

S.M. Stoller Corporation  
Environmental Surveillance, Education, and Research Program  
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# Idaho National Laboratory Site Offsite Environmental Surveillance Program Report: Fourth Quarter 2007

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*Contributors:  
Marilyn Case, Russ Mitchell*

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By the S.M. Stoller Corporation,  
Environmental Surveillance, Education and Research Program  
Douglas K. Halford, Program Manager  
120 Technology Dr., Idaho Falls, Idaho 83402  
[www.stoller-eser.com](http://www.stoller-eser.com)

## EXECUTIVE SUMMARY

None of the radionuclides detected in any of the samples collected during the fourth quarter of 2007 could be directly linked with INL Site activities. Levels of detected radionuclides were no different than values measured at other locations across the United States or were consistent with levels measured historically at the INL Site. All detected radionuclide concentrations were well below guidelines set by the U.S. Department of Energy (DOE) and regulatory standards established by the U.S. Environmental Protection Agency (EPA) for protection of the public.

This report for the fourth quarter of 2007 contains results from the Environmental Surveillance, Education and Research (ESER) Program's monitoring of the Department of Energy's Idaho National Laboratory (INL) Site's offsite environment, October 1 through December 31, 2007. All sample types (media) and the sampling schedule followed during 2007 are listed in Appendix A. Specifically, this report contains the results for the following:

- Air sampling, including particulate air filters, charcoal cartridges and atmospheric moisture
- Precipitation sampling
- Milk sampling
- Potato sampling
- Waterfowl sampling
- Environmental radiation measurements

**Table E-1 Summary of results for the Fourth Quarter of 2007.**

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were no statistical differences between Boundary and Distant location gross alpha or gross beta quarterly, monthly and weekly data in the fourth quarter. No result exceeded the DCG for gross alpha or gross beta activity in air.
		Gamma-emitting radionuclides, select actinides ( $^{241}\text{Am}$ , $^{238}\text{Pu}$ , and $^{239,240}\text{Pu}$ ), $^{90}\text{Sr}$	Cesium-137 was found above the detection level in two samples, but the values were not confirmed by recounts. One composite from an onsite location had detectable concentrations of $^{241}\text{Am}$ , $^{238}\text{Pu}$ , and $^{239,240}\text{Pu}$ .
	Charcoal Cartridge	Iodine-131	No detections of $^{131}\text{I}$ were made during the fourth quarter.
Atmospheric Moisture	Liquid	Tritium	A total of 12 samples were collected. Four of these samples had tritium results greater than the 3s uncertainty. No sample result exceeded the DCG for tritium in air.
Precipitation	Liquid	Tritium	Eleven samples were collected. Eight of the results were greater than the 3s uncertainty. Concentrations were consistent with those reported across the region and with previous

			results.
Milk	Liquid	Iodine-131, gamma-emitting radionuclides, $^{90}\text{Sr}$	Thirty-five samples, including two duplicates were collected. No manmade gamma-emitting radionuclides or Iodine-131 were detected in any sample. Strontium-90 was detected at low levels in all four samples analyzed. Results were within historical measurements.
Potatoes	Solid	Gamma-emitting radionuclides, $^{90}\text{Sr}$	Eight samples were collected. Cesium-137 was detected in one sample from Mud Lake but not confirmed by recount. Strontium-90 was not detected in any sample.
Waterfowl	Tissue	Gamma-emitting radionuclides, $^{90}\text{Sr}$ , select actinides ( $^{241}\text{Am}$ , $^{238}\text{Pu}$ , and $^{239,240}\text{Pu}$ )	Six radionuclides were found in tissues from ducks collected at the Reactor Technology Complex, including three radionuclides found in edible tissue. Concentrations were generally similar to those found in the previous year. The estimated dose from eating the entire edible mass of the duck with the highest concentrations was estimated at 0.015 mrem.
Environmental Radiation	TLD	Ambient ionizing radiation	Values were consistent with expected exposures given the altitude and location of the TLDs. There were no statistical differences between Boundary and Distant location results.

**LIST OF ABBREVIATIONS**

AEC	Atomic Energy Commission
CFA	Central Facilities Area
CMS	community monitoring station
DCG	Derived Concentration Guide
DOE	Department of Energy
DOE – ID	Department of Energy Idaho Operations Office
EAL	Environmental Assessment Laboratory
EFS	Experimental Field Station
EPA	Environmental Protection Agency
ERAMS	Environmental Radiation Ambient Monitoring System
ESER	Environmental Surveillance, Education, and Research
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
INEL	Idaho National Engineering Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
ISU	Idaho State University
MDC	minimum detectable concentration
NRTS	National Reactor Testing Station

## LIST OF UNITS

Bq	becquerel
Ci	curie
g	gram
L	liter
$\mu$ Ci	microcurie
mL	milliliter
mR	milliRoentgen
pCi	picocurie



## 1. ESER PROGRAM DESCRIPTION

Operations at the Idaho National Laboratory (INL) Site are conducted under requirements imposed by the U.S. Department of Energy (DOE) under authority of the Atomic Energy Act, and the U.S. Environmental Protection Agency (EPA) under a number of acts (e.g. the Clean Air Act and Safe Drinking Water Act). The requirements imposed by DOE are specified in DOE Orders. These requirements include those to monitor the effects of DOE activities both inside and outside the boundaries of DOE facilities (DOE 2003). During calendar year 2007, environmental monitoring within the INL Site boundaries was primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors, while monitoring outside the INL Site boundaries was conducted under the Environmental Surveillance, Education and Research (ESER) Program. The ESER Program is led by the S.M. Stoller Corporation in cooperation with its team members, including the University of Idaho, Idaho State University (ISU), the Wildlife Conservation Society and Teledyne Brown Engineering. This report contains monitoring results from the ESER Program for samples collected during the fourth quarter of 2007 (October 1–December 31, 2007).

The surveillance portion of the ESER Program is designed to satisfy the following program objectives:

- Verify compliance with applicable environmental laws, regulations, and DOE Orders
- Characterize and define trends in the physical, chemical, and biological condition of environmental media on and around the INL Site
- Assess the potential radiation dose to members of the public from INL Site effluents
- Present program results clearly and concisely through the use of reports, presentations, newsletter articles and press releases.

The goal of the surveillance program is to monitor different media at a number of potential exposure points within the various exposure pathways, including air, water, agricultural products, wildlife and soil, that could possibly contribute to the radiation dose received by the public.

Environmental samples collected include:

- air at 16 locations on and around the INL Site
- moisture in air at four locations around the INL Site
- precipitation from three locations on and around the INL Site
- agricultural products, including milk at eight dairies around the INL Site, potatoes from at least five local producers, wheat from approximately 10 local producers, and lettuce from approximately nine home-owned and portable gardens on and around the INL
- soil from 12 locations around the INL Site biennially
- environmental dosimeters from 15 locations semi-annually
- various numbers of wildlife including big game (pronghorn, mule deer, and elk) and waterfowl sampled on and near the INL Site.

Table A-1 in Appendix A lists samples, sampling locations and collection frequency for the ESER Program.

The ESER Program used two laboratories to perform analyses on routine environmental samples collected during the quarter reported here. The ISU Environmental Assessment Laboratory (EAL) performed routine gross alpha, gross beta, tritium and gamma spectrometry analyses. Analyses requiring radiochemistry including strontium-90 ( $^{90}\text{Sr}$ ), plutonium-238

(<sup>238</sup>Pu), plutonium-239/240 (<sup>239/240</sup>Pu) and americium-241 (<sup>241</sup>Am) were performed by Teledyne Brown Engineering, Inc. of Knoxville, Tennessee.

In the event of non-routine occurrences, such as suspected releases of radioactive material, the ESER Program may increase the frequency of sampling and/or the number of sampling locations based on the nature of the release and wind distribution patterns. Any data found to be outside historical norms in the ESER Program is thoroughly investigated to determine if an INL Site origin is likely. Investigation may include re-sampling and/or re-analysis of prior samples.

In the event of any suspected worldwide nuclear incidents, like the 1986 Chernobyl accident, the EPA may request additional sampling be performed through RadNet [previously known as the Environmental Radiation Ambient Monitoring System (ERAMS) network] (EPA 2006). The EPA established the ERAMS network in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. ERAMS was renamed RadNet in 2005 to reflect a new mission. RadNet is comprised of a nationwide network of sampling stations that provide air, precipitation, drinking water and milk samples. The ESER Program currently operates a high-volume air sampler and collects precipitation and drinking water in Idaho Falls for this national program and routinely sends samples to EPA's Eastern Environmental Radiation Facility for analyses. The RadNet data collected at Idaho Falls are not reported by the ESER Program but are available through the EPA RadNet website (<http://www.epa.gov/narel/radnet/>).

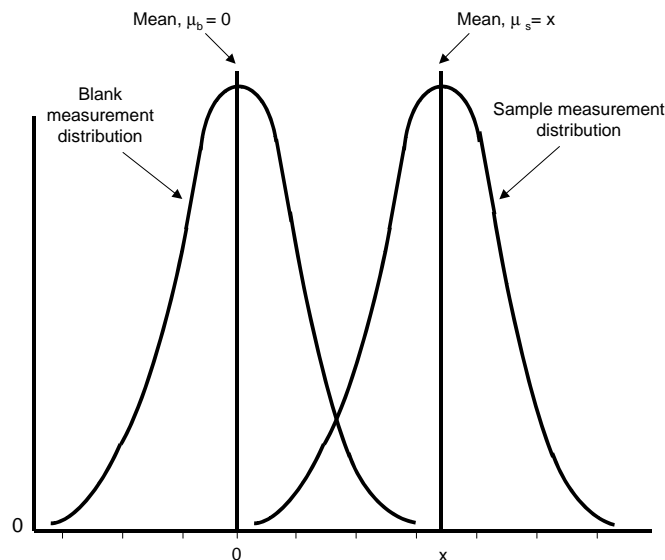
Once samples have been collected and analyzed, the ESER Program has the responsibility for quality control of the data and for preparing quarterly reports on results from the environmental surveillance program. The quarterly reports are then consolidated into the INL Site Environmental Report for each calendar year. These annual reports also include data collected by other INL Site contractors.

The results reported in the quarterly and annual reports are assessed in terms of data quality and statistical significance with respect to laboratory analytical uncertainties, sample locations, reported INL Site releases, meteorological data, and worldwide events that might conceivably have an effect on the INL Site environment. First, field collection and laboratory information are reviewed to determine identifiable errors that would invalidate or limit use of the data. Examples of such limitations include insufficient sample volume, torn filters, evidence of laboratory cross-contamination or quality control issues. Data that pass initial screening are further evaluated using statistical methods. Statistical tools are necessary for data evaluation particularly since environmental measurements typically involve the determination of minute concentrations, which are difficult to detect and even more difficult to distinguish from other measurements.

Results are presented in this report with an analytical uncertainty term, *s*, where "s" is the estimated sample standard deviation ( $\sigma$ ), assuming a Gaussian or normal distribution. All results are reported in this document, even those that do not necessarily represent detections. The term "detected", as used for the discussion of results in this report, does not imply any degree of risk to the public or environment, but rather indicates that the radionuclide was measured at a concentration sufficient for the analytical instrument to record a value that is statistically different from background. The ESER has adopted guidelines developed by the United States Geological Survey (Bartholomay, et al. 2003), based on an extension of a method proposed by Currie (1984), to interpret analytical results and make decisions concerning detection. Most of the following discussion is taken from Bartholomay et al (2003).



Laboratory measurements involve the analysis of a target sample and the analysis of a prepared laboratory blank (i.e., a sample which is identical to the sample collected in the environment, except that the radionuclide of interest is absent). Instrument signals for the target and blank vary randomly about the true signals and may overlap making it difficult to distinguish between radionuclide activities in blank and in environmental samples (Figure 1). That is, the variability around the sample result may substantially overlap the variability around a net activity of zero for samples with no radioactivity. In order to conclude that a radionuclide has been detected, it is essential to consider two fundamental aspects of the problem of detection: (1) the instrument signal for the sample must be greater than that observed for the blank before the decision can be made that the radionuclide has been detected; and (2) an estimate must be made of the minimum radionuclide concentration that will yield a sufficiently large observed signal before the correct decision can be made for detection or non-detection.



**Figure 1. Example of overlap of blank and sample measurement distributions.**

In the laboratory, instrument signals must exceed a critical level of  $1.6s$  before the qualitative decision can be made as to whether the radionuclide was detected in a sample. At  $1.6s$  there is about a 95-percent probability that the correct conclusion—not detected—will be made. Given a large number of samples, approximately 5 percent of the samples with measured concentrations greater than or equal to  $1.6s$ , which were concluded as being detected, might not contain the radionuclide. These are referred to as false positives. For purposes of simplicity and consistency with past reporting, the ESER has rounded the  $1.6s$  critical level estimate to  $2s$ .

Once the critical level has been defined, the minimum detectable concentration may be determined. Concentrations that equal  $3s$  represent a measurement at the detection level or minimum detectable concentration. For true concentrations of  $3s$  or greater, there is a 95-percent probability that the radionuclide was detected in the target sample. In a large number of samples, the conclusion—not detected—will be made in 5 percent of the samples with true concentrations at the minimum detectable concentration of  $3s$ . These measurements are known as false negatives. The ESER reports measured radionuclide concentrations greater than or equal to their respective  $3s$  uncertainties as being “detected with confidence.”

Concentrations between  $2s$  and  $3s$  are reported as “questionably detected”. That is, the radionuclide may be present in the sample; however, the detection may not be reliable.

Measurements made between 2s and 3s are examined further to determine if they are a part of a pattern (temporal or spatial) that might warrant further investigation or recounting. For example, if a particular radionuclide is typically detected at > 3s at a specific location, a sample result between 2s and 3s might be considered detected.

If a result is less than or equal to 2s there is little confidence that the radionuclide is present in the sample. Analytical results in this report are presented as the result value  $\pm$  one standard deviation (1s) for reporting consistency with the annual report. To obtain the 2s or 3s values simply multiply the uncertainty term by 2 or 3.

For more information concerning the ESER Program, contact the S.M. Stoller Corporation at (208) 525-9358, or visit the Program's web page (<http://www.stoller-eser.com>).

## 2. THE INL SITE

The INL Site is a nuclear energy and homeland security research and environmental management facility. It is owned and administered by the U.S. Department of Energy, Idaho Operations Office (DOE-ID) and occupies about 890 mi<sup>2</sup> (2,300 km<sup>2</sup>) of the upper Snake River Plain in Southeastern Idaho. The history of the INL Site began during World War II when the U.S. Naval Ordnance Station was located in Pocatello, Idaho. This station, one of two such installations in the U.S., retooled large guns from U.S. Navy warships. The retooled guns were tested on the nearby, uninhabited plain, known as the Naval Proving Ground. In the years following the war, as the nation worked to develop nuclear power, the Atomic Energy Commission (AEC), predecessor to the DOE, became interested in the Naval Proving Ground and made plans for a facility to build, test, and perfect nuclear power reactors.

The Naval Proving Ground became the National Reactor Testing Station (NRTS) in 1949, under the AEC. By the end of 1951, a reactor at the NRTS became the first to produce useful amounts of electricity. Over time the site has operated 52 various types of reactors, associated research centers, and waste handling areas. The NRTS was renamed the Idaho National Engineering Laboratory (INEL) in 1974, and the Idaho National Engineering and Environmental Laboratory (INEEL) in January 1997. With renewed interest in nuclear power the DOE announced in 2003 that Argonne National Laboratory and the INEEL would be the lead laboratories for development of the next generation of power reactors. On February 1, 2005 the INEEL and Argonne National Laboratory-West became the INL. The INL is committed to providing international nuclear leadership for the 21st Century, developing and demonstrating compelling national security technologies, and delivering excellence in science and technology as one of the Department of Energy's multiprogram national laboratories.

The cleanup operation, the ICP, is now a separately managed effort. The ICP is charged with safely and cost-effectively completing the majority of cleanup work from past laboratory missions by 2012.



### 3. AIR SAMPLING

The primary pathway by which radionuclides can move off the INL Site is through the air and for this reason the air pathway is the primary focus of monitoring on and around the INL Site. Samples for particulates and iodine-131 ( $^{131}\text{I}$ ) gas in air were collected weekly for the duration of the quarter at 16 locations using low-volume air samplers. Moisture in the atmosphere was sampled at four locations around the INL Site and analyzed for tritium. Air sampling activities and results for the fourth quarter of 2007 are discussed below. A summary of approximate minimum detectable concentrations (MDCs) for radiological analyses and DOE Derived Concentration Guide (DCG) (DOE 1993) values is provided in Appendix B.

#### LOW-VOLUME AIR SAMPLING

Radioactivity associated with airborne particulates was monitored continuously by 18 low-volume air samplers (two of which are used as replicate samplers) at 16 locations during the fourth quarter of 2007 (Figure 2). Four of these samplers are located on the INL Site, eight are situated off the INL Site near the boundary and six have been placed at locations distant to the INL Site. Samplers are divided into INL Site, Boundary and Distant groups to determine if there is a gradient of radionuclide concentrations, increasing towards the INL Site. Each replicate sampler is relocated every year to a new location. One replicate sampler was placed at Mud Lake (a Boundary location) and one at the Experimental Field Station (an INL Site location) during 2007. An average of 16,148 ft<sup>3</sup> (457 m<sup>3</sup>) of air was sampled at each location, each week, at an average flow rate of 1.60 ft<sup>3</sup>/min (0.05 m<sup>3</sup>/min). Particulates in air were collected on membrane particulate filters (1.2- $\mu\text{m}$  pore size). Gases passing through the filter were collected with an activated charcoal cartridge.

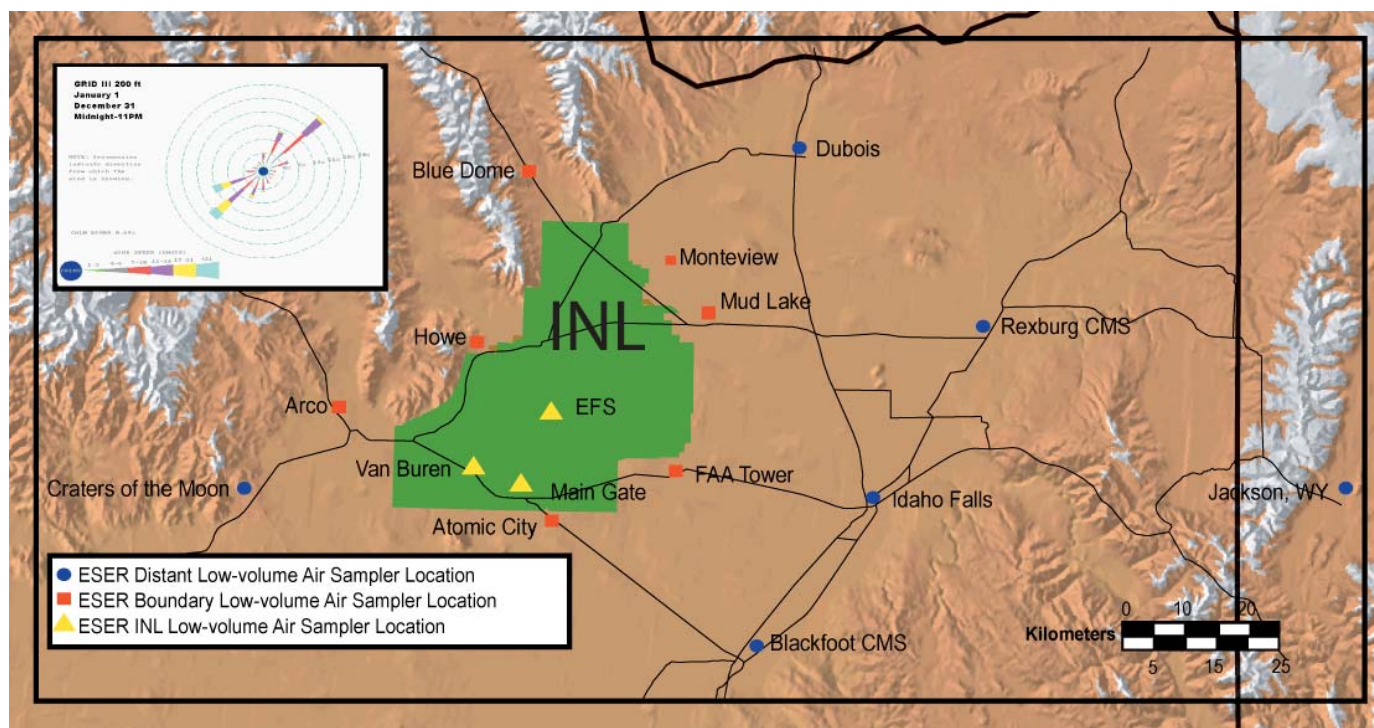


Figure 2. Low-volume air sampler locations.

