ^{137}Cs and tritium are presented in **Figures 19** and **20**. Beryllium-7 analysis result for composited blank PM_{10} filters was 0.0 ± 0.0 pCi/m^{3}. The blank result submitted for tritium in air analysis was 0.10 ± 0.09 nCi/L. Blank sample results submitted for nonradiological analyses are presented in **Tables 29** and **30**.

Spikes are samples to which known concentrations of specific analytes have been added. One indicator of agreement is the difference between the known concentration in the sample and the measured concentration, expressed as a relative percent difference. This quantity is calculated and averaged to give an average bias. The standard deviation of the differences can be used as an indicator of the overall precision of the data set. There were no spikes submitted for radiological analysis this quarter. Spike results for nonradiological analyses are presented in **Tables 31-32**.

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. Duplicate results are presented in **Tables 33** and **34** for nonradiological analyses and in **Table 35** for radiological analyses.

Once per quarter INEEL OP irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of QA EICs are conducted in a repeatable geometry to a known exposure of 30 mR and a "blind" exposure ranging form 20 to 50 mR. EIC responses are compared directly with the exposure received from the NIST traceable ^{137}Cs source provided by Idaho State University. EIC response is considered acceptable if each irradiated EIC agrees within 10% or within 3 standard deviations. The irradiation results for second quarter 2001 are presented in **Table 36.**

During the third quarter the EML reported 13 analyses results for water that were above MDC using the standard tritium method. Eight of these results were from the Magic Valley. Since there is no history of Magic Valley tritium samples being above the MDC using the standard method, aliquants of all of the

Magic Valley tritium samples were re-distilled and recounted. None of the re-distilled and recounted aliquant results were above MDC. This, as well as past tritium problems in the laboratory, indicates that laboratory contamination is the most probable cause of the original Magic Valley analyses being above MDC. While a specific event or timeframe could not be identified, all samples were qualified as "estimated values" due to this unquantified uncertainty. Specific analysis results where tritium was detected in the initial analysis, but not in the redistilled analysis, were rejected and not included in the averaged final result. One of the laboratory split samples for Mud Lake water supply was also rejected based on difference between laboratory splits, departure from historic values for this location, and evidence of laboratory tritium contamination in this sample.

Precipitation samples from Howe and the Big Lost River Rest Area stations were also above MDC. These samples were also re-distilled and then analyzed. All re-distilled samples were below MDC.

Water vapor samples from the Experimental Field Station, Van Buren and the Big Lost River Rest Area were above MDC for tritium as well. The Experimental Field Station and Van Buren water samples were re-pipetted and re-analyzed and all remained above MDC.

The cause of the suspected laboratory contamination for the samples above MDC has not been determined. The cause may be connected to the distillation dates prior to adequate ventilation of the laboratory. The laboratory has taken additional corrective actions and enacted more precautions in an effort to prevent future occurrences of this type.

Table 28. Summary

Sample Type	Analyte	Number of analyses
Blanks of all types	Gross alpha	15
	Gross beta	15
	Gamma emitters	3
	Tritium	3
	Enriched tritium	0
	EICs	4
	Metals	2
	Common Ion and Nutrient	6
Duplicates of all types	Gross alpha	4
	Gross beta	4
	Gamma emitters	4
	Tritium	4
	Metals	2
	Common Ion and Nutrient	6
Spikes of all types	Rad (EIC irradiations only)	8
	Nonrad	2
	Total	82

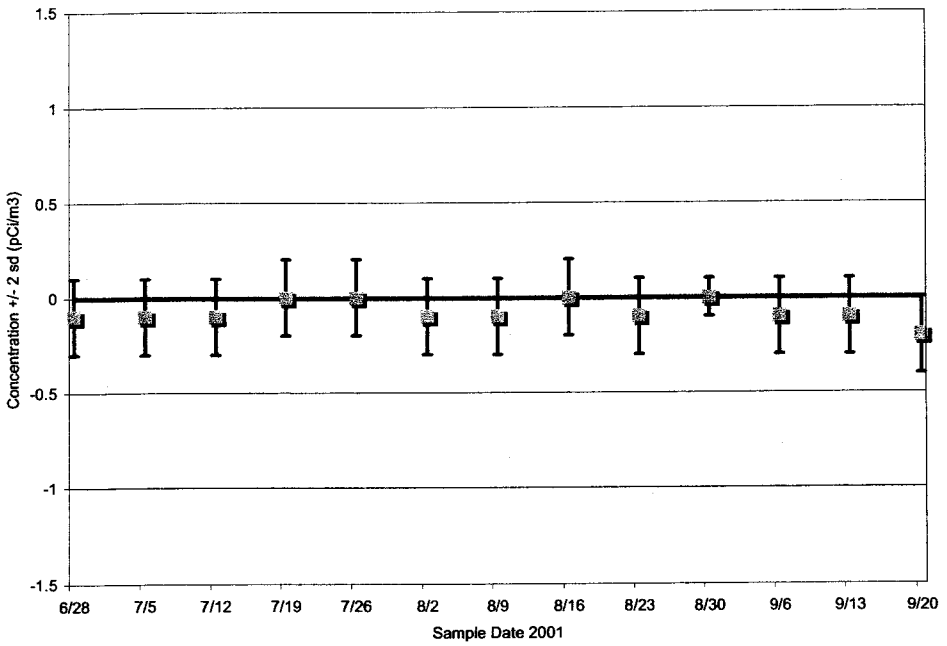

Figure 16. Blank results for PM_{10} gross alpha analysis.

