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Idaho National Laboratory Site Offsite Environmental Surveillance Program Report: Fourth Quarter 2018

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Contributors:
Marilyn Case, Racquel Clark, Russell Mitchell

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By
Veolia Nuclear Solutions - Federal Services
Environmental Surveillance, Education and Research Program
Bill Doering, Program Manager
120 Technology Dr., Idaho Falls, Idaho 83401
www.idahoeser.com

Executive Summary

Some human-made radionuclides were detected in samples collected during the fourth quarter of 2018. With the exception of waterfowl, none of the radionuclides detected in samples collected during the fourth quarter of 2018 could be directly linked with INL Site activities. 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 2018 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, 2018. All sample types (media) and the sampling schedule followed during 2018 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
- Waterfowl
- TLDs
- OSLDs

Table ES-1. Summary of Results for the Fourth Quarter of 2018.

Media	Sample Type	Analysis	Results
Air	Particulate Filters	Gross alpha, gross beta	There were no statistically significant differences in monthly and quarterly gross alpha and gross beta concentrations measured at Distant, Boundary, and INL Site sampling locations. No result exceeded results for the past ten years or the Derived Concentration Standard (DCS) for plutonium-239 (an alpha-emitting radionuclide) or strontium-90 (a beta-emitting radionuclide) in air.
	Particulate Filters Quarterly Composite	Gamma-emitting radionuclides, ^{90}Sr, actinides (americium and plutonium)	No human-made gamma-emitting radionuclides were detected in any of the fourth quarter composite air samples. Americium-241, ^{238}Pu and $^{239/240}Pu$, human-made alpha-emitting radionuclides, were not detected in any composited air sample, nor was strontium-90, a human-made beta-emitting radionuclide.
	Charcoal Cartridge	Iodine-131	Iodine-131 was not detected in any of the 26 batches counted during the quarter.
Atmospheric Moisture	Liquid	Tritium	Five of eleven results showed tritium concentrations greater than the 3s uncertainty during the quarter. No sample result exceeded results for the past ten years or the DCS for tritium in air.
Precipitation	Liquid	Tritium	A total of 17 samples were collected during the fourth quarter. Five of the tritium results were greater than the 3s uncertainty. All results were within the range previously measured in the past ten years and were consistent with those reported across the region by the Environmental Protection Agency.
Drinking/Surface Water	Liquid	Gross alpha, gross beta, tritium	Gross alpha activity was detected in four drinking water samples and one surface water sample. Gross beta activity was detected in seven of the nine drinking water and all four surface water samples. Values were consistent with natural levels of gross beta radioactivity in the Snake River Plain Aquifer. Tritium was not detected in any drinking water but was found in one surface water sample. Results were similar to previous results and those in precipitation.
Milk	Liquid	Iodine-131, other gamma-emitting radionuclides, strontium-90	Thirty-nine milk samples were collected at seven locations (including the offsite control sample from Colorado). No gamma emitting radionuclides of concern or tritium were detected. Strontium-90 was not detected in any samples. This radionuclide is sometimes detected, with similar concentrations among locations (including the offsite control from Colorado) indicating the INL Site has not been the source. Tritium was detected in one samples at a level similar to previous measurements and to precipitation.
Waterfowl	Tissue	Gamma-emitting radionuclides, ^{90}Sr, actinides (americium and plutonium)	Four human-made radionuclides were detected in some ducks at levels suggesting that they were ingested from ATR effluent ponds. The maximum dose from eating the edible tissue of a contaminated duck was estimated to be 0.016 mrem/year, lower than in the previous year.
Environmental Dosimeters	Environmental radiation	External radioactivity	Measurements of environmental radiation made using optically-stimulated luminescent dosimeters (OSLDs) show

Media	Sample Type	Analysis	Results
			similar measurements at Distant locations and Boundary locations. The average of all measurements is about 67 mrem for the quarter. Results of a study of thermoluminescent dosimeters (TLDs) and OSLDs are discussed.

List of Abbreviations

AEC	Atomic Energy Commission
BLR	Big Lost River
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
NRF	Naval Reactors Facility
NRTS	National Reactor Testing Station
ORAU	Oak Ridge Associated Universities
OSLD	Optically Stimulated Luminescent Dosimeter
RWMC	Radioactive Waste Management Complex
VNSFS	Veolia Nuclear Solutions – Federal Services

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 2018, environmental monitoring within the INL Site boundaries was primarily the responsibility of the INL and Idaho Cleanup Project (ICP) contractors.

During the first quarter of 2018, ESER Program responsibilities were assumed by Veolia Nuclear Solutions-Federal Services (VNSFS), in conjunction with team members Idaho State University and Oak Ridge Associated Universities (ORAU). ORAU ceased operations in April 2018 and was replaced in May by GEL Laboratories.

This report contains monitoring results from the ESER Program for samples collected during the fourth quarter of 2018 (October 1- December 30, 2018).

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 four locations (at the same sites where air moisture is sampled) on and around the INL Site
- drinking water from eight locations and surface water from three locations around the INL Site and five locations along the Big Lost River on the INL Site
- agricultural products, including milk at six dairies around the INL Site, potatoes from at least six local producers, alfalfa from three farms, grain (wheat and barley) from approximately 10 local producers, and lettuce from approximately nine home-owned and portable gardens on and around the INL Site
- soil from 13 locations around the INL Site biennially
- environmental dosimeters from 16 locations semi-annually
- various numbers of wildlife including dead bats, road-killed big game (pronghorn, mule deer, and elk) and waterfowl sampled from 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 GEL Laboratories.

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. RadNet is a nationwide environmental radiation monitoring system that monitors the nation's air, precipitation, and drinking water for radiation. 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, entry into the ESER database, and reporting in quarterly reports. The quarterly reports are then consolidated into the INL Site Environmental Report for each calendar year. The annual report also includes 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 laboratory 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. Each laboratory currently defines a detection of radioactivity in an individual sample if the result exceeds a detection level calculated by the laboratory after the analysis of a background sample (i.e., the *a posteriori* measurement) based on calculations derived by Curie (1984). The minimum detectable concentration (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 VNSFS 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 multi-program 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.