Filters and charcoal cartridges were changed weekly at each station during the quarter. Each particulate filter was analyzed for gross alpha and gross beta radioactivity using thin-window gas flow proportional counting systems after waiting about four days for naturally-occurring daughter products of radon and thorium to decay.

The weekly particulate filters collected during the quarter for each location were composited and analyzed for gamma-emitting radionuclides. Selected composites were also analyzed by location for  $^{90}\text{Sr}$ ,  $^{238}\text{Pu}$ ,  $^{239/240}\text{Pu}$  and  $^{241}\text{Am}$  as determined by a rotating quarterly schedule.

Charcoal cartridges were analyzed for gamma-emitting radionuclides, specifically for iodine-131 ( $^{131}\text{I}$ ). Iodine-131 is of particular interest because it is produced in relatively large quantities by nuclear fission, is readily accumulated in human and animal thyroids, and has a half-life of eight days. This means that any elevated level of  $^{131}\text{I}$  in the environment could be from a recent release of fission products.

Gross alpha results are reported in Table C-1. Median gross alpha concentrations in air for INL Site, Boundary, and Distant locations for the fourth quarter of 2007 are shown in Figure 3. Gross alpha data are tested for normality prior to statistical analyses, and generally show no consistent discernable distribution. Box and whisker plots are commonly used when there is no assumed distribution. Each data group in Figure 3 is presented as a box and whisker plot, with a median (small red square), a box enclosing values between the 25<sup>th</sup> and 75<sup>th</sup> percentiles, and whiskers representing the non-outlier range. Outliers and extreme values are identified separately from the box and whiskers. Outliers and extreme values are atypical, infrequent data points that are far from the middle of the data distribution. For this report, outliers are defined as values that are greater than 1.5 times the height of the box, above or below the box. Extreme values are greater than 2 times the height of the box, above or below the box. Outliers and extreme values may reflect inherent variability, may be due to errors associated with transcription or measurement, or may be related to other anomalies. A careful review of the data collected during the fourth quarter indicates that the outlier values were not due to mistakes in collection, analysis, or reporting procedures, but rather reflect natural variability in the measurements. The outlier values lie within the range of measurements made within the past several years. Thus, rather than dismissing the outliers, they were included in the subsequent statistical analyses.

Because there is no discernable distribution of the data, the nonparametric Kruskal-Wallis test of multiple independent groups was used to test for statistical differences between INL Site, Boundary and Distant locations. The use of nonparametric tests, such as Kruskal-Wallis, gives less weight to outlier and extreme values thus allowing a more appropriate comparison of data groups. A statistically significant difference exists between data groups if the (p) value is less than 0.05. Values greater than 0.05 translate into a 95 percent confidence that the medians are statistically the same. The p-value for each comparison is shown in Table D-1. Figure 3 graphically shows that the gross alpha measurements made at INL Site, Boundary and Distant locations are similar for the fourth quarter. If the INL Site were a significant source of offsite contamination, concentrations of contaminants could be statistically greater at Boundary locations than at Distant locations. However, in the fourth quarter no statistical differences were found.

Comparisons of gross alpha concentrations were made for each month of the quarter (Figures 4 – 6). Again the Kruskal-Wallis test of multiple independent groups was used to determine if statistical differences exist between INL Site, Boundary and Distant data groups.

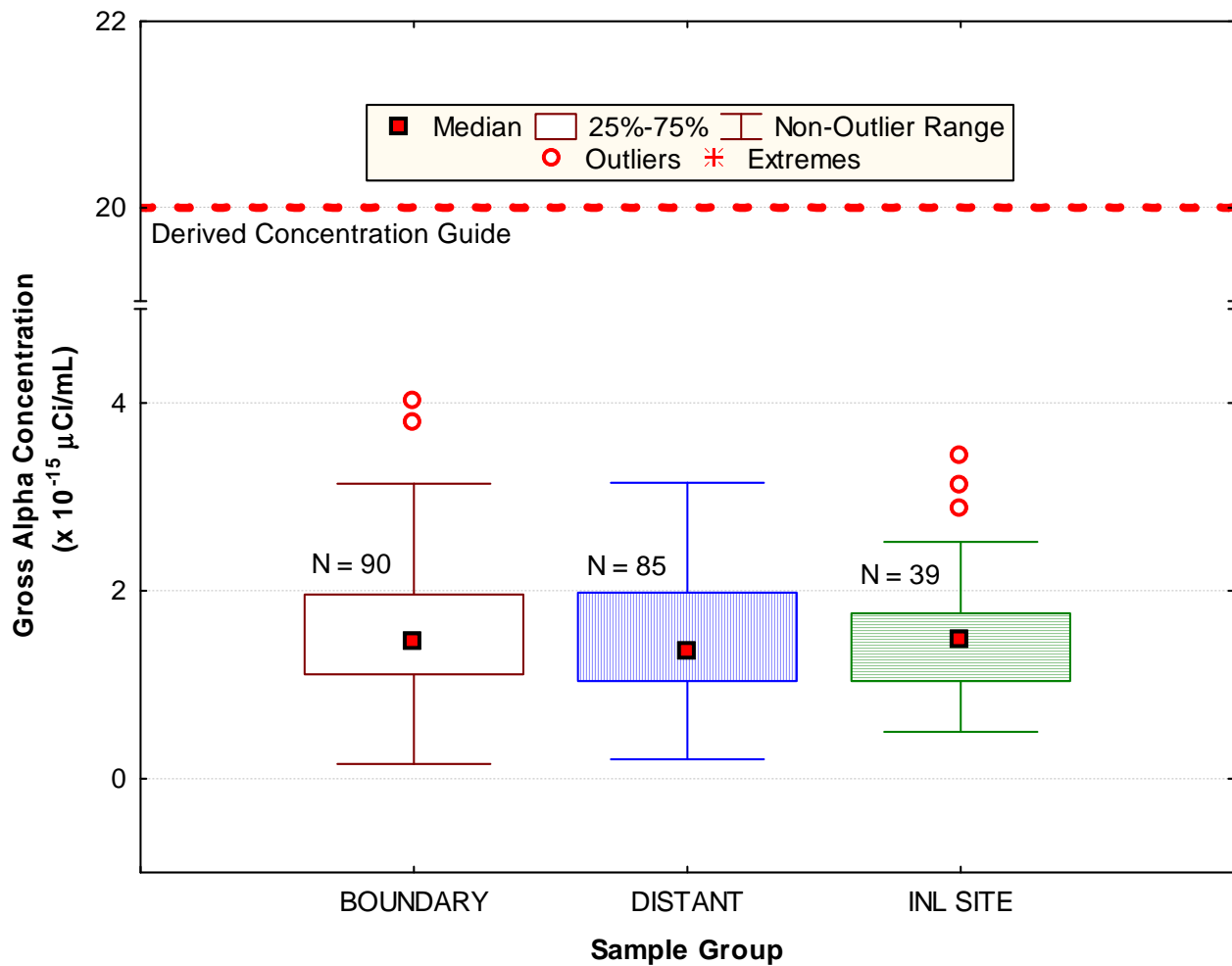


Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations for the fourth quarter of 2007.

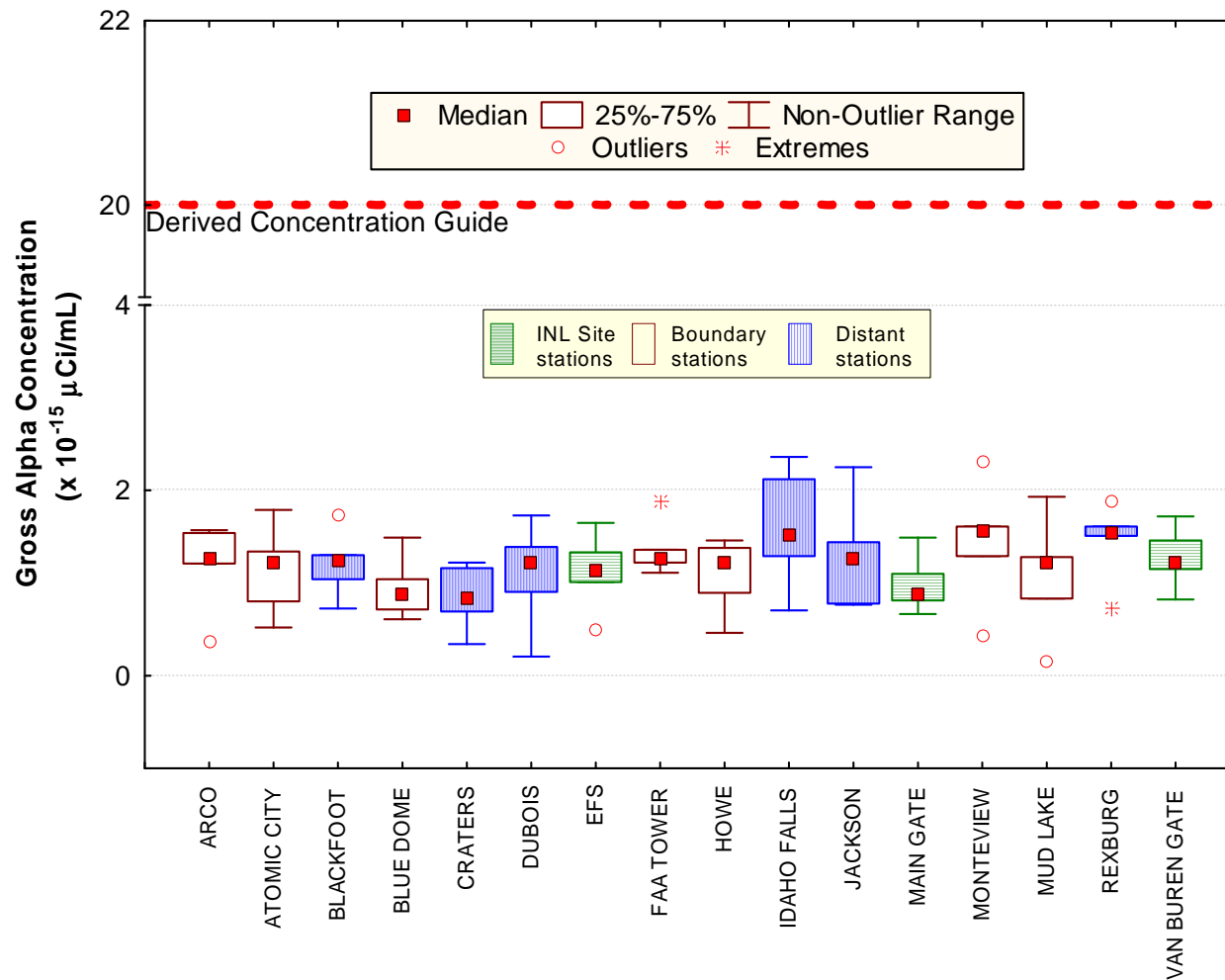
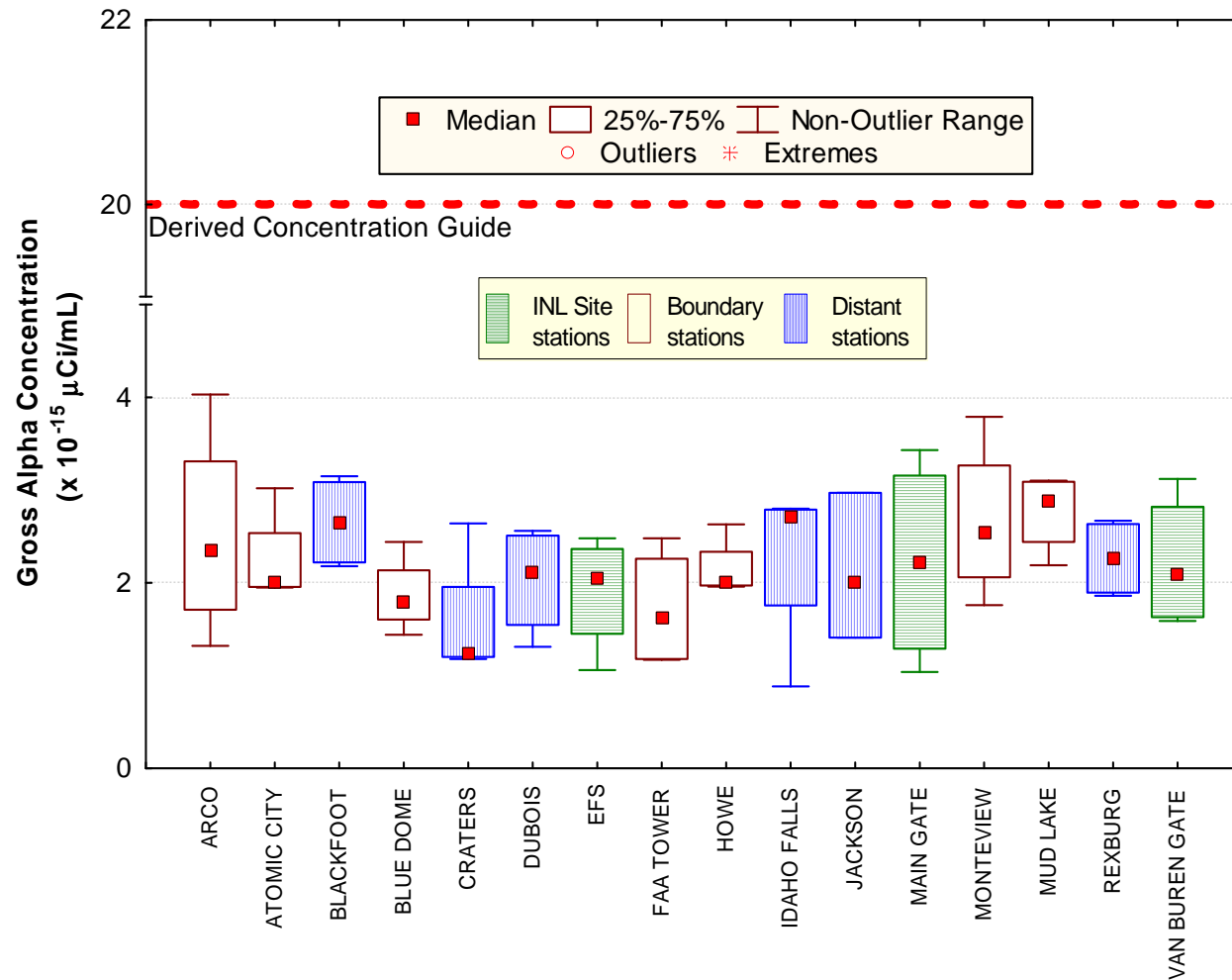


Figure 4. October gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 5 at each location.





**Figure 5. November gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except Jackson (N = 3).**

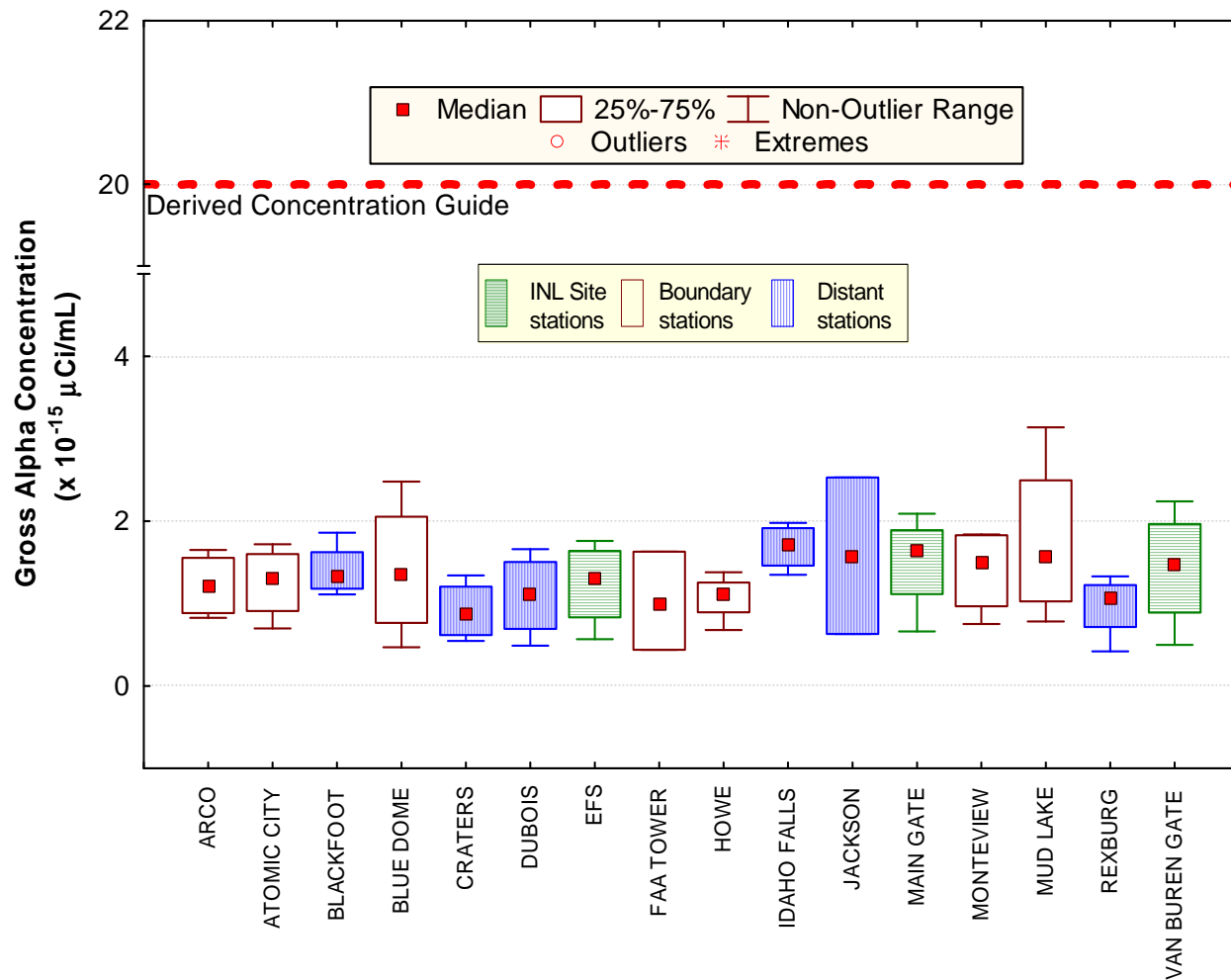


Figure 6. December gross alpha concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except FAA Tower (N = 3) and Jackson (N = 2).

No statistical differences in gross alpha concentrations between groups were noted during any month of the quarter (Table D-1).