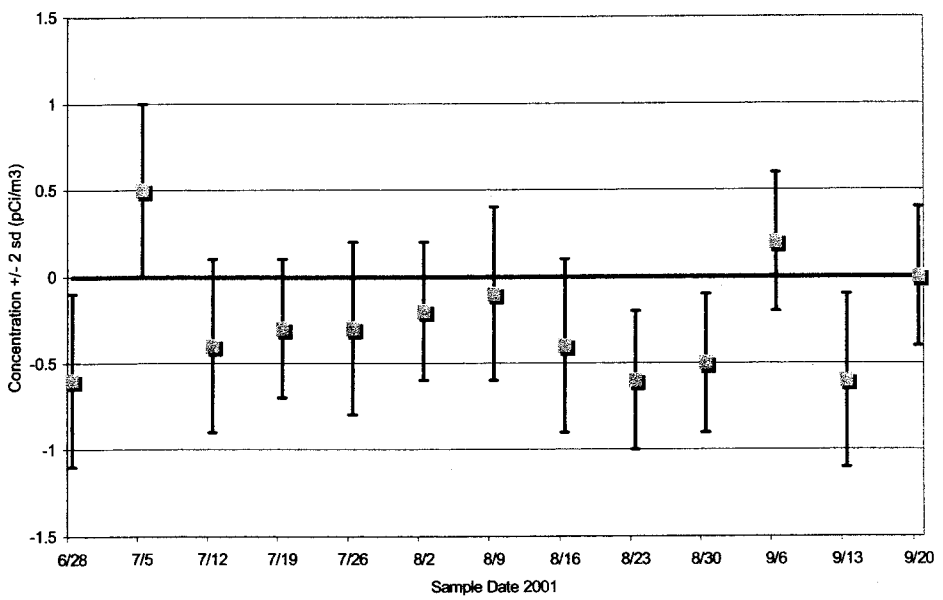

Figure 17. Blank results for PM_{10} gross beta analysis.

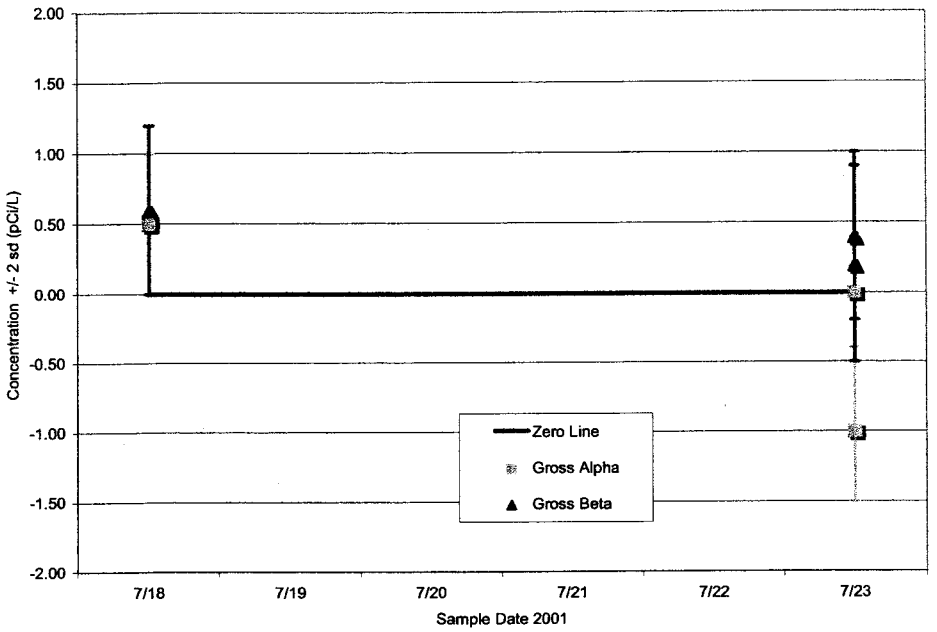

Figure 18. Blank water results for gross alpha and gross beta analysis.

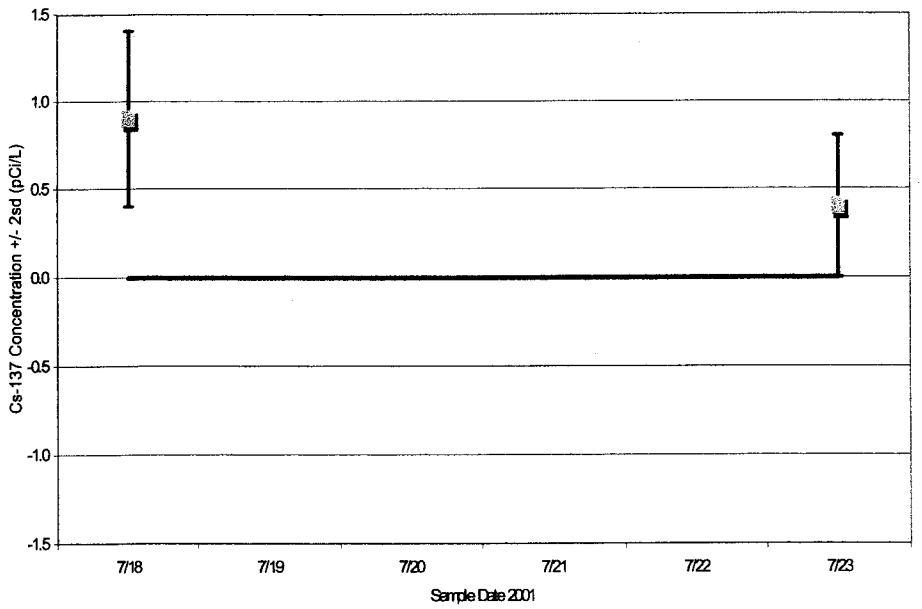

Figure 19. Blank results for water gamma spectroscopy analysis.