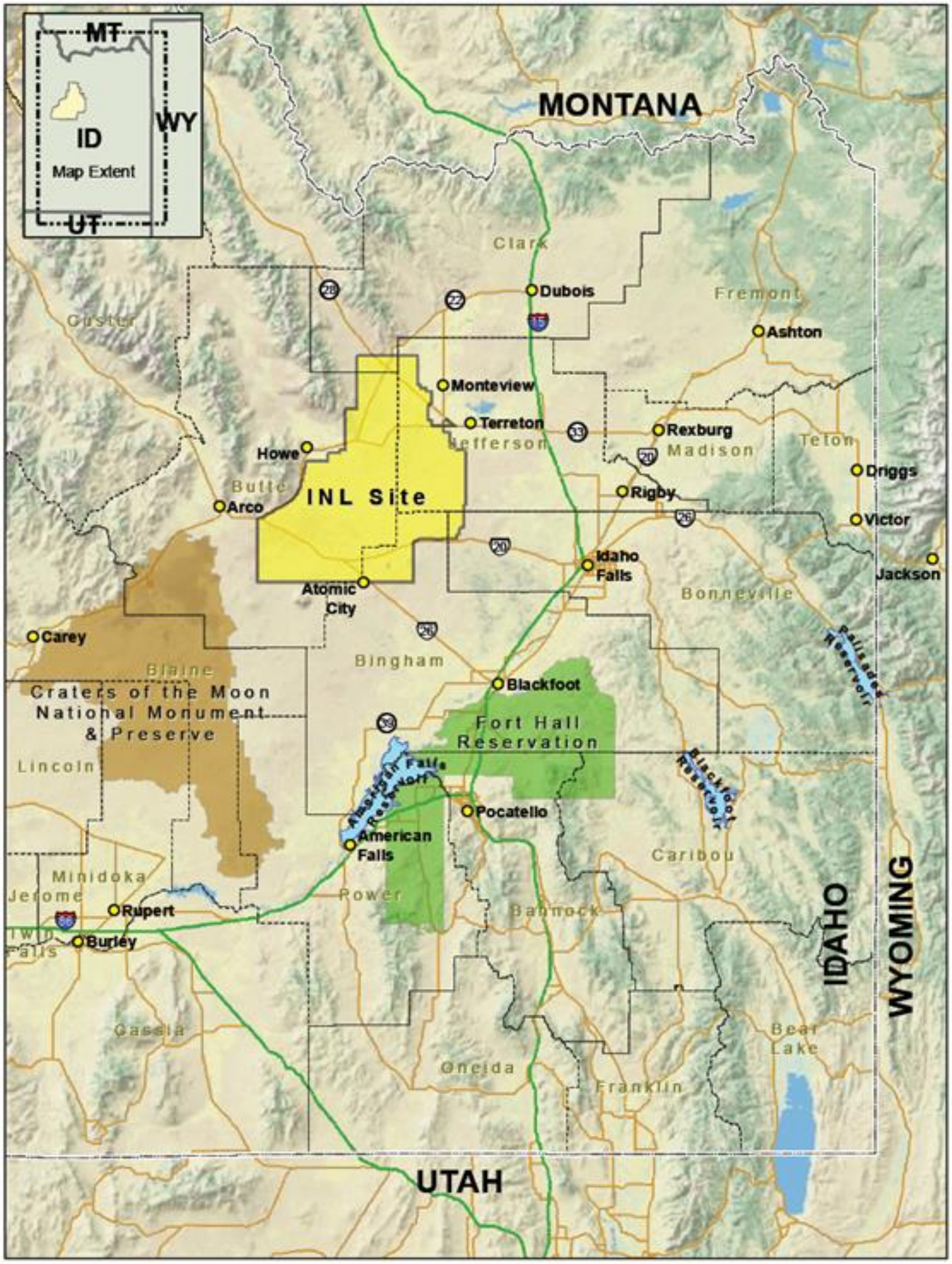

Figure 1. Location of the Idaho National Laboratory Site.

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 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 2018 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.

3.1 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 2018 (Figure 2). Three of these samplers are located on the INL Site, seven are situated off the INL Site near the boundary, and eight 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 2018, one replicate sampler was moved to Blue Dome (a Boundary location) and one was moved to Atomic City (also a Boundary location). An average of 20,615 ft^3 (584 m^3) of air was sampled at each location, each week, at an average flow rate of 2.05 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.

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. Gross alpha data were tested for normality prior to statistical analyses, and generally showed no consistent discernible distribution. The data are graphically shown in Figures 3 through 6. Box and whiskers plots were used to present the non-parametric data. As shown in the figures all data were below were well below the DCS for $^{239/240}$Pu, the most conservative value for a human-made alpha-emitting radionuclide that might be detected at the INL Site. Nothing unusual was noted in the gross alpha data and all were well within measurements taken within the last ten years (2008-2017).

Outliers and extreme values were retained in subsequent statistical analyses because they are within the range of measurements made in the past ten years, and because these values could not be attributed to mistakes in collection, analysis, or reporting procedures.