As an additional check, comparisons between gross alpha concentrations measured at Boundary and Distant locations were made on a weekly basis. The Mann-Whitney U test was used to compare the Boundary and Distant data because it is the most powerful nonparametric alternative to the t-test for independent samples. INL Site sample results were not included in this analysis because the onsite data, collected at only three locations, are not representative of the entire INL Site and would not aid in determining offsite impacts. In the fourth quarter, there were no weeks where a statistical difference existed between the two sample groups (Table D-2).

Gross beta results are presented in Table C-1. Gross beta concentrations in air for INL Site, Boundary and Distant locations for the fourth quarter of 2007 are shown in Figure 7. The data were tested and found to be neither normally nor log-normally distributed. Box and whiskers plots were used for presentation of the data. Outliers and extreme values were retained in subsequent statistical analyses because they are within the range of measurements made in the past five years, and because these values could not be attributed to mistakes in collection, analysis, or reporting procedures. The quarterly data for each group appear to be similar and were determined using the Kruskal-Wallis test to be statistically the same (Table D-1).

Monthly median gross beta concentrations in air for each sampling group are shown in Figures 8 – 10. Statistical data are presented in Table D-1. There were no statistical differences in gross beta between groups for any month during the quarter.

Comparison of weekly Boundary and Distant gross beta data sets, using the Mann-Whitney U test, showed no statistical differences between Boundary and Distant measurements during any week in the fourth quarter (Table D-2).

No  $^{131}\text{I}$  was detected in any of the charcoal cartridge batches collected during the fourth quarter of 2007. Weekly  $^{131}\text{I}$  results for each location are listed in Table C-2 of Appendix C. Gamma spectrographic analysis is also done with the  $^{131}\text{I}$  analysis. Cesium-137 was detected near the detection limit in 10 of the 26 measured batches of cartridges. The analytical laboratory considers these detections a result of the materials used in the charcoal filters.

Weekly filters for the fourth quarter of 2007 were composited by location. All samples were analyzed for gamma-emitting radionuclides, including  $^{137}\text{Cs}$  (see Table C-3, Appendix C). Cesium-137 was initially detected in two fourth quarter composites (FAA Tower and Montevue). However, recounts of both samples did not indicate the presence of  $^{137}\text{Cs}$  above the detection level.

Composites were also analyzed for  $^{90}\text{Sr}$ ,  $^{238}\text{Pu}$ ,  $^{239/240}\text{Pu}$  and  $^{241}\text{Am}$  (see Table C-3, Appendix C.) No composites had detectable  $^{90}\text{Sr}$ . Americium-241 was found near the detection limit on composites from three offsite locations. The composite from the Van Buren location had detectable concentrations of all three actinides analyzed ( $^{238}\text{Pu}$ ,  $^{239/240}\text{Pu}$  and  $^{241}\text{Am}$ ). Detections were within the range seen over the past five years, although generally toward the upper end of this range. The probable source of the detections is not known at this time.

#### **ATMOSPHERIC MOISTURE SAMPLING**

Twelve atmospheric moisture samples were obtained during the fourth quarter of 2007 from Atomic City, Blackfoot CMS, Idaho Falls and Rexburg CMS. Atmospheric moisture is collected by pulling air through a column of absorbent material (molecular sieve material) to absorb water vapor. The water is then extracted from the absorbent material by heat distillation. The resulting water samples are then analyzed for tritium using liquid scintillation.

Four of the 12 samples exceeded the 3s uncertainty level for tritium. All samples with detectable tritium were significantly below the DOE DCG for tritium in air of  $1 \times 10^{-7} \mu\text{Ci}/\text{mL}_{\text{air}}$ , and ranged from  $(4.7 \pm 1.4) \times 10^{-13} \mu\text{Ci}/\text{mL}_{\text{air}}$  at Atomic City in late October to  $(9.2 \pm 1.8) \times 10^{-13} \mu\text{Ci}/\text{mL}_{\text{air}}$  at Blackfoot in a sample collected early in October. All results are shown in Table C-4, Appendix C.

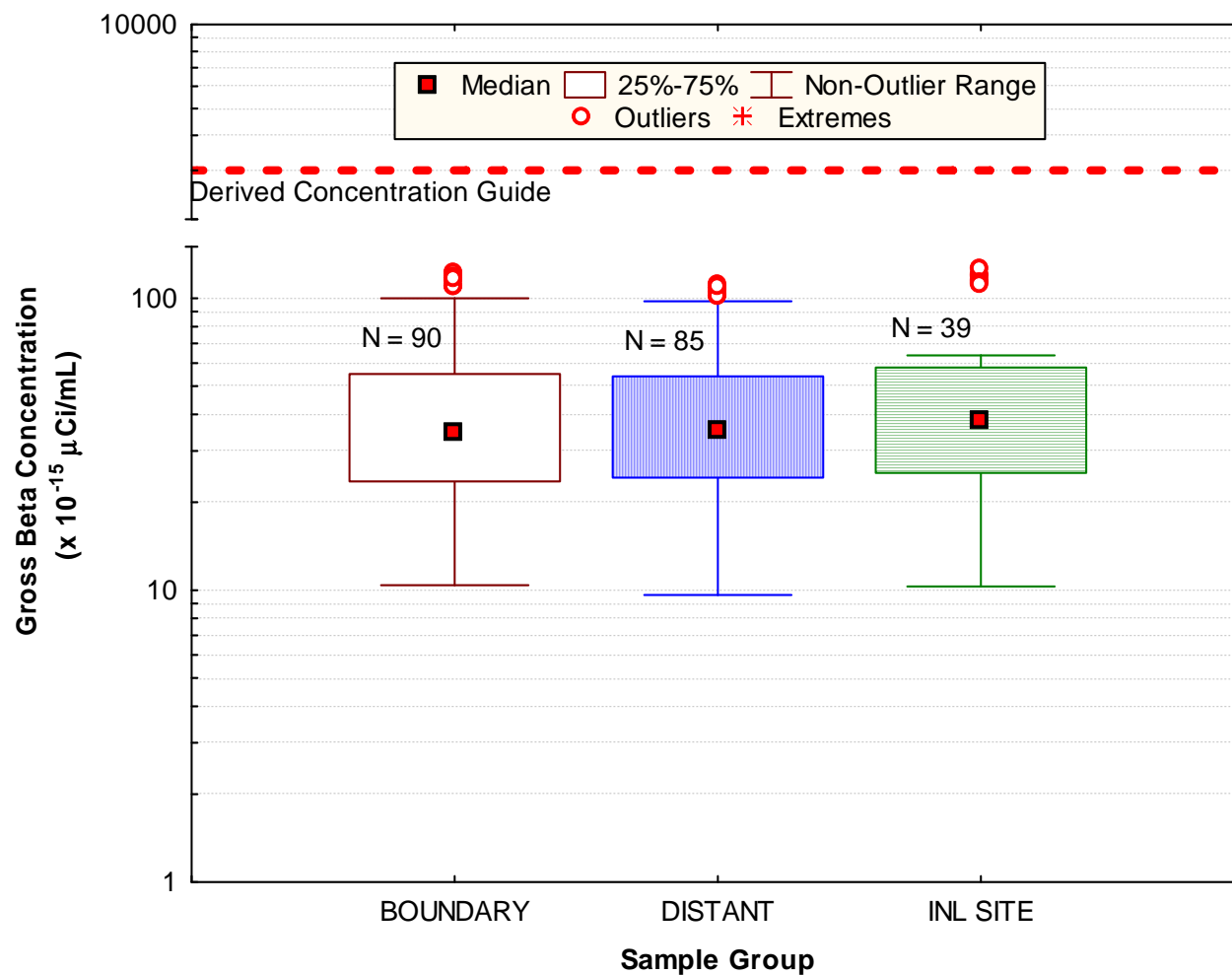
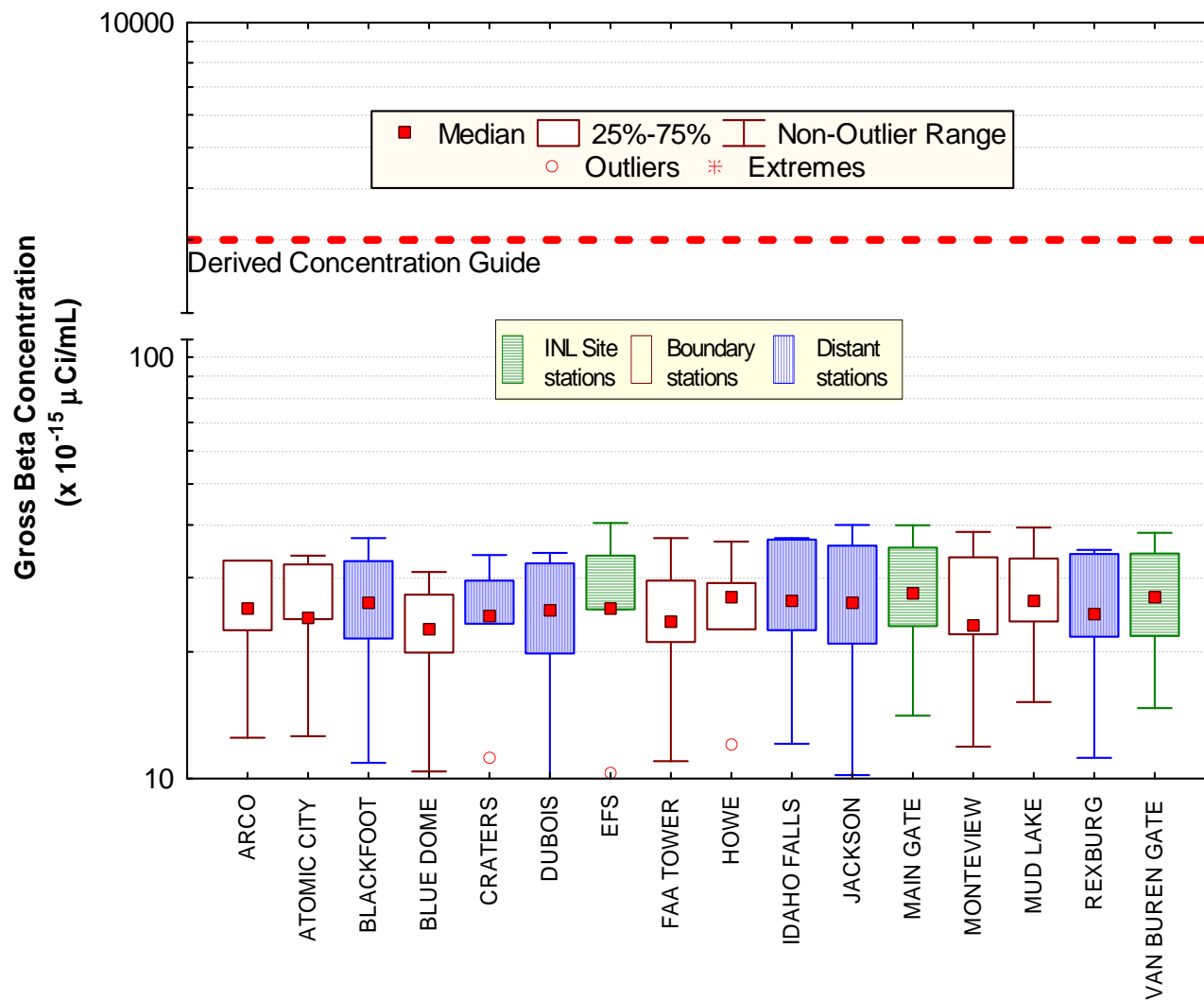
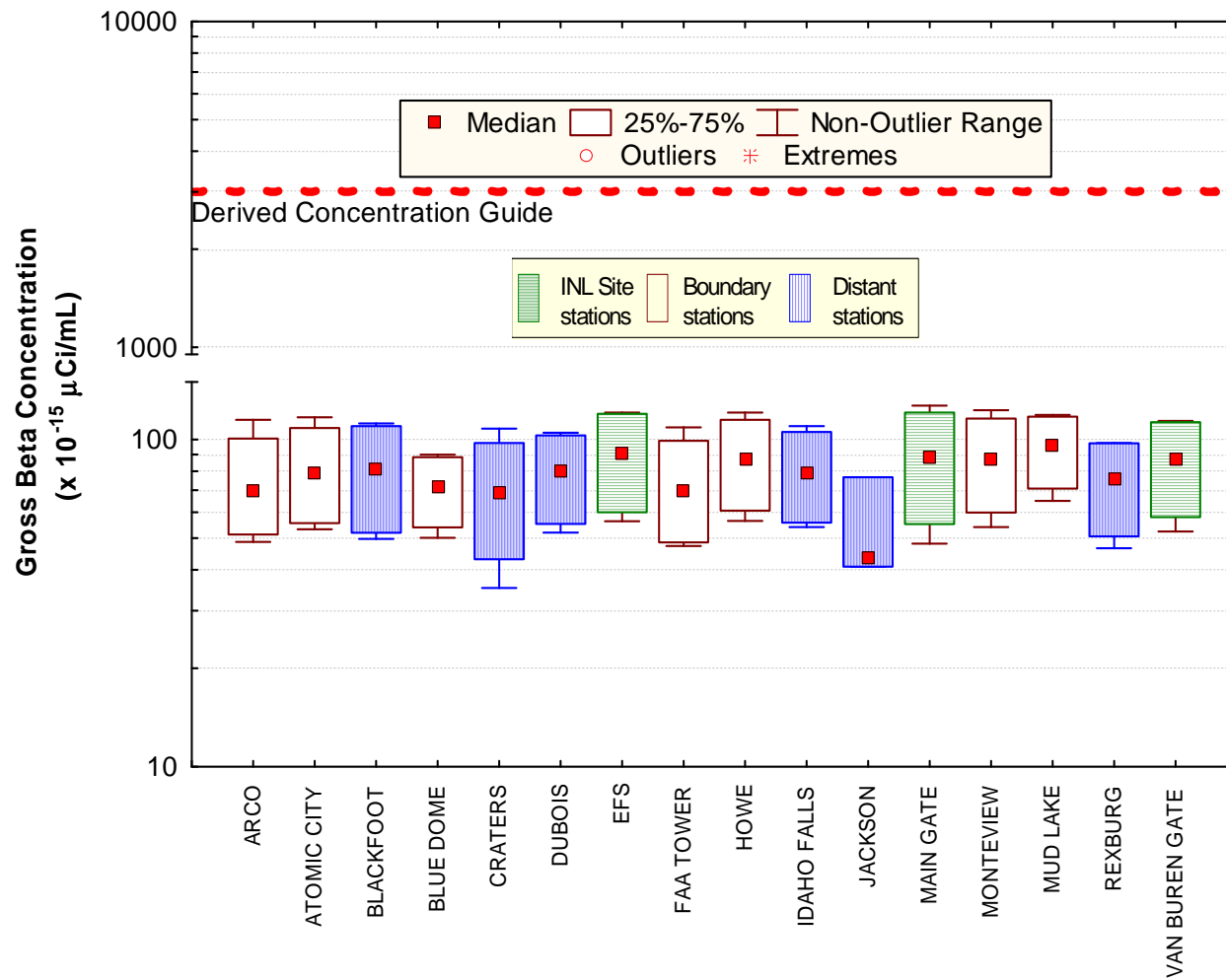


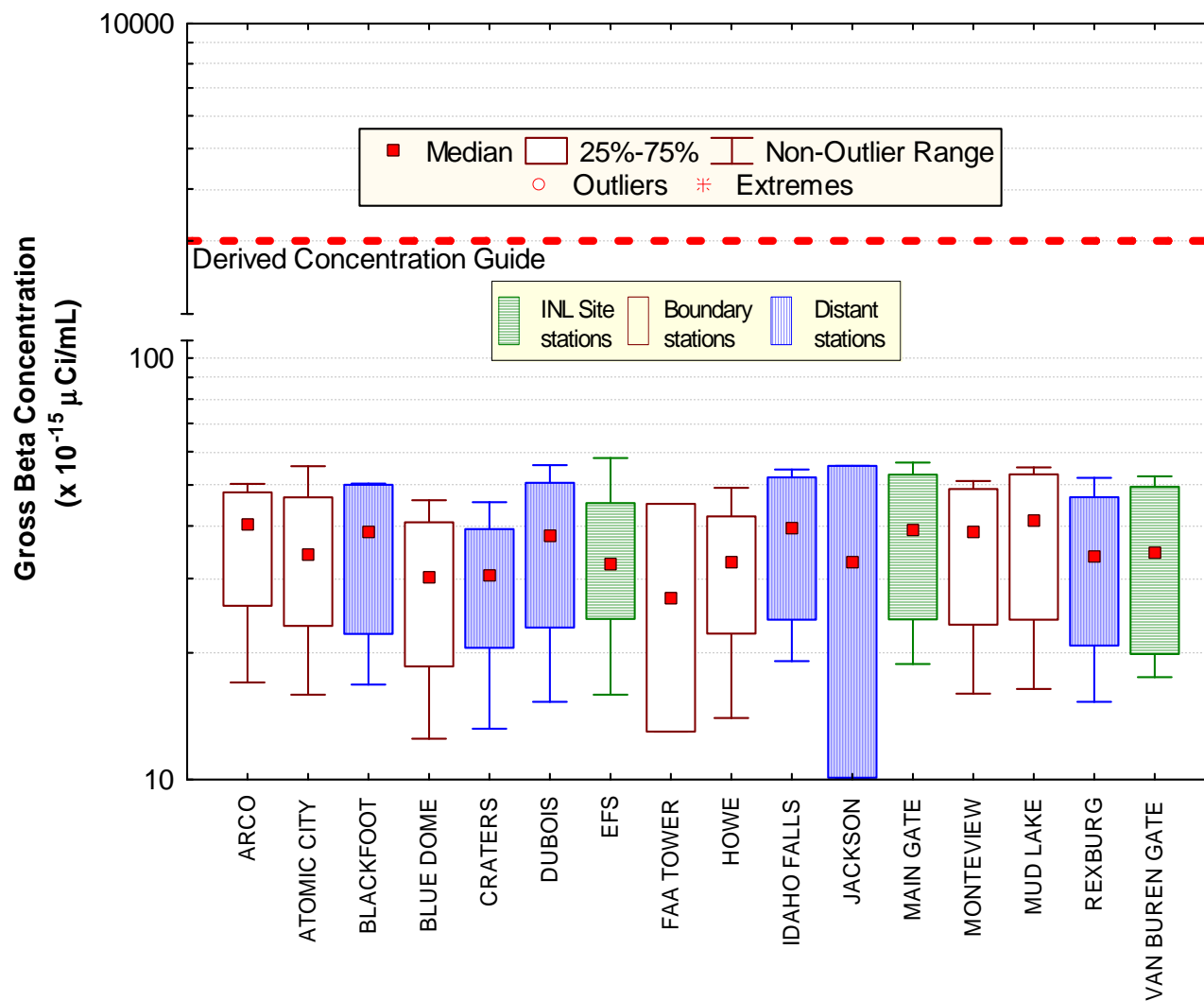
Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary and Distant locations for the fourth quarter 2007.



**Figure 8. October gross beta concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 5 at each location.**



**Figure 9.** November gross beta concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except Jackson (N = 3).



**Figure 10. December gross beta concentrations in air at ESER INL Site, Boundary and Distant locations. Number of samples (N) = 4 at each location, except FAA Tower (N = 3) and Jackson (N = 2).**



## 4. PRECIPITATION SAMPLING

Precipitation samples are gathered when sufficient precipitation occurs to allow for the collection of the minimum sample volume of approximately 20 mL. Samples are taken of monthly composites from Idaho Falls and CFA, and weekly from the EFS. Precipitation samples are analyzed for tritium. Storm events in the fourth quarter of 2007 produced sufficient precipitation to yield 11 samples –three from CFA, two from Idaho Falls and six from the EFS.

