Wastren Advantage Inc.
Environmental Surveillance, Education, and Research Program
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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report: Fourth Quarter 2016

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EXECUTIVE SUMMARY

None of the radionuclides detected in samples collected during the fourth quarter of 2016 could be directly linked with INL Site activities. Levels of detected radionuclides were no different than values measured at other locations across the western United States. All detected radionuclide concentrations were well below standards 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 2016 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, 2016. All sample types (media) and the sampling schedule followed during 2016 are listed in Appendix A. This report contains results for the following sample types:

- Air, including particulate air filters, charcoal cartridges, and atmospheric moisture
- Precipitation
- Drinking and surface water
- Milk
- Potatoes
- Large game animals
- Environmental radiation measurements using optically-stimulated luminescence dosimeters

Table E-1 Summary of results for the Fourth Quarter of 2016

Media	Sample Type	Analysis	Results
Air	Filters	Gross alpha, gross beta	There were no statistical differences in monthly or quarterly gross alpha or gross beta concentrations measured at Distant, Boundary, and INL Site sampling locations. Several differences were noted in weekly results but no pattern was discernible. No result exceeded the DCS for gross alpha or gross beta activity in air.
	Quarterly Composite	Gamma-emitting radionuclides, ^{90}Sr, actinides (americium and plutonium)	No human-made gamma-emitting radionuclides, ^{90}Sr, ^{238}Pu, or ^{241}Am were detected above 3s uncertainty in any of the fourth quarter composites. Plutonium-239/240 was detected in one composites above the 3s uncertainty level but below the laboratory's detection limit. The result was 0.005 percent of the DCS.
	Charcoal Cartridge	Iodine-131	Iodine-131 was not detected in any of the 26 batches counted during the quarter.
Atmospheric Moisture	Liquid	Tritium	Eight of the 14 sample results showed tritium concentrations greater than the 3s uncertainty during the quarter. No sample result exceeded the DCS for tritium in air.
Precipitation	Liquid	Tritium	Fifteen samples were collected. Six of the results were greater than the 3s uncertainty. All results were within the range previously measured and were consistent with those reported across the region by the Environmental Protection Agency.
Drinking and Surface Water	Liquid	Gross alpha, gross beta, and tritium	Gross alpha activity was not detected in any drinking or surface water sample. Gross beta activity was detected in all but one of the samples. Values were consistent with

			natural levels of gross beta radioactivity in the Snake River Plain Aquifer. Tritium was detected in one drinking water and two surface water samples. Results were similar to previous results and those in precipitation.
Milk	Liquid	Iodine-131, other gamma-emitting radionuclides, ^{90}Sr, tritium	Milk was collected at seven locations. No Iodine-131 or other human-made gamma emitting radionuclides were detected. Strontium-90 was detected in five samples. All were approximately the same concentration (including the offsite control sample from Colorado) indicating the INL Site is not the source. Tritium was detected in four samples at levels similar to previous measurements and to precipitation.
Potatoes	Vegetation	Gamma-emitting radionuclides and ^{90}Sr	No human-made gamma-emitting radionuclides were found. Strontium-90 was detected in one sample just above the detection limit.
Large game animals	Tissue	Gamma-emitting radionuclides	No human-made gamma-emitting radionuclides were found in the muscle tissues of a mule deer sampled in the fourth quarter.
Environmental radiation	Optically Stimulated Luminescent Dosimeters (OSLDs)	Ambient dose	Very similar measurements were observed at Distant locations and Boundary locations. Variation between locations appears to be a function of altitude and geologic composition of soils.

LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission
CFA	Central Facilities Area
DCS	Derived Concentration Standard
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
ORAU	Oak Ridge Associated Universities
WAI	Wastren Advantage, Inc.

LIST OF UNITS

Bq	becquerel
Ci	curie
g	gram
L	liter
µCi	microcurie
mL	milliliter
mrem	millirem
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 2011a, DOE 2015a). During calendar year 2016, environmental monitoring within the INL Site boundaries was primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors. At the beginning of the second quarter of 2016, ESER Program responsibilities were assumed by Wastren Advantage, Inc. (WAI), in conjunction with team members Idaho State University and Oak Ridge Associated Universities (ORAU).

This report contains monitoring results from the ESER Program for samples collected during the fourth quarter of 2016 (October 1- December 31, 2016).

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
- drinking water from eight locations and surface water from three locations around the INL Site
- agricultural products, including milk at seven dairies around the INL Site, potatoes from at least six local producers, alfalfa from a local producer, grain (wheat and barley) from approximately 10 local producers, and lettuce from approximately nine home-owned and portable gardens on and around the INL
- soil from 13 locations around the INL Site biennially
- environmental dosimeters from 17 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}Sr), plutonium-238 (^{238}Pu), plutonium-239/240 ($^{239/240}$Pu), and americium-241 (^{241}Am) were performed by Oak Ridge Associated Universities (ORAU).

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 or the 2011 Fukushima accident, the EPA may request additional sampling be performed through RadNet [previously known as the Environmental Radiation Ambient Monitoring System (ERAMS) network] (EPA 2017). 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 (https://www.epa.gov/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 (σ), 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. 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). 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. ESER currently defines a detection of radioactivity in an individual sample if the result exceeds the minimum detectable concentration (MDC) calculated by the laboratory after the analysis of a background sample (i.e., the *a posteriori* measurement) based on calculations derived by Curie (1968). The MDC is defined as the concentration at which there is a 95 percent confidence that an analyte signal will be distinguishable from an analyte-free sample.

In addition ESER uses a three standard deviation criterion to identify a potentially false positive result. A false positive result is indicated when the range encompassing the result, plus or minus the total uncertainty at three standard deviations, includes zero (e.g., 2.5 +/- 1.0; range of -0.5 to 3.5). Statistically, the probability that a result can exceed the absolute value of its total uncertainty at three standard deviations by chance alone is less than 1 percent. A result that is greater than three times the total uncertainty of the measurement represents a statistically positive detection with over 99 percent confidence (DOE 2015b). 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 probability that a result can exceed the absolute value of its total uncertainty at two standard deviations by chance alone may be as high as 5 percent. 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 routinely 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 even less statistical confidence that the radionuclide is present in the sample. Analytical results in this report are presented as the result value ± 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 WAI at (208) 525-8250, or visit the Program's web page (http://www.idahoeser.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^2 (2,300 km^2) of the upper Snake River Plain in Southeastern Idaho (Figure 1). 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 Idaho Cleanup Project (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 in an ongoing process.

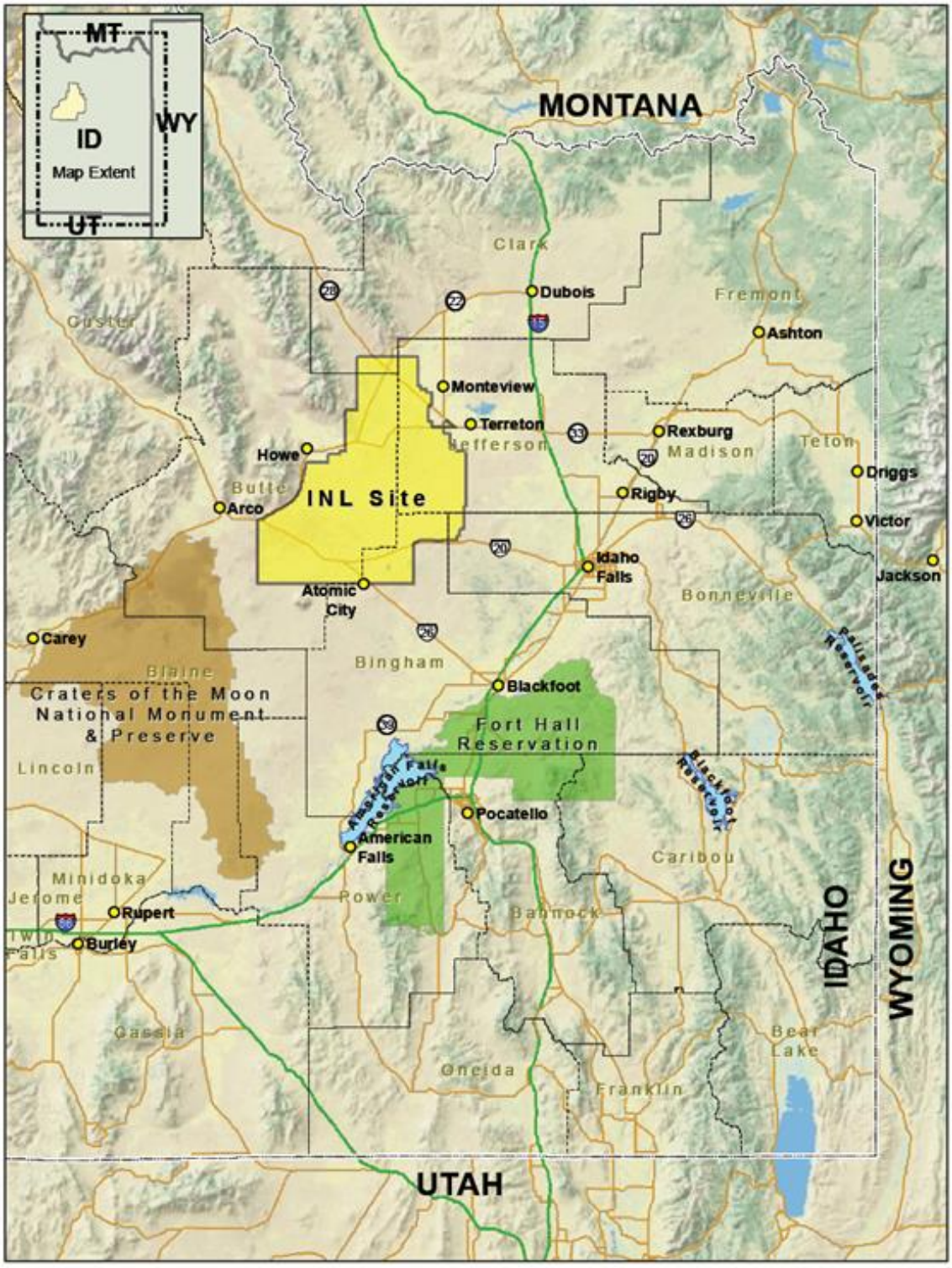

Figure 1. Location of the Idaho National Laboratory Site.

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}I) gas in air were collected weekly for the duration of the quarter at 15 locations using low-volume air samplers. The sampler in Jackson did not operate during most of 2016 while a more suitable location was selected and constructed. This was completed in December 2016 and the sampler was placed back in operation on December 29. 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 2016 are discussed below. A summary of approximate minimum detectable concentrations (MDCs) for radiological analyses and DOE Derived Concentration Standard (DCS) (DOE 2011b) values is provided in Appendix B.

LOW-VOLUME AIR SAMPLING

Radioactivity associated with airborne particulates was monitored continuously by 17 low-volume air samplers (two of which are used as replicate samplers) at 15 locations during the fourth quarter of 2016 (Figure 2). Three of these samplers are located on the INL Site, seven are situated off the INL Site near the boundary, and seven 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 other year to a new location. At the start of 2016, one replicate sampler was moved to Sugar City (a Distant location) and one was moved to Blackfoot (also a Distant location). An average of 19,876 ft^3 (563 m^3) of air was sampled at each location, each week, at an average flow rate of 1.97 ft^3/min (0.06 m^3/min). Particulates in air were collected on membrane particulate filters (1.2-µm pore size). Gases passing through the filter were collected with an activated charcoal cartridge.

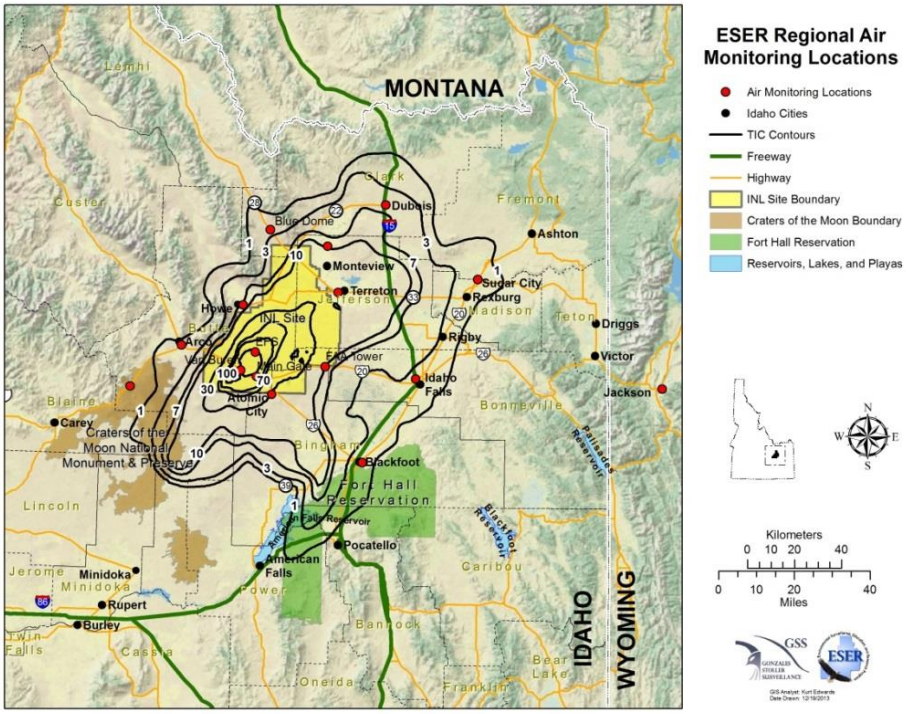

Figure 2. Low-volume air sampler locations.

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}Sr, ^{238}Pu, $^{239/240}Pu$, and ^{241}Am as determined by a rotating quarterly schedule.

Charcoal cartridges were analyzed for gamma-emitting radionuclides, specifically for iodine-131 (^{131}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}I in the environment could be from a recent release of fission products.

Gross alpha results are reported in Table C-1 and shown in Figures 3 through 6. Gross alpha data are tested for normality prior to statistical analyses, and generally show no consistent discernible distribution. Because there is no discernible 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. For the quarter, there was no statistical difference noted in the data, as the p-value was above 0.05.

Comparisons of gross alpha concentrations were made for each month of the quarter. 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. No statistical differences were found for 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. There was one week where a statistical difference existed between the two sample groups (Table D-2). This was the week of October 26; the Distant stations were statistically higher than the Boundary stations. Nothing unusual was noted in the data, with Blackfoot on the high end and Blue Dome on the low end.

Gross beta results are presented in Table C-1 and displayed in Figures 7 through 10. The data are tested quarterly and generally are 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. No statistical differences were noted in the quarterly data or during any month of the quarter using the Kruskal-Wallis test (Table D-1).

Weekly comparisons were also made using the same methodology as for the gross alpha data and statistical differences were found during several weeks of the quarter (Table D-2). These included October 12, November 23, November 30, December 7, and December 28. In

all the weeks the Boundary locations were higher than the Distant locations. No particular pattern was found when looking at individual location concentrations. All of the weeks with statistical differences were weeks when overall gross beta concentrations were fairly low. There seems to be more variability between locations (and between weeks) during the winter months, when some locations have more persistent inversion conditions.

Iodine-131 was not detected in any of the 26 sets of charcoal cartridges measured during the fourth quarter. Weekly ^{131}I results for each location are listed in Table C-2 of Appendix C.

No ^{137}Cs or other human-made gamma-emitting radionuclides were found in quarterly composites. No ^{90}Sr, ^{238}Pu, or ^{241}Am were found either. Plutonium-239/240 was detected just above the 3s uncertainty level in the composite from Atomic City, but the concentration was below the laboratory's detection limit. In comparison to the Derived Concentration Standard, the $^{239/240}Pu$ result was 0.005 percent of the DCS. Results for these analyses are found in Table C-3 of Appendix C.

ATMOSPHERIC MOISTURE SAMPLING

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.

Results were available for 14 atmospheric moisture samples collected during the fourth quarter of 2016. Eight of the 14 results exceeded the 3s uncertainty level for tritium, with similar results to those reported previously. Results also remain similar between the four sampling locations. All samples were significantly below the DOE DCS for tritium in air of 1.4×10^{-8} $\mu Ci/mL_{air}$ with a maximum reported value of 21.6×10^{-13} $\mu Ci/mL_{air}$ at Sugar City. Results are shown in Table C-4, Appendix C.