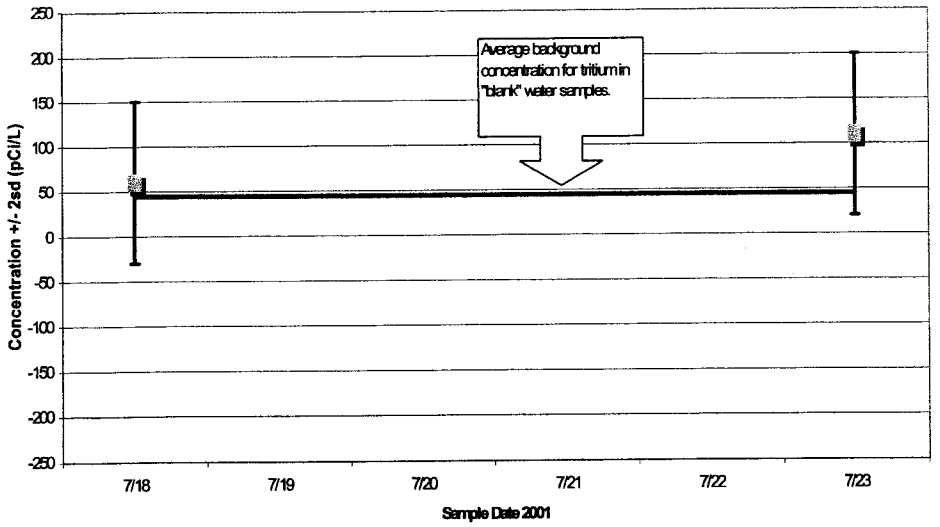

Figure 20. Blank results for water tritium analysis.

Table 29. Blank results submitted for metal analysis for water sampling program, third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (µg/L)				
			Barium	Chromium	Lead	Manganese	Zinc
Blank 1	013W107	07/18	<1	<2	<5	<1	<2
Blank 2	013W115	07/23	<1	<2	<5	<1	<2

Table 30. Blank results submitted for common ion and nutrients analysis for water sampling program, third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (mg/L)			
			Calcium	Magnesium	Sodium	Potassium
Blank 1	013W107	07/18	<0.1	<0.1	<0.1	<0.1
Blank 2	013W115	07/03	<0.1	<0.1	<0.1	<0.1

Table 30 continued. Blank results submitted for common ion and nutrients analysis for water sampling program, third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (mg/L)			
			Fluoride	Chloride	Sulfate	Total Alkalinity as $CaCO_3$
Blank 1	013W108	07/18	<0.1	<2	<2	1
Blank 2	013W116	07/03	<0.1	<2	<2	1

Table 30 continued. Blank results submitted for common ion and nutrients analysis for water sampling program, third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (µg/L)	
			Total Nitrogen	Total Phosphorus
Blank 1	013W109	07/18	<0.005	<0.005
Blank 2	013W117	07/30	<0.005	<0.005

Table 31 Spike results submitted for common ion and nutrient analysis for water sampling program, third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (mg/L)			
			Calcium	Magnesium	Sodium	Potassium
Laboratory analysis results						
Spike 1	013W102	08/14	9.9	10.0	10.0	9.8
Spike 2	013W110	08/15	9.9	9.8	10.0	9.8
Reference spike concentrations			10.0	10.0	10.0	10.0
Spike Recoveries						
Spike 1	013W102	08/14	0.99	1.00	1.00	0.98
Spike 2	013W110	08/15	0.99	0.98	1.00	0.98

Table 31 continued. Spike results submitted for common ion and nutrient analysis for water sampling program third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (mg/L)	
			Total Nitrogen	Total Phosphorus
Laboratory analysis results				
Spike 1	013W102	08/14	5.19	5.07
Spike 2	013W110	08/15	5.15	5.06
Reference spike concentrations			5.00	5.00
Spike Recoveries				
Spike 1	013W102	08/14	1.04	1.01
Spike 2	013W110	08/15	1.03	1.01

Table 32 Spike results submitted for metal analysis for water sampling program third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (mg/L)			
			Chromium	Lead	Manganese	Zinc
Laboratory analysis results						
Spike 1	013W102	08/14	20.0	21.0	5.0	21.0
Spike 2	013W110	08/15	20.0	20.0	5.0	21.0
Reference spike concentrations			20.0	20.0	5.0	21.0
Spike Recoveries						
Spike 1	013W102	08/14	1.00	1.05	1.00	1.05
Spike 2	013W110	08/15	1.00	1.00	1.00	1.05

Table 33. Duplicate analysis results for metals third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (µg/L)				
				Chromium	Lead	Manganese	Zinc
Duplicates							
Bill Jones Hatchery	013W068	08/14	20	3	<5	<1	<2
Bill Jones Hatchery (dup)	013W093	08/14	19	3	<5	<1	<2
USGS-115	013W053	07/23	59	6	<5	<1	483
USGS-115(dup)	013W063	07/23	59	7	<5	<1	487
Precision (analysis of duplicate samples, *100)							
Bill Jones Hatchery		08/14	5.1	In control	<DL	<DL	<DL
USGS-115		07/23	0	In control	<DL	<DL	0.8

DL = Detection Limit

Table 34. Duplicate analysis results for common ions and nutrients third quarter, 2001.