Tritium was measured above the 3s value in eight of the samples collected during the fourth quarter of 2007. Low levels of tritium exist in the environment at all times as a result of cosmic ray reactions with water molecules in the upper atmosphere. The EPA's RadNet program collects precipitation samples from across the United States. From 1980 to 2005, tritium measured in samples from Region 10 (which includes Idaho) ranged from -200 to 7500 pCi/L (EPA 2006). Tritium measured in all fourth quarter ESER samples were within this range and were consistent with historical measurements at the INL Site, with a maximum of  $270 \pm 35$  pCi/L at EFS. Data for all fourth quarter 2007 precipitation samples collected by the ESER Program are listed in Table C-5 (Appendix C).



## 5. AGRICULTURAL PRODUCT AND WILDLIFE SAMPLING

Another potential pathway for contaminants to reach humans is through the food chain. The ESER Program samples multiple agricultural products and game animals from around the INL Site and Southeast Idaho. Specifically, milk, wheat, potatoes, garden lettuce, big game, and waterfowl are sampled. Milk is sampled throughout the year and large game animals are sampled whenever large game are killed onsite from vehicle collisions. Lettuce and wheat are sampled during the third quarter, while potatoes are collected during the fourth quarter. Waterfowl are collected in either the third or fourth quarter. See Table A-1, Appendix A, for more details on agricultural product and wildlife sampling. This section discusses results from milk and large game animals sampled during the fourth quarter of 2007.

### MILK SAMPLING

Milk samples were collected weekly in Ucon until the dairy ceased operations in late November, after which the weekly sample was collected in Idaho Falls. Monthly samples were collected at seven other locations around the INL Site (Figure 11) during the fourth quarter of 2007. All samples were analyzed for gamma emitting radionuclides. During the second quarter, samples from half of the locations are analyzed for  $^{90}\text{Sr}$  and half are analyzed for tritium. In the fourth quarter the analyses are reversed, so that each location receives one analysis for  $^{90}\text{Sr}$  and tritium each year.

No Iodine-131 or other manmade gamma-emitting radionuclides were detected in any sample. Data for  $^{131}\text{I}$  and  $^{137}\text{Cs}$  in milk samples are listed in Appendix C, Table C-6.

Strontium-90 was detected in all four samples analyzed at levels within historical measurements, ranging from 0.36 to 0.57 pCi/L (Table C-7 in Appendix C). Tritium analysis was inadvertently not performed as scheduled in November.

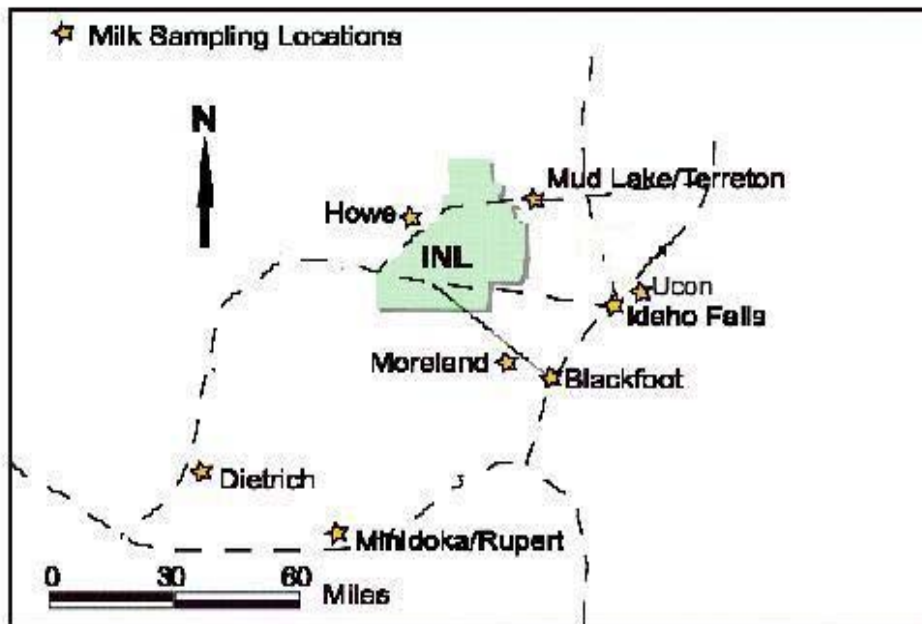


Figure 11. ESER milk sampling locations.

### **POTATO SAMPLING**

Eight potato samples were collected from area growers and from one out-of-state location (Colorado). All samples were analyzed for gamma emitting radionuclides and  $^{90}\text{Sr}$ . Cesium-137 was initially measured in one sample-the sample from Mud Lake-but this value was not confirmed upon recount. Strontium-90 was not detected in any of the samples. All values were within historic concentrations measured in potatoes collected from farms surrounding the INL and out-of-state areas.

Data for  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$  in all potato samples taken during the fourth quarter are listed in Table C -8 (Appendix C).

### **LARGE GAME ANIMAL SAMPLING**

No large game animals were available for sampling during the fourth quarter of 2007.

### **WATERFOWL SAMPLING**

Twelve ducks were collected during 2007. Four were collected from wastewater ponds located at the Reactor Technology Complex (RTC) facility, six came from wastewater ponds near the Materials and Fuels Complex (MFC) facility, and two control samples were collected near the Fort Hall Bottoms. Each duck sample was divided into three sub-samples: one consisting of edible tissue (muscle, gizzard, heart and liver); viscera; and a remainder sample that includes all remaining tissue (bones, feathers, feet, bill, head, and residual muscle). All were analyzed for gamma emitting radionuclides,  $^{90}\text{Sr}$ ,  $^{238}\text{Pu}$ ,  $^{239/240}\text{Pu}$ , and  $^{241}\text{Am}$ . Concentrations of radionuclides measured in the edible tissues of 2007 waterfowl are shown in Table C-9 (Appendix C).

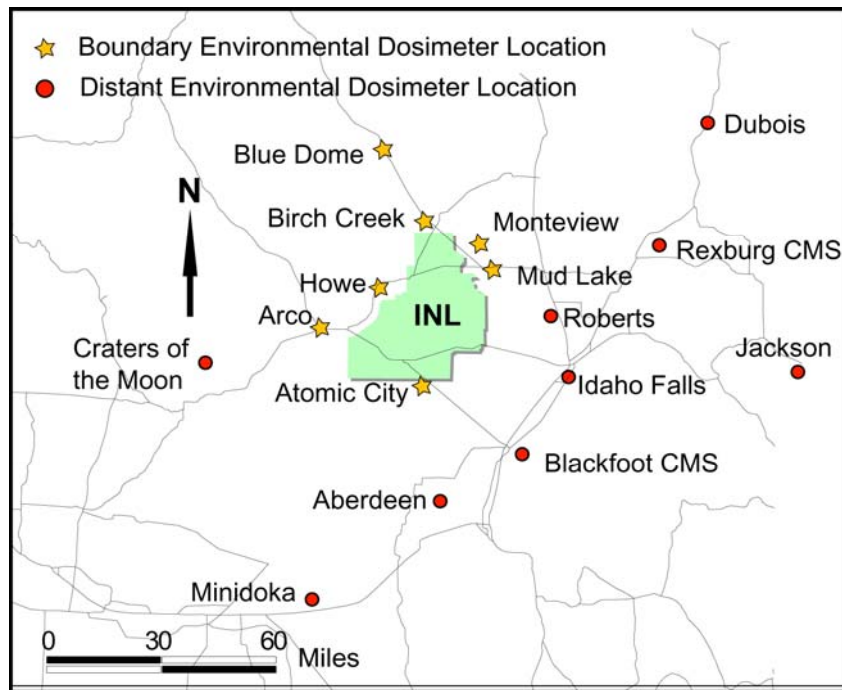
Several manmade radionuclides were detected in the samples taken from the RTC ponds. These included  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ ,  $^{51}\text{Cr}$ ,  $^{60}\text{Co}$ ,  $^{90}\text{Sr}$ , and  $^{65}\text{Zn}$ . Of these six, three ( $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{60}\text{Co}$ ) were found in the edible tissues. Three radionuclides,  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{90}\text{Sr}$ , were also detected in the birds from the MFC ponds. One manmade radionuclide ( $^{90}\text{Sr}$ ) was found in the control samples.

Since manmade radionuclides were found more frequently and at higher concentrations in ducks taken from the INL Site, it is assumed that the INL Site is the source of these detections. Concentrations of the detected radionuclides from RTC were similar to those from 2006, or significantly lower in the case of  $^{137}\text{Cs}$  than those found in 2005. Measured concentrations were also lower than those in ducks taken during a 1994-1998 study (Warren et al. 2001). The ducks were not taken directly from the two-celled hypalon-lined radioactive wastewater RTC Evaporation Pond but from an adjacent sewage lagoon. However, it is likely that the birds also used the RTC Evaporation Pond.

Waterfowl hunting is not allowed on the INL Site, but a maximum potential exposure scenario to humans would be someone collecting a contaminated duck directly from the ponds and immediately consuming all muscle, liver, heart, and gizzard tissue. The maximum potential dose from eating 225 g (8 oz) of meat from the most contaminated waterfowl collected in 2007 was estimated to be 0.015 mrem (0.00015 mSv). This dose is lower than dose estimates for some previous periods. The maximum dose estimated for the period from 1993 through 1998 was 0.89 mrem (0.009 mSv) and from 2000 through 2004 was 0.08 mrem (0.0008 mSv). In the late 1970s, when the percolation ponds were still in use, the maximum dose estimated from eating a contaminated duck was estimated to be 54 mrem (0.54 mSv).

## 6. ENVIRONMENTAL RADIATION

An array of thermoluminescent dosimeters (TLDs) is distributed throughout the Eastern Snake River Plain to monitor for environmental radiation (Figure 12). TLDs are changed out in May and again in November after six months in the field. The results of the TLDs exposed from May to November 2007 are discussed below.



**Figure 12. TLD locations.**

Similar to the low-volume air results the environmental dosimeter locations are also divided into Boundary and Distant groupings. Boundary average exposure rates ranged from a low of 0.28 mR/day at Blue Dome to a high of 0.36 mR/day at Atomic City. The overall Boundary average was 0.31 mR/day. The Distant group had a high of 0.40 mR/day at Rexburg and a low of 0.27 mR/day at the Dubois location. The overall average Distant value was 0.33 mR/day. There was no statistical difference between Boundary and Distant locations. Furthermore, all values are consistent with past readings. Table 4 lists the range and average for both groups over a six-month period. All results are listed in Appendix C, Table C-10.

**Table 1. TLD Exposures from May to November 2007.**

Location	Total Exposure <sup>a</sup>	
	Boundary	Distant
Minimum	51.6	50.0
Maximum	65.2	73.6
Average	59.03	61.49

a All values shown are in milliRoentgens (mR).



## 7. QUALITY ASSURANCE

The ESER Quality Assurance Program consists of five ongoing tasks which measure:

1. method uncertainty
2. data completeness
3. data accuracy, using spike, performance evaluation and laboratory control samples
4. data precision, using split samples, duplicate samples and recounts
5. presence of contamination in samples, using blanks.

Sample results are compared to criteria described in the Quality Assurance Project Plan for the INL Site Offsite Environmental Surveillance Program (Stoller 2007). The following table summarizes the results of the quality assurance program for the fourth quarter of 2007.

<b>QA Sample Type</b>	<b>Number of Sample Results</b>	<b>Number of Results Meeting Criteria</b>	<b>Percentage Meeting Criteria</b>
Spikes/Laboratory Control Samples	211	210	99.5
Field Duplicates	69	66	95.7
Laboratory Splits	19	19	100
Recounts	193	191	99.0
Blanks	68	68	100
Method Uncertainty	1870	1844	98.6





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## 8. REFERENCES

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**APPENDIX A**  
***SUMMARY OF SAMPLING SCHEDULE***

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**Table A-1. Summary of the ESER Program's Sampling Schedule**

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
<b>AIR SAMPLING</b>				
<i>LOW-VOLUME AIR</i>				
Gross Alpha, Gross Beta, <sup>131</sup> I	weekly	Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Rexburg	Arco, Atomic City, FAA Tower, Howe, Montevieu, Mud Lake, Blue Dome	Main Gate, EFS, Van Buren
Gamma Spec	quarterly	Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Rexburg	Arco, Atomic City, FAA Tower, Howe, Montevieu, Mud Lake, Blue Dome	Main Gate, EFS, Van Buren
<sup>90</sup> Sr, Transuranics	quarterly	Rotating schedule	Rotating schedule	Rotating schedule
<i>ATMOSPHERIC MOISTURE</i>				
Tritium	4 to 13 weeks	Blackfoot, Idaho Falls, Rexburg	Atomic City	None
<i>PRECIPITATION</i>				
Tritium	monthly	Idaho Falls	None	CFA
Tritium	weekly	None	None	EFS
<b>ENVIRONMENTAL RADIATION SAMPLING</b>				
<i>TLDs</i>				
Gamma Radiation	semiannual	Aberdeen, Blackfoot (2), Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Minidoka, Rexburg, Roberts	Arco, Atomic City, Birch Creek, Blue Dome, Howe, Montevieu, Mud Lake	None
<b>SOIL SAMPLING</b>				
<i>SOIL</i>				
Gamma Spec, <sup>90</sup> Sr, Transuranics	biennially	Carey, Crystal Ice Caves (Aberdeen), Blackfoot, St. Anthony	Butte City, Montevieu, Atomic City, FAA Tower, Howe, Mud Lake (2), Birch Creek	None

**Table A-1. Summary of the ESER Program's Sampling Schedule (continued)**

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
<b>FOODSTUFF SAMPLING</b>				
<i>MILK</i>				
Gamma Spec ( <sup>131</sup> I)	weekly	Ucon/Idaho Falls	None	None
Gamma Spec ( <sup>131</sup> I)	monthly	Blackfoot, Dietrich, Idaho Falls, Minidoka, Moreland	Howe, Terreton	None
Tritium, <sup>90</sup> Sr	Semi-annually	Blackfoot, Dietrich, Idaho Falls, Minidoka, Moreland	Howe, Terreton	None
<i>POTATOES</i>				
Gamma Spec, <sup>90</sup> Sr	annually	Aberdeen, Blackfoot, Fort Hall, Idaho Falls, Rupert, Taber, occasional samples across the U.S.	Arco, Monteview, Mud Lake, Terreton	None
<i>WHEAT</i>				
Gamma Spec, <sup>90</sup> Sr	annually	American Falls, Blackfoot, Dietrich, Idaho Falls, Minidoka, Carey	Arco, Monteview, Mud Lake, Taber, Terreton	None
<i>LETTUCE</i>				
Gamma Spec, <sup>90</sup> Sr	annually	Blackfoot, Carey, Idaho Falls, Pocatello	Arco, Atomic City, FAA Tower, Howe, Monteview	EFS
<i>BIG GAME</i>				
Gamma Spec	varies	Occasional samples across the U.S.	Public Highways	INL Site roads
<i>WATERFOWL</i>				
Gamma Spec, <sup>90</sup> Sr, Transuranics	annually	Varies among: Heise, Firth, Fort Hall, Mud Lake, Market Lake, and American Falls	None	Wastewater disposal ponds

**APPENDIX B**  
***SUMMARY OF MDCs AND DCGs***

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**Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses Performed During Fourth Quarter 2007**

Sample Type	Analysis	Approximate Minimum Detectable Concentration <sup>a</sup> (MDC)	Derived Concentration Guide <sup>b</sup> (DCG)
Air (particulate filter) <sup>e</sup>	Gross alpha <sup>c</sup>	$4.53 \times 10^{-16}$ $\mu\text{Ci/mL}$	$2 \times 10^{-14}$ $\mu\text{Ci/mL}$
	Gross beta <sup>d</sup>	$1.34 \times 10^{-15}$ $\mu\text{Ci/mL}$	$3 \times 10^{-12}$ $\mu\text{Ci/mL}$
	Specific gamma ( <sup>137</sup> Cs)	$1.99 \times 10^{-16}$ $\mu\text{Ci/mL}$	$4 \times 10^{-10}$ $\mu\text{Ci/mL}$
	<sup>238</sup> Pu	$3.33 \times 10^{-18}$ $\mu\text{Ci/mL}$	$3 \times 10^{-14}$ $\mu\text{Ci/mL}$
	<sup>239/240</sup> Pu	$9.97 \times 10^{-18}$ $\mu\text{Ci/mL}$	$2 \times 10^{-14}$ $\mu\text{Ci/mL}$
	<sup>241</sup> Am	$8.15 \times 10^{-19}$ $\mu\text{Ci/mL}$	$2 \times 10^{-14}$ $\mu\text{Ci/mL}$
	<sup>90</sup> Sr	$4.81 \times 10^{-17}$ $\mu\text{Ci/mL}$	$9 \times 10^{-12}$ $\mu\text{Ci/mL}$
Air (charcoal cartridge) <sup>e</sup>	<sup>131</sup> I	$3.53 \times 10^{-16}$ $\mu\text{Ci/mL}$	$4 \times 10^{-10}$ $\mu\text{Ci/mL}$
Air (atmospheric moisture)	<sup>3</sup> H	104.6 pCi/L <sub>water</sub>	$1 \times 10^{-7}$ $\mu\text{Ci/mL}_{\text{air}}$
Air (precipitation)	<sup>3</sup> H	105.2 pCi/L	$2 \times 10^{-3}$ $\mu\text{Ci/mL}$
Milk	<sup>131</sup> I	0.72 pCi/L	--
	<sup>137</sup> Cs	1.53 pCi/L	--
	<sup>90</sup> Sr	0.13 pCi/L	--
Potatoes	<sup>137</sup> Cs	1.06 pCi/kg	--
	<sup>90</sup> Sr	0.90 pCi/kg	--
<p>a The MDC is an estimate of the concentration of radioactivity in a given sample type that can be identified with a 95 percent level of confidence and precision of plus or minus 100 percent under a specified set of typical laboratory measurement conditions.</p> <p>b DCGs, set by the DOE, represent reference values for radiation exposure. They are based on a radiation dose of 100 mrem/yr for exposure through a particular exposure mode such as direct exposure, inhalation, or ingestion of water.</p> <p>c The DCG for gross alpha is equivalent to the DCGs for <sup>239,240</sup>Pu and <sup>241</sup>Am.</p> <p>d The DCG for gross beta is equivalent to the DCGs for <sup>228</sup>Ra</p> <p>e The approximate MDC is based on an average filtered air volume (pressure corrected) of 445 m<sup>3</sup>/week.</p>			



**APPENDIX C**  
***SAMPLE ANALYSIS RESULTS***

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TABLE C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air