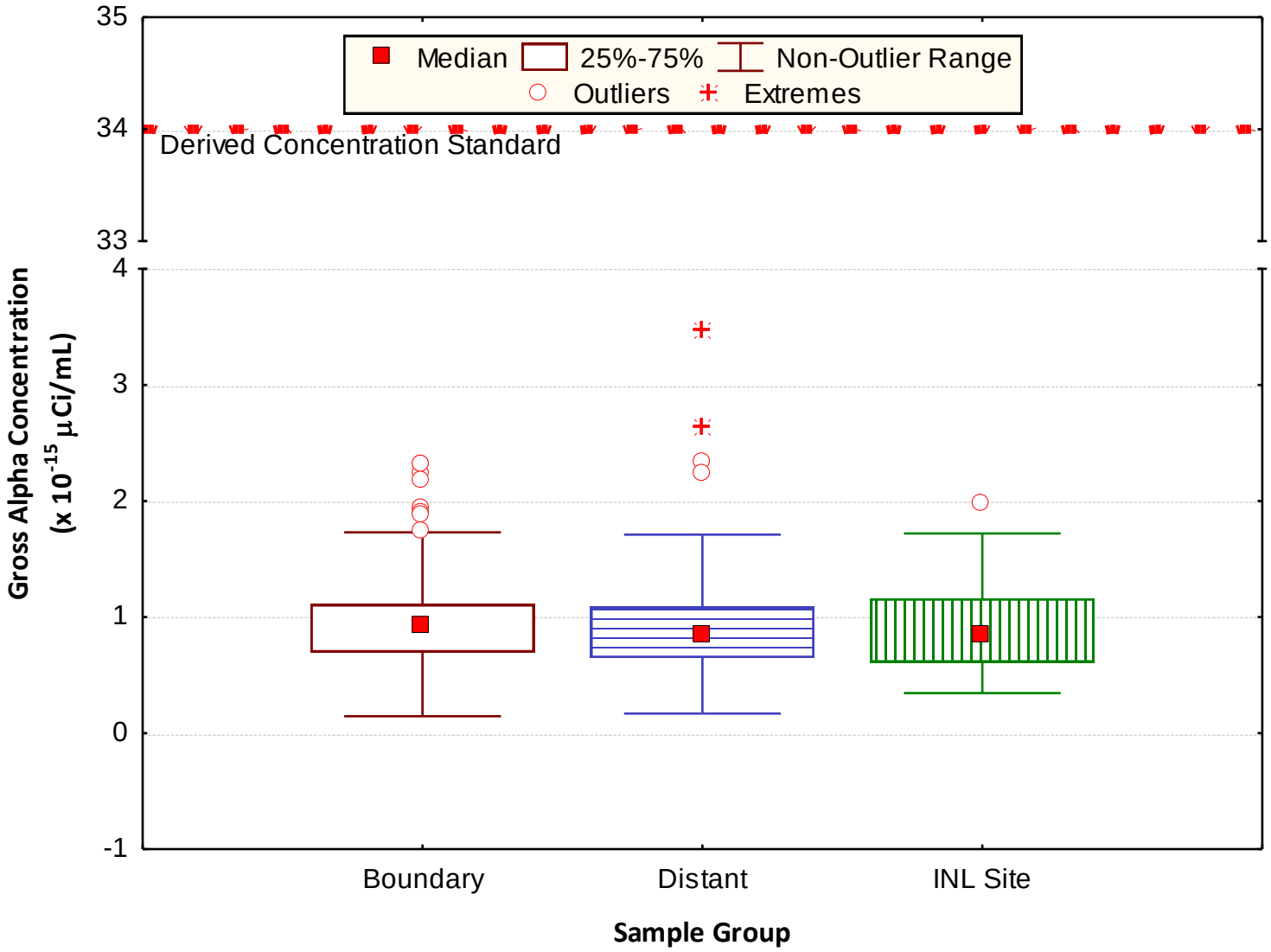

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the fourth quarter of 2016.

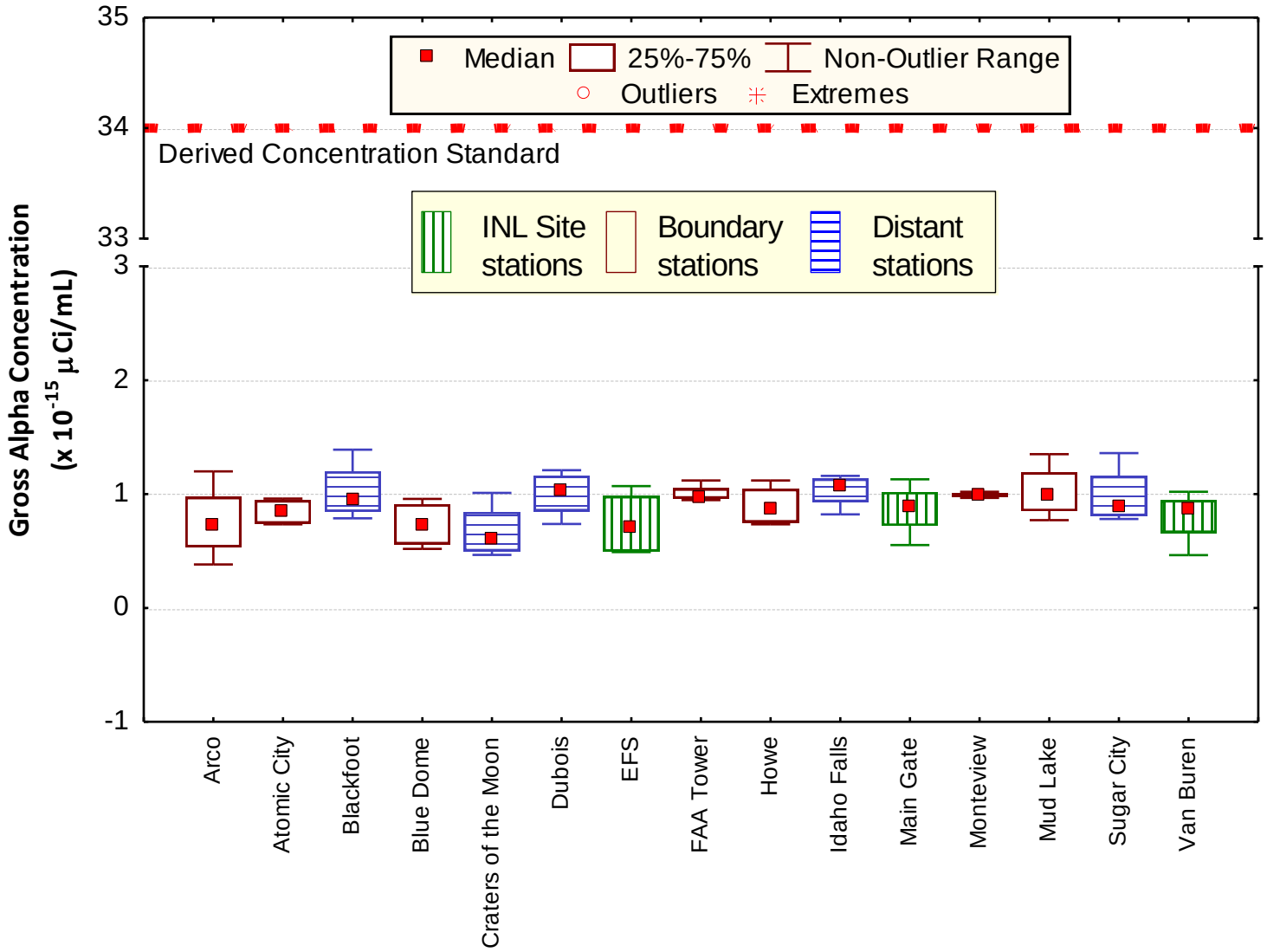

Figure 4. October gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location.

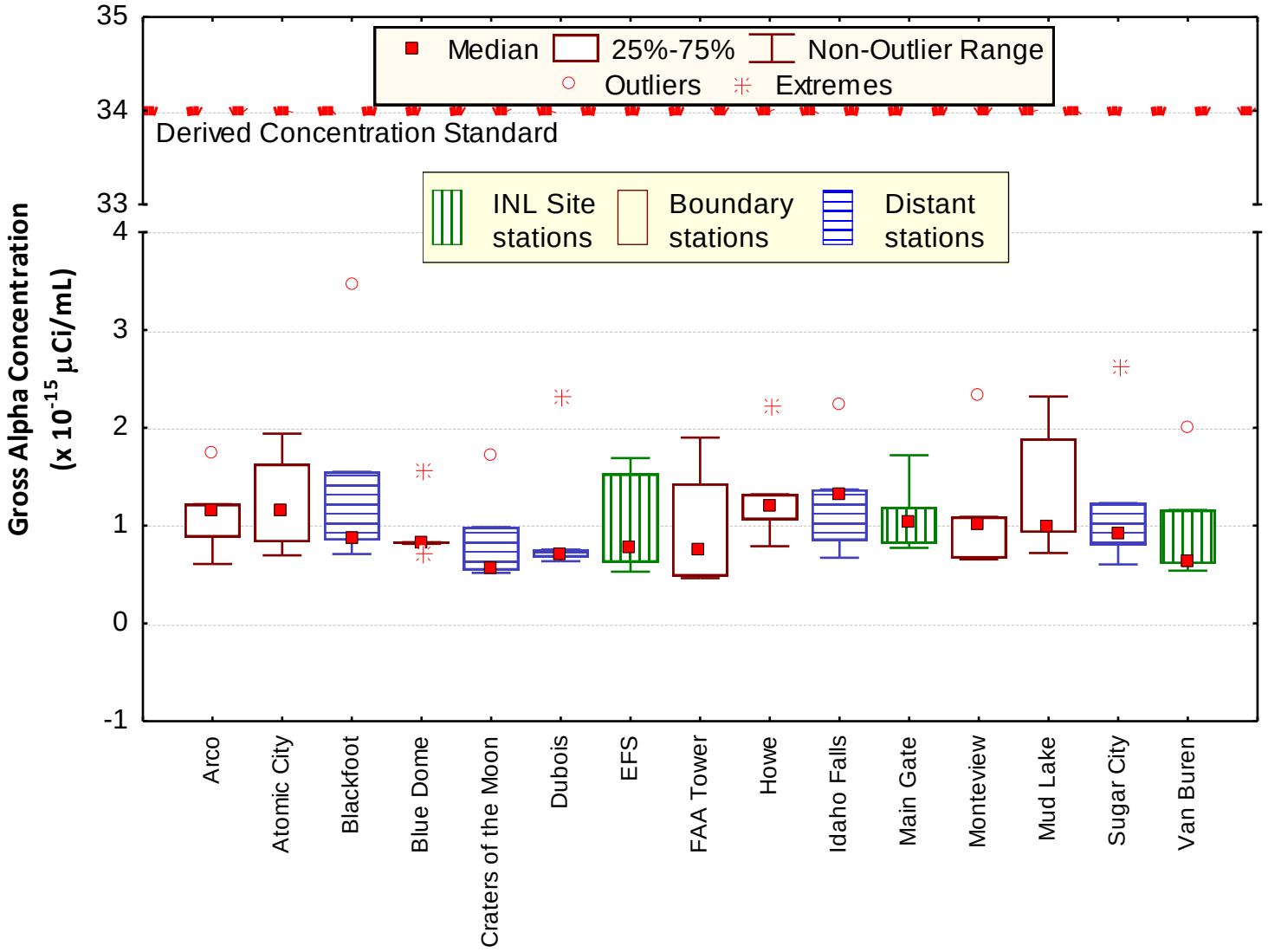

Figure 5. November gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location.

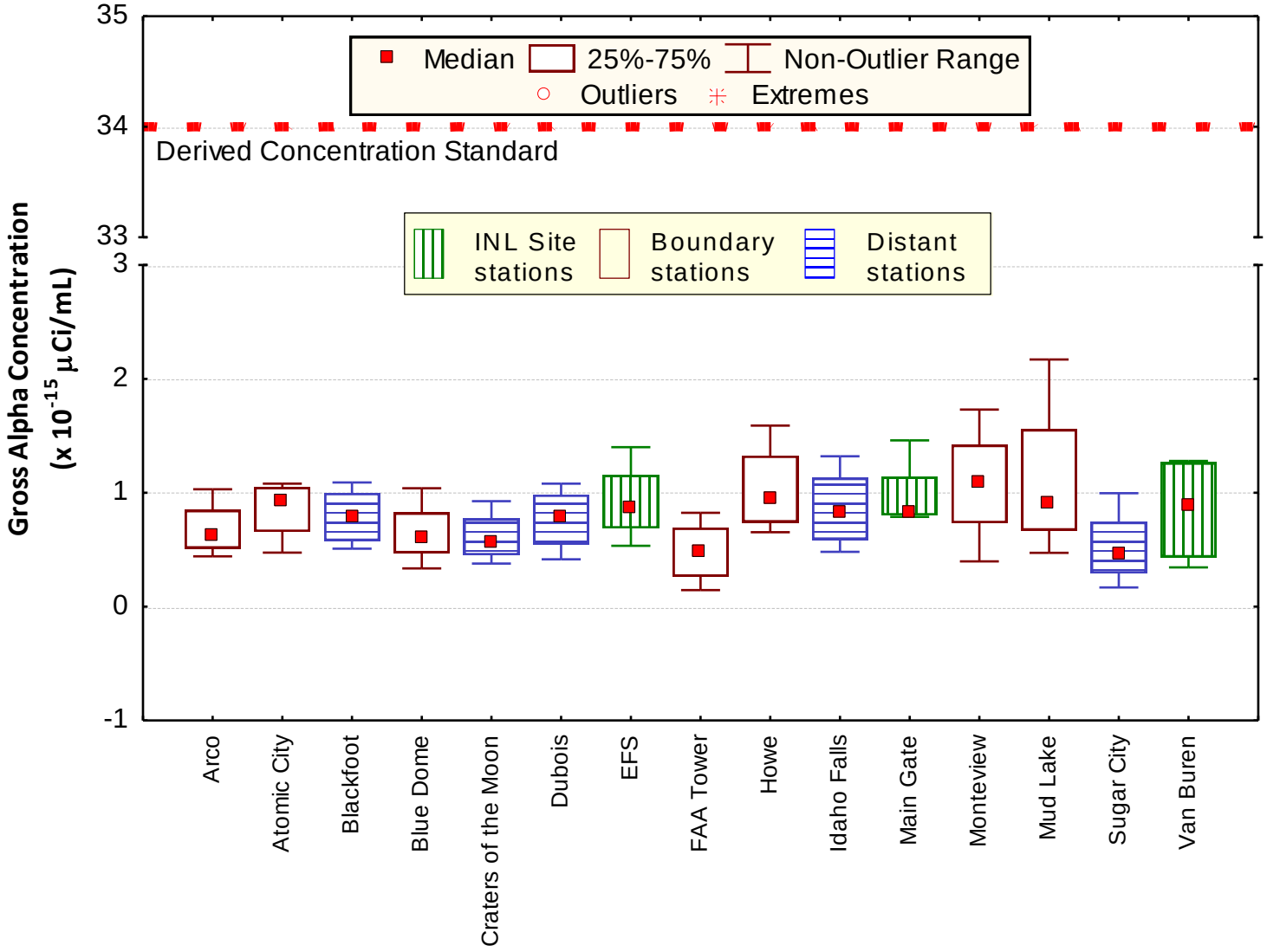

Figure 6. December gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location.

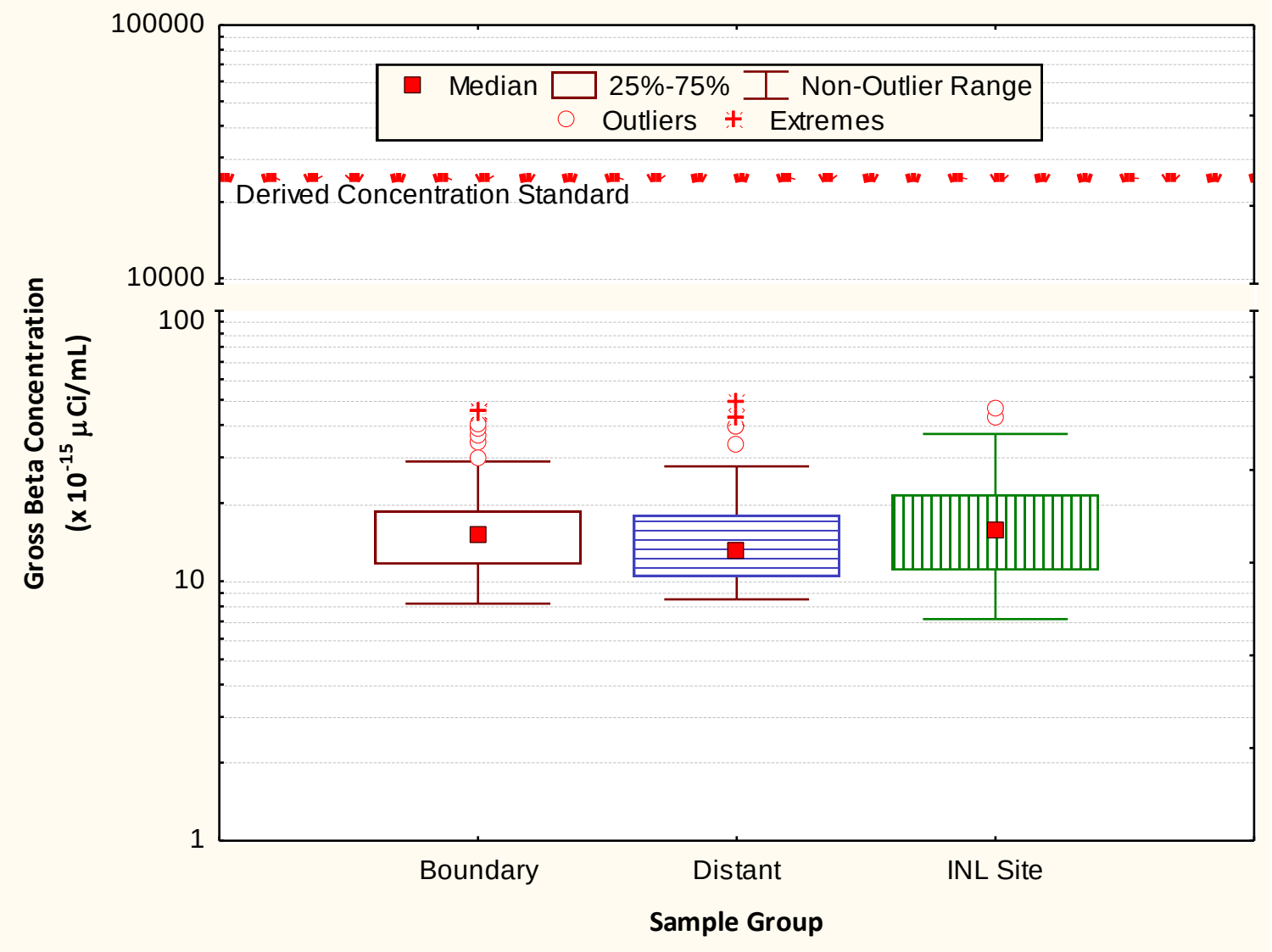

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the fourth quarter of 2016.