	Number	Sample Date 2001	Concentration (µg/L)			
			Calcium	Magnesium	Sodium	Potassium
Duplicates						
Bill Jones Hatchery	013W068	08/14	31.6	16.6	18	3.7
Bill Jones Hatchery (dup)	013W093	08/14	31.7	16.6	17	3.7
USGS-115	013W053	07/23	40.8	13.1	14	2.9
USGS-115 (dup)	013W063	07/23	41.2	13.2	14	3.0
Precision (analysis of duplicate samples, *100)						
Bill Jones Hatchery		08/14	0.3	0	5.7	0
USGS-115		07/23	1	0.8	0	3.4

DL = Detection Limit

Table 34 continued. Duplicate analysis results for common ions and nutrients third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (µg/L)			
			Fluoride	Chloride	Sulfate	Total Alkalinity as $CaCO_3$
Duplicates						
Bill Jones Hatchery	013W069	08/14	0.5	10	24.5	141
Bill Jones Hatchery (dup)	013W094	08/14	0.53	9.8	24.5	141
USGS-115	013W054	07/23	0.34	37.9	22.4	110
USGS-115 (dup)	013W064	07/23	0.37	37.8	22.5	110
Precision (analysis of duplicate samples, *100)						
Bill Jones Hatchery		08/14	In control	2	0	0
USGS-115		07/23	In control	0.3	0.4	0

DL = Detection Limit

Table 34 continued. Duplicate analysis results for common ions and nutrients third quarter, 2001.

	Sample Number	Sample Date 2001	Concentration (µg/L)	
			Dissolved Nitrite Nitrate	Total Phosphorus
Duplicates				
Bill Jones Hatchery	013W070	08/14	0.974	0.015
Bill Jones Hatchery (dup)	013W095	08/14	0.966	0.015
USGS-115	013W055	07/23	<0.005[a]	0.013
	013W065	07/23	1.37	0.012
Precision (analysis of duplicate samples, *100)				
Bill Jones Hatchery		08/14	0.8	In control
USGS-115		07/23	<DL	In control

[a] Value Rejected. The analysis was conducted on a sample preserved with nitric acid.
DL = Detection Limit

Table 35. Duplicate radiological analysis results for water sampling program, third quarter, 2001.

Sample Location	First Analysis Date 2001	Concentration	2 SD	Third Analysis Date 2001	Concentration	2 SD	/R1-R2/	$3(s_1^2+s_2^2)^{1/2}$	Within Criteria?[1]
Gross Alpha									
USGS-115	09/17	-0.9	1.4	11/10	-2.4	1.9	1.5	3.5	Yes
Bill Jones Hatchery	10/25	2.3	1.4	11/18	-0.3	1.9	2.6	3.5	Yes
MV-03	11/05	1.1	0.7	09/07	1.5	1.7	0.4	2.8	Yes
MV-53	09/17	2.2	2.1	09/24	1.1	2.6	1.1	5.0	Yes
Gross Beta									
USGS-115	09/17	3.5	0.9	11/10	3.8	0.9	0.3	1.9	Yes
Bill Jones Hatchery	10/25	1.8	0.8	11/18	2.9	0.9	1.1	1.8	Yes
MV-03	11/05	2.0	0.6	09/07	1.7	0.9	0.3	1.6	Yes
MV-53	09/17	5.8	1.1	09/24	5.0	1.1	0.8	2.3	Yes
Gamma Spectrosocpy - ^{137}Cs									
USGS-115	08/29	1.3	1.9	10/02	-0.3	1.3	1.6	3.5	Yes
Bill Jones Hatchery	10/08	2.5	1.8	10/08	-0.7	1.5	3.2	3.5	Yes
MV-03	08/02	-0.2	1.1	08/14	1.3	1.6	1.5	2.9	Yes
MV-53	08/03	2.2	2.1	08/17	0.2	1.3	2.0	3.7	Yes
Gamma Spectroscopy ^{40}K (pCi/L)									
USGS-115	08/29	21.0	44.0	10/02	44.0	43.0	23.0	92.3	Yes
Bill Jones Hatchery	10/08	26.0	44.0	10/08	39.0	36.0	13.0	85.3	Yes
MV-03	08/02	12.0	29.0	08/14	-13.0	42.0	25.0	76.6	Yes
MV-53	08/03	-0.8	41.0	08/17	10.0	40.0	18.0	85.9	Yes
^{3}H (pCi/L)									
USGS-115	10/22	2.26	0.13	10/25	2.27	0.13	0.0	0.3	Yes
Bill Jones Hatchery	10/19	0.02	0.09	10/25	-0.03	0.09	0.1	0.2	Yes
MV-03	09/21	85.0	70.0	10/17	45.0	45.0	40.0	124.8	Yes
MV-53	12/20	100.0	90.0	09/04	65.0	64.0	35.0	165.7	Yes

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

Table 36. Electret ionization chamber irradiation results third quarter, 2001.