Sampling Group and Location	Sampling Date	GROSS ALPHA							GROSS BETA						
		Result ± 1s Uncertainty			Result ± 1s Uncertainty				Result ± 1s Uncertainty			Result ± 1s Uncertainty		Result > 3s	
		(x 10 <sup>-15</sup> µCi/mL)			(x 10 <sup>-11</sup> Bq/mL)				(x 10 <sup>-15</sup> µCi/mL)			(x 10 <sup>-11</sup> Bq/mL)			
<b>BOUNDARY</b>															
ARCO	10/3/2007	1.54	±	0.22	5.70	±	0.83	Y	25.20	±	0.78	93.24	±	2.90	Y
	10/10/2007	1.57	±	0.20	5.81	±	0.75	Y	22.50	±	0.68	83.25	±	2.50	Y
	10/17/2007	1.27	±	0.25	4.70	±	0.92	Y	32.90	±	0.97	121.73	±	3.60	Y
	10/24/2007	0.37	±	0.25	1.37	±	0.92	Y	12.50	±	0.88	46.25	±	3.25	Y
	10/31/2007	1.21	±	0.23	4.48	±	0.86	Y	32.90	±	0.93	121.73	±	3.46	Y
	11/7/2007	2.10	±	0.25	7.77	±	0.93	Y	53.80	±	1.00	199.06	±	3.68	Y
	11/14/2007	2.59	±	0.35	9.58	±	1.28	Y	86.40	±	2.35	319.68	±	8.70	Y
	11/21/2007	1.32	±	0.25	4.88	±	0.92	Y	48.70	±	1.70	180.19	±	6.29	Y
	11/28/2007	4.03	±	0.41	14.91	±	1.50	Y	115.00	±	2.68	425.50	±	9.92	Y
	12/5/2007	0.94	±	0.26	3.49	±	0.95	Y	45.70	±	1.82	169.09	±	6.73	Y
	12/12/2007	1.46	±	0.21	5.40	±	0.76	Y	34.70	±	0.86	128.39	±	3.19	Y
	12/19/2007	1.65	±	0.22	6.11	±	0.80	Y	50.30	±	0.95	186.11	±	3.50	Y
	12/26/2007	0.83	±	0.18	3.06	±	0.65	Y	17.00	±	0.68	62.90	±	2.53	Y
ATOMIC CITY	10/3/2007	0.80	±	0.17	2.97	±	0.63	Y	23.90	±	0.74	88.43	±	2.72	Y
	10/10/2007	0.52	±	0.17	1.92	±	0.63	Y	24.00	±	0.81	88.80	±	2.99	Y
	10/17/2007	1.23	±	0.24	4.55	±	0.87	Y	32.20	±	0.93	119.14	±	3.43	Y
	10/24/2007	1.34	±	0.31	4.96	±	1.13	Y	12.60	±	0.87	46.62	±	3.23	Y
	10/31/2007	1.79	±	0.25	6.62	±	0.93	Y	33.80	±	0.90	125.06	±	3.32	Y
	11/7/2007	1.96	±	0.27	7.25	±	1.00	Y	57.90	±	1.12	214.23	±	4.14	Y
	11/14/2007	1.95	±	0.35	7.22	±	1.29	Y	100.00	±	2.68	370.00	±	9.92	Y
	11/21/2007	2.05	±	0.30	7.59	±	1.11	Y	53.20	±	1.86	196.84	±	6.88	Y
	11/28/2007	3.02	±	0.35	11.17	±	1.31	Y	117.00	±	2.63	432.90	±	9.73	Y
	12/5/2007	1.48	±	0.29	5.48	±	1.07	Y	38.00	±	1.75	140.60	±	6.48	Y
	12/12/2007	1.12	±	0.18	4.14	±	0.65	Y	30.40	±	0.78	112.48	±	2.89	Y
	12/19/2007	1.72	±	0.25	6.36	±	0.92	Y	55.40	±	1.09	204.98	±	4.03	Y
	12/26/2007	0.70	±	0.16	2.58	±	0.59	Y	15.90	±	0.65	58.83	±	2.39	Y
BLUE DOME	10/3/2007	1.04	±	0.19	3.85	±	0.69	Y	22.5	±	0.727	83.25	±	2.69	Y
	10/10/2007	0.72	±	0.15	2.65	±	0.57	Y	19.9	±	0.644	73.63	±	2.38	Y
	10/17/2007	0.87	±	0.17	3.23	±	0.64	Y	27.3	±	0.724	101.01	±	2.68	Y
	10/24/2007	0.61	±	0.24	2.25	±	0.88	Y	10.4	±	0.772	38.48	±	2.86	Y
	10/31/2007	1.49	±	0.21	5.51	±	0.78	Y	30.9	±	0.778	114.33	±	2.88	Y
	11/7/2007	1.44	±	0.24	5.33	±	0.88	Y	50.1	±	1.03	185.37	±	3.81	Y
	11/14/2007	1.77	±	0.28	6.55	±	1.02	Y	86.7	±	2.12	320.79	±	7.84	Y
	11/21/2007	1.83	±	0.34	6.77	±	1.26	Y	57.7	±	2.21	213.49	±	8.18	Y
	11/28/2007	2.44	±	0.29	9.03	±	1.09	Y	89.9	±	2.13	332.63	±	7.88	Y
	12/5/2007	2.48	±	0.40	9.18	±	1.47	Y	35.6	±	2.03	131.72	±	7.51	Y
	12/12/2007	1.06	±	0.18	3.92	±	0.65	Y	24.6	±	0.741	91.02	±	2.74	Y
	12/19/2007	1.63	±	0.23	6.03	±	0.84	Y	46	±	0.959	170.20	±	3.55	Y
	12/26/2007	0.47	±	0.13	1.74	±	0.49	Y	12.5	±	0.557	46.25	±	2.06	Y
FAA TOWER	10/3/2007	1.11	±	0.22	4.11	±	0.81	Y	23.60	±	0.86	87.32	±	3.17	Y
	10/10/2007	1.22	±	0.22	4.51	±	0.82	Y	21.10	±	0.80	78.07	±	2.96	Y
	10/17/2007	1.89	±	0.29	6.99	±	1.07	Y	29.50	±	0.96	109.15	±	3.56	Y
	10/24/2007	1.36	±	0.31	5.03	±	1.15	Y	11.00	±	0.87	40.70	±	3.21	Y
	10/31/2007	1.27	±	0.31	4.70	±	1.13	Y	37.20	±	1.25	137.64	±	4.63	Y
	11/7/2007	1.19	±	0.21	4.40	±	0.79	Y	49.70	±	0.98	183.89	±	3.63	Y
	11/14/2007	2.04	±	0.33	7.55	±	1.22	Y	89.20	±	2.43	330.04	±	8.99	Y
	11/21/2007	1.17	±	0.30	4.33	±	1.12	Y	47.30	±	2.07	175.01	±	7.66	Y
	11/28/2007	2.48	±	0.40	9.18	±	1.48	Y	109.00	±	3.04	403.30	±	11.25	Y
	12/5/2007	1.63	±	0.44	6.03	±	1.62	Y	45.10	±	2.64	166.87	±	9.77	Y
	12/12/2007	1.00	±	0.20	3.70	±	0.73	Y	27.00	±	0.87	99.90	±	3.22	Y
<b>a</b>	12/19/2007	1.90	±	0.41	7.03	±	1.50	Y	52.90	±	1.64	195.73	±	6.07	Y
	12/26/2007	0.44	±	0.14	1.62	±	0.51	Y	13.00	±	0.59	48.10	±	2.18	Y
HOWE	10/3/2007	1.46	±	0.20	5.40	±	0.73	Y	26.90	±	0.72	99.53	±	2.66	Y

TABLE C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air

Sampling Group and Location	Sampling Date	GROSS ALPHA				GROSS BETA					
		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)			
				Result > 3s					Result > 3s		
	10/10/2007	1.22	± 0.19	4.51	± 0.68	Y	22.60	± 0.68	83.62	± 2.50	Y
	10/17/2007	0.89	± 0.19	3.31	± 0.69	Y	29.10	± 0.78	107.67	± 2.89	Y
	10/24/2007	0.46	± 0.21	1.71	± 0.77		12.00	± 0.73	44.40	± 2.68	Y
	10/31/2007	1.38	± 0.21	5.11	± 0.79	Y	36.50	± 0.85	135.05	± 3.16	Y
	11/7/2007	1.96	± 0.23	7.25	± 0.84	Y	56.40	± 0.94	208.68	± 3.48	Y
	11/14/2007	1.98	± 0.28	7.33	± 1.02	Y	109.00	± 2.24	403.30	± 8.29	Y
	11/21/2007	2.04	± 0.33	7.55	± 1.22	Y	64.90	± 2.17	240.13	± 8.03	Y
	11/28/2007	2.63	± 0.29	9.73	± 1.06	Y	121.00	± 2.27	447.70	± 8.40	Y
	12/5/2007	1.38	± 0.27	5.11	± 0.98	Y	35.00	± 1.59	129.50	± 5.88	Y
	12/12/2007	1.11	± 0.17	4.11	± 0.64	Y	30.40	± 0.76	112.48	± 2.81	Y
	12/19/2007	1.13	± 0.19	4.18	± 0.68	Y	49.20	± 0.90	182.04	± 3.32	Y
	12/26/2007	0.68	± 0.13	2.52	± 0.48	Y	14.00	± 0.50	51.80	± 1.86	Y
MONTEVIEW	10/3/2007	1.56	± 0.21	5.77	± 0.77	Y	23.10	± 0.70	85.47	± 2.58	Y
	10/10/2007	1.29	± 0.24	4.77	± 0.89	Y	22.00	± 0.87	81.40	± 3.22	Y
	10/17/2007	1.61	± 0.23	5.96	± 0.84	Y	33.50	± 0.83	123.95	± 3.08	Y
	10/24/2007	0.43	± 0.24	1.57	± 0.90		11.90	± 0.85	44.03	± 3.13	Y
	10/31/2007	2.30	± 0.33	8.51	± 1.22	Y	38.50	± 1.13	142.45	± 4.18	Y
	11/7/2007	2.74	± 0.31	10.14	± 1.15	Y	54.00	± 1.12	199.80	± 4.14	Y
	11/14/2007	2.36	± 0.34	8.73	± 1.27	Y	109.00	± 2.59	403.30	± 9.58	Y
	11/21/2007	1.76	± 0.36	6.51	± 1.34	Y	65.70	± 2.47	243.09	± 9.14	Y
	11/28/2007	3.79	± 0.42	14.02	± 1.55	Y	123.00	± 2.92	455.10	± 10.80	Y
	12/5/2007	1.84	± 0.32	6.81	± 1.19	Y	51.10	± 1.99	189.07	± 7.36	Y
	12/12/2007	1.82	± 0.23	6.73	± 0.84	Y	30.60	± 0.84	113.22	± 3.11	Y
	12/19/2007	1.18	± 0.23	4.37	± 0.84	Y	46.70	± 1.04	172.79	± 3.85	Y
	12/26/2007	0.75	± 0.15	2.78	± 0.57	Y	16.00	± 0.61	59.20	± 2.24	Y
MUD LAKE	10/3/2007	1.21	± 0.20	4.48	± 0.74	Y	26.40	± 0.78	97.68	± 2.87	Y
	10/10/2007	1.28	± 0.21	4.74	± 0.79	Y	23.60	± 0.78	87.32	± 2.89	Y
	10/17/2007	0.83	± 0.20	3.08	± 0.73	Y	33.30	± 0.88	123.21	± 3.24	Y
	10/24/2007	0.16	± 0.24	0.58	± 0.89		15.20	± 0.94	56.24	± 3.49	Y
	10/31/2007	1.93	± 0.35	7.14	± 1.28	Y	39.40	± 1.27	145.78	± 4.70	Y
	11/7/2007	3.08	± 0.29	11.40	± 1.06	Y	65.00	± 1.06	240.50	± 3.92	Y
	11/14/2007	2.69	± 0.36	9.95	± 1.32	Y	119.00	± 2.67	440.30	± 9.88	Y
	11/21/2007	2.19	± 0.37	8.10	± 1.38	Y	76.60	± 2.52	283.42	± 9.32	Y
	11/28/2007	3.10	± 0.36	11.47	± 1.32	Y	116.00	± 2.60	429.20	± 9.62	Y
	12/5/2007	3.14	± 0.45	11.62	± 1.65	Y	50.90	± 2.34	188.33	± 8.66	Y
	12/12/2007	1.27	± 0.19	4.70	± 0.70	Y	31.50	± 0.81	116.55	± 2.98	Y
	12/19/2007	1.85	± 0.28	6.85	± 1.02	Y	55.00	± 1.18	203.50	± 4.37	Y
	12/26/2007	0.78	± 0.16	2.89	± 0.60	Y	16.40	± 0.63	60.68	± 2.34	Y
QA-2 (MUD LAKE)	10/3/2007	1.37	± 0.23	5.07	± 0.85	Y	26.80	± 0.86	99.16	± 3.19	Y
	10/10/2007	1.02	± 0.19	3.77	± 0.71	Y	22.90	± 0.75	84.73	± 2.76	Y
	10/17/2007	1.60	± 0.27	5.92	± 0.99	Y	33.90	± 0.98	125.43	± 3.63	Y
	10/24/2007	0.78	± 0.20	2.90	± 0.75	Y	15.00	± 0.70	55.50	± 2.58	Y
	10/31/2007	1.51	± 0.26	5.59	± 0.95	Y	43.80	± 1.06	162.06	± 3.92	Y
	11/7/2007	2.85	± 0.32	10.55	± 1.17	Y	69.40	± 1.23	256.78	± 4.55	Y
	11/14/2007	2.85	± 0.41	10.55	± 1.53	Y	120.00	± 3.03	444.00	± 11.21	Y
	11/21/2007	1.96	± 0.37	7.25	± 1.36	Y	75.70	± 2.55	280.09	± 9.44	Y
	11/28/2007	5.36	± 0.49	19.83	± 1.83	Y	136.00	± 3.13	503.20	± 11.58	Y
	12/5/2007	2.45	± 0.38	9.07	± 1.40	Y	38.70	± 1.99	143.19	± 7.36	Y
	12/12/2007	0.98	± 0.19	3.62	± 0.71	Y	32.60	± 0.91	120.62	± 3.37	Y
	12/19/2007	1.93	± 0.28	7.14	± 1.02	Y	57.80	± 1.18	213.86	± 4.37	Y
	12/26/2007	1.08	± 0.19	4.00	± 0.72	Y	18.20	± 0.71	67.34	± 2.63	Y
DISTANT		0.00	± 0.00								
BLACKFOOT CMS	10/3/2007	26.10	± 0.69	96.57	± 2.57	Y	26.10	± 0.69	96.57	± 2.57	Y
	10/10/2007	21.50	± 0.70	79.55	± 2.59	Y	21.50	± 0.70	79.55	± 2.59	Y
	10/17/2007	32.80	± 0.81	121.36	± 2.98	Y	32.80	± 0.81	121.36	± 2.98	Y

TABLE C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air

Sampling Group and Location	Sampling Date	GROSS ALPHA				GROSS BETA			
		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)	
				Result > 3s				Result > 3s	
	10/24/2007	10.90 ± 0.67	40.33 ± 2.48	Y	10.90 ± 0.67	40.33 ± 2.48	Y		
	10/31/2007	37.20 ± 0.89	137.64 ± 3.30	Y	37.20 ± 0.89	137.64 ± 3.30	Y		
	11/7/2007	49.70 ± 1.00	183.89 ± 3.70	Y	49.70 ± 1.00	183.89 ± 3.70	Y		
	11/14/2007	112.00 ± 2.51	414.40 ± 9.29	Y	112.00 ± 2.51	414.40 ± 9.29	Y		
	11/21/2007	54.20 ± 1.94	200.54 ± 7.18	Y	54.20 ± 1.94	200.54 ± 7.18	Y		
	11/28/2007	108.00 ± 2.46	399.60 ± 9.10	Y	108.00 ± 2.46	399.60 ± 9.10	Y		
	12/5/2007	50.40 ± 1.75	186.48 ± 6.48	Y	50.40 ± 1.75	186.48 ± 6.48	Y		
	12/12/2007	27.50 ± 0.76	101.75 ± 2.80	Y	27.50 ± 0.76	101.75 ± 2.80	Y		
	12/19/2007	49.70 ± 0.97	183.89 ± 3.60	Y	49.70 ± 0.97	183.89 ± 3.60	Y		
	12/26/2007	16.80 ± 0.60	62.16 ± 2.22	Y	16.80 ± 0.60	62.16 ± 2.22	Y		
CRATERS OF THE MOON	10/3/2007	24.30 ± 0.92	89.91 ± 3.39	Y	24.30 ± 0.92	89.91 ± 3.39	Y		
	10/10/2007	23.30 ± 0.73	86.21 ± 2.71	Y	23.30 ± 0.73	86.21 ± 2.71	Y		
	10/17/2007	29.50 ± 1.02	109.15 ± 3.77	Y	29.50 ± 1.02	109.15 ± 3.77	Y		
	10/24/2007	11.20 ± 0.72	41.44 ± 2.66	Y	11.20 ± 0.72	41.44 ± 2.66	Y		
	10/31/2007	33.90 ± 1.15	125.43 ± 4.26	Y	33.90 ± 1.15	125.43 ± 4.26	Y		
	11/7/2007	51.00 ± 0.94	188.70 ± 3.49	Y	51.00 ± 0.94	188.70 ± 3.49	Y		
	11/14/2007	87.10 ± 2.26	322.27 ± 8.36	Y	87.10 ± 2.26	322.27 ± 8.36	Y		
	11/21/2007	35.20 ± 1.84	130.24 ± 6.81	Y	35.20 ± 1.84	130.24 ± 6.81	Y		
	11/28/2007	108.00 ± 2.60	399.60 ± 9.62	Y	108.00 ± 2.60	399.60 ± 9.62	Y		
	12/5/2007	33.10 ± 1.64	122.47 ± 6.07	Y	33.10 ± 1.64	122.47 ± 6.07	Y		
	12/12/2007	27.90 ± 1.03	103.23 ± 3.81	Y	27.90 ± 1.03	103.23 ± 3.81	Y		
	12/19/2007	45.50 ± 0.97	168.35 ± 3.57	Y	45.50 ± 0.97	168.35 ± 3.57	Y		
	12/26/2007	13.20 ± 0.71	48.84 ± 2.62	Y	13.20 ± 0.71	48.84 ± 2.62	Y		
DUBOIS	10/3/2007	25.00 ± 0.76	92.50 ± 2.81	Y	25.00 ± 0.76	92.50 ± 2.81	Y		
	10/10/2007	19.80 ± 0.74	73.26 ± 2.72	Y	19.80 ± 0.74	73.26 ± 2.72	Y		
	10/17/2007	32.40 ± 0.86	119.88 ± 3.17	Y	32.40 ± 0.86	119.88 ± 3.17	Y		
	10/24/2007	9.63 ± 0.63	35.63 ± 2.33	Y	9.63 ± 0.63	35.63 ± 2.33	Y		
	10/31/2007	34.30 ± 0.93	126.91 ± 3.45	Y	34.30 ± 0.93	126.91 ± 3.45	Y		
	11/7/2007	52.00 ± 0.95	192.40 ± 3.51	Y	52.00 ± 0.95	192.40 ± 3.51	Y		
	11/14/2007	105.00 ± 2.42	388.50 ± 8.95	Y	105.00 ± 2.42	388.50 ± 8.95	Y		
	11/21/2007	58.50 ± 2.41	216.45 ± 8.92	Y	58.50 ± 2.41	216.45 ± 8.92	Y		
	11/28/2007	101.00 ± 2.32	373.70 ± 8.58	Y	101.00 ± 2.32	373.70 ± 8.58	Y		
	12/5/2007	55.70 ± 2.32	206.09 ± 8.58	Y	55.70 ± 2.32	206.09 ± 8.58	Y		
	12/12/2007	30.60 ± 1.02	113.22 ± 3.77	Y	30.60 ± 1.02	113.22 ± 3.77	Y		
	12/19/2007	45.50 ± 1.14	168.35 ± 4.22	Y	45.50 ± 1.14	168.35 ± 4.22	Y		
	12/26/2007	15.30 ± 0.71	56.61 ± 2.63	Y	15.30 ± 0.71	56.61 ± 2.63	Y		
IDAHO FALLS	10/3/2007	26.50 ± 0.83	98.05 ± 3.08	Y	26.50 ± 0.83	98.05 ± 3.08	Y		
	10/10/2007	22.50 ± 0.79	83.25 ± 2.90	Y	22.50 ± 0.79	83.25 ± 2.90	Y		
	10/17/2007	36.90 ± 0.96	136.53 ± 3.55	Y	36.90 ± 0.96	136.53 ± 3.55	Y		
	10/24/2007	12.10 ± 1.05	44.77 ± 3.89	Y	12.10 ± 1.05	44.77 ± 3.89	Y		
	10/31/2007	37.20 ± 1.04	137.64 ± 3.85	Y	37.20 ± 1.04	137.64 ± 3.85	Y		
	11/7/2007	54.00 ± 1.16	199.80 ± 4.29	Y	54.00 ± 1.16	199.80 ± 4.29	Y		
	11/14/2007	101.00 ± 2.46	373.70 ± 9.10	Y	101.00 ± 2.46	373.70 ± 9.10	Y		
	11/21/2007	57.50 ± 2.32	212.75 ± 8.58	Y	57.50 ± 2.32	212.75 ± 8.58	Y		
	11/28/2007	110.00 ± 2.76	407.00 ± 10.21	Y	110.00 ± 2.76	407.00 ± 10.21	Y		
	12/5/2007	54.40 ± 2.16	201.28 ± 7.99	Y	54.40 ± 2.16	201.28 ± 7.99	Y		
	12/12/2007	28.80 ± 1.14	106.56 ± 4.22	Y	28.80 ± 1.14	106.56 ± 4.22	Y		
	12/19/2007	49.80 ± 1.18	184.26 ± 4.37	Y	49.80 ± 1.18	184.26 ± 4.37	Y		
	12/26/2007	19.10 ± 0.74	70.67 ± 2.73	Y	19.10 ± 0.74	70.67 ± 2.73	Y		
JACKSON	10/3/2007	43.80 ± 1.11	162.06 ± 4.11	Y	26.00 ± 0.82	96.20 ± 3.03	Y		
	10/10/2007	76.70 ± 2.74	283.79 ± 10.14	Y	20.90 ± 0.75	77.33 ± 2.79	Y		
	10/17/2007	40.90 ± 2.52	151.33 ± 9.32	Y	35.70 ± 0.93	132.09 ± 3.42	Y		
	10/24/2007	74.70 ± 3.72	276.39 ± 13.76	Y	10.20 ± 0.69	37.74 ± 2.57	Y		
	10/31/2007	55.50 ± 1.60	205.35 ± 5.92	Y	40.00 ± 1.07	148.00 ± 3.96	Y		
	11/7/2007	9.57 ± 1.45	35.41 ± 5.37	Y	43.80 ± 1.11	162.06 ± 4.11	Y		