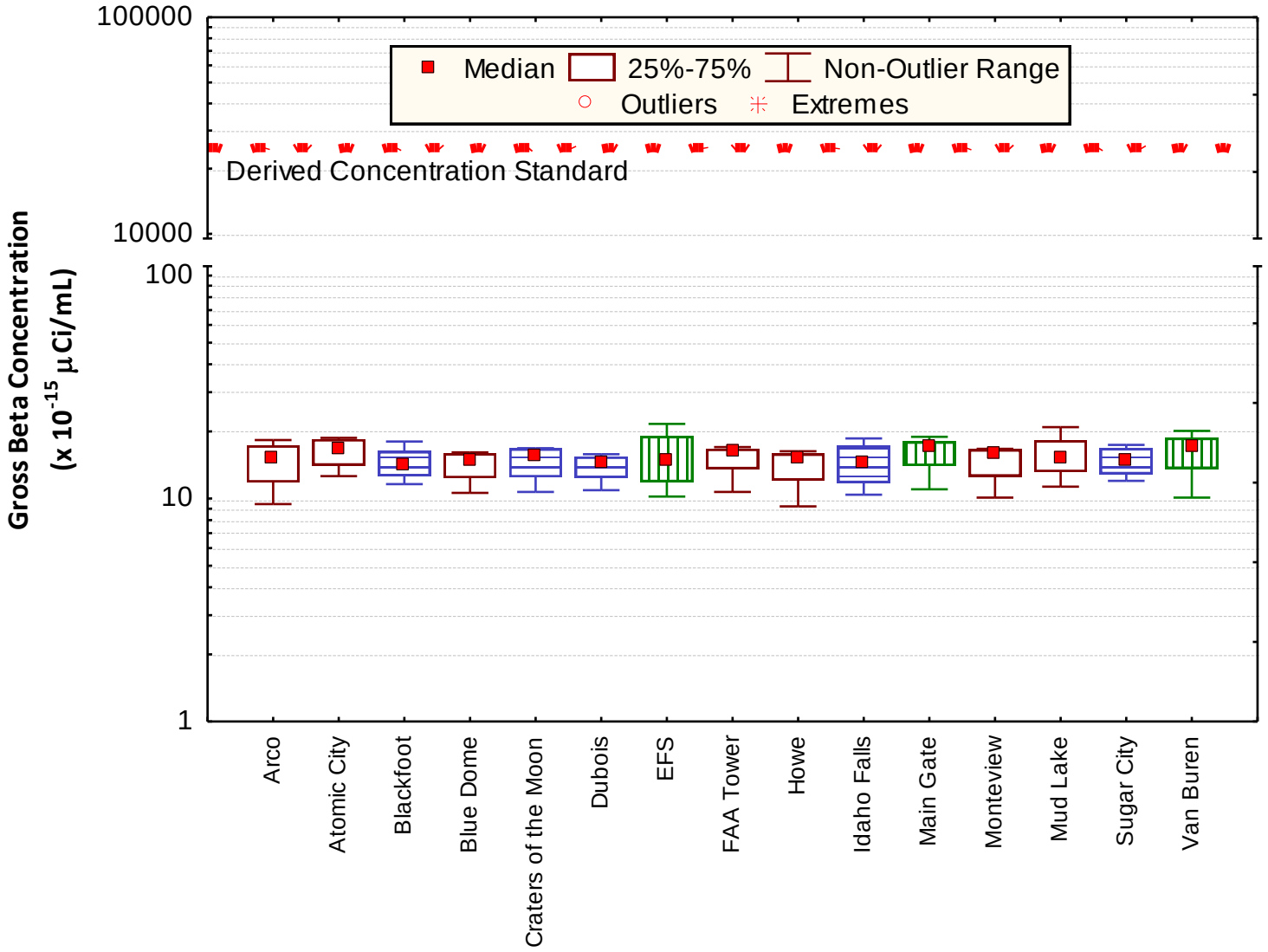

Figure 8. October gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location.

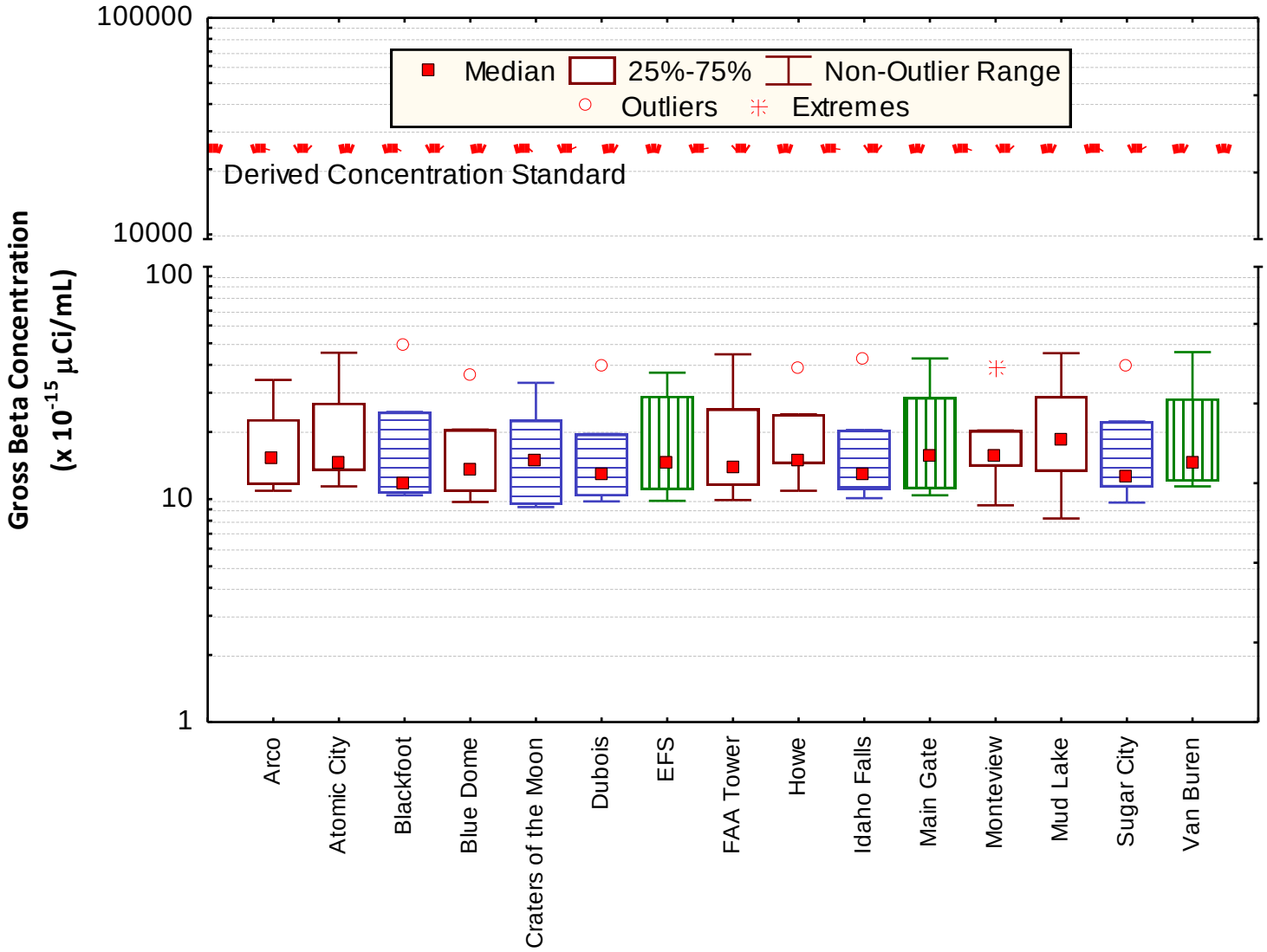

Figure 9. November gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location.

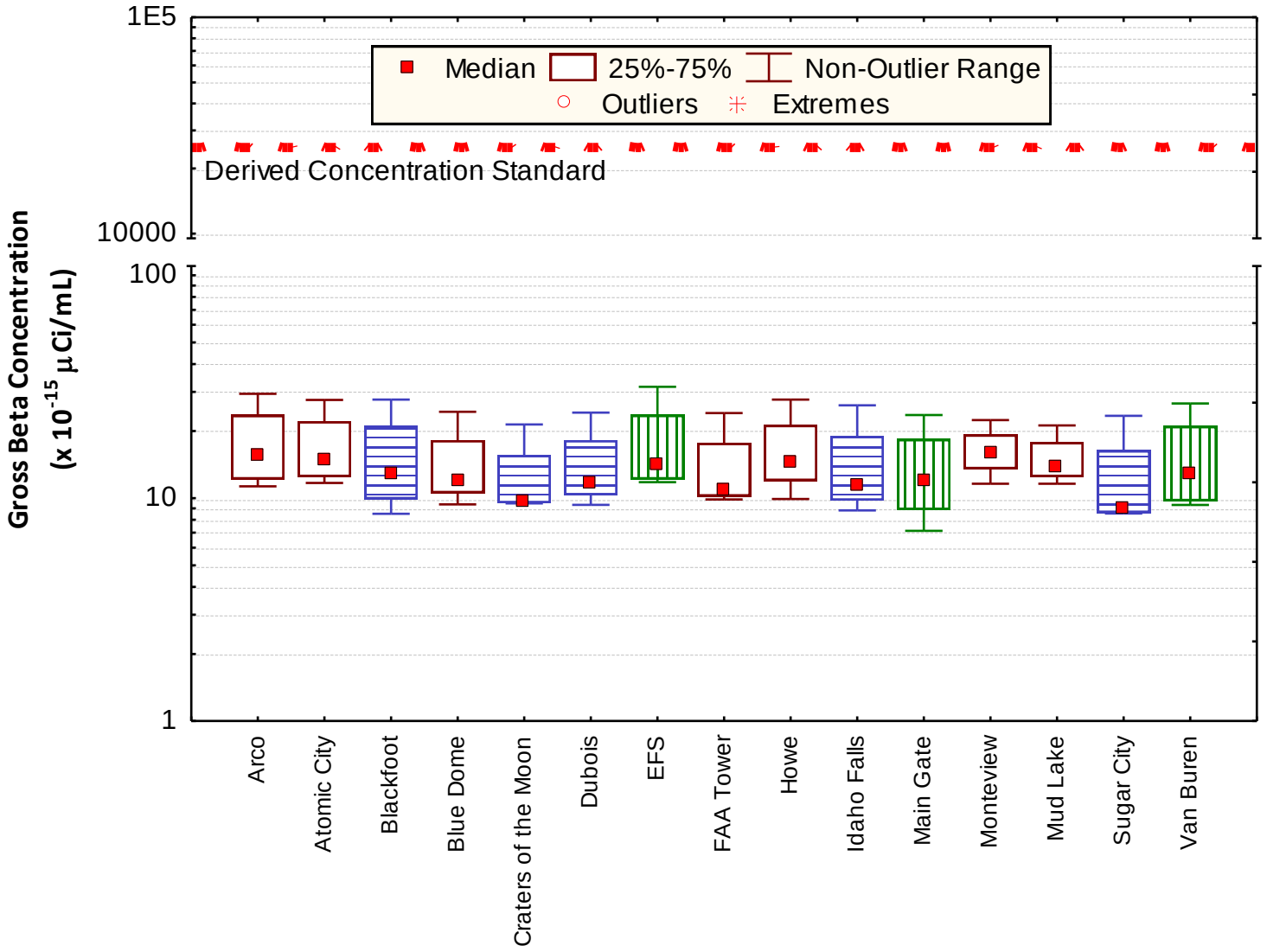

Figure 10. December gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location.

4. PRECIPITATION AND WATER SAMPLING

PRECIPITATION SAMPLING

Precipitation samples are gathered when sufficient precipitation occurs to allow for the collection of the minimum sample volume of approximately 50 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 2016 produced sufficient precipitation to yield 15 samples.

Tritium was measured above the 3s values in 6 of the 15 samples. These results are listed in Table C-5 (Appendix C). 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 and the remnants of fallout from nuclear weapons testing. When detected, tritium values have remained well within the historical range and the range measured across the country by the EPA Radnet program (EPA 2015). Most samples have values up to about 150 pCi/L, with occasional values ranging up to about 300-400 pCi/L. The maximum value in the fourth quarter was 215 pCi/L in a December EFS sample.

WATER SAMPLING

Drinking water samples were collected at eight locations. A control sample of bottled water was also prepared. Surface water samples were collected at three Thousand Springs locations, plus a duplicate. All samples were analyzed for gross alpha, gross beta, and tritium. Results are listed in Table C-6 of Appendix C.

Gross alpha activity was not detected in any of the drinking or surface water samples. Gross beta activity was detected in eight of the nine drinking water samples (all except Shoshone), and in all four of the surface water samples. All concentrations were generally similar to previous results from drinking and surface water sampling. Natural levels of radioactive decay products of thorium and uranium exist in the Snake River Plain Aquifer and are the likely source of the measured concentrations. The highest reported value was 8.47 pCi/L in the sample from Alpheus Spring near Twin Falls. This location has historically shown the highest levels of natural activity.

Tritium was also detected in one of the drinking water samples (the US 20/26 Rest Area) and two of the four surface water samples. The concentrations were similar to those found in atmospheric moisture and precipitation samples and were consistent with previous results. The maximum value was 89 pCi/L at the Rest Area on US20/26. The results are well below the DCS of 1.9×10^6 pCi/L for tritium in drinking water.

5. AGRICULTURAL PRODUCT, WILDLIFE, AND SOIL 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, alfalfa, grain, potatoes, lettuce, large game animals, and waterfowl are sampled. Milk is sampled throughout the year and large game animals are sampled whenever large game animals are killed onsite from vehicle collisions. Alfalfa is collected during the second quarter, lettuce and grain 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 agricultural products samples available during the fourth quarter of 2016.

MILK SAMPLING

Milk samples were collected weekly in Idaho Falls. Monthly samples were collected at five other locations around the INL Site (Figure 11) during the fourth quarter of 2016. The Fort Hall dairy was not in operation during the quarter. In addition to the local locations, commercially-available organic milk (from Colorado) was purchased as a control sample each month. All samples were analyzed for gamma emitting radionuclides, with particular emphasis on Iodine-131. Samples in November were also analyzed for ^{90}Sr and tritium.

Iodine-131 was not detected in any weekly or monthly samples during the fourth quarter. No other human-made gamma-emitting radionuclides were found either. Data for ^{131}I and ^{137}Cs in milk samples are listed in Appendix C, Table C-7. During the summer of 2020, a review of Appendix C, Table C-7 determined the ^{131}I and ^{137}Cs activity concentrations and uncertainty values were correct except for one Idaho Falls milk sample. The ^{137}Cs activity concentration and uncertainty values and the ^{131}I activity concentration values for the Idaho Falls milk sample collected on November 29, 2016 were incorrect. The incorrect values appear to be due to inadvertently copying the wrong values. The activity concentration and uncertainty values were updated with the correct values. Iodine-131 and ^{137}Cs was not detected in the Idaho Falls milk sample collected on November 29, 2016.

Results for ^{90}Sr and tritium are listed in Appendix C, Table C-8. Strontium-90 was detected in five of the seven samples analyzed, including the control sample. The maximum concentration of 0.47 pCi/L from Terreton and the average concentration of 0.26 pCi/L are in the lower portion of the range for these values over the past several years. The presence of ^{90}Sr at similar levels in samples from near the INL Site and distant from the INL Site (as well as the organic milk from Colorado), does not indicate an INL Site impact of the results. There is no DCS for ^{90}Sr in milk; however, for comparison the results were well below the drinking water DCS of 1.1×10^3 pCi/L.