Electret #	Location	Start Volt	Stop Volt	Electret-type Correction Factor	Gross Exposure (mR)	Uncertainty (mR)	Net Exposure	Uncertainty (mR)	Exposure Received (mR)	(mR)	Relative Difference	Within Spec? (Rel.Diff.)	Within Spec? (1-sigma)	Within Spec? (2-sigma)
SV3035[a]	Control 1	431	428	1.90	1.58	0.86								
SX1742[a]	Control 1	647	646	1.99	0.50	0.86								
SX1836	Control 1	641	637	1.99	2.01	0.86								
SX1696	Control 1	638	636	1.98	1.01	0.86								
		Average Background:			**1.28**	**0.86**								
SX1811	Spike 1	618	559	1.97	29.98	0.86	29.98	0.86	30.0	1.5	-0.1%	Yes	Yes	Yes
SV0184	Spike 1	387	328	1.86	31.66	0.86	31.66	0.86	30.0	1.5	5.5%	Yes	Yes	Yes
SX1693	Spike 1	677	617	1.99	30.18	0.86	30.18	0.86	30.0	1.5	0.5%	Yes	Yes	Yes
SV0197	Spike 1	391	333	1.87	31.08	0.86	31.08	0.86	30.0	1.5	3.5%	Yes	Yes	Yes
				Average Net Exposure:			**30.72**	**Average Relative Difference:**			**2.3%**			
				Standard Deviation of Net Exposure:			**0.79**							
SX8097	Spike 2	639	551	1.97	44.66	0.86	44.66	0.86	45.0	2.3	-0.8%	Yes	Yes	Yes
SUV067	Spike 2	492	410	1.91	42.88	0.86	42.88	0.86	45.0	2.3	-4.8%	Yes	Yes	Yes
SV0176	Spike 2	312	229	1.81	45.98	0.86	45.98	0.86	45.0	2.3	2.1%	Yes	Yes	Yes
SX8190	Spike 2	654	567	1.98	44.03	0.86	44.03	0.86	45.0	2.3	-2.2%	Yes	Yes	Yes
				Average Net Exposure:			**44.395**	**Average Relative Difference:**			**-1.4%**			
				Standard Deviation of Net Exposure:			**1.29**							

[a] These EICs used for control measurements and are not irradiated.

Appendix A

Table A1. Weekly concentrations for gross alpha and gross beta analyses for PM_{10} particulate filters for all locations, third quarter, 2001.

Sample Location	Sample Date 2001	Gross Alpha (10^{-3} pCi/m^3)		Gross Beta (10^{-3} pCi/m^3)	
		Concentration		Concentration	± 2 SD
On-Site Locations					
Big Lost River Rest Area	06/28 – 07/05	1.4	0.4	30.1	1.6
	07/05 – 07/12	0.6	0.3	31.2	1.6
	07/12 – 07/19	0.7	0.3	26.2	1.5
	07/19 – 07/26	0.7	0.3	22.5	1.4
	07/26 – 08/02	1.2	0.4	26.2	1.5
	08/02 – 08/09	1.0	0.3	25.4	1.4
	08/09 – 08/17	1.0	0.4	27.5	1.5
	08/17 – 08/23	1.3	0.4	30.7	1.6
	08/23 – 08/30	1.0	0.3	35.0	1.7
	08/30 – 09/06	1.3	0.3	35.6	1.7
	09/06 – 09/13	0.6	0.3	27.7	1.5
	09/13 – 09/20	0.6	0.3	26.2	1.5
	09/20 – 09/27	1.2	0.4	38.3	1.7
Experimental Field Station	06/28 – 07/05	1.5	0.4	27.0	1.5
	07/05 – 07/12	0.6	0.3	24.6	1.4
	07/12 – 07/19	0.8	0.4	25.9	1.5
	07/19 – 07/26	0.8	0.3	23.8	1.4
	07/26 – 08/02	1.3	0.4	23.0	1.4
	08/02 – 08/09	0.8	0.3	31.0	1.5
	08/09 – 08/17	1.1	0.4	29.8	1.6
	08/17 – 08/23	1.4	0.4	35.1	1.7
	08/23 – 08/30	1.3	0.4	36.8	1.7
	08/30 – 09/06	1.6	0.4	38.1	1.7
	09/06 – 09/13	0.6	0.3	22.3	1.3
	09/13 – 09/20	1.3	0.4	32.4	1.7
	09/20 – 09/27	1.1	0.4	40.7	1.8
Sand Dunes Tower	06/28 – 07/05	1.2	0.4	35.9	1.7
	07/05 – 07/12	0.9	0.4	29.1	1.5
	07/12 – 07/19	0.9	0.4	29.8	1.6
	07/19 – 07/26	0.9	0.3	30.9	1.6
	07/26 – 08/02	0.9	0.3	30.7	1.5
	08/02 – 08/09	1.4	0.4	38.6	1.8
	08/09 – 08/17	NS[2]			
	08/17 – 08/23	1.4	0.4	39.8	1.9
	08/23 – 08/30	NS[2]			
	08/30 – 09/06	1.5	0.4	41.4	1.8
	09/06 – 09/13	0.9	0.3	27.7	1.5
	09/13 – 09/20	1.1	0.4	42.3	1.8
	09/20 – 09/27	1.2	0.4	51.3	2.1