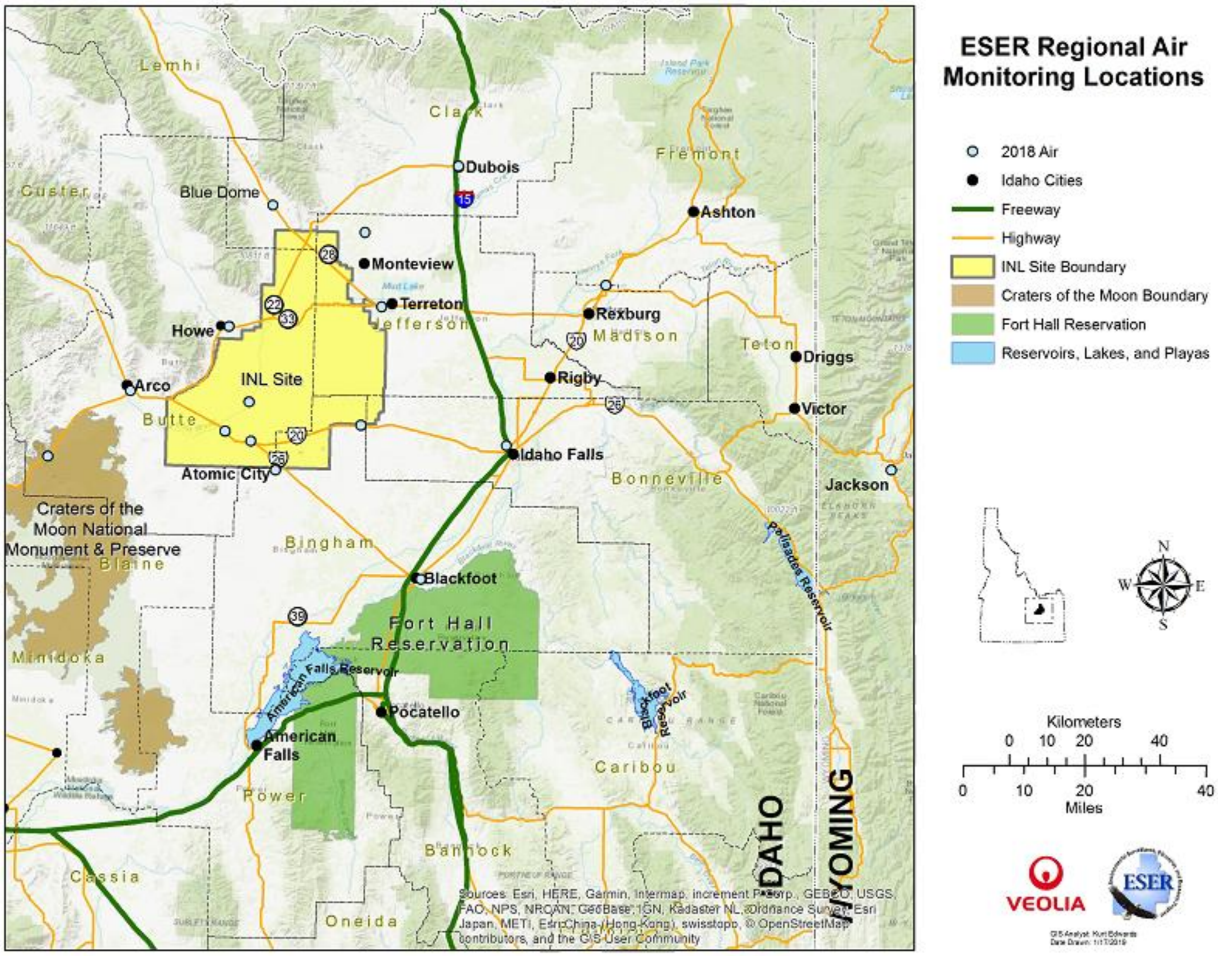

Figure 2. ESER air monitoring locations.

Because there is no discernible distribution of the data, the nonparametric Kruskal-Wallis (K-W) test of multiple independent groups was used to test if there are 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 groups if the (p) value is less than 0.05. Values greater than 0.05 translate into a 95 percent confidence that the groups are statistically the same. The p value for each comparison is shown in Table D-1. The results show that there were no differences between location groups during the fourth quarter or during the months of October, November and December.

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 to present the non-parametric data. Outliers and extreme values were retained in subsequent statistical analyses because they are within the range of measurements made in the past ten years, and because these values could not be attributed to mistakes in collection, analysis, or reporting procedures. There was no statistically significant difference in the data between groups for the quarter as a whole using the Kruskal-Wallis ANOVA by ranks test (Table D-1). There were also no statistical differences between location groups during any month of the quarter.