Tritium was also detected in four of seven samples analyzed, with a maximum value of 177 pCi/L in the sample from Howe. All results were similar to those previously measured and similar to those found in other liquid media like precipitation. There is no DCS for tritium in milk, but the results were well below the DCS for tritium in drinking water (1.9×10^6 pCi/L).

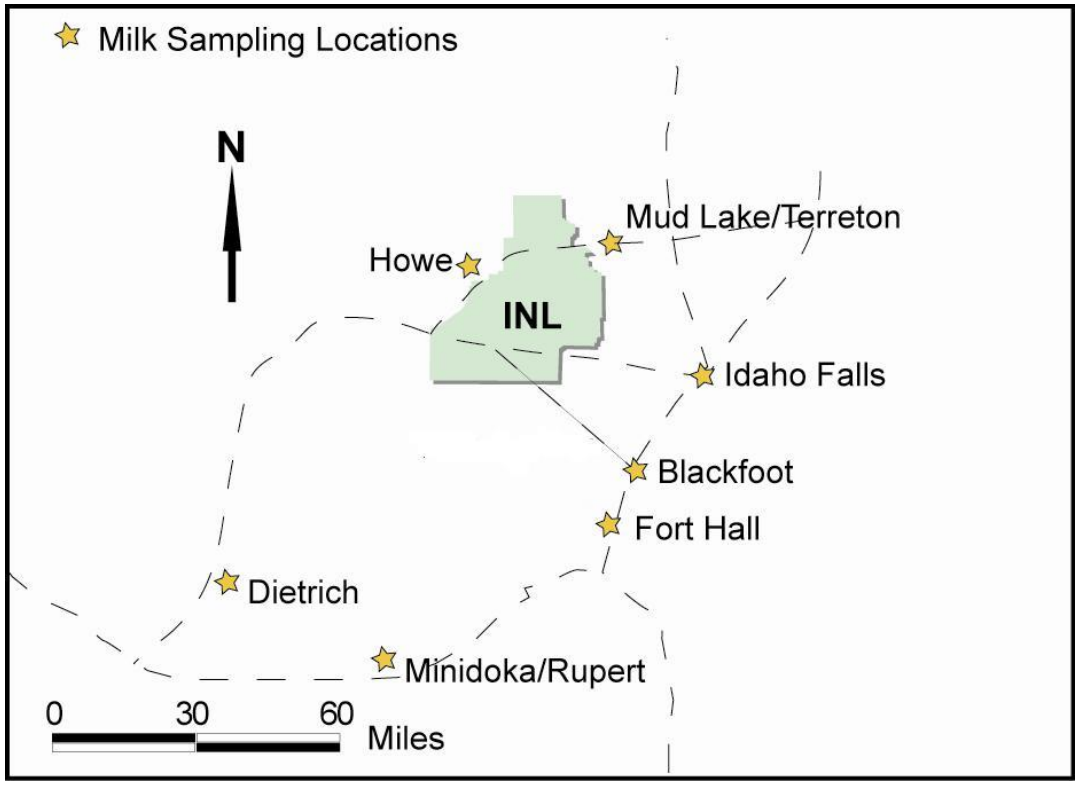

Figure 11. ESER milk sampling locations.

POTATO SAMPLING

Locally-grown potatoes from seven locations and one duplicate were analyzed for gamma-emitting radionuclides like ^{137}Cs and for ^{90}Sr. A control sample from a local grocery store (grown in Washington state) was also analyzed. No human-made gamma-emitters were found in any sample. Strontium-90 was reported in the sample from Idaho Falls at 8.3 pCi/kg, but not in the duplicate sample from the same location. Both ^{137}Cs and ^{90}Sr are present in the soil as a result of worldwide fallout from nuclear weapons testing, but they are only occasionally detected in potato samples. This is because potatoes are generally less efficient at removing radioactive elements from soil than leafy vegetables such as lettuce. Data for potato samples are listed in Appendix C, Table C-9.

LARGE GAME ANIMAL SAMPLING

Muscle tissue was collected from one game animal, a mule deer, during the fourth quarter. No manmade gamma-emitting radionuclides were detected (Appendix C, Table C-10).

6. ENVIRONMENTAL RADIATION

An array of optically stimulated luminescent dosimeters (OSLDs) is distributed throughout the Eastern Snake River Plain to monitor for environmental radiation. Two OSLDs are in place at each location. OSLDs are changed out at the beginning of May and again at the beginning of November after six months in the field.

OSLD results from the fourth quarter are displayed in Appendix C, Table C-11. Results are presented in dose units of millirem (mrem). Boundary OSLD values ranged from 49.23 mrem at Blue Dome to 70.14 mrem at Mud Lake, with an overall average of 60.39 mrem. This equates to an average dose of 0.31 mrem per day. Distant results varied from 48.72 mrem at Minidoka to 77.31 mrem at Sugar City. The Distant average was 60.53 mrem, also 0.31 mrem per day. Results vary between sampling locations based on the geologic composition of the soils in the vicinity of the OSLD and the elevation of the station.

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 (WAI 2016). Criteria established by DOE for Quality Assurance activities include:

- Quality assurance program
- Personnel training and qualification
- Quality improvement process
- Documents and records
- Established work processes
- Established standards for design and verification
- Established procurement requirements
- Inspection and acceptance testing
- Management assessment
- Independent assessment

Assessments of ESER data quality are achieved through analysis of spike, performance evaluation, and duplicate samples; through sample recounts; through analysis of blank samples; and through comparison of sample results to established method quality objectives. These assessments are documented in the ESER Quality Assurance for the Fourth Quarter of 2016 (WAI 2017).

8. REFERENCES

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APPENDIX A

SUMMARY OF SAMPLING SCHEDULE

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

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
AIR SAMPLING				
LOW-VOLUME AIR				
Gross Alpha, Gross Beta, ^{131}I	weekly	Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Sugar City	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Blue Dome	Main Gate, EFS, Van Buren
Gamma Spec	quarterly	Blackfoot, Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Sugar City	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Blue Dome	Main Gate, EFS, Van Buren
^{90}Sr, Transuranics	quarterly	Rotating schedule	Rotating schedule	Rotating schedule
ATMOSPHERIC MOISTURE				
Tritium	2 to 13 weeks	Blackfoot, Idaho Falls, Sugar City	Atomic City	None
PRECIPITATION				
Tritium	monthly	Idaho Falls	None	CFA
Tritium	weekly	None	None	EFS
DRINKING WATER				
Gross Alpha, Gross Beta, Tritium	Semiannually	Craters of the Moon, Idaho Falls, Minidoka, Shoshone	Atomic City, Howe, Mud Lake, Rest Area	None
SURFACE WATER				
Gross Alpha, Gross Beta, Tritium	Semiannually	Buhl, Hagerman, Twin Falls	None	Big Lost River (when flowing)
ENVIRONMENTAL RADIATION SAMPLING				
TLDs/OSLDs				
Gamma Radiation	semiannual	Aberdeen, Blackfoot (2), Craters of the Moon, Dubois, Idaho Falls, Jackson WY, Minidoka, Sugar City, Roberts	Arco, Atomic City, Birch Creek, Blue Dome, Howe, Monteview, Mud Lake	None
SOIL SAMPLING				
SOIL				
Gamma Spec, ^{90}Sr, Transuranics	biennially	Carey, Blackfoot, St. Anthony	Butte City, Monteview, Atomic City, FAA Tower, Howe, Mud Lake (2), Birch Creek, Frenchman's Cabin	None

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

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INL Site
FOODSTUFF SAMPLING				
MILK				
Gamma Spec (^{131}I)	weekly	Idaho Falls	None	None
Gamma Spec (^{131}I)	monthly	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka	Howe, Terreton	None
Tritium, ^{90}Sr	Semi-annually	Blackfoot, Dietrich, Fort Hall, Idaho Falls, Minidoka	Howe, Terreton	None
POTATOES				
Gamma Spec, ^{90}Sr	annually	Varies among Blackfoot, Idaho Falls, Rupert, Shelley, Hamer, Driggs, occasional samples across the U.S.	Varies among Arco, Monteview, Mud Lake, Terreton	None
ALFALFA				
Gamma Spec, ^{90}Sr	annually	None	Mud Lake	None
GRAIN				
Gamma Spec, ^{90}Sr	annually	Varies among American Falls, Blackfoot, Carey, Idaho Falls, Rupert/Minidoka, Roberts	Varies among Arco, Monteview, Mud Lake, Taber, Terreton	None
LETTUCE				
Gamma Spec, ^{90}Sr	annually	Varies among Blackfoot, Carey, Idaho Falls, Rigby, Sugar City	Varies among Arco, Atomic City, FAA Tower, Howe, Monteview	EFS
BIG GAME				
Gamma Spec	varies	Occasional samples across the U.S.	Public Highways	INL Site roads
WATERFOWL				
Gamma Spec, ^{90}Sr, Transuranics	annually	Varies among: Heise, Firth, Fort Hall, Mud Lake, Market Lake, and American Falls	None	INL Site wastewater disposal ponds

APPENDIX B

SUMMARY OF MDCs AND DCSs

Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses Performed during Fourth Quarter 2016

Sample Type	Analysis	Approximate Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha[c]	4.65×10^{-16} µCi/mL	3.4×10^{-14} µCi/mL
	Gross beta[d]	1.21×10^{-15} µCi/mL	2.5×10^{-11} µCi/mL
	^{137}Cs	7.09×10^{-17} µCi/mL	9.8×10^{-11} µCi/mL
	^{90}Sr	2.09×10^{-17} µCi/mL	2.5×10^{-11} µCi/mL
	^{241}Am	6.87×10^{-18} µCi/mL	4.1×10^{-14} µCi/mL
	^{238}Pu	3.95×10^{-18} µCi/mL	3.7×10^{-14} µCi/mL
	$^{239/240}$Pu	1.87×10^{-18} µCi/mL	3.4×10^{-14} µCi/mL
Air (charcoal cartridge)[e]	^{131}I	4.24×10^{-16} µCi/mL	2.3×10^{-19} µCi/mL
Air (atmospheric moisture)	^{3}H	87.8 pCi/L_{water}	2.1×10^{-7} µCi/mL_{air}
Air (precipitation)	^{3}H	93.5 pCi/L	1.9×10^{-3} µCi/mL
Milk	^{131}I	0.47 pCi/L	--
	^{137}Cs	0.83 pCi/L	--
	^{90}Sr	0.19 pCi/L	--
	^{3}H	98.0 pCi/L	--
Potatoes	^{137}Cs	0.72 pCi/kg	--
	^{90}Sr	4.64 pCi/kg	--
Game Animals	^{137}Cs	1.5 pCi/kg	--

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. MDCs are calculated and reported by the laboratories based on actual ESER sample results following analysis.

b DCSs, 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.

c Based on the most restrictive human-made alpha emitter (^{239}Pu).

d Based on the most restrictive human-made beta emitter (^{90}Sr).

e The approximate MDC is based on an average filtered air volume (pressure corrected) of 445 m^3/week.

APPENDIX C

SAMPLE ANALYSIS RESULTS

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS BETA Result > 3s
BOUNDARY							
ARCO	10/5/2016	0.69 ± 0.18	2.54 ± 0.68	**Yes**	16.30 ± 0.53	60.31 ± 1.95	**Yes**
	10/12/2016	0.75 ± 0.18	2.77 ± 0.65	**Yes**	14.20 ± 0.49	52.54 ± 1.81	**Yes**
	10/19/2016	0.38 ± 0.16	1.41 ± 0.59	No	9.44 ± 0.44	34.93 ± 1.62	**Yes**
	10/26/2016	1.20 ± 0.20	4.44 ± 0.73	**Yes**	18.30 ± 0.55	67.71 ± 2.03	**Yes**
	11/2/2016	1.16 ± 0.19	4.29 ± 0.70	**Yes**	10.90 ± 0.47	40.33 ± 1.74	**Yes**
	11/9/2016	1.22 ± 0.20	4.51 ± 0.75	**Yes**	22.80 ± 0.60	84.36 ± 2.22	**Yes**
	11/16/2016	1.75 ± 0.23	6.48 ± 0.83	**Yes**	34.20 ± 0.69	126.54 ± 2.56	**Yes**
	11/23/2016	0.61 ± 0.18	2.25 ± 0.67	**Yes**	15.20 ± 0.51	56.24 ± 1.90	**Yes**
	11/30/2016	0.88 ± 0.18	3.26 ± 0.67	**Yes**	11.60 ± 0.45	42.92 ± 1.68	**Yes**
	12/7/2016	0.58 ± 0.19	2.15 ± 0.70	**Yes**	11.30 ± 0.50	41.81 ± 1.83	**Yes**
	12/14/2016	0.67 ± 0.21	2.46 ± 0.76	**Yes**	13.00 ± 0.55	48.10 ± 2.02	**Yes**
	12/21/2016	1.03 ± 0.23	3.81 ± 0.84	**Yes**	29.40 ± 0.72	108.78 ± 2.68	**Yes**
	12/28/2016	0.44 ± 0.19	1.64 ± 0.69	No	17.80 ± 0.58	65.86 ± 2.13	**Yes**
ATOMIC CITY	10/5/2016	0.74 ± 0.21	2.72 ± 0.77	**Yes**	18.20 ± 0.60	67.34 ± 2.22	**Yes**
	10/12/2016	0.93 ± 0.19	3.44 ± 0.71	**Yes**	15.50 ± 0.52	57.35 ± 1.93	**Yes**
	10/19/2016	0.75 ± 0.18	2.77 ± 0.66	**Yes**	12.60 ± 0.48	46.62 ± 1.78	**Yes**
	10/26/2016	0.96 ± 0.19	3.56 ± 0.69	**Yes**	18.70 ± 0.55	69.19 ± 2.04	**Yes**
	11/2/2016	0.83 ± 0.18	3.07 ± 0.67	**Yes**	11.40 ± 0.49	42.18 ± 1.82	**Yes**
	11/9/2016	1.63 ± 0.23	6.03 ± 0.84	**Yes**	27.00 ± 0.65	99.90 ± 2.42	**Yes**
	11/16/2016	1.94 ± 0.25	7.18 ± 0.93	**Yes**	45.30 ± 0.82	167.61 ± 3.05	**Yes**
	11/23/2016	1.15 ± 0.21	4.26 ± 0.79	**Yes**	14.60 ± 0.53	54.02 ± 1.95	**Yes**
	11/30/2016	0.70 ± 0.20	2.58 ± 0.75	**Yes**	13.40 ± 0.54	49.58 ± 1.99	**Yes**
	12/7/2016	1.02 ± 0.22	3.77 ± 0.80	**Yes**	11.70 ± 0.52	43.29 ± 1.94	**Yes**
	12/14/2016	0.47 ± 0.19	1.75 ± 0.71	No	13.20 ± 0.53	48.84 ± 1.98	**Yes**
	12/21/2016	0.84 ± 0.21	3.10 ± 0.79	**Yes**	27.60 ± 0.69	102.12 ± 2.56	**Yes**
	12/28/2016	1.08 ± 0.22	4.00 ± 0.83	**Yes**	16.70 ± 0.59	61.79 ± 2.17	**Yes**
BLUE DOME	10/5/2016	0.96 ± 0.22	3.54 ± 0.80	**Yes**	16.10 ± 0.57	59.57 ± 2.12	**Yes**
	10/12/2016	0.60 ± 0.17	2.22 ± 0.64	**Yes**	14.10 ± 0.50	52.17 ± 1.86	**Yes**
	10/19/2016	0.52 ± 0.18	1.92 ± 0.67	No	10.60 ± 0.49	39.22 ± 1.82	**Yes**
	10/26/2016	0.86 ± 0.19	3.19 ± 0.71	**Yes**	15.80 ± 0.55	58.46 ± 2.02	**Yes**
	11/2/2016	0.81 ± 0.18	3.01 ± 0.66	**Yes**	9.71 ± 0.47	35.93 ± 1.74	**Yes**
	11/9/2016	0.83 ± 0.19	3.07 ± 0.70	**Yes**	20.50 ± 0.58	75.85 ± 2.16	**Yes**
	11/16/2016	1.57 ± 0.22	5.81 ± 0.82	**Yes**	35.90 ± 0.71	132.83 ± 2.64	**Yes**
	11/23/2016	0.72 ± 0.19	2.68 ± 0.69	**Yes**	13.40 ± 0.49	49.58 ± 1.82	**Yes**
	11/30/2016	0.83 ± 0.19	3.07 ± 0.69	**Yes**	10.80 ± 0.46	39.96 ± 1.71	**Yes**
	12/7/2016	0.34 ± 0.17	1.24 ± 0.64	No	9.38 ± 0.46	34.71 ± 1.72	**Yes**
	12/14/2016	0.60 ± 0.20	2.23 ± 0.73	**Yes**	11.70 ± 0.52	43.29 ± 1.92	**Yes**
	12/21/2016	1.04 ± 0.22	3.85 ± 0.80	**Yes**	24.40 ± 0.65	90.28 ± 2.41	**Yes**
	12/28/2016	0.61 ± 0.20	2.26 ± 0.73	**Yes**	12.00 ± 0.52	44.40 ± 1.93	**Yes**
FAA TOWER	10/5/2016	0.95 ± 0.20	3.50 ± 0.74	**Yes**	16.40 ± 0.54	60.68 ± 2.01	**Yes**
	10/12/2016	0.98 ± 0.19	3.61 ± 0.72	**Yes**	16.40 ± 0.53	60.68 ± 1.98	**Yes**
	10/19/2016	1.12 ± 0.20	4.14 ± 0.74	**Yes**	10.70 ± 0.47	39.59 ± 1.75	**Yes**
	10/26/2016	0.98 ± 0.19	3.61 ± 0.70	**Yes**	17.00 ± 0.54	62.90 ± 1.99	**Yes**
	11/2/2016	0.76 ± 0.18	2.79 ± 0.65	**Yes**	9.90 ± 0.47	36.63 ± 1.74	**Yes**
	11/9/2016	1.43 ± 0.22	5.29 ± 0.80	**Yes**	25.40 ± 0.64	93.98 ± 2.35	**Yes**
	11/16/2016	1.90 ± 0.23	7.03 ± 0.87	**Yes**	44.60 ± 0.77	165.02 ± 2.86	**Yes**
	11/23/2016	0.48 ± 0.18	1.79 ± 0.67	No	13.70 ± 0.51	50.69 ± 1.88	**Yes**