Van Buren Avenue	06/28 – 07/05	2.0	0.5	39.6	1.8
	07/05 – 07/12	NS[2]			
	07/12 – 07/19	0.9	0.4	33.5	1.7
	07/19 – 07/26	0.6	0.3	32.2	1.6
	07/26 – 08/02	1.5	0.4	31.5	1.6
	08/02 – 08/09	1.4	0.4	45.1	1.9
	08/09 – 08/17	1.5	0.4	38.5	1.8
	08/17 – 08/23	2.0	0.4	48.9	2.0
	08/23 – 08/30	2.0	0.4	47.6	1.9
	08/30 – 09/06	1.5	0.4	51.6	2.0
	09/06 – 09/13	0.7	0.3	30.4	1.6
	09/13 – 09/20	1.0	0.3	43.5	1.9
	09/20 – 09/27	1.8	0.4	54.1	2.0
Boundary Locations					
Atomic City	06/28 – 07/05	1.6	0.4	33.8	1.6
	07/05 – 07/12	0.8	0.4	26.4	1.5
	07/12 – 07/19	1.0	0.4	29.6	1.5
	07/19 – 07/26	0.7	0.3	28.5	1.5
	07/26 – 08/02	1.0	0.3	20.1	1.3
	08/02 – 08/09	1.0	0.3	30.2	1.5
	08/09 – 08/17	1.2	0.4	24.9	1.4
	08/17 – 08/23	1.2	0.4	28.5	1.5
	08/23 – 08/30	1.3	0.4	31.4	1.6
	08/30 – 09/06	1.2	0.3	33.9	1.6
	09/06 – 09/13	0.5	0.3	18.6	1.2
	09/13 – 09/20	NS[2]			
	09/20 – 09/27	NS[2]			
Howe	06/28 – 07/05	1.2	0.6	34.6	2.5
	07/05 – 07/12	1.1	0.6	29.6	2.1
	07/12 – 07/19	0.7	0.3	31.4	1.6
	07/19 – 07/26	NS[2]			
	07/26 – 08/02	1.1	0.3	30.1	1.5
	08/02 – 08/09	1.1	0.3	38.2	1.7
	08/09 – 08/17	1.5	0.4	38.3	1.7
	08/17 – 08/23	1.1	0.3	21.0	1.3
	08/23 – 08/30	1.1	0.5	40.4	2.3
	08/30 – 09/06	1.8	0.4	44.8	1.8
	09/06 – 09/13	0.5	0.4	19.0	1.7
	09/13 – 09/20	NS[2]			
	09/20 – 09/27	NS[2]			

Mud Lake	06/28 – 07/05	1.3	0.4	31.9	1.6
	07/05 – 07/12	0.8	0.3	24.5	1.4
	07/12 – 07/19	0.6	0.3	26.1	1.5
	07/19 – 07/26	0.6	0.3	28.2	1.5
	07/26 – 08/02	0.8	0.3	25.0	1.4
	08/02 – 08/09	1.7	0.4	36.3	1.7
	08/09 – 08/17	1.5	0.4	31.7	1.6
	08/17 – 08/23	1.3	0.4	38.4	1.7
	08/23 – 08/30	1.4	0.4	40.4	1.8
	08/30 – 09/06	1.4	0.3	41.4	1.8
	09/06 – 09/13	NS[2]			
	09/13 – 09/20	NS[2]			
	09/20 – 09/27	NS[2]			
Distant Locations					
Craters of the Moon	06/28 – 07/05	1.2	0.4	32.0	1.6
	07/05 – 07/12	0.5	0.3	31.9	1.6
	07/12 – 07/19	1.0	0.4	27.4	1.5
	07/19 – 07/26	1.1	0.3	30.2	1.6
	07/26 – 08/02	0.9	0.3	29.0	1.5
	08/02 – 08/09	1.3	0.4	37.5	1.7
	08/09 – 08/17	NS[2]			
	08/17 – 08/23	0.0	0.2	42.4	1.8
	08/23 – 08/30	1.4	0.4	44.2	1.9
	08/30 – 09/06	2.2	0.5	48.2	2.1
	09/06 – 09/13	0.7	0.3	28.7	1.6
	09/13 – 09/20	1.2	0.4	40.5	1.8
	09/20 – 09/27	1.4	0.4	46.4	1.9
Fort Hall[1]	06/28 – 07/05	2.6	0.5	34.4	1.7
	07/05 – 07/12	1.6	0.5	22.4	1.4
	07/12 – 07/19	1.1	0.4	34.2	1.7
	07/19 – 07/26	1.4	0.4	30.8	1.6
	07/26 – 08/02	1.8	0.4	28.0	1.5
	08/02 – 08/09	1.4	0.4	30.0	1.6
	08/09 – 08/17	1.9	0.5	32.4	1.6
	08/17 – 08/23	3.2	0.5	41.4	1.9
	08/23 – 08/30	1.4	0.4	33.3	1.6
	08/30 – 09/06	2.1	0.4	44.5	1.9
	09/06 – 09/13	0.9	0.3	28.4	1.5
	09/13 – 09/20	1.3	0.4	42.3	1.8
	09/20 – 09/27	2.5	0.5	49.7	2.0