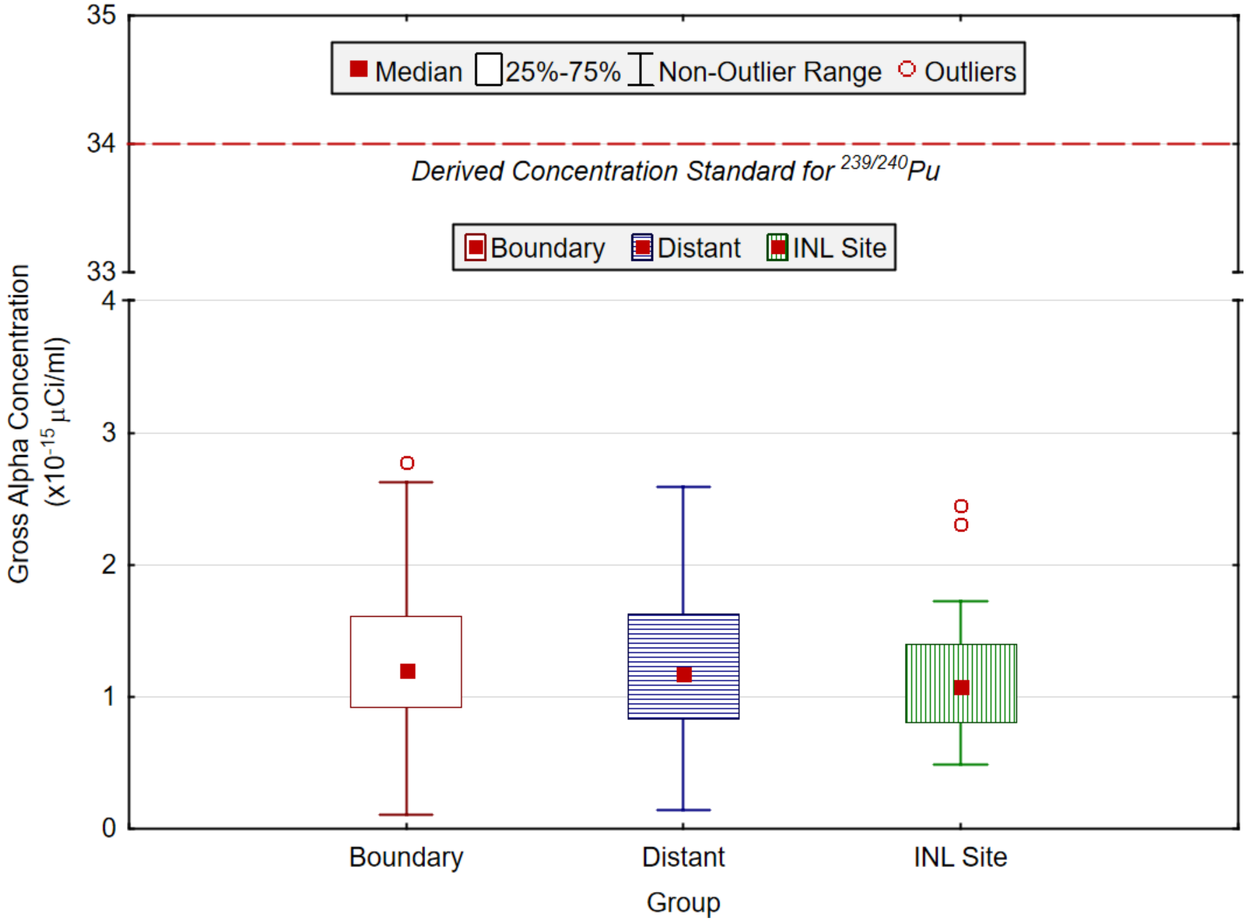

Figure 3. Gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations for the fourth quarter of 2018. The DOE Derived Concentration Standard (DCS) is the concentration of plutonium-239 ($^{239/240}Pu$) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}Pu$ is shown because it is the most restrictive human-made alpha emitter.

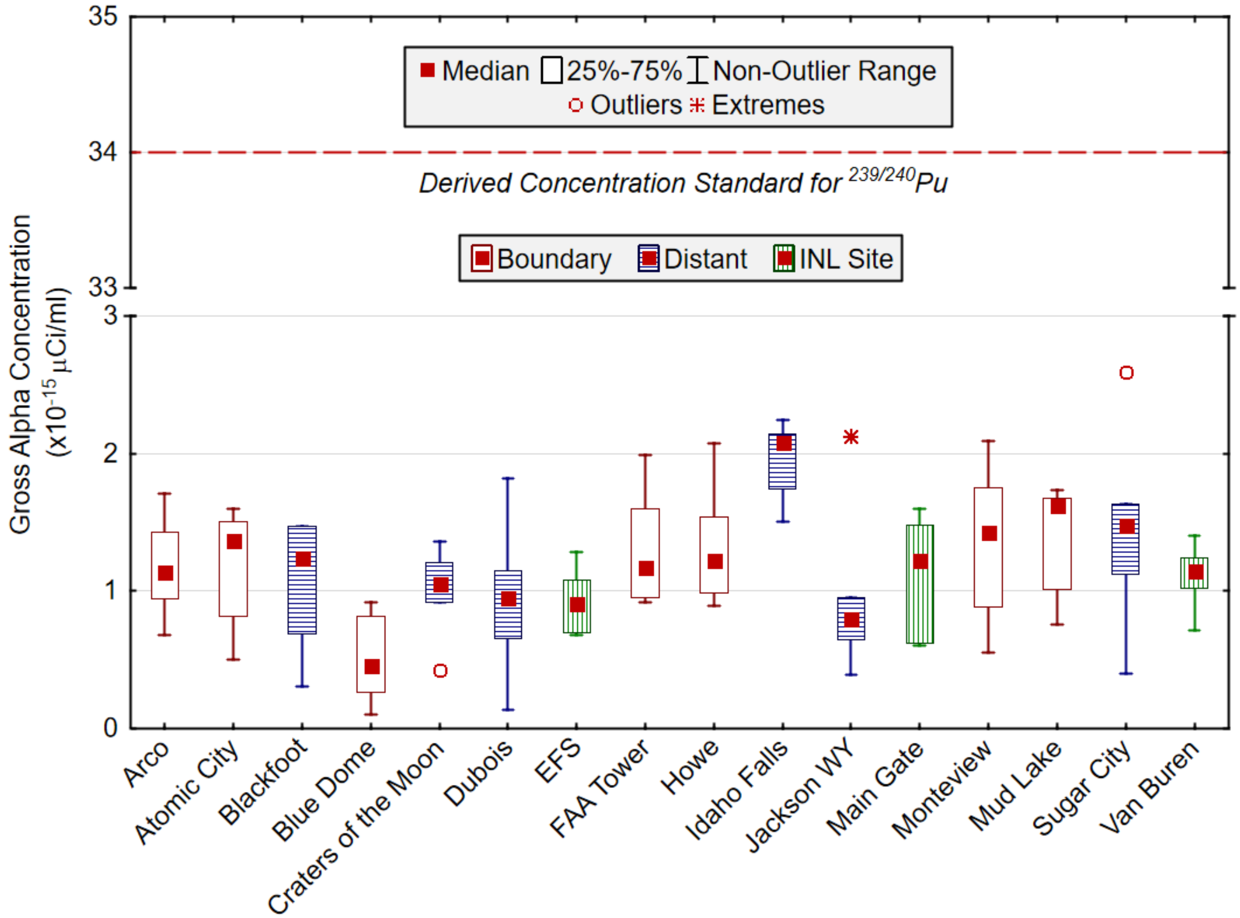

Figure 4. October gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 5 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}Pu$) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}Pu$ is shown because it is the most restrictive human-made alpha emitter.