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	11/30/2016	0.46	±	0.17	1.71	±	0.64	No	11.50	±	0.48	42.55	±	1.77	**Yes**
	12/7/2016	0.38	±	0.18	1.42	±	0.66	No	10.50	±	0.48	38.85	±	1.79	**Yes**
	12/14/2016	0.15	±	0.16	0.54	±	0.60	No	11.30	±	0.48	41.81	±	1.79	**Yes**
	12/21/2016	0.82	±	0.20	3.05	±	0.74	**Yes**	24.10	±	0.63	89.17	±	2.32	**Yes**
	12/28/2016	0.56	±	0.18	2.08	±	0.66	**Yes**	9.87	±	0.46	36.52	±	1.70	**Yes**
HOWE	10/5/2016	1.12	±	0.21	4.14	±	0.77	**Yes**	16.30	±	0.54	60.31	±	2.01	**Yes**
	10/12/2016	0.74	±	0.18	2.72	±	0.67	**Yes**	14.90	±	0.52	55.13	±	1.91	**Yes**
	10/19/2016	0.77	±	0.19	2.85	±	0.70	**Yes**	9.22	±	0.47	34.11	±	1.73	**Yes**
	10/26/2016	0.97	±	0.20	3.59	±	0.73	**Yes**	15.50	±	0.54	57.35	±	2.00	**Yes**
	11/2/2016	1.19	±	0.20	4.40	±	0.74	**Yes**	10.90	±	0.49	40.33	±	1.82	**Yes**
	11/9/2016	0.79	±	0.19	2.92	±	0.70	**Yes**	24.00	±	0.62	88.80	±	2.29	**Yes**
	11/16/2016	2.24	±	0.25	8.29	±	0.94	**Yes**	38.50	±	0.76	142.45	±	2.80	**Yes**
	11/23/2016	1.06	±	0.20	3.92	±	0.75	**Yes**	14.40	±	0.51	53.28	±	1.90	**Yes**
	11/30/2016	1.32	±	0.29	4.88	±	1.08	**Yes**	15.00	±	0.70	55.50	±	2.58	**Yes**
	12/7/2016	0.65	±	0.20	2.42	±	0.74	**Yes**	9.92	±	0.50	36.70	±	1.85	**Yes**
	12/14/2016	1.06	±	0.22	3.92	±	0.80	**Yes**	14.00	±	0.55	51.80	±	2.02	**Yes**
	12/21/2016	1.59	±	0.25	5.88	±	0.92	**Yes**	27.70	±	0.70	102.49	±	2.60	**Yes**
	12/28/2016	0.83	±	0.20	3.06	±	0.75	**Yes**	14.90	±	0.55	55.13	±	2.02	**Yes**
MONTEVIEW	10/5/2016	0.98	±	0.21	3.64	±	0.76	**Yes**	16.50	±	0.55	61.05	±	2.04	**Yes**
	10/12/2016	1.02	±	0.19	3.77	±	0.72	**Yes**	15.00	±	0.51	55.50	±	1.90	**Yes**
	10/19/2016	1.00	±	0.20	3.69	±	0.72	**Yes**	10.10	±	0.47	37.37	±	1.72	**Yes**
	10/26/2016	0.97	±	0.19	3.58	±	0.71	**Yes**	16.70	±	0.55	61.79	±	2.02	**Yes**
	11/2/2016	0.67	±	0.18	2.46	±	0.66	**Yes**	9.38	±	0.48	34.71	±	1.79	**Yes**
	11/9/2016	1.01	±	0.20	3.74	±	0.72	**Yes**	20.30	±	0.58	75.11	±	2.15	**Yes**
	11/16/2016	2.32	±	0.26	8.58	±	0.97	**Yes**	39.80	±	0.78	147.26	±	2.88	**Yes**
	11/23/2016	1.09	±	0.21	4.03	±	0.78	**Yes**	15.60	±	0.54	57.72	±	1.99	**Yes**
	11/30/2016	0.66	±	0.19	2.42	±	0.70	**Yes**	14.00	±	0.52	51.80	±	1.93	**Yes**
	12/7/2016	0.40	±	0.18	1.47	±	0.67	No	11.60	±	0.50	42.92	±	1.86	**Yes**
	12/14/2016	1.07	±	0.22	3.96	±	0.81	**Yes**	16.20	±	0.57	59.94	±	2.10	**Yes**
	12/21/2016	1.73	±	0.30	6.40	±	1.10	**Yes**	22.40	±	0.76	82.88	±	2.81	**Yes**
	12/28/2016	1.11	±	0.23	4.11	±	0.85	**Yes**	15.40	±	0.58	56.98	±	2.16	**Yes**
MUD LAKE	10/5/2016	0.93	±	0.19	3.45	±	0.71	**Yes**	15.00	±	0.51	55.50	±	1.88	**Yes**
	10/12/2016	1.03	±	0.20	3.81	±	0.73	**Yes**	15.60	±	0.52	57.72	±	1.94	**Yes**
	10/19/2016	0.77	±	0.19	2.85	±	0.71	**Yes**	11.30	±	0.50	41.81	±	1.84	**Yes**
	10/26/2016	1.35	±	0.23	5.00	±	0.83	**Yes**	20.90	±	0.63	77.33	±	2.32	**Yes**
	11/2/2016	0.99	±	0.19	3.67	±	0.71	**Yes**	8.19	±	0.46	30.30	±	1.71	**Yes**
	11/9/2016	1.89	±	0.24	6.99	±	0.87	**Yes**	28.90	±	0.67	106.93	±	2.47	**Yes**
	11/16/2016	2.32	±	0.25	8.58	±	0.94	**Yes**	45.10	±	0.80	166.87	±	2.94	**Yes**
	11/23/2016	0.93	±	0.21	3.43	±	0.78	**Yes**	18.40	±	0.58	68.08	±	2.15	**Yes**
	11/30/2016	0.72	±	0.18	2.66	±	0.68	**Yes**	13.30	±	0.50	49.21	±	1.84	**Yes**
	12/7/2016	0.47	±	0.18	1.75	±	0.66	No	11.60	±	0.49	42.92	±	1.80	**Yes**
	12/14/2016	0.94	±	0.21	3.49	±	0.78	**Yes**	14.50	±	0.54	53.65	±	2.01	**Yes**
	12/21/2016	2.17	±	0.24	8.03	±	0.90	**Yes**	21.20	±	0.58	78.44	±	2.16	**Yes**
	12/28/2016	0.87	±	0.20	3.20	±	0.74	**Yes**	13.30	±	0.52	49.21	±	1.91	**Yes**
DISTANT															
BLACKFOOT	10/5/2016	0.90	±	0.19	3.34	±	0.70	**Yes**	14.60	±	0.50	54.02	±	1.85	**Yes**
	10/12/2016	0.79	±	0.19	2.91	±	0.70	**Yes**	13.60	±	0.52	50.32	±	1.91	**Yes**
	10/19/2016	1.01	±	0.20	3.74	±	0.73	**Yes**	11.60	±	0.48	42.92	±	1.79	**Yes**

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	10/26/2016	1.39	±	0.22	5.14	±	0.82	Yes	18.00	±	0.59	66.60	±	2.16	Yes
	11/2/2016	0.85	±	0.18	3.14	±	0.65	Yes	10.40	±	0.47	38.48	±	1.73	Yes
	11/9/2016	1.55	±	0.23	5.74	±	0.84	Yes	24.60	±	0.64	91.02	±	2.38	Yes
	11/16/2016	3.47	±	0.38	12.84	±	1.41	Yes	48.80	±	1.06	180.56	±	3.92	Yes
	11/23/2016	0.71	±	0.20	2.62	±	0.73	Yes	11.80	±	0.50	43.66	±	1.86	Yes
	11/30/2016	0.86	±	0.20	3.17	±	0.73	Yes	10.60	±	0.48	39.22	±	1.77	Yes
	12/7/2016	0.65	±	0.19	2.39	±	0.70	Yes	8.51	±	0.45	31.49	±	1.68	Yes
	12/14/2016	0.51	±	0.19	1.88	±	0.69	No	11.30	±	0.50	41.81	±	1.85	Yes
	12/21/2016	0.91	±	0.21	3.35	±	0.78	Yes	27.70	±	0.68	102.49	±	2.51	Yes
	12/28/2016	1.09	±	0.20	4.03	±	0.73	Yes	14.50	±	0.50	53.65	±	1.86	Yes
QA-1	10/5/2016	0.94	±	0.19	3.48	±	0.69	Yes	16.60	±	0.51	61.42	±	1.90	Yes
(BLACKFOOT)	10/12/2016	0.60	±	0.17	2.22	±	0.64	Yes	14.70	±	0.50	54.39	±	1.86	Yes
	10/19/2016	0.83	±	0.18	3.08	±	0.67	Yes	10.00	±	0.45	37.00	±	1.66	Yes
	10/26/2016	0.58	±	0.18	2.16	±	0.65	Yes	19.00	±	0.57	70.30	±	2.11	Yes
	11/2/2016	0.90	±	0.19	3.31	±	0.68	Yes	12.40	±	0.51	45.88	±	1.87	Yes
	11/9/2016	1.72	±	0.23	6.36	±	0.84	Yes	26.70	±	0.64	98.79	±	2.37	Yes
	11/16/2016	2.36	±	0.33	8.73	±	1.22	Yes	52.20	±	1.06	193.14	±	3.92	Yes
	11/23/2016	0.44	±	0.19	1.62	±	0.68	No	12.40	±	0.51	45.88	±	1.89	Yes
	11/30/2016	0.45	±	0.18	1.66	±	0.67	No	12.20	±	0.50	45.14	±	1.86	Yes
	12/7/2016	0.60	±	0.18	2.22	±	0.67	Yes	10.30	±	0.46	38.11	±	1.71	Yes
	12/14/2016	0.38	±	0.19	1.39	±	0.71	No	13.10	±	0.54	48.47	±	2.01	Yes
	12/21/2016	1.16	±	0.21	4.29	±	0.77	Yes	25.40	±	0.63	93.98	±	2.32	Yes
	12/28/2016	0.60	±	0.18	2.23	±	0.65	Yes	14.30	±	0.50	52.91	±	1.85	Yes
CRATERS OF	10/5/2016	0.47	±	0.18	1.72	±	0.68	No	16.70	±	0.56	61.79	±	2.06	Yes
THE MOON	10/12/2016	0.68	±	0.18	2.50	±	0.67	Yes	14.20	±	0.52	52.54	±	1.91	Yes
	10/19/2016	0.53	±	0.17	1.96	±	0.63	Yes	10.70	±	0.46	39.59	±	1.71	Yes
	10/26/2016	1.01	±	0.20	3.74	±	0.73	Yes	16.80	±	0.56	62.16	±	2.06	Yes
	11/2/2016	0.57	±	0.16	2.11	±	0.60	Yes	9.21	±	0.45	34.08	±	1.67	Yes
	11/9/2016	0.99	±	0.21	3.64	±	0.76	Yes	22.60	±	0.63	83.62	±	2.33	Yes
	11/16/2016	1.71	±	0.23	6.33	±	0.87	Yes	33.20	±	0.72	122.84	±	2.65	Yes
	11/23/2016	0.52	±	0.19	1.91	±	0.70	No	14.70	±	0.54	54.39	±	1.98	Yes
	11/30/2016	0.54	±	0.18	2.01	±	0.66	Yes	9.45	±	0.46	34.97	±	1.69	Yes
	12/7/2016	0.93	±	0.20	3.43	±	0.75	Yes	9.87	±	0.48	36.52	±	1.78	Yes
	12/14/2016	0.38	±	0.18	1.40	±	0.65	No	9.48	±	0.47	35.08	±	1.74	Yes
	12/21/2016	0.62	±	0.19	2.30	±	0.68	Yes	21.40	±	0.59	79.18	±	2.19	Yes
	12/28/2016	0.52	±	0.18	1.94	±	0.66	No	9.53	±	0.46	35.26	±	1.70	Yes
DUBOIS	10/5/2016	0.96	±	0.20	3.56	±	0.75	Yes	15.00	±	0.54	55.50	±	1.98	Yes
	10/12/2016	1.11	±	0.21	4.11	±	0.78	Yes	13.80	±	0.53	51.06	±	1.96	Yes
	10/19/2016	0.74	±	0.19	2.73	±	0.69	Yes	10.90	±	0.48	40.33	±	1.79	Yes
	10/26/2016	1.21	±	0.21	4.48	±	0.78	Yes	15.80	±	0.55	58.46	±	2.05	Yes
	11/2/2016	0.68	±	0.17	2.51	±	0.64	Yes	9.77	±	0.47	36.15	±	1.75	Yes
	11/9/2016	0.76	±	0.19	2.79	±	0.69	Yes	19.60	±	0.58	72.52	±	2.15	Yes
	11/16/2016	2.33	±	0.26	8.62	±	0.94	Yes	39.10	±	0.76	144.67	±	2.80	Yes
	11/23/2016	0.64	±	0.18	2.35	±	0.67	Yes	13.00	±	0.49	48.10	±	1.79	Yes
	11/30/2016	0.70	±	0.17	2.60	±	0.64	Yes	10.30	±	0.44	38.11	±	1.63	Yes
	12/7/2016	0.42	±	0.18	1.54	±	0.66	No	11.30	±	0.49	41.81	±	1.80	Yes
	12/14/2016	0.89	±	0.22	3.29	±	0.81	Yes	12.20	±	0.55	45.14	±	2.02	Yes
	12/21/2016	1.08	±	0.21	4.00	±	0.78	Yes	24.20	±	0.63	89.54	±	2.32	Yes