Idaho Falls	06/28 – 07/05	1.0	0.4	20.5	1.3
	07/05 – 07/12	0.8	0.3	19.5	1.3
	07/12 – 07/19	0.5	0.3	17.7	1.3
	07/19 – 07/26	0.9	0.3	19.1	1.3
	07/26 – 08/02	0.9	0.3	14.6	1.2
	08/02 – 08/09	1.2	0.4	25.8	1.5
	08/09 – 08/17	1.2	0.4	19.2	1.3
	08/17 – 08/23	1.6	0.4	28.4	1.5
	08/23 – 08/30	1.1	0.3	23.0	1.4
	08/30 – 09/06	1.7	0.4	29.4	1.5
	09/06 – 09/13	0.6	0.3	14.8	1.1
	09/13 – 09/20	0.7	0.3	29.0	1.5
	09/20 – 09/27	1.2	0.4	26.3	1.5

[1] Operated by Shoshone-Bannock Tribe
[2] No sample obtained due to equipment failure.

Appendix B

Table B1. Weekly concentrations for gross alpha and gross beta analyses for TSP particulate filters for all locations, third quarter, 2001.

Sample Location	Sample Date	Gross Alpha (10^{-3} pCi/m^3)		Gross Beta (10^{-3})	
		Concentration	± 2 SD	Concentration	± 2 SD
On-Site Locations					
Big Lost River Rest Area	06/28 – 07/05	1.1	0.3	25.4	1.0
	07/05 – 07/12	1.0	0.2	22.0	1.0
	07/12 – 07/19	1.2	0.2	25.0	1.0
	07/19 – 07/26	0.8	0.2	23.2	1.0
	07/26 – 08/02	1.2	0.3	23.6	1.0
	08/02 – 08/09	1.3	0.2	31.3	1.1
	08/09 – 08/17	2.0	0.3	24.5	1.0
	08/17 – 08/23	1.6	0.3	31.3	1.1
	08/23 – 08/30	1.2	0.2	28.3	1.1
	08/30 – 09/06	1.3	0.3	35.7	1.2
	09/06 – 09/13	0.8	0.2	19.9	0.9
	09/13 – 09/20	0.8	0.2	28.8	1.1
	09/20 – 09/27	1.0	0.2	33.6	1.1
Experimental Field Station	06/28 – 07/05	0.9	0.2	22.6	0.8
	07/05 – 07/12	0.5	0.2	21.1	0.8
	07/12 – 07/19	1.0	0.2	22.1	0.8
	07/19 – 07/26	0.7	0.2	20.1	0.9
	07/26 – 08/02	0.6	0.2	20.9	0.9
	08/02 – 08/09	1.3	0.2	28.6	1.1
	08/09 – 08/17	1.4	0.2	26.1	1.0
	08/17 – 08/23	1.5	0.3	29.4	1.1
	08/23 – 08/30	1.2	0.2	29.4	1.1
	08/30 – 09/06	1.4	0.3	32.4	1.1
	09/06 – 09/13	0.7	0.2	20.6	0.9
	09/13 – 09/20	0.9	0.2	29.4	1.1
	09/20 – 09/27	1.1	0.2	35.0	1.1
Sand Dunes Tower	06/28 – 07/05	0.9	0.2	27.9	0.9
	07/05 – 07/12	0.8	0.2	24.4	0.9
	07/12 – 07/19	0.9	0.2	26.2	0.9
	07/19 – 07/26	0.6	0.2	25.7	1.0
	07/26 – 08/02	0.5	0.2	23.9	1.0
	08/02 – 08/09	1.4	0.3	31.8	1.2
	08/09 – 08/17	1.5	0.3	29.3	1.1
	08/17 – 08/23	1.6	0.3	38.1	1.3
	08/23 – 08/30	1.1	0.2	30.2	1.1
	08/30 – 09/06	1.4	0.3	35.2	1.2
	09/06 – 09/13	0.7	0.2	23.1	0.9
	09/13 – 09/20	0.8	0.2	30.4	1.1
	09/20 – 09/27	1.0	0.2	35.6	1.2