TABLE C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air

Sampling Group and Location	Sampling Date	GROSS ALPHA					GROSS BETA				
		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result > 3s	Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result > 3s
a	11/14/2007	18.40 ± 2.86	68.08 ± 10.58	Y	76.70 ± 2.74	283.79 ± 10.14	Y				
	11/20/2007	10.10 ± 0.58	37.37 ± 2.14	Y	40.90 ± 2.52	151.33 ± 9.32	Y				
	11/24/2007	26.00 ± 0.82	96.20 ± 3.03	Y	74.70 ± 3.72	276.39 ± 13.76	Y				
	12/5/2007	20.90 ± 0.75	77.33 ± 2.79	Y	55.50 ± 1.60	205.35 ± 5.92	Y				
	12/12/2007	35.70 ± 0.93	132.09 ± 3.42	Y	9.57 ± 1.45	35.41 ± 5.37	Y				
	12/19/2007	10.20 ± 0.69	37.74 ± 2.57	Y	18.40 ± 2.86	68.08 ± 10.58	Y				
	12/26/2007	40.00 ± 1.07	148.00 ± 3.96	Y	10.10 ± 0.58	37.37 ± 2.14	Y				
REXBURG CMS	10/3/2007	24.50 ± 0.73	90.65 ± 2.68	Y	24.50 ± 0.73	90.65 ± 2.68	Y				
	10/10/2007	21.70 ± 0.63	80.29 ± 2.33	Y	21.70 ± 0.63	80.29 ± 2.33	Y				
	10/17/2007	34.10 ± 0.92	126.17 ± 3.39	Y	34.10 ± 0.92	126.17 ± 3.39	Y				
	10/24/2007	11.20 ± 0.59	41.44 ± 2.19	Y	11.20 ± 0.59	41.44 ± 2.19	Y				
	10/31/2007	34.90 ± 0.86	129.13 ± 3.17	Y	34.90 ± 0.86	129.13 ± 3.17	Y				
	11/7/2007	46.60 ± 0.95	172.42 ± 3.51	Y	46.60 ± 0.95	172.42 ± 3.51	Y				
	11/14/2007	97.00 ± 2.33	358.90 ± 8.62	Y	97.00 ± 2.33	358.90 ± 8.62	Y				
	11/21/2007	54.60 ± 1.90	202.02 ± 7.03	Y	54.60 ± 1.90	202.02 ± 7.03	Y				
	11/28/2007	97.70 ± 2.54	361.49 ± 9.40	Y	97.70 ± 2.54	361.49 ± 9.40	Y				
	12/5/2007	52.00 ± 1.81	192.40 ± 6.70	Y	52.00 ± 1.81	192.40 ± 6.70	Y				
	12/12/2007	26.30 ± 0.73	97.31 ± 2.70	Y	26.30 ± 0.73	97.31 ± 2.70	Y				
	12/19/2007	41.50 ± 0.89	153.55 ± 3.29	Y	41.50 ± 0.89	153.55 ± 3.29	Y				
	12/26/2007	15.30 ± 0.54	56.61 ± 1.98	Y	15.30 ± 0.54	56.61 ± 1.98	Y				
	TNL SITE		0.00 ± 0.00				0.00 ± 0.00				
EFS	10/3/2007	1.14 ± 0.20	4.22 ± 0.75	Y	25.20 ± 0.80	93.24 ± 2.97	Y				
	10/10/2007	1.01 ± 0.23	3.74 ± 0.85	Y	25.20 ± 0.93	93.24 ± 3.43	Y				
	10/17/2007	1.33 ± 0.25	4.92 ± 0.91	Y	33.80 ± 0.96	125.06 ± 3.54	Y				
	10/24/2007	0.50 ± 0.20	1.86 ± 0.75	Y	10.30 ± 0.68	38.11 ± 2.51	Y				
	10/31/2007	1.65 ± 0.27	6.11 ± 1.00	Y	40.40 ± 1.06	149.48 ± 3.92	Y				
	11/7/2007	1.84 ± 0.26	6.81 ± 0.95	Y	63.70 ± 1.12	235.69 ± 4.14	Y				
	11/14/2007	2.25 ± 0.35	8.33 ± 1.30	Y	119.00 ± 2.78	440.30 ± 10.29	Y				
	11/21/2007	1.06 ± 0.29	3.92 ± 1.07	Y	56.30 ± 2.12	208.31 ± 7.84	Y				
	11/28/2007	2.48 ± 0.35	9.18 ± 1.30	Y	121.00 ± 2.80	447.70 ± 10.36	Y				
	12/5/2007	1.76 ± 0.29	6.51 ± 1.07	Y	32.70 ± 1.60	120.99 ± 5.92	Y				
	12/12/2007	1.10 ± 0.20	4.07 ± 0.73	Y	32.20 ± 0.90	119.14 ± 3.32	Y				
	12/19/2007	1.52 ± 0.23	5.62 ± 0.85	Y	57.90 ± 1.07	214.23 ± 3.96	Y				
	12/26/2007	0.57 ± 0.15	2.10 ± 0.54	Y	15.90 ± 0.62	58.83 ± 2.30	Y				
	QA-1 (EFS)	10/3/2007	1.23 ± 0.22	4.55 ± 0.83	Y	24.80 ± 0.86	91.76 ± 3.17	Y			
10/10/2007		0.82 ± 0.20	3.02 ± 0.74	Y	25.30 ± 0.86	93.61 ± 3.19	Y				
10/17/2007		1.55 ± 0.26	5.74 ± 0.95	Y	34.50 ± 0.97	127.65 ± 3.57	Y				
10/24/2007		0.73 ± 0.27	2.69 ± 0.99	Y	13.20 ± 0.88	48.84 ± 3.26	Y				
10/31/2007		1.61 ± 0.26	5.96 ± 0.96	Y	38.10 ± 1.00	140.97 ± 3.69	Y				
11/7/2007		1.38 ± 0.26	5.11 ± 0.98	Y	63.60 ± 1.25	235.32 ± 4.63	Y				
11/14/2007		2.41 ± 0.36	8.92 ± 1.34	Y	118.00 ± 2.79	436.60 ± 10.32	Y				
11/21/2007		1.58 ± 0.32	5.85 ± 1.17	Y	59.90 ± 2.16	221.63 ± 7.99	Y				
11/28/2007		2.37 ± 0.36	8.77 ± 1.32	Y	128.00 ± 2.94	473.60 ± 10.88	Y				
12/5/2007		1.66 ± 0.33	6.14 ± 1.21	Y	34.00 ± 1.84	125.80 ± 6.81	Y				
12/12/2007		1.35 ± 0.20	5.00 ± 0.75	Y	31.70 ± 0.85	117.29 ± 3.13	Y				
12/19/2007		2.47 ± 0.28	9.14 ± 1.02	Y	59.60 ± 1.11	220.52 ± 4.11	Y				
12/26/2007		0.64 ± 0.14	2.35 ± 0.51	Y	17.40 ± 0.59	64.38 ± 2.19	Y				
MAIN GATE		10/3/2007	1.49 ± 0.25	5.51 ± 0.93	Y	27.60 ± 0.93	102.12 ± 3.42	Y			
	10/10/2007	1.10 ± 0.20	4.07 ± 0.74	Y	23.00 ± 0.77	85.10 ± 2.85	Y				
	10/17/2007	0.81 ± 0.21	3.00 ± 0.78	Y	35.30 ± 0.96	130.61 ± 3.54	Y				
	10/24/2007	0.67 ± 0.25	2.46 ± 0.93	Y	14.10 ± 0.85	52.17 ± 3.14	Y				
	10/31/2007	0.89 ± 0.21	3.28 ± 0.79	Y	39.90 ± 1.00	147.63 ± 3.68	Y				
	11/7/2007	1.54 ± 0.26	5.70 ± 0.97	Y	62.20 ± 1.20	230.14 ± 4.44	Y				
	11/14/2007	2.88 ± 0.48	10.66 ± 1.76	Y	115.00 ± 3.37	425.50 ± 12.47	Y				
	11/21/2007	1.04 ± 0.29	3.85 ± 1.08	Y	48.10 ± 2.04	177.97 ± 7.55	Y				



TABLE C-1. Weekly Gross Alpha and Gross Beta Concentrations in Air

Sampling Group and Location	Sampling Date	GROSS ALPHA				GROSS BETA			
		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)	
	11/28/2007	3.43 ± 0.37	12.69 ± 1.37	Y	127.00 ± 2.70	469.90 ± 9.99	Y		
	12/5/2007	2.09 ± 0.37	7.73 ± 1.37	Y	49.30 ± 2.18	182.41 ± 8.07	Y		
	12/12/2007	1.57 ± 0.22	5.81 ± 0.83	Y	29.20 ± 0.87	108.04 ± 3.20	Y		
	12/19/2007	1.69 ± 0.25	6.25 ± 0.93	Y	56.50 ± 1.12	209.05 ± 4.14	Y		
	12/26/2007	0.66 ± 0.19	2.45 ± 0.68	Y	18.80 ± 0.79	69.56 ± 2.92	Y		
VAN BUREN GATE	10/3/2007	1.15 ± 0.20	4.26 ± 0.75	Y	26.90 ± 0.81	99.53 ± 2.99	Y		
	10/10/2007	1.22 ± 0.21	4.51 ± 0.78	Y	21.80 ± 0.77	80.66 ± 2.83	Y		
	10/17/2007	0.82 ± 0.24	3.05 ± 0.90	Y	34.20 ± 1.07	126.54 ± 3.96	Y		
	10/24/2007	1.46 ± 0.35	5.40 ± 1.30	Y	14.70 ± 1.02	54.39 ± 3.77	Y		
	10/31/2007	1.72 ± 0.25	6.36 ± 0.94	Y	38.30 ± 0.96	141.71 ± 3.54	Y		
	11/7/2007	1.59 ± 0.26	5.88 ± 0.97	Y	63.50 ± 1.20	234.95 ± 4.44	Y		
	11/14/2007	2.52 ± 0.38	9.32 ± 1.41	Y	114.00 ± 2.85	421.80 ± 10.55	Y		
	11/21/2007	1.67 ± 0.33	6.18 ± 1.22	Y	52.40 ± 2.14	193.88 ± 7.92	Y		
	11/28/2007	3.12 ± 0.39	11.54 ± 1.44	Y	112.00 ± 2.79	414.40 ± 10.32	Y		
	12/5/2007	2.24 ± 0.36	8.29 ± 1.31	Y	46.60 ± 2.01	172.42 ± 7.44	Y		
	12/12/2007	1.28 ± 0.20	4.74 ± 0.75	Y	22.20 ± 0.78	82.14 ± 2.87	Y		
	12/19/2007	1.69 ± 0.29	6.25 ± 1.07	Y	52.40 ± 1.23	193.88 ± 4.55	Y		
	12/26/2007	0.50 ± 0.14	1.84 ± 0.53	Y	17.50 ± 0.65	64.75 ± 2.39	Y		
a. Invalid Sample Result									

**TABLE C-2. Weekly Iodine-131 Activity in Air.**

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result > 3s
<b>BOUNDARY</b>						
ARCO	10/03/2007	-0.50	± 2.71	-1.83	± 10.04	
	10/10/2007	-2.77	± 2.11	-10.24	± 7.81	
	10/17/2007	8.57	± 3.12	31.72	± 11.56	
	10/24/2007	0.63	± 3.05	2.34	± 11.30	
	10/31/2007	1.89	± 2.90	7.01	± 10.75	
	11/07/2007	2.72	± 2.51	10.05	± 9.30	
	11/14/2007	2.17	± 2.39	8.01	± 8.83	
	11/21/2007	3.22	± 1.77	11.92	± 6.53	
	11/28/2007	0.57	± 1.43	2.11	± 5.30	
	12/05/2007	-1.03	± 1.93	-3.81	± 7.13	
	12/12/2007	-1.68	± 1.51	-6.21	± 5.58	
	12/19/2007	1.50	± 1.35	5.56	± 4.99	
	12/26/2007	1.17	± 1.67	4.32	± 6.16	
ATOMIC CITY	10/03/2007	-0.46	± 2.54	-1.72	± 9.40	
	10/10/2007	-3.57	± 2.72	-13.20	± 10.07	
	10/17/2007	8.02	± 2.92	29.69	± 10.82	
	10/24/2007	0.62	± 3.02	2.31	± 11.16	
	10/31/2007	1.74	± 2.66	6.43	± 9.85	
	11/07/2007	3.19	± 2.95	11.81	± 10.93	
	11/14/2007	2.47	± 2.72	9.13	± 10.05	
	11/21/2007	3.52	± 1.93	13.04	± 7.15	
	11/28/2007	0.54	± 1.37	2.01	± 5.05	
	12/05/2007	-1.05	± 1.97	-3.89	± 7.28	
	12/12/2007	-1.56	± 1.40	-5.76	± 5.18	
	12/19/2007	1.82	± 1.63	6.72	± 6.03	
	12/26/2007	1.11	± 1.58	4.09	± 5.84	
BLUE DOME	10/03/2007	1.33	± 1.52	4.93	± 5.62	
	10/10/2007	-1.14	± 1.20	-4.23	± 4.45	
	10/17/2007	1.61	± 1.20	5.94	± 4.45	
	10/24/2007	0.95	± 1.53	3.52	± 5.68	
	10/31/2007	-1.69	± 1.23	-6.27	± 4.55	
	11/07/2007	3.80	± 1.66	14.07	± 6.13	
	11/14/2007	1.02	± 1.14	3.76	± 4.23	
	11/21/2007	-1.76	± 1.38	-6.51	± 5.12	
	11/28/2007	1.77	± 1.22	6.55	± 4.53	
	12/05/2007	2.59	± 1.62	9.59	± 6.00	
	12/12/2007	-2.16	± 1.38	-7.98	± 5.12	
	12/19/2007	-1.27	± 1.38	-4.71	± 5.09	
	12/26/2007	3.34	± 1.28	12.35	± 4.74	
FAA TOWER	10/03/2007	1.69	± 1.93	6.26	± 7.13	
	10/10/2007	-1.55	± 1.63	-5.75	± 6.04	
	10/17/2007	2.45	± 1.84	9.08	± 6.80	
	10/24/2007	1.09	± 1.75	4.02	± 6.48	
	10/31/2007	-3.30	± 2.39	-12.19	± 8.85	
	11/07/2007	3.48	± 1.52	12.88	± 5.61	
	11/14/2007	1.25	± 1.41	4.63	± 5.20	
	11/21/2007	-1.76	± 1.38	-6.51	± 5.12	
	11/28/2007	2.83	± 1.96	10.46	± 7.23	

TABLE C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)		Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)		Result > 3s
<b>BOUNDARY</b>						
a	12/05/2007	3.45	± 2.16	12.78	± 8.00	
	12/12/2007	-2.65	± 1.70	-9.79	± 6.28	
	12/19/2007	-2.90	± 3.13	-10.72	± 11.58	
	12/26/2007	3.56	± 1.37	13.18	± 5.06	
HOWE	10/03/2007	1.16	± 1.32	4.30	± 4.90	
	10/10/2007	-1.13	± 1.19	-4.20	± 4.41	
	10/17/2007	1.75	± 1.31	6.49	± 4.86	
	10/24/2007	0.84	± 1.35	3.10	± 4.99	
	10/31/2007	-1.77	± 1.28	-6.53	± 4.74	
	11/07/2007	2.91	± 1.27	10.75	± 4.68	
	11/14/2007	0.95	± 1.06	3.50	± 3.94	
	11/21/2007	-1.61	± 1.26	-5.95	± 4.67	
	11/28/2007	1.58	± 1.09	5.84	± 4.04	
	12/05/2007	1.85	± 1.16	6.86	± 4.29	
	12/12/2007	-1.94	± 1.25	-7.18	± 4.61	
	12/19/2007	-1.07	± 1.16	-3.97	± 4.29	
12/26/2007	2.66	± 1.02	9.86	± 3.79		
MONTEVIEW	10/03/2007	1.22	± 1.39	4.52	± 5.15	
	10/10/2007	-1.73	± 1.82	-6.41	± 6.74	
	10/17/2007	1.76	± 1.32	6.51	± 4.88	
	10/24/2007	1.03	± 1.66	3.82	± 6.15	
	10/31/2007	-2.75	± 2.00	-10.17	± 7.38	
	11/07/2007	4.12	± 1.79	15.23	± 6.63	
	11/14/2007	1.22	± 1.38	4.53	± 5.09	
	11/21/2007	-1.95	± 1.53	-7.23	± 5.68	
	11/28/2007	2.41	± 1.66	8.91	± 6.16	
	12/05/2007	2.16	± 1.35	8.00	± 5.01	
	12/12/2007	-2.30	± 1.47	-8.50	± 5.46	
	12/19/2007	-1.47	± 1.58	-5.42	± 5.86	
12/26/2007	3.30	± 1.27	12.20	± 4.68		
MUD LAKE	10/03/2007	1.34	± 1.52	4.95	± 5.64	
	10/10/2007	-1.40	± 1.48	-5.20	± 5.46	
	10/17/2007	1.94	± 1.45	7.18	± 5.37	
	10/24/2007	1.10	± 1.78	4.08	± 6.57	
	10/31/2007	-3.29	± 2.39	-12.17	± 8.83	
	11/07/2007	3.19	± 1.39	11.79	± 5.14	
	11/14/2007	1.20	± 1.35	4.45	± 5.00	
	11/21/2007	-1.85	± 1.45	-6.84	± 5.37	
	11/28/2007	2.07	± 1.43	7.65	± 5.29	
	12/05/2007	2.74	± 1.71	10.13	± 6.34	
	12/12/2007	-2.10	± 1.35	-7.76	± 4.98	
	12/19/2007	-1.59	± 1.72	-5.90	± 6.37	
12/26/2007	3.50	± 1.34	12.94	± 4.97		
QA-2	10/03/2007	1.58	± 1.80	5.85	± 6.66	
	10/10/2007	-1.33	± 1.39	-4.90	± 5.16	
	10/17/2007	2.31	± 1.73	8.54	± 6.40	
	10/24/2007	0.73	± 1.17	2.68	± 4.33	
	10/31/2007	-2.26	± 1.64	-8.35	± 6.06	