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS ALPHA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)	GROSS BETA Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)	GROSS BETA Result > 3s
	12/28/2016	0.67 ± 0.19	2.48 ± 0.70	Yes	9.33 ± 0.47	34.52 ± 1.74	Yes
IDAHO FALLS	10/5/2016	1.16 ± 0.21	4.29 ± 0.79	Yes	16.00 ± 0.55	59.20 ± 2.02	Yes
	10/12/2016	1.04 ± 0.20	3.85 ± 0.74	Yes	13.10 ± 0.51	48.47 ± 1.87	Yes
	10/19/2016	0.82 ± 0.19	3.04 ± 0.70	Yes	10.40 ± 0.47	38.48 ± 1.75	Yes
	10/26/2016	1.11 ± 0.20	4.11 ± 0.74	Yes	18.60 ± 0.56	68.82 ± 2.09	Yes
	11/2/2016	0.85 ± 0.18	3.13 ± 0.65	Yes	10.10 ± 0.46	37.37 ± 1.71	Yes
	11/9/2016	1.37 ± 0.21	5.07 ± 0.78	Yes	20.40 ± 0.58	75.48 ± 2.16	Yes
	11/16/2016	2.23 ± 0.26	8.25 ± 0.97	Yes	42.40 ± 0.81	156.88 ± 2.98	Yes
	11/23/2016	1.32 ± 0.23	4.88 ± 0.85	Yes	12.70 ± 0.53	46.99 ± 1.95	Yes
	11/30/2016	0.67 ± 0.19	2.49 ± 0.69	Yes	11.00 ± 0.48	40.70 ± 1.78	Yes
	12/7/2016	0.48 ± 0.18	1.78 ± 0.67	No	8.81 ± 0.46	32.60 ± 1.71	Yes
	12/14/2016	0.70 ± 0.20	2.57 ± 0.75	Yes	10.70 ± 0.51	39.59 ± 1.89	Yes
	12/21/2016	1.32 ± 0.23	4.88 ± 0.83	Yes	26.10 ± 0.66	96.57 ± 2.43	Yes
	12/28/2016	0.94 ± 0.21	3.49 ± 0.78	Yes	12.00 ± 0.52	44.40 ± 1.94	Yes
SUGAR CITY	10/5/2016	0.78 ± 0.19	2.89 ± 0.69	Yes	16.20 ± 0.52	59.94 ± 1.94	Yes
	10/12/2016	0.96 ± 0.18	3.54 ± 0.68	Yes	13.70 ± 0.48	50.69 ± 1.79	Yes
	10/19/2016	0.84 ± 0.20	3.09 ± 0.74	Yes	12.00 ± 0.51	44.40 ± 1.89	Yes
	10/26/2016	1.36 ± 0.21	5.03 ± 0.79	Yes	17.40 ± 0.56	64.38 ± 2.08	Yes
	11/2/2016	0.60 ± 0.17	2.23 ± 0.62	Yes	9.65 ± 0.47	35.71 ± 1.73	Yes
	11/9/2016	1.23 ± 0.22	4.55 ± 0.80	Yes	22.30 ± 0.63	82.51 ± 2.32	Yes
	11/16/2016	2.63 ± 0.27	9.73 ± 0.98	Yes	39.10 ± 0.76	144.67 ± 2.81	Yes
	11/23/2016	0.92 ± 0.20	3.41 ± 0.74	Yes	12.40 ± 0.50	45.88 ± 1.84	Yes
	11/30/2016	0.80 ± 0.19	2.97 ± 0.71	Yes	11.30 ± 0.48	41.81 ± 1.79	Yes
	12/7/2016	0.17 ± 0.16	0.62 ± 0.59	No	8.53 ± 0.44	31.56 ± 1.63	Yes
	12/14/2016	0.49 ± 0.19	1.82 ± 0.71	No	8.67 ± 0.48	32.08 ± 1.79	Yes
	12/21/2016	1.00 ± 0.21	3.69 ± 0.78	Yes	23.40 ± 0.63	86.58 ± 2.33	Yes
	12/28/2016	0.42 ± 0.18	1.54 ± 0.65	No	9.40 ± 0.46	34.78 ± 1.72	Yes
QA-2	10/5/2016	0.99 ± 0.24	3.64 ± 0.88	Yes	18.70 ± 0.65	69.19 ± 2.41	Yes
(SUGAR CITY)	10/12/2016	0.97 ± 0.21	3.57 ± 0.78	Yes	15.00 ± 0.56	55.50 ± 2.08	Yes
	10/19/2016	1.03 ± 0.21	3.81 ± 0.76	Yes	12.50 ± 0.51	46.25 ± 1.90	Yes
	10/26/2016	1.27 ± 0.21	4.70 ± 0.77	Yes	18.40 ± 0.57	68.08 ± 2.10	Yes
	11/2/2016	0.76 ± 0.18	2.80 ± 0.65	Yes	11.20 ± 0.49	41.44 ± 1.80	Yes
	11/9/2016	1.37 ± 0.21	5.07 ± 0.78	Yes	21.40 ± 0.60	79.18 ± 2.20	Yes
	11/16/2016	2.08 ± 0.25	7.70 ± 0.91	Yes	39.40 ± 0.76	145.78 ± 2.80	Yes
	11/23/2016	0.80 ± 0.19	2.96 ± 0.69	Yes	11.10 ± 0.46	41.07 ± 1.71	Yes
	11/30/2016	0.87 ± 0.19	3.22 ± 0.70	Yes	12.90 ± 0.49	47.73 ± 1.81	Yes
	12/7/2016	0.30 ± 0.17	1.09 ± 0.61	No	8.77 ± 0.45	32.45 ± 1.65	Yes
	12/14/2016	0.45 ± 0.19	1.66 ± 0.70	No	9.03 ± 0.49	33.41 ± 1.80	Yes
	12/21/2016	1.39 ± 0.31	5.14 ± 1.14	Yes	33.40 ± 0.92	123.58 ± 3.42	Yes
	12/28/2016	0.56 ± 0.19	2.08 ± 0.70	No	12.00 ± 0.51	44.40 ± 1.87	Yes
INL SITE							
EFS	10/5/2016	0.50 ± 0.19	1.86 ± 0.70	No	13.50 ± 0.53	49.95 ± 1.98	Yes
	10/12/2016	0.89 ± 0.19	3.30 ± 0.71	Yes	16.50 ± 0.54	61.05 ± 2.01	Yes
	10/19/2016	0.49 ± 0.17	1.81 ± 0.64	No	10.20 ± 0.47	37.74 ± 1.73	Yes
	10/26/2016	1.07 ± 0.21	3.96 ± 0.78	Yes	21.60 ± 0.63	79.92 ± 2.31	Yes
	11/2/2016	0.62 ± 0.18	2.31 ± 0.65	Yes	9.82 ± 0.49	36.33 ± 1.81	Yes
	11/9/2016	1.53 ± 0.23	5.66 ± 0.85	Yes	29.00 ± 0.69	107.30 ± 2.55	Yes
	11/16/2016	1.69 ± 0.24	6.25 ± 0.88	Yes	36.90 ± 0.76	136.53 ± 2.81	Yes

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

		GROSS ALPHA							GROSS BETA						
Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	11/23/2016	0.77	±	0.19	2.85	±	0.71	Yes	14.50	±	0.52	53.65	±	1.91	Yes
	11/30/2016	0.53	±	0.18	1.96	±	0.65	Yes	11.00	±	0.47	40.70	±	1.73	Yes
	12/7/2016	0.53	±	0.19	1.98	±	0.71	No	12.50	±	0.52	46.25	±	1.92	Yes
	12/14/2016	0.91	±	0.26	3.37	±	0.97	Yes	11.80	±	0.63	43.66	±	2.34	Yes
	12/21/2016	1.40	±	0.31	5.18	±	1.14	Yes	31.60	±	0.90	116.92	±	3.34	Yes
	12/28/2016	0.84	±	0.23	3.11	±	0.85	Yes	15.70	±	0.62	58.09	±	2.29	Yes
MAIN GATE	10/5/2016	0.55	±	0.18	2.04	±	0.66	Yes	17.00	±	0.54	62.90	±	1.98	Yes
	10/12/2016	0.89	±	0.20	3.29	±	0.74	Yes	17.10	±	0.56	63.27	±	2.08	Yes
	10/19/2016	0.90	±	0.18	3.34	±	0.68	Yes	11.00	±	0.46	40.70	±	1.71	Yes
	10/26/2016	1.13	±	0.20	4.18	±	0.74	Yes	18.90	±	0.57	69.93	±	2.11	Yes
	11/2/2016	0.77	±	0.17	2.86	±	0.64	Yes	10.40	±	0.47	38.48	±	1.72	Yes
	11/9/2016	1.19	±	0.22	4.40	±	0.80	Yes	28.60	±	0.69	105.82	±	2.55	Yes
	11/16/2016	1.72	±	0.24	6.36	±	0.88	Yes	42.70	±	0.79	157.99	±	2.92	Yes
	11/23/2016	0.82	±	0.20	3.02	±	0.74	Yes	15.50	±	0.54	57.35	±	1.98	Yes
	11/30/2016	1.03	±	0.20	3.81	±	0.74	Yes	11.10	±	0.48	41.07	±	1.76	Yes
	12/7/2016	0.79	±	0.20	2.92	±	0.74	Yes	10.60	±	0.49	39.22	±	1.82	Yes
	12/14/2016	0.82	±	0.20	3.02	±	0.73	Yes	13.20	±	0.51	48.84	±	1.90	Yes
	12/21/2016	0.82	±	0.20	3.04	±	0.73	Yes	23.60	±	0.62	87.32	±	2.30	Yes
	12/28/2016	1.46	±	0.23	5.40	±	0.85	Yes	7.14	±	0.46	26.42	±	1.71	Yes
VAN BUREN GATE	10/5/2016	0.87	±	0.19	3.23	±	0.71	Yes	17.30	±	0.54	64.01	±	1.99	Yes
	10/12/2016	1.02	±	0.20	3.77	±	0.74	Yes	17.10	±	0.55	63.27	±	2.04	Yes
	10/19/2016	0.46	±	0.16	1.72	±	0.60	No	10.10	±	0.44	37.37	±	1.64	Yes
	10/26/2016	0.86	±	0.19	3.17	±	0.69	Yes	20.10	±	0.57	74.37	±	2.12	Yes
	11/2/2016	0.62	±	0.17	2.30	±	0.63	Yes	11.40	±	0.49	42.18	±	1.81	Yes
	11/9/2016	1.16	±	0.21	4.29	±	0.77	Yes	28.20	±	0.66	104.34	±	2.46	Yes
	11/16/2016	1.99	±	0.25	7.36	±	0.91	Yes	45.60	±	0.81	168.72	±	2.99	Yes
	11/23/2016	0.54	±	0.19	1.99	±	0.69	No	14.50	±	0.53	53.65	±	1.94	Yes
	11/30/2016	0.61	±	0.18	2.25	±	0.67	Yes	12.00	±	0.48	44.40	±	1.79	Yes
	12/7/2016	0.35	±	0.18	1.28	±	0.65	No	9.32	±	0.47	34.48	±	1.74	Yes
	12/14/2016	0.52	±	0.19	1.92	±	0.69	No	10.10	±	0.49	37.37	±	1.79	Yes
	12/21/2016	1.25	±	0.23	4.63	±	0.85	Yes	26.60	±	0.68	98.42	±	2.53	Yes
	12/28/2016	1.28	±	0.24	4.74	±	0.88	Yes	15.50	±	0.59	57.35	±	2.17	Yes