Van Buren Avenue	06/28 – 07/05	0.7	0.2	21.9	0.9
	07/05 – 07/12	NS[1]			
	07/12 – 07/19	0.9	0.2	21.2	0.8
	07/19 – 07/26	0.9	0.2	26.2	1.0
	07/26 – 08/02	0.6	0.2	22.0	0.9
	08/02 – 08/09	1.0	0.2	30.0	1.1
	08/09 – 08/17	1.6	0.3	27.7	1.1
	08/17 – 08/23	1.3	0.3	28.7	1.1
	08/23 – 08/30	1.3	0.2	29.3	1.1
	08/30 – 09/06	1.4	0.3	33.6	1.1
	09/06 – 09/13	0.7	0.2	19.8	0.9
	09/13 – 09/20	0.7	0.2	28.6	1.1
	09/20 – 09/27	1.1	0.2	32.8	1.1
Boundary Locations					
Atomic City	06/28 – 07/05	0.8	0.3	24.8	1.2
	07/05 – 07/12	0.6	0.2	24.2	0.9
	07/12 – 07/19	1.0	0.2	25.0	0.9
	07/19 – 07/26	1.0	0.2	22.0	1.0
	07/26 – 08/02	0.8	0.3	23.0	1.0
	08/02 – 08/09	1.4	0.3	31.7	1.1
	08/09 – 08/17	1.6	0.3	28.3	1.1
	08/17 – 08/23	1.5	0.3	30.8	1.2
	08/23 – 08/30	1.3	3.9	32.5	1.1
	08/30 – 09/06	1.7	0.3	35.6	1.2
	09/06 – 09/13	0.6	0.2	21.8	1.0
	09/13 – 09/20	0.9	0.2	30.9	1.1
	09/20 – 09/27	1.2	0.2	34.6	1.2
Howe	06/28 – 07/05	0.8	0.3	21.1	1.2
	07/05 – 07/12	0.8	0.3	17.0	0.9
	07/12 – 07/19	0.7	0.2	19.2	0.8
	07/19 – 07/26	NS[1]			
	07/26 – 08/02	0.7	0.5	20.1	1.4
	08/02 – 08/09	0.9	0.2	24.6	1.0
	08/09 – 08/17	1.4	0.2	24.8	1.0
	08/17 – 08/23	1.2	0.3	23.0	1.0
	08/23 – 08/30	1.1	0.3	25.7	1.3
	08/30 – 09/06	1.3	0.3	30.6	1.1
	09/06 – 09/13	0.4	0.2	17.6	0.8
	09/13 – 09/20	NS[1]			
	09/20 – 09/27	1.1	0.2	28.3	1.0

Monteview	06/28 – 07/05	0.9	0.3	20.0	1.0
	07/05 – 07/12	0.6	0.2	18.8	0.8
	07/12 – 07/19	0.9	0.2	19.1	0.7
	07/19 – 07/26	0.7	0.2	18.7	0.8
	07/26 – 08/02	0.4	0.2	17.2	0.8
	08/02 – 08/09	1.1	0.2	24.2	1.0
	08/09 – 08/17	1.1	0.2	20.4	0.9
	08/17 – 08/23	1.1	0.2	21.8	0.9
	08/23 – 08/30	1.2	0.2	23.4	0.9
	08/30 – 09/06	0.9	0.2	24.0	1.0
	09/06 – 09/13	0.9	0.2	15.2	0.8
	09/13 – 09/20	0.7	0.2	25.3	1.0
	09/20 – 09/27	1.1	0.2	23.6	1.0
Mud Lake	06/28 – 07/05	0.9	0.2	21.1	0.9
	07/05 – 07/12	0.8	0.2	18.2	0.7
	07/12 – 07/19	0.9	0.2	20.1	0.8
	07/19 – 07/26	0.7	0.2	21.1	0.9
	07/26 – 08/02	0.8	0.2	20.0	0.9
	08/02 – 08/09	1.3	0.3	26.5	1.1
	08/09 – 08/17	1.3	0.2	21.8	0.9
	08/17 – 08/23	1.3	0.3	26.7	1.0
	08/23 – 08/30	1.2	0.2	26.6	1.0
	08/30 – 09/06	1.4	0.3	28.0	1.0
	09/06 – 09/13	0.8	0.2	17.1	0.8
	09/13 – 09/20	0.9	0.2	27.8	1.0
	09/20 – 09/27	1.2	0.2	31.2	1.1
Distant Locations					
Craters of the Moon	06/28 – 07/05	0.8	0.3	19.5	1.0
	07/05 – 07/12	0.6	0.3	23.2	1.1
	07/12 – 07/19	1.1	0.3	24.2	1.1
	07/19 – 07/26	0.6	0.3	20.5	1.2
	07/26 – 08/02	0.3	0.4	22.3	1.3
	08/02 – 08/09	1.6	0.4	41.2	1.7
	08/09 – 08/17	NS[1]			
	08/17 – 08/23	1.5	0.4	42.1	1.8
	08/23 – 08/30	1.5	0.3	41.1	1.7
	08/30 – 09/06	2.1	0.4	43.5	1.8
	09/06 – 09/13	0.5	0.2	14.5	0.8
	09/13 – 09/20	0.7	0.2	26.4	1.0
	09/20 – 09/27	0.7	0.2	24.6	1.0

Idaho Falls	06/28 – 07/05	0.9	0.3	20.9	1.0
	07/05 – 07/12	0.9	0.2	19.4	0.7
	07/12 – 07/19	0.9	0.2	20.1	0.8
	07/19 – 07/26	0.9	0.2	21.6	0.9
	07/26 – 08/02	0.8	0.3	17.2	0.8
	08/02 – 08/09	1.2	0.2	25.8	1.0
	08/09 – 08/17	1.4	0.2	23.5	1.0
	08/17 – 08/23	1.6	0.3	28.2	1.1
	08/23 – 08/30	1.5	0.2	28.6	1.1
	08/30 – 09/06	1.4	0.3	28.5	1.0
	09/06 – 09/13	0.8	0.2	19.2	0.9
	09/13 – 09/20	0.8	0.2	29.5	1.1
	09/20 – 09/27	1.5	0.3	33.0	1.1

[1] No sample obtained due to power failure.