**TABLE C-2. Weekly Iodine-131 Activity in Air.**

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)			Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)			Result > 3s
<b>BOUNDARY</b>								
	11/07/2007	4.01	±	1.75	14.83	±	6.46	
	11/14/2007	1.48	±	1.67	5.49	±	6.16	
	11/21/2007	-1.89	±	1.49	-7.00	±	5.50	
	11/28/2007	2.52	±	1.74	9.31	±	6.44	
	12/05/2007	2.44	±	1.53	9.01	±	5.64	
	12/12/2007	-2.53	±	1.62	-9.35	±	6.00	
	12/19/2007	-1.55	±	1.67	-5.72	±	6.18	
	12/26/2007	3.96	±	1.52	14.64	±	5.62	
<b>DISTANT</b>								
BLACKFOOT CMS	10/03/2007	-0.40	±	2.16	-1.46	±	8.01	
	10/10/2007	-3.02	±	2.30	-11.17	±	8.53	
	10/17/2007	6.23	±	2.27	23.05	±	8.40	
	10/24/2007	0.46	±	2.22	1.70	±	8.20	
	10/31/2007	1.61	±	2.47	5.95	±	9.13	
	11/07/2007	2.93	±	2.71	10.83	±	10.02	
	11/14/2007	2.03	±	2.23	7.50	±	8.26	
	11/21/2007	3.70	±	2.03	13.68	±	7.50	
	11/28/2007	0.51	±	1.29	1.91	±	4.79	
	12/05/2007	-0.91	±	1.71	-3.38	±	6.32	
	12/12/2007	-1.58	±	1.42	-5.86	±	5.27	
	12/19/2007	1.60	±	1.44	5.92	±	5.31	
	12/26/2007	0.95	±	1.35	3.50	±	4.99	
CRATERS	10/03/2007	-0.65	±	3.58	-2.42	±	13.24	
	10/10/2007	-3.09	±	2.36	-11.45	±	8.74	
	10/17/2007	10.04	±	3.66	37.16	±	13.54	
	10/24/2007	0.50	±	2.44	1.87	±	9.02	
	10/31/2007	2.60	±	3.99	9.64	±	14.77	
	11/07/2007	2.58	±	2.39	9.55	±	8.84	
	11/14/2007	2.04	±	2.24	7.54	±	8.30	
	11/21/2007	4.22	±	2.31	15.60	±	8.55	
	11/28/2007	0.57	±	1.43	2.10	±	5.28	
	12/05/2007	-1.03	±	1.93	-3.82	±	7.15	
	12/12/2007	-2.58	±	2.32	-9.56	±	8.60	
	12/19/2007	1.70	±	1.52	6.28	±	5.63	
	12/26/2007	1.40	±	2.00	5.19	±	7.41	
DUBOIS	10/03/2007	1.34	±	1.53	4.96	±	5.65	
	10/10/2007	-1.41	±	1.48	-5.22	±	5.49	
	10/17/2007	1.90	±	1.42	7.02	±	5.26	
	10/24/2007	0.75	±	1.21	2.77	±	4.47	
	10/31/2007	-2.15	±	1.56	-7.95	±	5.77	
	11/07/2007	3.16	±	1.38	11.69	±	5.09	
	11/14/2007	1.11	±	1.25	4.11	±	4.62	
	11/21/2007	-1.99	±	1.57	-7.37	±	5.79	
	11/28/2007	1.88	±	1.30	6.95	±	4.80	
	12/05/2007	2.61	±	1.63	9.65	±	6.04	
	12/12/2007	-3.16	±	2.03	-11.70	±	7.51	
	12/19/2007	-1.74	±	1.88	-6.43	±	6.95	
	12/26/2007	4.36	±	1.67	16.11	±	6.19	

TABLE C-2. Weekly Iodine-131 Activity in Air.

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)			Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)			Result > 3s
<b>BOUNDARY</b>								
IDAHO FALLS	10/03/2007	1.50	±	1.71	5.54	±	6.31	
	10/10/2007	-1.45	±	1.53	-5.37	±	5.65	
	10/17/2007	2.09	±	1.57	7.74	±	5.79	
	10/24/2007	1.34	±	2.16	4.97	±	8.01	
	10/31/2007	-2.43	±	1.77	-9.01	±	6.54	
	11/07/2007	4.36	±	1.90	16.14	±	7.03	
	11/14/2007	1.18	±	1.32	4.35	±	4.89	
	11/21/2007	-1.91	±	1.50	-7.07	±	5.55	
	11/28/2007	2.38	±	1.65	8.82	±	6.10	
	12/05/2007	2.36	±	1.48	8.75	±	5.48	
	12/12/2007	-3.93	±	2.52	-14.53	±	9.33	
	12/19/2007	-1.72	±	1.86	-6.37	±	6.88	
	12/26/2007	4.05	±	1.56	15.00	±	5.76	
JACKSON	10/03/2007	-0.52	±	2.85	-1.93	±	10.56	
	10/10/2007	-3.46	±	2.64	-12.80	±	9.77	
	10/17/2007	7.46	±	2.72	27.60	±	10.06	
	10/24/2007	0.49	±	2.39	1.83	±	8.83	
	10/31/2007	2.09	±	3.20	7.72	±	11.83	
	11/07/2007	3.87	±	3.58	14.32	±	13.25	
	11/14/2007	3.01	±	3.32	11.14	±	12.27	
	11/20/2007	6.13	±	3.36	22.69	±	12.44	
	a 11/24/2007	1.23	±	3.08	4.54	±	11.40	
	12/05/2007	-0.74	±	1.38	-2.73	±	5.10	
a 12/12/2007	-5.92	±	5.32	-21.89	±	19.69		
a 12/19/2007	12.22	±	10.96	45.22	±	40.56		
12/26/2007	1.18	±	1.68	4.35	±	6.21		
REXBURG CMS	10/03/2007	1.25	±	1.43	4.63	±	5.28	
	10/10/2007	-1.04	±	1.09	-3.84	±	4.03	
	10/17/2007	2.05	±	1.54	7.59	±	5.68	
	10/24/2007	0.65	±	1.05	2.40	±	3.87	
	10/31/2007	-1.84	±	1.33	-6.80	±	4.94	
	11/07/2007	3.44	±	1.50	12.73	±	5.55	
	11/14/2007	1.10	±	1.24	4.08	±	4.58	
	11/21/2007	-1.44	±	1.13	-5.33	±	4.18	
	11/28/2007	2.24	±	1.55	8.30	±	5.74	
	12/05/2007	1.85	±	1.16	6.85	±	4.29	
	12/12/2007	-2.02	±	1.29	-7.46	±	4.79	
	12/19/2007	-1.21	±	1.31	-4.47	±	4.83	
	12/26/2007	2.79	±	1.07	10.32	±	3.96	
<b>INL SITE</b>								
EFS	10/03/2007	-0.52	±	2.83	-1.91	±	10.48	
	10/10/2007	-4.32	±	3.30	-15.98	±	12.20	
	10/17/2007	8.21	±	2.99	30.38	±	11.07	
	10/24/2007	0.48	±	2.30	1.76	±	8.52	
	10/31/2007	2.03	±	3.11	7.50	±	11.50	
	11/07/2007	2.94	±	2.72	10.89	±	10.08	
	11/14/2007	2.33	±	2.56	8.61	±	9.48	
	11/21/2007	4.21	±	2.31	15.58	±	8.54	

**TABLE C-2. Weekly Iodine-131 Activity in Air.**

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10 <sup>-15</sup> µCi/mL)			Result ± 1s Uncertainty (x 10 <sup>-11</sup> Bq/mL)			Result > 3s
<b>BOUNDARY</b>								
	11/28/2007	0.59	±	1.49	2.20	±	5.53	
	12/05/2007	-0.98	±	1.84	-3.64	±	6.81	
	12/12/2007	-1.90	±	1.71	-7.03	±	6.32	
	12/19/2007	1.68	±	1.51	6.23	±	5.59	
	12/26/2007	1.04	±	1.49	3.86	±	5.50	
QA-1	10/03/2007	-0.58	±	3.18	-2.15	±	11.77	
	10/10/2007	-3.84	±	2.93	-14.22	±	10.86	
	10/17/2007	8.19	±	2.99	30.32	±	11.05	
	10/24/2007	0.62	±	3.01	2.30	±	11.12	
	10/31/2007	1.91	±	2.93	7.08	±	10.85	
	11/07/2007	3.61	±	3.34	13.35	±	12.36	
	11/14/2007	2.35	±	2.59	8.71	±	9.60	
	11/21/2007	4.16	±	2.28	15.39	±	8.44	
	11/28/2007	0.62	±	1.57	2.31	±	5.80	
	12/05/2007	-1.19	±	2.22	-4.39	±	8.21	
	12/12/2007	-1.73	±	1.56	-6.42	±	5.77	
	12/19/2007	1.75	±	1.57	6.47	±	5.81	
	12/26/2007	0.91	±	1.30	3.38	±	4.82	
MAIN GATE	10/03/2007	-0.61	±	3.36	-2.27	±	12.44	
	10/10/2007	-3.37	±	2.58	-12.49	±	9.53	
	10/17/2007	7.99	±	2.91	29.57	±	10.78	
	10/24/2007	0.58	±	2.80	2.14	±	10.36	
	10/31/2007	1.85	±	2.83	6.83	±	10.47	
	11/07/2007	3.41	±	3.15	12.61	±	11.67	
	11/14/2007	3.28	±	3.61	12.13	±	13.36	
	11/21/2007	4.30	±	2.36	15.92	±	8.73	
	11/28/2007	0.54	±	1.35	1.99	±	5.01	
	12/05/2007	-1.29	±	2.41	-4.76	±	8.90	
	12/12/2007	-1.90	±	1.71	-7.05	±	6.34	
	12/19/2007	1.86	±	1.67	6.87	±	6.17	
	12/26/2007	1.38	±	1.98	5.12	±	7.31	
VAN BUREN GATE	10/03/2007	-0.50	±	2.75	-1.86	±	10.17	
	10/10/2007	-3.46	±	2.64	-12.80	±	9.77	
	10/17/2007	9.82	±	3.58	36.34	±	13.25	
	10/24/2007	0.73	±	3.55	2.72	±	13.12	
	10/31/2007	1.78	±	2.72	6.58	±	10.08	
	11/07/2007	3.35	±	3.10	12.39	±	11.47	
	11/14/2007	2.50	±	2.75	9.24	±	10.18	
	11/21/2007	4.40	±	2.41	16.29	±	8.93	
	11/28/2007	0.62	±	1.57	2.30	±	5.79	
	12/05/2007	-1.18	±	2.20	-4.35	±	8.13	
	12/12/2007	-1.89	±	1.70	-6.98	±	6.28	
	12/19/2007	2.34	±	2.10	8.67	±	7.78	
	12/26/2007	1.05	±	1.50	3.89	±	5.55	

a. Invalid Sample Result

TABLE C-3. Quarterly Americium-241, Cesium-137, Plutonium-238, Plutonium-239/240, and Strontium-90 Concentrations in Composite Air Filters.

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty (x 10 <sup>-18</sup> µCi/mL)			Result ± 1s Uncertainty (x 10 <sup>-13</sup> Bq/mL)			Result > 3s
<b>BOUNDARY</b>									
ARCO	12/30/2007	CESIUM-137	-61.50	±	132.57	-227.56	±	490.50	
ATOMIC CITY	12/30/2007	CESIUM-137	264.86	±	163.27	979.99	±	604.12	
		STRONTIUM-90	42.90	±	17.20	158.73	±	63.64	
BLUE DOME	12/30/2007	CESIUM-137	266.64	±	132.61	986.57	±	490.67	
FAA TOWER	12/30/2007	AMERICIUM-241	5.74	±	1.74	21.24	±	6.44	Y
		CESIUM-137	841.85	±	201.95	3114.84	±	747.23	Y
		PLUTONIUM-238	2.15	±	1.86	7.96	±	6.88	
		PLUTONIUM-239/40	2.15	±	1.70	7.96	±	6.29	
HOWE	12/30/2007	CESIUM-137	-20.21	±	81.22	-74.77	±	300.51	
MONTEVIEW	12/30/2007	CESIUM-137	629.29	±	177.03	2328.37	±	655.01	Y
		STRONTIUM-90	17.20	±	18.75	63.64	±	69.38	
MUD LAKE	12/30/2007	AMERICIUM-241	1.98	±	0.87	7.33	±	3.22	
		CESIUM-137	-262.55	±	146.75	-971.45	±	542.99	
		PLUTONIUM-238	-0.24	±	0.42	-0.90	±	1.57	
		PLUTONIUM-239/40	0.24	±	0.55	0.90	±	2.02	
MUD LAKE (QA-2)	12/30/2007	AMERICIUM-241	2.02	±	0.65	7.47	±	2.40	Y
		CESIUM-137	-105.96	±	113.23	-392.04	±	418.94	
		PLUTONIUM-238	1.60	±	0.77	5.92	±	2.83	
		PLUTONIUM-239/40	1.60	±	0.77	5.92	±	2.83	
<b>DISTANT</b>									
BLACKFOOT	12/30/2007	CESIUM-137	206.43	±	92.12	763.80	±	340.86	
		STRONTIUM-90	-22.00	±	14.05	-81.40	±	51.99	
CRATERS	12/30/2007	CESIUM-137	60.68	±	151.60	224.50	±	560.92	
DUBOIS	12/30/2007	CESIUM-137	-404.10	±	329.01	-1495.18	±	1217.35	
IDAHO FALLS	12/30/2007	AMERICIUM-241	2.20	±	0.72	8.14	±	2.66	Y
		CESIUM-137	-139.03	±	160.96	-514.41	±	595.55	
		PLUTONIUM-238	1.70	±	0.77	6.29	±	2.85	
JACKSON	12/30/2007	PLUTONIUM-239/40	1.02	±	0.59	3.77	±	2.19	
		CESIUM-137	-197.46	±	195.47	-730.59	±	723.23	
REXBURG CMS	12/30/2007	CESIUM-137	-37.02	±	278.02	-136.98	±	1028.69	
		STRONTIUM-90	45.30	±	26.75	167.61	±	98.98	

**TABLE C-3. Quarterly Americium-241, Cesium-137, Plutonium-238, Plutonium-239/240, and Strontium-90 Concentrations in Composite Air Filters.**

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty (x 10 <sup>-18</sup> µCi/mL)			Result ± 1s Uncertainty (x 10 <sup>-13</sup> Bq/mL)			Result > 3s
<b>INL SITE</b>									
EFS	12/30/2007	CESIUM-137	5.80	±	331.02	21.47	±	1224.78	
		STRONTIUM-90	-39.10	±	16.35	-144.67	±	60.50	
EFS (QA-1)	12/30/2007	CESIUM-137	454.45	±	176.70	1681.45	±	653.79	
		STRONTIUM-90	-14.50	±	17.50	-53.65	±	64.75	
MAIN GATE	12/30/2007	AMERICIUM-241	0.97	±	0.46	3.60	±	1.72	
		CESIUM-137	-225.43	±	186.94	-834.09	±	691.68	
		PLUTONIUM-238	0.37	±	0.63	1.35	±	2.34	
		PLUTONIUM-239/40	1.10	±	0.64	4.07	±	2.36	
VAN BUREN GATE	12/30/2007	AMERICIUM-241	13.90	±	1.81	51.43	±	6.70	Y
		CESIUM-137	79.57	±	187.63	294.41	±	694.22	
		PLUTONIUM-238	32.60	±	3.65	120.62	±	13.51	Y
		PLUTONIUM-239/40	8.53	±	1.56	31.56	±	5.77	Y



**TABLE C-4. Tritium Concentrations in Atmospheric Moisture.**

Sampling Group and Location	Start Date	Sampling Date	Result ± 1s Uncertainty			Result ± 1s Uncertainty			Collection Medium	Result > 3s
			(x 10 <sup>-13</sup> μCi/mL <sub>air</sub> )			(x 10 <sup>-9</sup> Bq/mL <sub>air</sub> )				
<b>BOUNDARY</b>										
ATOMIC CITY	09/26/2007	10/24/2007	4.71	±	1.40	17.44	±	5.18	Molecular Sieve	Y
ATOMIC CITY	10/24/2007	11/21/2007	1.26	±	1.33	4.67	±	4.92	Molecular Sieve	
<b>DISTANT</b>										
BLACKFOOT	09/12/2007	10/03/2007	9.24	±	1.81	34.20	±	6.71	Molecular Sieve	Y
BLACKFOOT	10/03/2007	10/24/2007	3.75	±	2.04	13.86	±	7.55	Molecular Sieve	
BLACKFOOT	10/24/2007	11/14/2007	8.29	±	1.97	30.68	±	7.27	Molecular Sieve	Y
BLACKFOOT	11/14/2007	12/12/2007	1.87	±	1.35	6.93	±	5.00	Molecular Sieve	
IDAHO FALLS	09/27/2007	10/17/2007	4.32	±	1.65	15.97	±	6.09	Molecular Sieve	
IDAHO FALLS	10/17/2007	11/12/2007	4.70	±	1.69	17.40	±	6.24	Molecular Sieve	
IDAHO FALLS	11/12/2007	12/20/2007	0.29	±	0.99	1.06	±	3.67	Molecular Sieve	
REXBURG CMS	09/26/2007	10/17/2007	6.41	±	1.98	23.70	±	7.34	Molecular Sieve	Y
REXBURG CMS	10/17/2007	11/07/2007	5.22	±	2.05	19.31	±	7.57	Molecular Sieve	
REXBURG CMS	11/07/2007	12/05/2007	-0.46	±	1.43	-1.71	±	5.30	Molecular Sieve	

**TABLE C-5. Monthly and Weekly Tritium Concentrations in Precipitation.**

Location	Start Date	End Date	Result ± 1s Uncertainty			Result ± 1s Uncertainty			Result > 3s
			(pCi/L)			(Bq/L)			
Idaho Falls	10/1/2007	11/2/2007	100.00	±	32.00	3.70	±	1.18	Y
	11/2/2007	12/6/2007	24.40	±	31.30	0.90	±	1.16	
CFA	9/4/2007	10/1/2007	196.00	±	33.70	7.25	±	1.25	Y
	10/1/2007	11/1/2007	107.00	±	33.20	3.96	±	1.23	Y
	11/1/2007	12/3/2007	48.00	±	31.60	1.78	±	1.17	
EFS	9/27/2007	10/3/2007	199.00	±	33.70	7.36	±	1.25	Y
	10/3/2007	10/10/2007	188.00	±	33.50	6.96	±	1.24	Y
	10/17/2007	10/24/2007	270.00	±	35.10	9.99	±	1.30	Y
	10/24/2007	10/31/2007	196.00	±	33.50	7.25	±	1.24	Y
	11/7/2007	11/14/2007	183.00	±	33.30	6.77	±	1.23	Y
	12/19/2007	12/26/2007	90.00	±	32.60	3.33	±	1.21	