a. Invalid sample result shown in red

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
BOUNDARY								
ARCO	10/05/2016	-1.76	±	1.14	-6.51	±	4.22	No
	10/12/2016	-0.12	±	1.09	-0.43	±	4.03	No
	10/19/2016	0.27	±	1.10	1.00	±	4.07	No
	10/26/2016	-0.40	±	1.11	-1.48	±	4.11	No
	11/02/2016	0.26	±	1.21	0.95	±	4.48	No
	11/09/2016	0.22	±	1.12	0.83	±	4.14	No
	11/16/2016	0.27	±	1.09	0.98	±	4.03	No
	11/23/2016	-0.81	±	1.35	-2.99	±	5.00	No
	11/30/2016	1.03	±	1.07	3.81	±	3.96	No
	12/07/2016	1.08	±	1.26	4.00	±	4.66	No
	12/14/2016	-2.18	±	1.39	-8.07	±	5.14	No
	12/21/2016	-0.11	±	1.37	-0.42	±	5.07	No
	12/28/2016	-0.44	±	1.36	-1.64	±	5.03	No
ATOMIC CITY	10/05/2016	-2.02	±	1.31	-7.47	±	4.85	No
	10/12/2016	-0.12	±	1.14	-0.45	±	4.22	No
	10/19/2016	0.27	±	1.10	1.01	±	4.07	No
	10/26/2016	-0.40	±	1.11	-1.47	±	4.11	No
	11/02/2016	0.27	±	1.27	1.00	±	4.70	No
	11/09/2016	0.23	±	1.16	0.86	±	4.29	No
	11/16/2016	0.29	±	1.20	1.08	±	4.44	No
	11/23/2016	-0.85	±	1.43	-3.16	±	5.29	No
	11/30/2016	1.24	±	1.30	4.59	±	4.81	No
	12/07/2016	1.14	±	1.33	4.22	±	4.92	No
	12/14/2016	-2.11	±	1.34	-7.81	±	4.96	No
	12/21/2016	-0.11	±	1.33	-0.40	±	4.92	No
	12/28/2016	-0.47	±	1.43	-1.72	±	5.29	No
BLUE DOME	10/05/2016	2.16	±	1.24	7.99	±	4.59	No
	10/12/2016	-0.61	±	1.05	-2.26	±	3.89	No
	10/19/2016	0.43	±	1.12	1.60	±	4.14	No
	10/26/2016	-1.82	±	1.10	-6.73	±	4.07	No
	11/02/2016	1.17	±	1.09	4.33	±	4.03	No
	11/09/2016	0.59	±	1.09	2.17	±	4.03	No
	11/16/2016	2.27	±	1.09	8.40	±	4.03	No
	11/23/2016	0.27	±	1.02	1.00	±	3.77	No
	11/30/2016	-0.40	±	1.02	-1.46	±	3.77	No
	12/07/2016	-0.62	±	1.11	-2.29	±	4.11	No
	12/14/2016	0.13	±	1.21	0.48	±	4.48	No
	12/21/2016	0.36	±	1.19	1.32	±	4.40	No
	12/28/2016	-1.03	±	1.20	-3.81	±	4.44	No
FAA TOWER	10/05/2016	1.98	±	1.14	7.33	±	4.22	No
	10/12/2016	-0.62	±	1.07	-2.30	±	3.96	No
	10/19/2016	0.41	±	1.05	1.51	±	3.89	No
	10/26/2016	-1.72	±	1.04	-6.36	±	3.85	No
	11/02/2016	1.17	±	1.08	4.33	±	4.00	No
	11/09/2016	0.60	±	1.10	2.20	±	4.07	No
	11/16/2016	2.23	±	1.07	8.25	±	3.96	No
	11/23/2016	0.28	±	1.05	1.03	±	3.89	No
	11/30/2016	-0.41	±	1.05	-1.51	±	3.89	No
	12/07/2016	-0.63	±	1.12	-2.32	±	4.14	No
	12/14/2016	0.12	±	1.11	0.44	±	4.11	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	12/21/2016	0.34	±	1.13	1.26	±	4.18	No
	12/28/2016	-0.93	±	1.08	-3.43	±	4.00	No
HOWE	10/05/2016	1.98	±	1.14	7.33	±	4.22	No
	10/12/2016	-0.62	±	1.06	-2.29	±	3.92	No
	10/19/2016	0.42	±	1.09	1.57	±	4.03	No
	10/26/2016	-1.81	±	1.10	-6.70	±	4.07	No
	11/02/2016	1.20	±	1.11	4.44	±	4.11	No
	11/09/2016	0.59	±	1.10	2.19	±	4.07	No
	11/16/2016	2.38	±	1.14	8.81	±	4.22	No
	11/23/2016	0.28	±	1.04	1.02	±	3.85	No
	11/30/2016	-0.62	±	1.60	-2.29	±	5.92	No
	12/07/2016	-0.67	±	1.19	-2.47	±	4.40	No
	12/14/2016	0.13	±	1.20	0.47	±	4.44	No
	12/21/2016	0.38	±	1.24	1.39	±	4.59	No
	12/28/2016	-0.99	±	1.16	-3.68	±	4.29	No
MONTEVIEW	10/05/2016	2.02	±	1.15	7.47	±	4.26	No
	10/12/2016	-0.61	±	1.05	-2.26	±	3.89	No
	10/19/2016	0.41	±	1.05	1.50	±	3.89	No
	10/26/2016	-1.78	±	1.07	-6.59	±	3.96	No
	11/02/2016	1.24	±	1.15	4.59	±	4.26	No
	11/09/2016	0.58	±	1.08	2.16	±	4.00	No
	11/16/2016	2.45	±	1.18	9.07	±	4.37	No
	11/23/2016	0.28	±	1.07	1.05	±	3.96	No
	11/30/2016	-0.42	±	1.09	-1.57	±	4.03	No
	12/07/2016	-0.64	±	1.14	-2.36	±	4.22	No
	12/14/2016	0.13	±	1.19	0.47	±	4.40	No
	12/21/2016	0.47	±	1.56	1.75	±	5.77	No
	12/28/2016	-1.08	±	1.26	-4.00	±	4.66	No
MUD LAKE	10/05/2016	1.87	±	1.07	6.92	±	3.96	No
	10/12/2016	-0.62	±	1.07	-2.30	±	3.96	No
	10/19/2016	0.43	±	1.10	1.58	±	4.07	No
	10/26/2016	-1.94	±	1.17	-7.18	±	4.33	No
	11/02/2016	1.22	±	1.13	4.51	±	4.18	No
	11/09/2016	0.59	±	1.10	2.19	±	4.07	No
	11/16/2016	2.32	±	1.11	8.58	±	4.11	No
	11/23/2016	0.29	±	1.11	1.09	±	4.11	No
	11/30/2016	-0.40	±	1.04	-1.48	±	3.85	No
	12/07/2016	-0.61	±	1.09	-2.25	±	4.03	No
	12/14/2016	0.13	±	1.17	0.46	±	4.33	No
	12/21/2016	0.33	±	1.08	1.21	±	4.00	No
	12/28/2016	-0.97	±	1.13	-3.57	±	4.18	No
DISTANT								
BLACKFOOT	10/05/2016	-1.71	±	1.11	-6.33	±	4.11	No
	10/12/2016	-0.13	±	1.20	-0.47	±	4.44	No
	10/19/2016	0.28	±	1.15	1.05	±	4.26	No
	10/26/2016	-0.44	±	1.23	-1.64	±	4.55	No
	11/02/2016	0.26	±	1.23	0.97	±	4.55	No
	11/09/2016	0.24	±	1.19	0.88	±	4.40	No
	11/16/2016	0.43	±	1.75	1.58	±	6.48	No
	11/23/2016	-0.88	±	1.47	-3.25	±	5.44	No
	11/30/2016	1.15	±	1.21	4.26	±	4.48	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	12/07/2016	1.06	±	1.24	3.92	±	4.59	No
	12/14/2016	-2.04	±	1.30	-7.55	±	4.81	No
	12/21/2016	-0.11	±	1.28	-0.39	±	4.74	No
	12/28/2016	-0.40	±	1.22	-1.47	±	4.51	No
QA-1	10/05/2016	-1.68	±	1.09	-6.22	±	4.03	No
(BLACKFOOT)	10/12/2016	-0.12	±	1.11	-0.44	±	4.11	No
	10/19/2016	0.27	±	1.10	1.00	±	4.07	No
	10/26/2016	-0.42	±	1.16	-1.54	±	4.29	No
	11/02/2016	0.27	±	1.27	1.00	±	4.70	No
	11/09/2016	0.23	±	1.13	0.84	±	4.18	No
	11/16/2016	0.40	±	1.65	1.49	±	6.11	No
	11/23/2016	-0.88	±	1.47	-3.25	±	5.44	No
	11/30/2016	1.17	±	1.22	4.33	±	4.51	No
	12/07/2016	1.02	±	1.19	3.77	±	4.40	No
	12/14/2016	-2.16	±	1.37	-7.99	±	5.07	No
	12/21/2016	-0.10	±	1.19	-0.36	±	4.40	No
	12/28/2016	-0.40	±	1.22	-1.47	±	4.51	No
CRATERS	10/05/2016	-1.90	±	1.23	-7.03	±	4.55	No
	10/12/2016	-0.12	±	1.17	-0.46	±	4.33	No
	10/19/2016	0.28	±	1.12	1.02	±	4.14	No
	10/26/2016	-0.43	±	1.19	-1.58	±	4.40	No
	11/02/2016	0.26	±	1.22	0.96	±	4.51	No
	11/09/2016	0.24	±	1.21	0.90	±	4.48	No
	11/16/2016	0.29	±	1.17	1.05	±	4.33	No
	11/23/2016	-0.87	±	1.46	-3.23	±	5.40	No
	11/30/2016	1.13	±	1.18	4.18	±	4.37	No
	12/07/2016	1.08	±	1.27	4.00	±	4.70	No
	12/14/2016	-2.01	±	1.27	-7.44	±	4.70	No
	12/21/2016	-0.10	±	1.19	-0.36	±	4.40	No
	12/28/2016	-0.42	±	1.28	-1.55	±	4.74	No
DUBOIS	10/05/2016	2.01	±	1.15	7.44	±	4.26	No
	10/12/2016	-0.67	±	1.15	-2.48	±	4.26	No
	10/19/2016	0.42	±	1.07	1.54	±	3.96	No
	10/26/2016	-1.86	±	1.12	-6.88	±	4.14	No
	11/02/2016	1.18	±	1.09	4.37	±	4.03	No
	11/09/2016	0.60	±	1.11	2.21	±	4.11	No
	11/16/2016	2.36	±	1.13	8.73	±	4.18	No
	11/23/2016	0.27	±	1.00	0.98	±	3.70	No
	11/30/2016	-0.38	±	0.98	-1.40	±	3.63	No
	12/07/2016	-0.62	±	1.10	-2.28	±	4.07	No
	12/14/2016	0.14	±	1.28	0.50	±	4.74	No
	12/21/2016	0.34	±	1.12	1.26	±	4.14	No
	12/28/2016	-0.97	±	1.14	-3.60	±	4.22	No
IDAHO FALLS	10/05/2016	2.02	±	1.16	7.47	±	4.29	No
	10/12/2016	-0.64	±	1.10	-2.36	±	4.07	No
	10/19/2016	0.41	±	1.06	1.53	±	3.92	No
	10/26/2016	-1.76	±	1.06	-6.51	±	3.92	No
	11/02/2016	1.13	±	1.05	4.18	±	3.89	No
	11/09/2016	0.59	±	1.09	2.17	±	4.03	No
	11/16/2016	2.47	±	1.19	9.14	±	4.40	No
	11/23/2016	0.30	±	1.14	1.12	±	4.22	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	11/30/2016	-0.42	±	1.08	-1.54	±	4.00	No
	12/07/2016	-0.62	±	1.12	-2.31	±	4.14	No
	12/14/2016	0.13	±	1.22	0.48	±	4.51	No
	12/21/2016	0.35	±	1.16	1.29	±	4.29	No
	12/28/2016	-1.03	±	1.20	-3.81	±	4.44	No
SUGAR CITY	10/05/2016	1.88	±	1.08	6.96	±	4.00	No
	10/12/2016	-0.59	±	1.01	-2.17	±	3.74	No
	10/19/2016	0.44	±	1.12	1.61	±	4.14	No
	10/26/2016	-1.81	±	1.09	-6.70	±	4.03	No
	11/02/2016	1.17	±	1.08	4.33	±	4.00	No
	11/09/2016	0.63	±	1.16	2.31	±	4.29	No
	11/16/2016	2.36	±	1.14	8.73	±	4.22	No
	11/23/2016	0.28	±	1.06	1.04	±	3.92	No
	11/30/2016	-0.41	±	1.07	-1.53	±	3.96	No
	12/07/2016	-0.60	±	1.07	-2.21	±	3.96	No
	12/14/2016	0.13	±	1.22	0.48	±	4.51	No
	12/21/2016	0.35	±	1.15	1.29	±	4.26	No
	12/28/2016	-0.96	±	1.12	-3.54	±	4.14	No
QA-2	10/05/2016	2.43	±	1.39	8.99	±	5.14	No
(SUGAR CITY)	10/12/2016	-0.70	±	1.21	-2.59	±	4.48	No
	10/19/2016	0.43	±	1.10	1.58	±	4.07	No
	10/26/2016	-1.79	±	1.08	-6.62	±	4.00	No
	11/02/2016	1.16	±	1.08	4.29	±	4.00	No
	11/09/2016	0.59	±	1.09	2.18	±	4.03	No
	11/16/2016	2.35	±	1.13	8.70	±	4.18	No
	11/23/2016	0.27	±	1.00	0.98	±	3.70	No
	11/30/2016	-0.40	±	1.03	-1.48	±	3.81	No
	12/07/2016	-0.60	±	1.07	-2.21	±	3.96	No
	12/14/2016	0.13	±	1.21	0.48	±	4.48	No
	12/21/2016	0.52	±	1.72	1.92	±	6.36	No
	12/28/2016	-0.98	±	1.15	-3.63	±	4.26	No
INL SITE								
EFS	10/05/2016	-1.97	±	1.28	-7.29	±	4.74	No
	10/12/2016	-0.12	±	1.17	-0.46	±	4.33	No
	10/19/2016	0.29	±	1.16	1.06	±	4.29	No
	10/26/2016	-0.45	±	1.24	-1.65	±	4.59	No
	11/02/2016	0.28	±	1.33	1.05	±	4.92	No
	11/09/2016	0.24	±	1.21	0.90	±	4.48	No
	11/16/2016	0.29	±	1.20	1.08	±	4.44	No
	11/23/2016	-0.83	±	1.39	-3.07	±	5.14	No
	11/30/2016	1.10	±	1.15	4.07	±	4.26	No
	12/07/2016	1.10	±	1.29	4.07	±	4.77	No
	12/14/2016	-2.76	±	1.75	-10.21	±	6.48	No
	12/21/2016	-0.15	±	1.86	-0.57	±	6.88	No
	12/28/2016	-0.52	±	1.59	-1.92	±	5.88	No
MAIN GATE	10/05/2016	-1.77	±	1.15	-6.55	±	4.26	No
	10/12/2016	-0.13	±	1.21	-0.47	±	4.48	No
	10/19/2016	0.27	±	1.10	1.00	±	4.07	No
	10/26/2016	-0.42	±	1.16	-1.54	±	4.29	No
	11/02/2016	0.26	±	1.22	0.96	±	4.51	No
	11/09/2016	0.24	±	1.22	0.90	±	4.51	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-11}$ Bq/mL)			Result > 3s
	11/16/2016	0.28	±	1.16	1.05	±	4.29	No
	11/23/2016	-0.85	±	1.42	-3.15	±	5.25	No
	11/30/2016	1.12	±	1.17	4.14	±	4.33	No
	12/07/2016	1.09	±	1.28	4.03	±	4.74	No
	12/14/2016	-1.99	±	1.26	-7.36	±	4.66	No
	12/21/2016	-0.10	±	1.22	-0.37	±	4.51	No
	12/28/2016	-0.46	±	1.40	-1.69	±	5.18	No
VAN BUREN GATE	10/05/2016	-1.76	±	1.14	-6.51	±	4.22	No
	10/12/2016	-0.13	±	1.18	-0.46	±	4.37	No
	10/19/2016	0.27	±	1.08	0.99	±	4.00	No
	10/26/2016	-0.41	±	1.13	-1.51	±	4.18	No
	11/02/2016	0.27	±	1.26	0.99	±	4.66	No
	11/09/2016	0.23	±	1.16	0.86	±	4.29	No
	11/16/2016	0.28	±	1.16	1.04	±	4.29	No
	11/23/2016	-0.85	±	1.43	-3.16	±	5.29	No
	11/30/2016	1.11	±	1.16	4.11	±	4.29	No
	12/07/2016	1.08	±	1.26	4.00	±	4.66	No
	12/14/2016	-2.04	±	1.30	-7.55	±	4.81	No
	12/21/2016	-0.11	±	1.32	-0.40	±	4.88	No
	12/28/2016	-0.48	±	1.48	-1.79	±	5.48	No

a. Invalid sample result shown in red.

TABLE C-3. Quarterly Cesium-137, Strontium-90, and Actinide Concentrations in Composite Air Filters.

Sampling Group and Location	Sampling Date	Analyte	Result ± 1s Uncertainty ($\times 10^{-18}$ µCi/mL)			Result ± 1s Uncertainty ($\times 10^{-14}$ Bq/mL)			Result > 3s
BOUNDARY									
ARCO	12/28/2016	CESIUM-137	-65.60	±	116.00	-242.72	±	429.20	No
		STRONTIUM-90	-2.45	±	6.03	-9.06	±	22.30	No
ATOMIC CITY	12/28/2016	AMERICIUM-241	-2.19	±	1.39	-8.12	±	5.14	No
		CESIUM-137	-32.30	±	107.00	-119.51	±	395.90	No
		PLUTONIUM-238	0.91	±	0.57	3.38	±	2.11	No
		PLUTONIUM-239/240	1.83	±	0.59	6.77	±	2.17	**Yes**
BLUE DOME	12/28/2016	AMERICIUM-241	0.79	±	1.36	2.91	±	5.05	No
		CESIUM-137	-35.50	±	105.00	-131.35	±	388.50	No
		PLUTONIUM-238	1.74	±	0.83	6.43	±	3.05	No
		PLUTONIUM-239/240	0.87	±	0.54	3.21	±	2.00	No
FAA TOWER	12/28/2016	CESIUM-137	32.40	±	96.60	119.88	±	357.42	No
		STRONTIUM-90	-1.18	±	5.86	-4.38	±	21.67	No
HOWE	12/28/2016	CESIUM-137	44.60	±	126.00	165.02	±	466.20	No
MONTEVIEW	12/28/2016	CESIUM-137	136.00	±	89.70	503.20	±	331.89	No
MUD LAKE	12/28/2016	CESIUM-137	2.90	±	101.00	10.73	±	373.70	No
		STRONTIUM-90	-9.85	±	6.07	-36.44	±	22.46	No
DISTANT									
BLACKFOOT	12/28/2016	CESIUM-137	-12.40	±	123.00	-45.88	±	455.10	No
		STRONTIUM-90	-3.77	±	6.16	-13.95	±	22.78	No
QA-1 (BLACKFOOT)	12/28/2016	CESIUM-137	55.10	±	124.00	203.87	±	458.80	No
		STRONTIUM-90	-11.66	±	5.81	-43.13	±	21.48	No
CRATERS	12/28/2016	CESIUM-137	-73.80	±	135.00	-273.06	±	499.50	No
DUBOIS	12/28/2016	CESIUM-137	-4.95	±	79.50	-18.32	±	294.15	No
IDAHO FALLS	12/28/2016	CESIUM-137	94.80	±	77.30	350.76	±	286.01	No
SUGAR CITY	12/28/2016	AMERICIUM-241	1.56	±	0.96	5.75	±	3.55	No
		CESIUM-137	-83.80	±	83.90	-310.06	±	310.43	No
		PLUTONIUM-238	0.94	±	0.82	3.47	±	3.02	No
		PLUTONIUM-239/240	1.21	±	0.52	4.47	±	1.93	No
QA-2 (SUGAR CITY)	12/28/2016	AMERICIUM-241	-2.47	±	1.82	-9.14	±	6.73	No
		CESIUM-137	46.80	±	79.20	173.16	±	293.04	No
		PLUTONIUM-238	0.42	±	0.80	1.54	±	2.94	No
		PLUTONIUM-239/240	0.69	±	0.31	2.56	±	1.15	No

TABLE C-3. Quarterly Cesium-137, Strontium-90, and Actinide Concentrations in Composite Air Filters.

INL SITE									
EFS	12/28/2016	AMERICIUM-241	-2.04	±	1.66	-7.53	±	6.16	No
		CESIUM-137	46.30	±	130.00	171.31	±	481.00	No
		PLUTONIUM-238	-1.09	±	0.86	-4.04	±	3.18	No
		PLUTONIUM-239/240	1.42	±	0.48	5.25	±	1.77	No
MAIN GATE	12/28/2016	CESIUM-137	-78.50	±	85.00	-290.45	±	314.50	No
		STRONTIUM-90	0.31	±	6.13	1.14	±	22.68	No
VAN BUREN GATE	12/28/2016	AMERICIUM-241	0.00	±	1.43	0.00	±	5.30	No
		CESIUM-137	-97.00	±	133.00	-358.90	±	492.10	No
		PLUTONIUM-238	0.41	±	1.09	1.52	±	4.02	No
		PLUTONIUM-239/240	1.23	±	0.41	4.56	±	1.53	No

TABLE C-4. Tritium Concentrations in Atmospheric Moisture

Sampling Group and Location	Start Date	Sampling Date	Result ± 1s Uncertainty ($\times 10^{-13}$ µCi/mL$_{air}$)			Result ± 1s Uncertainty ($\times 10^{-9}$ Bq/mL$_{air}$)			Result > 3s
BOUNDARY									
ATOMIC CITY	09/28/16	10/26/16	2.56	±	1.87	9.47	±	6.92	No
ATOMIC CITY	10/26/16	11/16/16	16.20	±	1.95	59.94	±	7.22	**Yes**
ATOMIC CITY	11/16/16	12/28/16	3.22	±	0.85	11.91	±	3.13	**Yes**
DISTANT									
BLACKFOOT	09/21/16	10/05/16	2.78	±	2.07	10.29	±	7.66	No
BLACKFOOT	10/05/16	10/27/16	1.29	±	1.14	4.77	±	4.22	No
BLACKFOOT	10/27/16	11/16/16	9.94	±	1.33	36.78	±	4.92	**Yes**
BLACKFOOT	11/16/16	12/21/16	1.93	±	0.84	7.14	±	3.10	No
IDAHO FALLS	09/22/16	10/06/16	4.83	±	2.62	17.87	±	9.69	No
IDAHO FALLS	10/06/16	10/24/16	5.53	±	1.97	20.46	±	7.29	No
IDAHO FALLS	10/24/16	11/19/16	11.70	±	1.89	43.29	±	6.99	**Yes**
IDAHO FALLS	11/09/16	12/07/16	4.25	±	1.21	15.73	±	4.48	**Yes**
SUGAR CITY	09/22/16	10/12/16	21.60	±	2.79	79.92	±	10.32	**Yes**
SUGAR CITY	10/12/16	11/09/16	10.10	±	1.82	37.37	±	6.73	**Yes**
SUGAR CITY	11/09/16	12/14/16	3.61	±	1.15	13.36	±	4.26	**Yes**

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

Location	Start Date	End Date	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
IDAHO FALLS	09/30/16	10/31/16	55.60	±	30.50	2.06	±	1.13	No
	10/31/16	11/30/16	52.40	±	24.70	1.94	±	0.91	No
	11/30/16	12/30/16	79.60	±	25.40	2.95	±	0.94	**Yes**
CFA	09/01/16	10/03/16	106.00	±	25.60	3.92	±	0.95	**Yes**
	10/03/16	11/07/16	27.20	±	31.00	1.01	±	1.15	No
	11/07/16	12/01/16	58.40	±	25.20	2.16	±	0.93	No
EFS	09/28/16	10/05/16	30.60	±	24.70	1.13	±	0.91	No
	10/05/16	10/12/16	87.40	±	30.70	3.23	±	1.14	No
	10/12/16	10/19/16	79.40	±	30.60	2.94	±	1.13	No
	10/19/16	10/26/16	43.70	±	30.50	1.62	±	1.13	No
	10/26/16	11/02/16	149.00	±	31.20	5.51	±	1.15	**Yes**
	11/23/16	11/30/16	151.00	±	25.80	5.59	±	0.95	**Yes**
	12/07/16	12/14/16	215.00	±	27.30	7.96	±	1.01	**Yes**
	12/14/16	12/21/16	69.50	±	25.60	2.57	±	0.95	No
	12/21/16	12/28/16	97.20	±	25.40	3.60	±	0.94	**Yes**