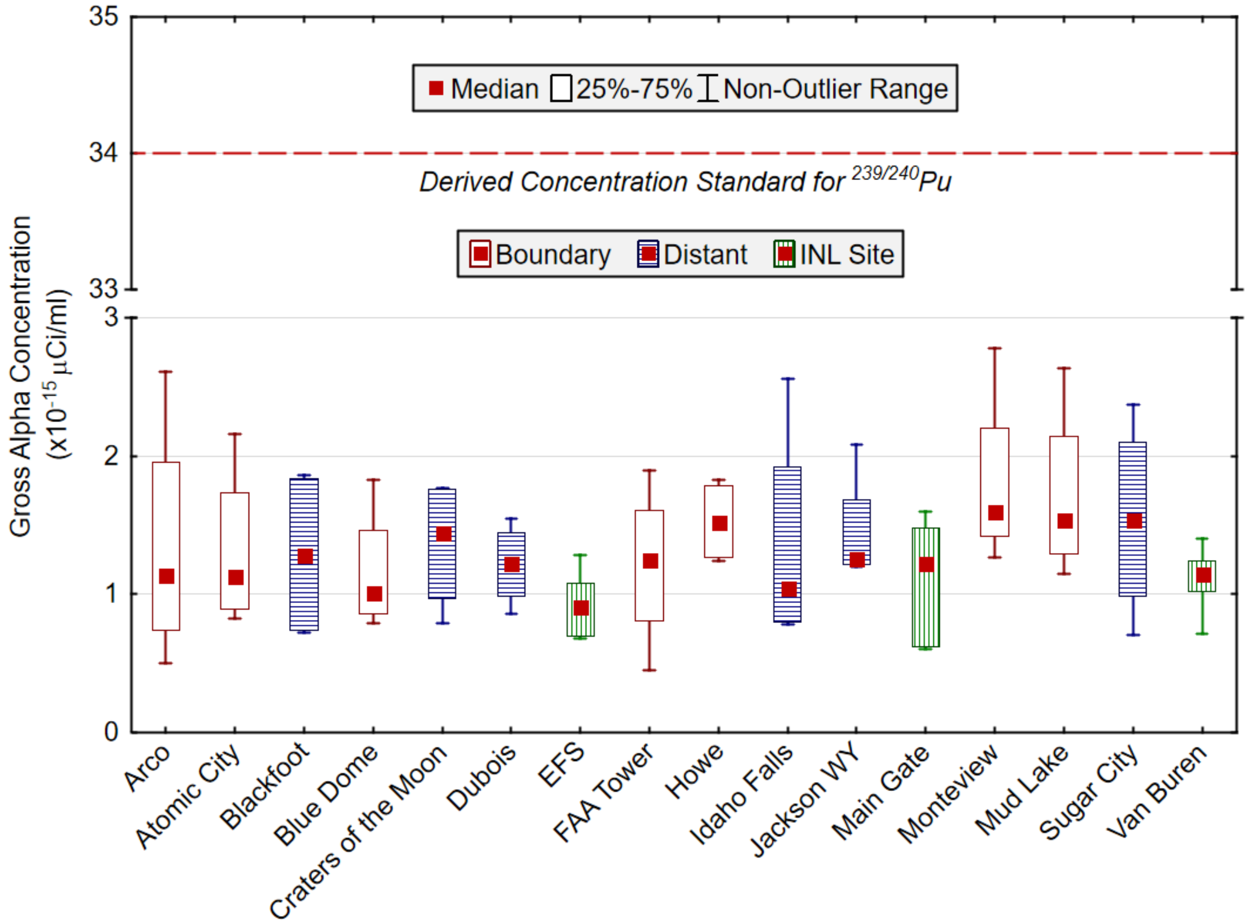

Figure 5. November gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}Pu$) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}Pu$ is shown because it is the most restrictive human-made alpha emitter.