**Table C-6. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk**

Location	Sampling Date	Iodine-131			Cesium-137				
		Result ± 1s Uncertainty (pCi <sup>†</sup> /L)		Result ± 1s Uncertainty (Bq <sup>†</sup> /L)		Result ± 1s Uncertainty (pCi/L)		Result ± 1s Uncertainty (Bq/L)	
<b>BLACKFOOT</b>									
	10/02/2007	-0.33 ± 1.63	-0.012 ± 0.060		1.93 ± 1.36	0.071 ± 0.050			
	11/06/2007	4.47 ± 1.52	0.166 ± 0.056		1.04 ± 1.33	0.039 ± 0.049			
	12/04/2007	0.51 ± 1.21	0.019 ± 0.045		0.14 ± 0.89	0.005 ± 0.033			
<b>DIETRICH</b>									
	10/02/2007	2.22 ± 2.12	0.082 ± 0.079		2.67 ± 2.69	0.099 ± 0.100			
	11/06/2007	-0.67 ± 1.07	-0.025 ± 0.040		1.26 ± 0.91	0.047 ± 0.034			
	12/04/2007	0.25 ± 1.54	0.009 ± 0.057		-2.37 ± 1.43	-0.088 ± 0.053			
<b>HOWE</b>									
	10/02/2007	0.53 ± 2.09	0.019 ± 0.077		0.47 ± 1.40	0.017 ± 0.052			
	11/06/2007	-4.80 ± 2.37	-0.178 ± 0.088		4.80 ± 2.70	0.178 ± 0.100			
	12/04/2007	-0.66 ± 0.87	-0.024 ± 0.032		-0.08 ± 0.80	-0.003 ± 0.030			
<b>IDAHO FALLS</b>									
	10/02/2007	-0.25 ± 1.93	-0.009 ± 0.071		0.79 ± 1.39	0.029 ± 0.051			
	11/06/2007	2.64 ± 1.96	0.098 ± 0.073		-1.68 ± 1.36	-0.062 ± 0.050			
	11/27/2007	0.77 ± 1.09	0.029 ± 0.040		-1.41 ± 0.92	-0.052 ± 0.034			
	12/04/2007	0.81 ± 1.09	0.030 ± 0.040		2.17 ± 0.92	0.080 ± 0.034			
	12/11/2007	0.56 ± 1.13	0.021 ± 0.042		0.98 ± 0.88	0.036 ± 0.033			
	12/18/2007	2.37 ± 1.12	0.088 ± 0.041		0.51 ± 0.92	0.019 ± 0.034			
	12/27/2007	0.39 ± 0.94	0.014 ± 0.035		-0.01 ± 0.89	0.000 ± 0.033			
<b>MORELAND</b>									
	10/02/2007	-2.75 ± 2.45	-0.102 ± 0.091		-0.50 ± 2.61	-0.019 ± 0.097			
	11/06/2007	-0.88 ± 1.76	-0.033 ± 0.065		-1.68 ± 1.41	-0.062 ± 0.052			
	12/04/2007	-1.43 ± 1.69	-0.053 ± 0.063		-1.86 ± 1.47	-0.069 ± 0.054			
Duplicate	12/04/2007	1.21 ± 1.45	0.045 ± 0.054		1.52 ± 0.94	0.056 ± 0.035			
<b>RUPERT</b>									
	10/02/2007	-1.83 ± 1.20	-0.068 ± 0.044		-0.05 ± 0.91	-0.002 ± 0.034			
	11/06/2007	-0.21 ± 0.80	-0.008 ± 0.030		-0.25 ± 0.81	-0.009 ± 0.030			
	12/04/2007	-2.46 ± 2.43	-0.091 ± 0.090		0.19 ± 2.72	0.007 ± 0.101			

**Table C-6. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk**

TERRETON													
	10/02/2007	0.69	±	0.81	0.026	±	0.030	-0.72	±	0.81	-0.027	±	0.030
	11/06/2007	3.13	±	2.16	0.116	±	0.080	-0.84	±	1.42	-0.031	±	0.053
	12/04/2007	0.12	±	1.33	0.004	±	0.049	0.64	±	0.91	0.024	±	0.034
Duplicate	12/04/2007	-1.04	±	2.02	-0.039	±	0.075	1.19	±	1.37	0.044	±	0.051
UCON													
	10/02/2007	-1.38	±	0.74	-0.051	±	0.027	1.17	±	0.79	0.043	±	0.029
	10/09/2007	0.38	±	0.73	0.014	±	0.027	0.81	±	0.77	0.030	±	0.029
	10/16/2007	1.36	±	1.11	0.050	±	0.041	1.15	±	0.89	0.043	±	0.033
	10/23/2007	-0.63	±	1.09	-0.023	±	0.040	-0.52	±	0.92	-0.019	±	0.034
	10/30/2007	-0.16	±	1.08	-0.006	±	0.040	-1.15	±	0.89	-0.043	±	0.033
	11/06/2007	-0.18	±	0.76	-0.007	±	0.028	0.59	±	0.84	0.022	±	0.031
	11/13/2007	-0.46	±	1.08	-0.017	±	0.040	-0.27	±	0.91	-0.010	±	0.034
	11/20/2007	0.23	±	1.03	0.008	±	0.038	-1.74	±	0.91	-0.064	±	0.034

**Table C-7. Strontium-90 Concentrations in Milk**

<b>Strontium-90</b>								
<b>Location</b>	<b>Sampling Date</b>	<b>Result ± 1s Uncertainty (pCi/L)</b>			<b>Result ± 1s Uncertainty (Bq/L)</b>			<b>Result &gt; 3s</b>
DIETRICH	11/06/2007	0.47	±	0.04	0.017	±	0.002	Y
HOWE	11/06/2007	0.36	±	0.04	0.013	±	0.001	Y
IDAHO FALLS	11/06/2007	0.49	±	0.08	0.018	±	0.003	Y
MORELAND	11/06/2007	0.57	±	0.04	0.021	±	0.001	Y

**Table C-8. Cesium-137 and Strontium-90 Concentrations in Potatoes**

		<b>Cesium-137</b>						
<b>Sampling Date</b>	<b>Location</b>	<b>Result ± 1s Uncertainty</b>			<b>Result ± 1s Uncertainty</b>			
		<b>pCi/kg</b>			<b>bq/kg</b>			
					<b>Result &gt; 3s</b>			
10/3/2007	ARCO	-0.22	±	0.52	-0.01	±	0.02	
10/5/2007	BLACKFOOT	-0.32	±	0.73	-0.01	±	0.03	
10/15/2007	COLORADO	0.53	±	0.49	0.02	±	0.02	
10/9/2007	IDAHO FALLS	-0.23	±	1.76	-0.01	±	0.07	
10/9/2007	IDAHO FALLS	0.88	±	0.72	0.03	±	0.03	
10/4/2007	MONTEVIEW	0.58	±	0.47	0.02	±	0.02	
10/4/2007	MUD LAKE	6.38	±	1.83	0.24	±	0.07	Y
10/2/2007	RUPERT	-0.02	±	0.69	0.00	±	0.03	
		<b>Strontium-90</b>						
		<b>Result ± 1s Uncertainty</b>			<b>Result ± 1s Uncertainty</b>			
		<b>pCi/kg</b>			<b>bq/kg</b>			
					<b>Result &gt; 3s</b>			
10/3/2007	ARCO	-0.42	±	0.37	-0.02	±	0.01	
10/5/2007	BLACKFOOT	0.15	±	0.17	0.01	±	0.01	
10/15/2007	COLORADO	-1.17	±	0.20	-0.04	±	0.01	
10/9/2007	IDAHO FALLS	-1.51	±	0.29	-0.06	±	0.01	
10/9/2007	IDAHO FALLS	-0.90	±	0.31	-0.03	±	0.01	
10/4/2007	MONTEVIEW	0.62	±	0.33	0.02	±	0.01	
10/4/2007	MUD LAKE	-0.28	±	0.19	-0.01	±	0.01	
10/2/2007	RUPERT	0.55	±	0.34	0.02	±	0.01	

**Table C-9. Gamma-emitting Radionuclides,  
Strontium-90 and Actinides in Waterfowl**

Location	Species	Sampling Date	Analyte	Result ± Uncertainty(1s) (x 10 <sup>-3</sup> ) pCi/g		Result ± Uncertainty(1s) (x 10 <sup>-5</sup> ) Bq/g		Result > 3s
<b>RTC</b>								
	Shoveler		AMERICIUM-241	0.21	± 0.09	0.79	± 0.35	
			CESIUM-137	4.22	± 6.43	15.62	± 23.83	
			CHROMIUM-51	923.20	± 1918.03	3419.27	± 7103.82	
			COBALT-60	12.54	± 4.48	46.43	± 16.58	
			PLUTONIUM-238	0.05	± 0.07	0.20	± 0.25	
			PLUTONIUM-239/240	0.00	± 0.00	0.00	± 0.00	
			STRONTIUM-90	1.82	± 0.85	6.74	± 3.13	
			ZINC-65	10.91	± 19.36	40.41	± 71.69	
<b>RTC</b>								
	Shoveler		AMERICIUM-241	0.07	± 0.05	0.25	± 0.18	
			CESIUM-137	1300.01	± 30.43	4814.84	± 112.72	Y
			CHROMIUM-51	1523.04	± 1561.31	5640.89	± 5782.62	
			COBALT-60	42.15	± 4.20	156.10	± 15.56	Y
			PLUTONIUM-238	-0.04	± 0.08	-0.13	± 0.30	
			PLUTONIUM-239/240	0.07	± 0.05	0.27	± 0.19	
			STRONTIUM-90	3.09	± 1.27	11.44	± 4.70	
			ZINC-65	-4.20	± 13.29	-15.55	± 49.23	
<b>RTC</b>								
	Coot		AMERICIUM-241	0.22	± 0.09	0.82	± 0.34	
			CESIUM-137	120.27	± 45.80	445.43	± 169.61	
			CHROMIUM-51	12464.67	± 10448.01	46165.46	± 38696.35	
			COBALT-60	-90.21	± 4000.67	-334.13	± 14817.29	
			PLUTONIUM-238	-0.35	± 0.17	-1.30	± 0.61	
			PLUTONIUM-239/240	0.23	± 0.14	0.86	± 0.53	
			STRONTIUM-90	-3.05	± 1.81	-11.30	± 6.70	
			ZINC-65	-77.77	± 94.50	-288.05	± 349.99	
<b>RTC</b>								
	Coot		AMERICIUM-241	2.35	± 0.33	8.70	± 1.24	Y
			CESIUM-137	2.85	± 18.77	10.54	± 69.53	

**Table C-9. Gamma-emitting Radionuclides,  
Strontium-90 and Actinides in Waterfowl**

		CHROMIUM-51	3755.17	±	4995.09	13908.04	±	18500.32	
		COBALT-60	-23.00	±	1783.53	-85.20	±	6605.66	
		PLUTONIUM-238	1.12	±	0.96	4.15	±	3.56	
		PLUTONIUM-239/240	0.57	±	0.41	2.10	±	1.50	
		STRONTIUM-90	0.66	±	0.58	2.44	±	2.13	
		ZINC-65	-39.28	±	41.39	-145.48	±	153.29	
<hr/>									
<b>MFC</b>									
	Grebe	AMERICIUM-241	16.00	±	0.81	59.26	±	3.01	Y
		CESIUM-137	613.26	±	429.70	2271.34	±	1591.48	
		CHROMIUM-51	2974.88	±	2506.61	11018.06	±	9283.73	
		COBALT-60	0.78	±	5.21	2.89	±	19.29	
		PLUTONIUM-238	-0.07	±	0.05	-0.26	±	0.18	
		PLUTONIUM-239/240	0.04	±	0.04	0.13	±	0.13	
		STRONTIUM-90	-2.97	±	1.95	-11.00	±	7.22	
		ZINC-65	-8.79	±	21.73	-32.55	±	80.47	
<hr/>									
<b>MFC</b>									
	Shoveler	AMERICIUM-241	-0.06	±	0.06	-0.22	±	0.22	
		CESIUM-137	2.05	±	3.58	7.60	±	13.27	
		CHROMIUM-51	665.94	±	1341.41	2466.44	±	4968.20	
		COBALT-60	0.63	±	2.70	2.33	±	9.99	
		PLUTONIUM-238	0.04	±	0.04	0.15	±	0.15	
		PLUTONIUM-239/240	0.04	±	0.07	0.15	±	0.26	
		STRONTIUM-90	-1.47	±	0.86	-5.44	±	3.19	
		ZINC-65	-14.73	±	11.13	-54.56	±	41.24	
<hr/>									
<b>MFC</b>									
	Shoveler	AMERICIUM-241	-0.04	±	0.06	-0.14	±	0.24	
		CESIUM-137	15.92	±	19.35	58.95	±	71.68	
		CHROMIUM-51	3444.55	±	4526.09	12757.61	±	16763.30	
		COBALT-60	-26.73	±	1805.32	-99.00	±	6686.37	
		PLUTONIUM-238	-0.09	±	0.08	-0.34	±	0.29	
		PLUTONIUM-239/240	0.14	±	0.10	0.51	±	0.38	
		STRONTIUM-90	0.30	±	0.97	1.10	±	3.57	
		ZINC-65	98.88	±	42.28	366.24	±	156.61	



**Table C-9. Gamma-emitting Radionuclides,  
Strontium-90 and Actinides in Waterfowl**

<b>MFC</b>							
Shoveler	AMERICIUM-241	-0.04	±	0.04	-0.14	±	0.14
	CESIUM-137	0.27	±	3.53	1.01	±	13.07
	CHROMIUM-51	293.75	±	1530.18	1087.95	±	5667.34
	COBALT-60	6.04	±	2.77	22.36	±	10.24
	PLUTONIUM-238	0.07	±	0.04	0.24	±	0.14
	PLUTONIUM-239/240	0.11	±	0.06	0.41	±	0.22
	STRONTIUM-90	0.98	±	1.13	3.63	±	4.19
	ZINC-65	-33.42	±	12.22	-123.77	±	45.26
<hr/>							
<b>MFC</b>							
Shoveler	AMERICIUM-241	0.02	±	0.05	0.08	±	0.17
	CESIUM-137	22.43	±	5.63	83.08	±	20.86
	CHROMIUM-51	-4087.28	±	2006.48	-15138.08	±	7431.42
	COBALT-60	2.43	±	4.06	8.99	±	15.02
	PLUTONIUM-238	0.05	±	0.13	0.17	±	0.47
	PLUTONIUM-239/240	0.03	±	0.10	0.11	±	0.38
	STRONTIUM-90	-0.17	±	0.68	-0.62	±	2.50
	ZINC-65	-30.84	±	16.26	-114.24	±	60.22
<hr/>							
<b>MFC</b>							
Shoveler	AMERICIUM-241	0.18	±	0.09	0.67	±	0.34
	CESIUM-137	1.84	±	7.53	6.83	±	27.89
	CHROMIUM-51	3460.05	±	3157.30	12815.02	±	11693.70
	COBALT-60	0.84	±	5.32	3.11	±	19.69
	PLUTONIUM-238	0.29	±	1.14	1.09	±	4.22
	PLUTONIUM-239/240	-0.59	±	0.42	-2.17	±	1.55
	STRONTIUM-90	-0.41	±	0.95	-1.52	±	3.50
	ZINC-65	36.35	±	23.65	134.62	±	87.59
<hr/>							
<b>CONTROL</b>							
Mallard	AMERICIUM-241	0.00	±	0.03	0.00	±	0.10
	CESIUM-137	2.21	±	1.38	8.18	±	5.10
	CHROMIUM-51	-4.38	±	31.06	-16.22	±	115.03
	COBALT-60	-0.25	±	1.02	-0.91	±	3.79
	PLUTONIUM-238	0.02	±	0.02	0.09	±	0.06
	PLUTONIUM-239/240	0.01	±	0.01	0.03	±	0.03

**Table C-9. Gamma-emitting Radionuclides,  
Strontium-90 and Actinides in Waterfowl**

	STRONTIUM-90	-0.43 ±	0.23	-1.57 ±	0.87
	ZINC-65	4.35 ±	3.30	16.10 ±	12.24
<hr/>					
<b>CONTROL</b>					
Goldeneye	AMERICIUM-241	0.13 ±	0.08	0.46 ±	0.28
	CESIUM-137	3.63 ±	2.02	13.46 ±	7.50
	CHROMIUM-51	-4.80 ±	48.05	-17.79 ±	177.95
	COBALT-60	2.45 ±	1.49	9.06 ±	5.51
	PLUTONIUM-238	0.03 ±	0.03	0.12 ±	0.12
	PLUTONIUM-239/240	0.06 ±	0.02	0.21 ±	0.09
	STRONTIUM-90	-0.48 ±	0.36	-1.79 ±	1.34
	ZINC-65	-7.54 ±	5.21	-27.91 ±	19.30
<hr/>					

Table C-10. Environmental Radiation Results

Location	Start Date	End Date	Radiation Measurement $\pm$ 2s Uncertainty mR	Exposure mR/day
<b>BOUNDARY</b>				
ARCO	5/2/2007	11/7/2007	63.90 $\pm$ 12.50	0.35
ATOMIC CITY	5/2/2007	11/7/2007	65.20 $\pm$ 12.80	0.36
BIRCH CREEK	5/2/2007	11/7/2007	53.50 $\pm$ 10.50	0.29
BLUE DOME	5/2/2007	11/7/2007	51.60 $\pm$ 10.10	0.28
HOWE	5/2/2007	11/7/2007	58.60 $\pm$ 11.50	0.32
MONTEVIEW	5/2/2007	11/7/2007	57.30 $\pm$ 11.20	0.31
MUD LAKE	5/2/2007	11/7/2007	63.10 $\pm$ 12.40	0.34
<b>Boundary Average</b>				<b>0.32</b>
<b>DISTANT</b>				
ABERDEEN	5/1/2007	11/6/2007	66.10 $\pm$ 12.90	0.36
BLACKFOOT	5/2/2007	11/7/2007	61.00 $\pm$ 12.00	0.33
BLACKFOOT CMS	5/2/2007	11/7/2007	54.00 $\pm$ 10.60	0.29
CRATERS	5/2/2007	11/7/2007	61.00 $\pm$ 12.00	0.33
DUBOIS	5/2/2007	11/7/2007	50.00 $\pm$ 9.80	0.27
IDAHO FALLS	5/3/2007	11/7/2007	63.80 $\pm$ 12.50	0.35
MINIDOKA	5/1/2007	11/6/2007	55.30 $\pm$ 10.80	0.30
REXBURG	5/2/2007	11/7/2007	73.60 $\pm$ 14.40	0.40
ROBERTS	5/1/2007	11/6/2007	68.60 $\pm$ 13.40	0.37
<b>Distant Average</b>				<b>0.34</b>
<b>OUT-OF-STATE</b>				
JACKSON	5/3/2007	11/8/2007	47.80 $\pm$ 9.40	0.26

**APPENDIX D**  
***STATISTICAL ANALYSIS RESULTS***

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**Table D-1. Results of the Kruskal-Wallace statistical test between INL Site, Boundary and Distant sample groups by month.**

<b>Parameter</b>	<b>P<sup>a</sup></b>
<b>Gross Alpha</b>	
Quarter	0.94
October	0.70
November	0.85
December	0.71
<b>Gross Beta</b>	
Quarter	0.72
October	0.60
November	0.16
December	0.84
a. A 'p' value greater than 0.05 signifies no statistical difference between data groups.	

**Table D-2. Statistical difference in weekly gross alpha and gross beta concentrations measured at Boundary and Distant locations.**

Parameter	Mann-Whitney U test	
	Week	P <sup>a</sup>
<b>Gross Alpha</b>		
	October 3	0.39
	October 10	0.83
	October 17	0.67
	October 24	0.89
	October 31	0.48
	November 7	1.00
	November 14	0.57
	November 21	0.37
	November 28	0.57
	December 5	0.67
	December 12	0.81
	December 19	0.10
	December 26	0.68
<b>Gross Beta</b>		
	October 3	0.32
	October 10	0.28
	October 17	0.13
	October 24	0.09
	October 31	0.57
	November 7	0.06
	November 14	0.78
	November 21	0.46
	November 28	0.06
	December 5	0.09
	December 12	0.33
	December 19	0.10
	December 26	0.94
a. A 'p' value greater than 0.05 signifies no statistical difference between data groups.		