Table C-6. Gross Alpha, Gross Beta, and Tritium Concentrations in Surface and Drinking Water

Location	Sampling Date	Analyte	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
SURFACE WATER									
Alpheus Spring	11/4/2016	GROSS ALPHA	0.39	±	0.62	0.01	±	0.02	No
		GROSS BETA	8.47	±	0.61	0.31	±	0.02	**Yes**
		TRITIUM	79.63	±	24.69	2.95	±	0.91	**Yes**
Bill Jones, Jr. Trout Farm	11/4/2016	GROSS ALPHA	0.35	±	0.41	0.01	±	0.02	No
		GROSS BETA	2.65	±	0.48	0.10	±	0.02	**Yes**
		TRITIUM	82.17	±	24.82	3.04	±	0.92	**Yes**
Bill Jones, Jr. Trout Farm (duplicate)	11/4/2016	GROSS ALPHA	-0.09	±	0.43	0.00	±	0.02	No
		GROSS BETA	4.77	±	0.53	0.18	±	0.02	**Yes**
		TRITIUM	9.43	±	23.80	0.35	±	0.88	No
Clear Springs	11/4/2016	GROSS ALPHA	0.68	±	0.61	0.03	±	0.02	No
		GROSS BETA	3.29	±	0.55	0.12	±	0.02	**Yes**
		TRITIUM	9.26	±	23.92	0.34	±	0.89	No
DRINKING WATER									
Atomic City	11/9/2016	GROSS ALPHA	-0.33	±	0.42	-0.01	±	0.02	No
		GROSS BETA	3.69	±	0.51	0.14	±	0.02	**Yes**
		TRITIUM	27.80	±	24.47	1.03	±	0.91	No
Control	11/9/2016	GROSS ALPHA	0.77	±	0.30	0.03	±	0.01	No
		GROSS BETA	1.54	±	0.43	0.06	±	0.02	**Yes**
		TRITIUM	22.32	±	24.25	0.83	±	0.90	No
Craters of the Moon	11/9/2016	GROSS ALPHA	0.18	±	0.21	0.01	±	0.01	No
		GROSS BETA	2.08	±	0.42	0.08	±	0.02	**Yes**
		TRITIUM	19.69	±	24.37	0.73	±	0.90	No
Howe	11/9/2016	GROSS ALPHA	0.04	±	0.51	0.00	±	0.02	No
		GROSS BETA	2.30	±	0.52	0.09	±	0.02	**Yes**
		TRITIUM	52.12	±	24.59	1.93	±	0.91	No
Idaho Falls	11/10/2016	GROSS ALPHA	-0.93	±	0.50	-0.03	±	0.02	No
		GROSS BETA	2.48	±	0.53	0.09	±	0.02	**Yes**
		TRITIUM	73.63	±	24.85	2.73	±	0.92	No
Minidoka	11/4/2016	GROSS ALPHA	0.01	±	0.53	0.00	±	0.02	No
		GROSS BETA	3.61	±	0.54	0.13	±	0.02	**Yes**
		TRITIUM	2.78	±	23.86	0.10	±	0.88	No

Table C-6. Gross Alpha, Gross Beta, and Tritium Concentrations in Surface and Drinking Water

Location	Sampling Date	Analyte	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
Mud Lake	11/3/2016	GROSS ALPHA	-0.09	±	0.31	0.00	±	0.01	No
		GROSS BETA	4.02	±	0.49	0.15	±	0.02	**Yes**
		TRITIUM	58.71	±	24.56	2.17	±	0.91	No
Rest Area	11/9/2016	GROSS ALPHA	0.43	±	0.41	0.02	±	0.02	No
		GROSS BETA	2.14	±	0.53	0.08	±	0.02	**Yes**
		TRITIUM	89.12	±	24.94	3.30	±	0.92	**Yes**
Shoshone	11/4/2016	GROSS ALPHA	0.65	±	0.46	0.02	±	0.02	No
		GROSS BETA	1.43	±	0.54	0.05	±	0.02	No
		TRITIUM	19.28	±	24.07	0.71	±	0.89	No

Table C-7. Weekly and Monthly Iodine-131 and Cesium-137 Concentrations in Milk

Location	Sampling Date	Iodine-131 Result ± 1s Uncertainty (pCi/L)	Iodine-131 Result ± 1s Uncertainty (Bq/L)	Iodine-131 Result > 3s	Cesium-137 Result ± 1s Uncertainty (pCi/L)	Cesium-137 Result ± 1s Uncertainty (Bq/L)	Cesium-137 Result > 3s
BLACKFOOT	10/03/16	0.41 ± 3.61	0.015 ± 0.134	No	-1.00 ± 1.37	-0.037 ± 0.051	No
	11/07/16	-3.98 ± 2.12	-0.147 ± 0.079	No	-0.85 ± 1.37	-0.032 ± 0.051	No
	12/05/16	-1.01 ± 1.87	-0.037 ± 0.069	No	-1.18 ± 1.41	-0.044 ± 0.052	No
CONTROL	10/04/16	-0.45 ± 2.27	-0.017 ± 0.084	No	0.85 ± 1.35	0.032 ± 0.050	No
	11/01/16	1.55 ± 2.15	0.057 ± 0.080	No	-0.33 ± 1.32	-0.012 ± 0.049	No
	12/06/16	-0.90 ± 2.15	-0.033 ± 0.080	No	2.23 ± 1.43	0.083 ± 0.053	No
DIETRICH	10/04/16	0.90 ± 1.44	0.033 ± 0.053	No	0.50 ± 1.58	0.018 ± 0.059	No
	11/01/16	-2.49 ± 1.85	-0.092 ± 0.069	No	0.52 ± 1.39	0.019 ± 0.051	No
	12/06/16	-0.06 ± 1.60	-0.002 ± 0.059	No	2.81 ± 1.41	0.104 ± 0.052	No
Duplicate	12/06/16	-3.83 ± 1.79	-0.142 ± 0.066	No	1.27 ± 0.90	0.047 ± 0.033	No
HOWE	10/04/16	1.58 ± 2.01	0.059 ± 0.074	No	0.38 ± 1.33	0.014 ± 0.049	No
	11/01/16	-0.24 ± 1.08	-0.009 ± 0.040	No	-0.22 ± 0.91	-0.008 ± 0.034	No
	12/06/16	2.88 ± 1.88	0.107 ± 0.070	No	0.06 ± 1.46	0.002 ± 0.054	No
IDAHO FALLS	10/04/16	-0.05 ± 1.26	-0.002 ± 0.047	No	0.62 ± 1.50	0.023 ± 0.056	No
Duplicate	10/04/16	2.12 ± 1.88	0.079 ± 0.070	No	0.19 ± 1.31	0.007 ± 0.049	No
	10/11/16	1.17 ± 1.34	0.043 ± 0.050	No	-0.74 ± 1.60	-0.027 ± 0.059	No
	10/18/16	0.10 ± 0.99	0.004 ± 0.037	No	0.91 ± 0.94	0.034 ± 0.035	No
	10/25/16	-0.48 ± 1.00	-0.018 ± 0.037	No	1.69 ± 0.99	0.063 ± 0.037	No
	11/01/16	-2.33 ± 1.39	-0.086 ± 0.051	No	-1.63 ± 1.56	-0.060 ± 0.058	No
	11/08/16	0.41 ± 1.31	0.015 ± 0.049	No	-0.75 ± 1.48	-0.028 ± 0.055	No
	11/15/16	-0.59 ± 1.27	-0.022 ± 0.047	No	-2.31 ± 1.62	-0.086 ± 0.060	No
	11/22/16	-2.43 ± 1.53	-0.090 ± 0.057	No	-0.34 ± 1.44	-0.013 ± 0.053	No
	11/29/2016[a]	-0.65 ± 1.36	-0.024 ± 0.050	No	-0.71 ± 1.55	-0.026 ± 0.057	No
	12/06/16	-2.58 ± 1.73	-0.096 ± 0.064	No	1.48 ± 1.49	0.055 ± 0.055	No
	12/13/16	0.29 ± 1.57	0.011 ± 0.058	No	0.33 ± 1.46	0.012 ± 0.054	No
	12/20/16	-2.26 ± 1.69	-0.084 ± 0.063	No	0.85 ± 1.43	0.031 ± 0.053	No
	12/28/16	1.75 ± 1.46	0.065 ± 0.054	No	-0.03 ± 1.40	-0.001 ± 0.052	No
MINIDOKA	10/04/16	-0.12 ± 1.09	-0.004 ± 0.040	No	0.14 ± 0.91	0.005 ± 0.034	No
	11/01/16	-0.39 ± 1.44	-0.014 ± 0.053	No	1.91 ± 1.49	0.071 ± 0.055	No
	12/06/16	1.09 ± 1.78	0.040 ± 0.066	No	1.14 ± 1.37	0.042 ± 0.051	No
TERRETON	10/04/16	-1.10 ± 1.22	-0.041 ± 0.045	No	0.23 ± 0.91	0.008 ± 0.034	No
	11/01/16	1.42 ± 1.58	0.053 ± 0.059	No	-2.24 ± 1.67	-0.083 ± 0.062	No
	12/06/16	0.16 ± 1.96	0.006 ± 0.073	No	0.90 ± 1.33	0.033 ± 0.049	No

[a] During the summer of 2020, a review of the table determined the ^{137}Cs activity concentration and uncertainty values and ^{131}I activity concentration values for the Idaho Falls milk sample collected on November 29, 2016 were incorrect. The activity concentration and uncertainty values were updated with the correct values. For further discussion, see Milk Sampling in Section 5.

Table C-8. Strontium-90 and Tritium Concentrations in Milk

		Strontium-90						
Location	Sampling Date	Result ± 1s Uncertainty			Result ± 1s Uncertainty			Result > 3s
BLACKFOOT	11/07/16	0.23	±	0.05	0.009	±	0.002	**Yes**
CONTROL	11/01/16	0.30	±	0.06	0.011	±	0.002	**Yes**
DIETRICH	11/01/16	0.26	±	0.07	0.010	±	0.003	**Yes**
HOWE	11/01/16	0.03	±	0.05	0.001	±	0.002	No
IDAHO FALLS	11/01/16	0.41	±	0.08	0.015	±	0.003	**Yes**
MINIDOKA	11/01/16	0.12	±	0.06	0.004	±	0.002	No
TERRETON	11/01/16	0.47	±	0.07	0.017	±	0.002	**Yes**
		Tritium						
		Concentration ± 1s (pCi/L)			Concentration ± 1s (Bq/L)			Result > 3s
BLACKFOOT	11/07/16	122.00	±	25.90	4.519	±	0.959	**Yes**
CONTROL	11/01/16	42.10	±	25.00	1.559	±	0.926	No
DIETRICH	11/01/16	-37.10	±	25.20	-1.374	±	0.933	No
HOWE	11/01/16	177.00	±	26.50	6.556	±	0.981	**Yes**
IDAHO FALLS	11/01/16	22.40	±	25.00	0.830	±	0.926	No
MINIDOKA	11/01/16	151.00	±	26.50	5.593	±	0.981	**Yes**
TERRETON	11/01/16	90.40	±	25.50	3.348	±	0.944	**Yes**

Table C-9. Gamma-emitting Radionuclides and Strontium-90 in Potatoes

		Cesium-137						
		Result ± 1s Uncertainty			Result ± 1s Uncertainty			
Location	Sampling Date	pCi/kg			Bq/kg			Result > 3s
ARCO	9/14/2016	-2.03	±	2.12	-0.08	±	0.08	No
BLACKFOOT	9/15/2016	0.42	±	1.58	0.02	±	0.06	No
CONTROL	10/11/2016	2.05	±	2.08	0.08	±	0.08	No
DRIGGS	10/23/2016	3.26	±	2.01	0.12	±	0.07	No
IDAHO FALLS	10/2/2016	1.70	±	2.18	0.06	±	0.08	No
IDAHO FALLS (duplicate)	10/2/2016	2.00	±	1.65	0.07	±	0.06	No
REXBURG	9/14/2016	-1.92	±	1.58	-0.07	±	0.06	No
SHELLEY	10/10/2016	-3.92	±	1.74	-0.15	±	0.06	No
TERRETON	9/30/2016	1.52	±	1.93	0.06	±	0.07	No
		Strontium-90						
		Result ± 1s Uncertainty			Result ± 1s Uncertainty			
		pCi/kg			Bq/kg			Result > 3s
ARCO	9/14/2016	1.80	±	0.96	0.07	±	0.04	No
BLACKFOOT	9/15/2016	0.06	±	1.14	0.00	±	0.04	No
CONTROL	10/11/2016	0.01	±	1.19	0.00	±	0.04	No
DRIGGS	10/23/2016	2.01	±	1.70	0.07	±	0.06	No
IDAHO FALLS	10/2/2016	8.30	±	1.51	0.31	±	0.06	**Yes**
IDAHO FALLS (duplicate)	10/2/2016	0.14	±	1.42	0.01	±	0.05	No
REXBURG	9/14/2016	0.85	±	1.14	0.03	±	0.04	No
SHELLEY	10/10/2016	2.15	±	1.20	0.08	±	0.04	No
TERRETON	9/30/2016	6.18	±	2.54	0.23	±	0.09	No

Table C-10. Gamma-emitting Radionuclides in Large Game Animals

Species	Collection Date	Tissue	Analyte	Result ± 1s Uncertainty (pCi/kg wet weight)			Result ± 1s Uncertainty (x 10^{-2} Bq/kg wet weight)			Result > 3s
MULE DEER	11/14/2016	Muscle	^{131}I	-1.34	±	9.04	-4.96	±	33.45	No
			^{137}Cs	-1.10	±	2.90	-4.07	±	10.73	No

Table C-11. Environmental Radiation Measurements Using OSLDs

Location	Start Date	End Date	Radiation Measurement ± 1s Uncertainty mrem	Exposure mrem/day
BOUNDARY				
ARCO	5/4/2016	11/2/2016	62.77 ± 3.14	0.34
ATOMIC CITY	5/4/2016	11/2/2016	64.71 ± 3.24	0.36
BIRCH CREEK	5/4/2016	11/2/2016	54.95 ± 2.75	0.30
BLUE DOME	5/4/2016	11/2/2016	49.27 ± 2.46	0.27
HOWE	5/4/2016	11/2/2016	59.01 ± 2.95	0.32
MONTEVIEW	5/4/2016	11/2/2016	61.87 ± 3.09	0.34
MUD LAKE	5/4/2016	11/2/2016	70.14 ± 3.51	0.39
Boundary Average			**60.39**	**0.33**
DISTANT				
ABERDEEN	5/3/2016	11/1/2016	55.67 ± 2.78	0.31
BLACKFOOT	5/4/2016	11/2/2016	60.65 ± 3.03	0.33
CRATERS	5/4/2016	11/2/2016	60.10 ± 3.01	0.33
DUBOIS	5/4/2016	11/2/2016	53.64 ± 2.68	0.29
IDAHO FALLS	5/4/2016	11/2/2016	63.06 ± 3.15	0.35
MINIDOKA	5/3/2016	11/1/2016	48.72 ± 2.44	0.27
MOUNTAIN VIEW	5/4/2016	11/2/2016	56.45 ± 2.82	0.31
ROBERTS	5/2/2016	11/1/2016	69.20 ± 3.46	0.38
SUGAR CITY	5/4/2016	11/2/2016	77.31 ± 3.87	0.42
Distant Average			**60.53**	**0.33**

APPENDIX D

STATISTICAL ANALYSIS RESULTS

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

Parameter	P[a]
Gross Alpha	
Quarter	0.67
October	0.34
November	0.58
December	0.43
Gross Beta	
Quarter	0.14
October	0.29
November	0.50
December	0.10

a. A 'p' value greater than 0.05 signifies no statistical difference between data groups. Any values below 0.05 are indicated in red.

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

		Mann-Whitney U test
Parameter	**Week**	**P[a]**
Gross Alpha		
	October 5	0.81
	October 12	0.46
	October 19	0.68
	October 26	0.04
	November 2	0.17
	November 9	0.68
	November 16	0.17
	November 23	0.68
	November 30	0.68
	December 7	0.94
	December 14	0.46
	December 21	0.37
	December 28	0.68
Gross Beta		
	October 5	0.19
	October 12	0.01
	October 19	0.26
	October 26	1.00
	November 2	0.57
	November 9	0.17
	November 16	0.94
	November 23	0.03
	November 30	0.01
	December 7	0.03
	December 14	0.01
	December 21	0.74
	December 28	0.03

a. A 'p' value greater than 0.05 signifies no statistical difference between data groups (i.e., Boundary and Distant locations). Any values below 0.05 are indicated in red.