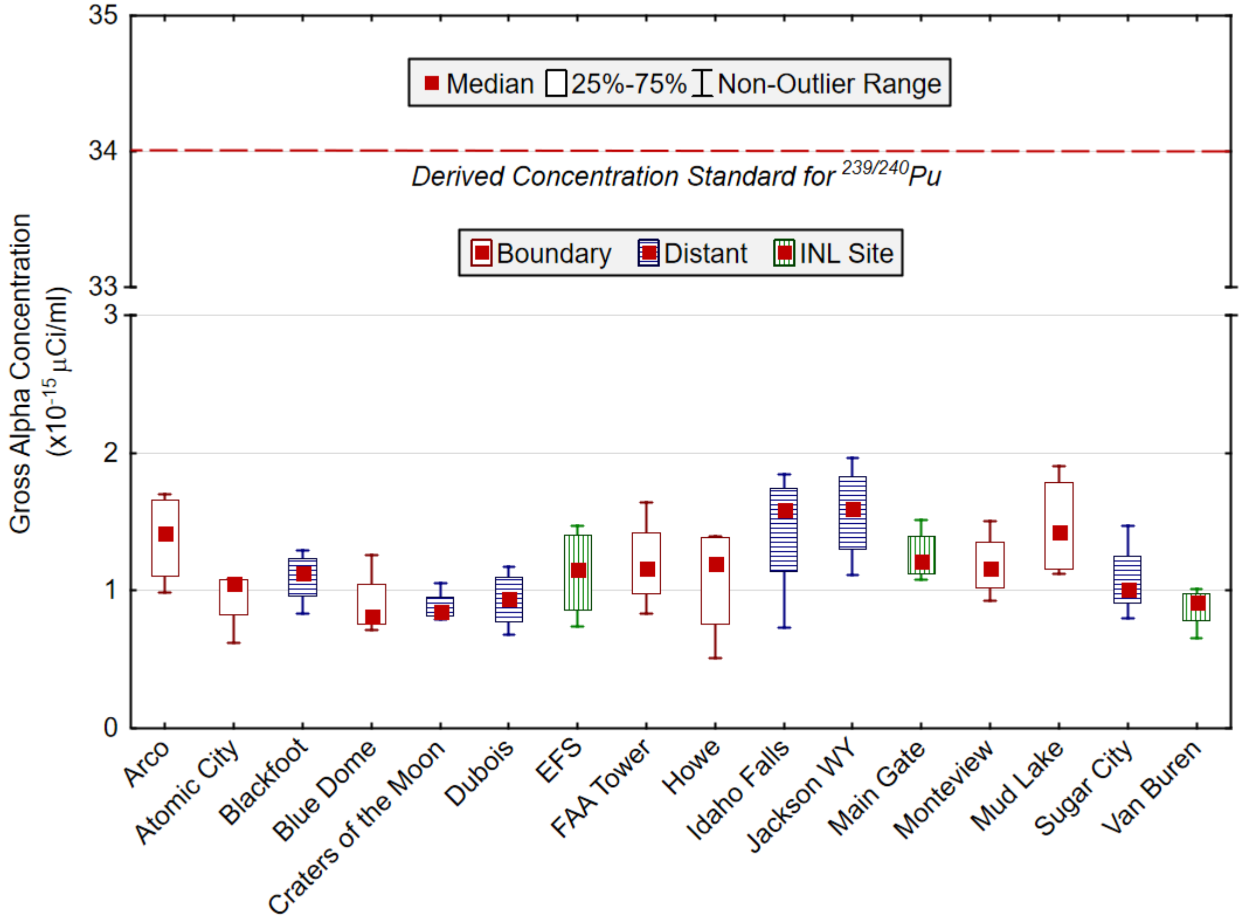

Figure 6. December gross alpha concentrations in air at ESER INL Site, Boundary, and Distant locations. Number of samples (N) = 4 at each location. The Derived Concentration Standard (DCS) is the concentration of plutonium-239/240 ($^{239/240}Pu$) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{238}U, ^{234}U, ^{232}Th, ^{226}Ra and ^{210}Po) in uncertain proportions, a meaningful DCS cannot be constructed for gross alpha concentrations. The DCS for $^{239/240}Pu$ is shown because it is the most restrictive human-made alpha emitter.

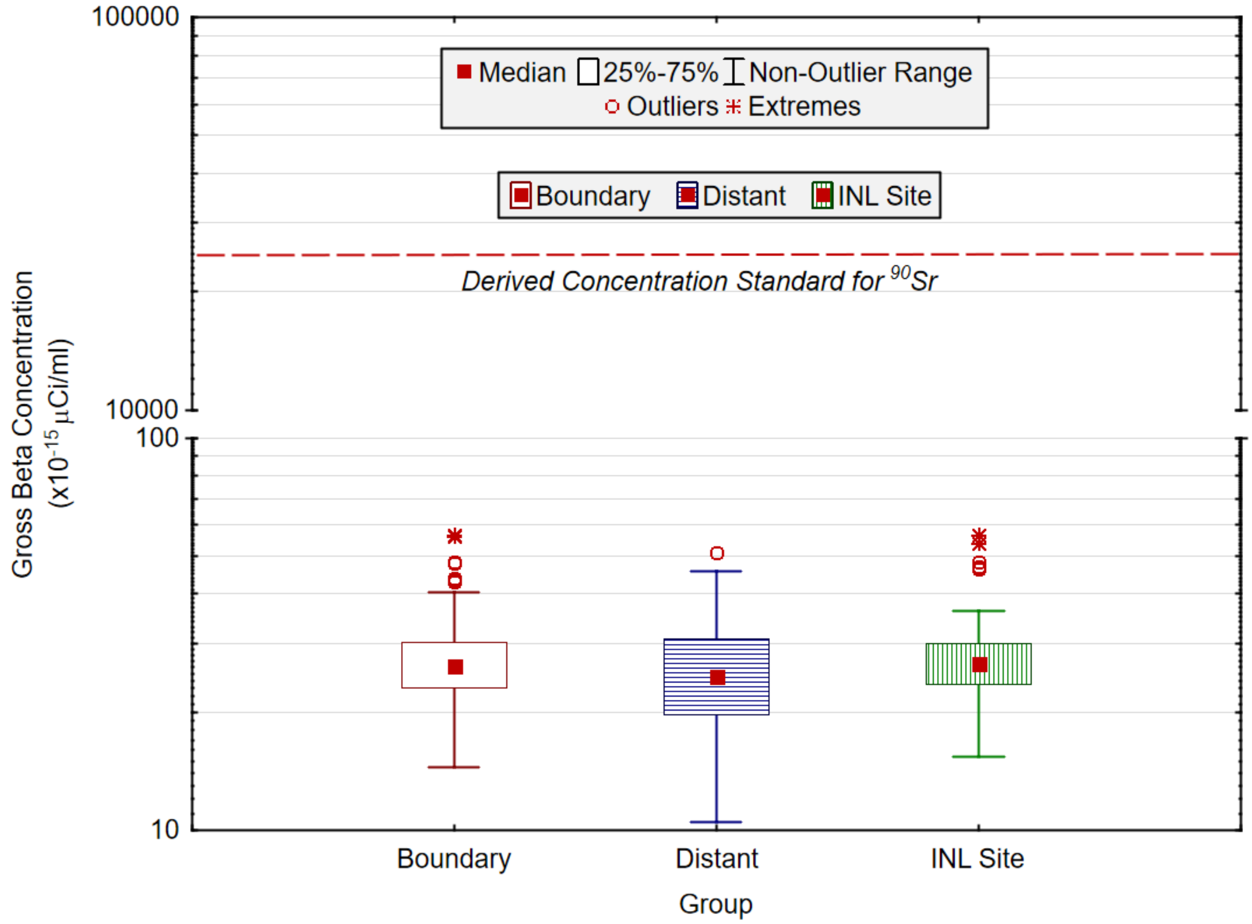

Figure 7. Gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations for the fourth quarter of 2018. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

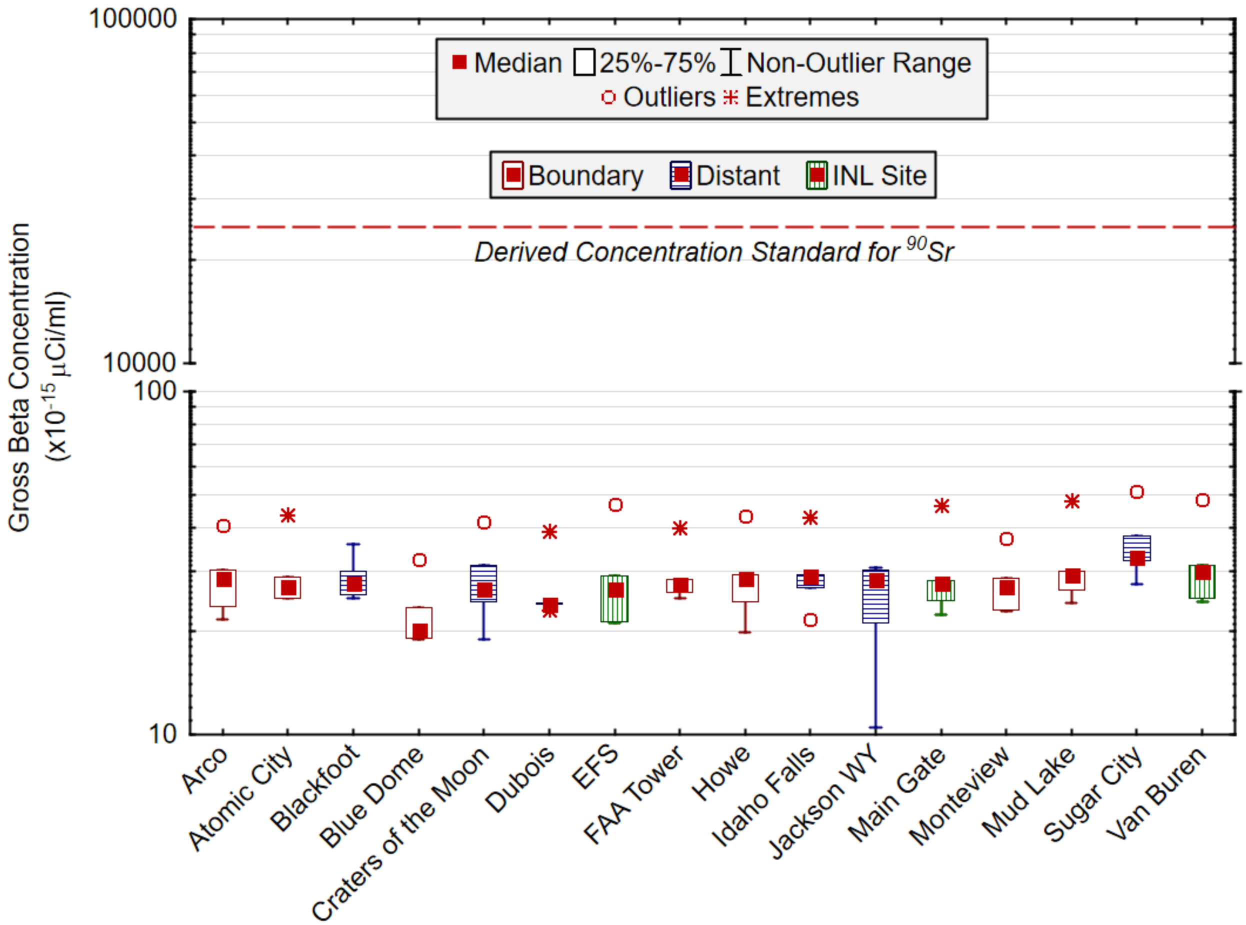

Figure 8. October gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

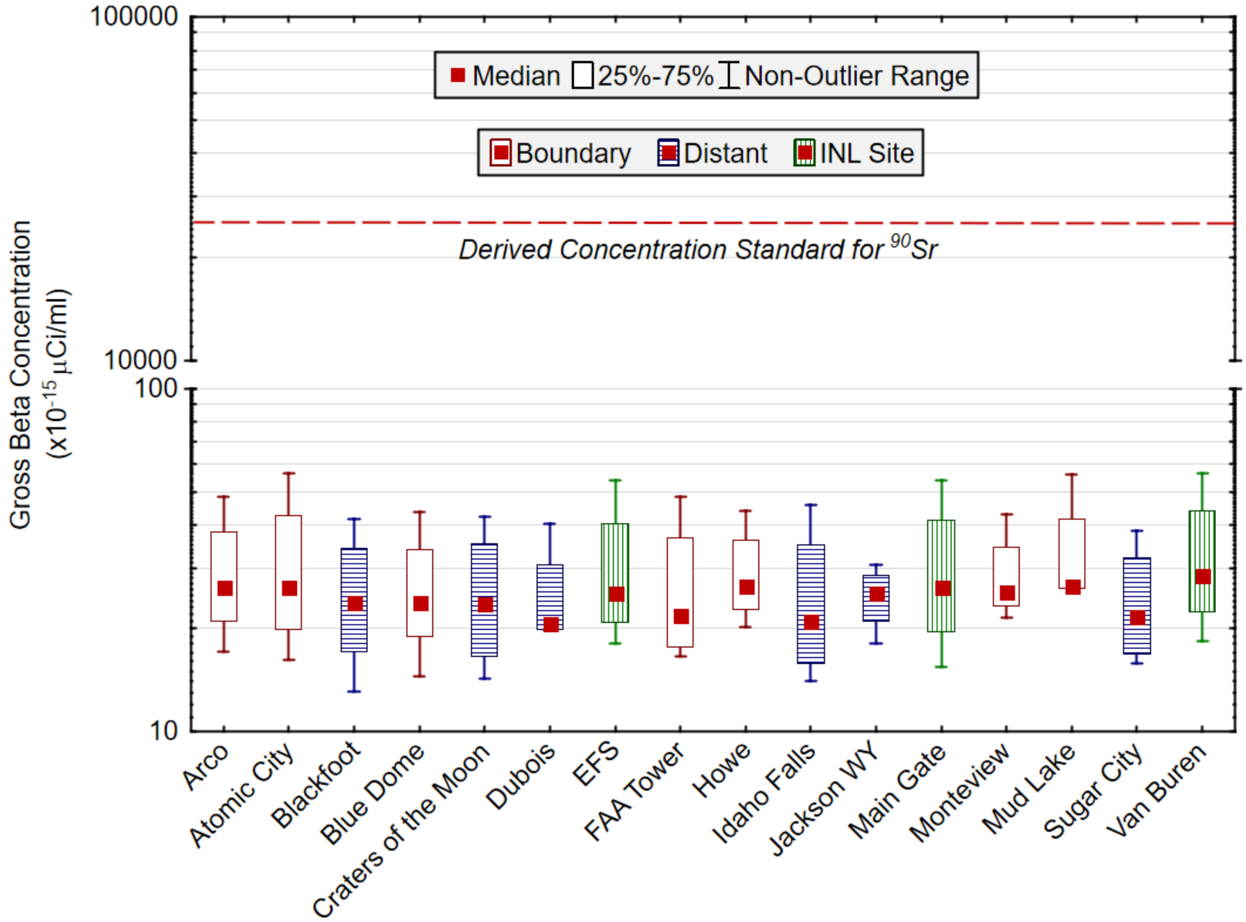

Figure 9. November gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

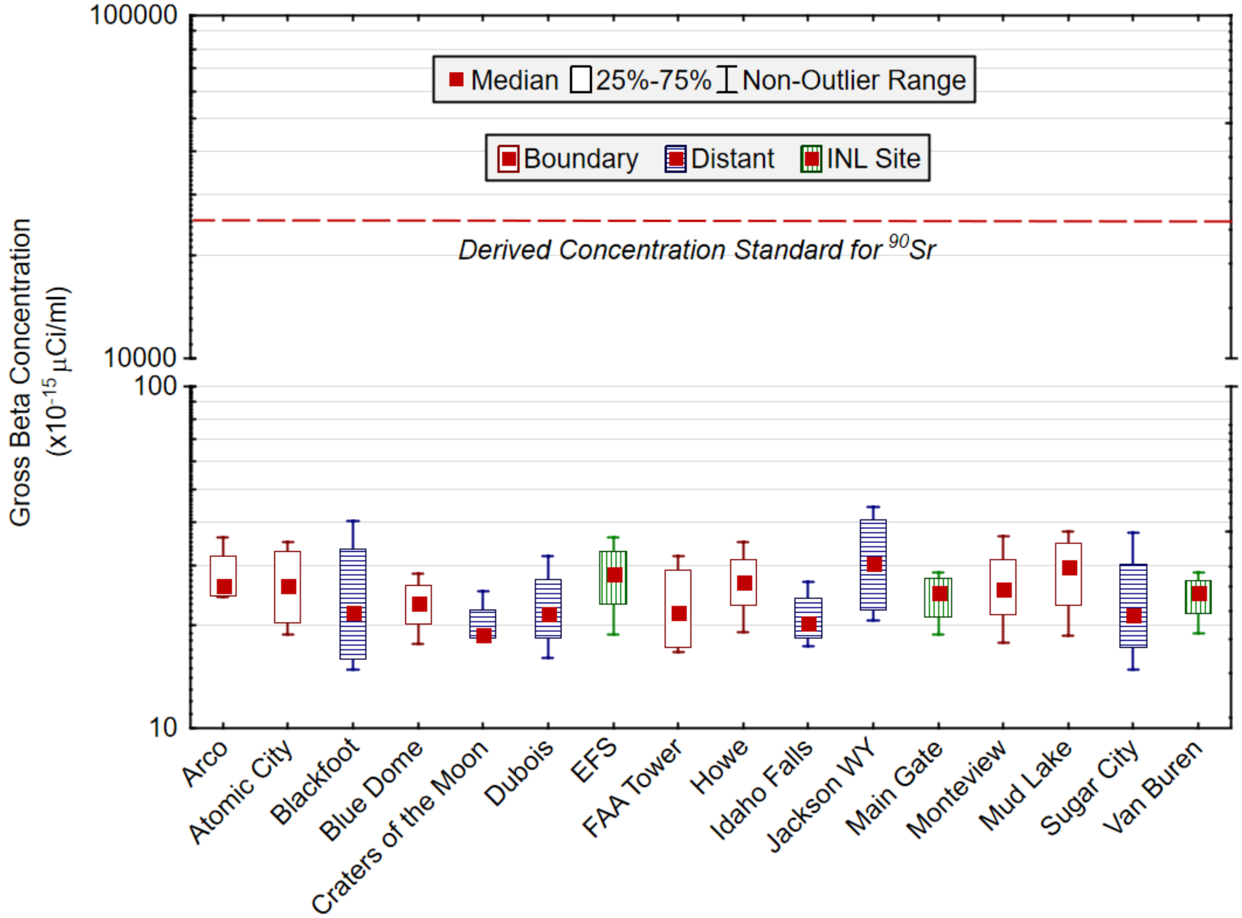

Figure 10. December gross beta concentrations in air at ESER INL Site, Boundary, and Distant locations. The Derived Concentration Standard (DCS) is the concentration of strontium-90 (^{90}Sr) in air which, if inhaled for a year, would result in a dose of 100 mrem/yr. Because the measurements include naturally occurring radionuclides (such as ^{40}K, ^{228}Ra, and ^{210}Pb) in uncertain proportions, a meaningful DCS cannot be constructed for gross beta concentrations. The DCS for ^{90}Sr is shown because it is the most restrictive human-made beta emitter.

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.

The results of analyses of quarterly composited filters are presented in Table C-3 of Appendix C. No ^{137}Cs or other human-made gamma-emitting radionuclides were found in quarterly composited filters. Srontium-90, a beta-emitting radionuclide, was not detected in any composite sample. Americium-241, Plutonium-238, and -239/240, alpha-emitting radionuclides, were also not detected in any composite sample.

3.2 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 eleven atmospheric moisture samples collected at the INL Site, Boundary, and Distant locations during the fourth quarter of 2018 (Figure 11). Five of the results exceeded the 3s uncertainty level for tritium, with similar results to those reported during the past ten years (2008-2017). Results also remain similar between the four sampling locations. All samples were significantly below the DOE DCS for tritium in air of 1.4 x 10^{-8} $\mu Ci/mL_{air}$ with a maximum reported value of 14.0 x 10^{-13} $\mu Ci/mL_{air}$ at EFS. Results are shown in Table C-4, Appendix C.

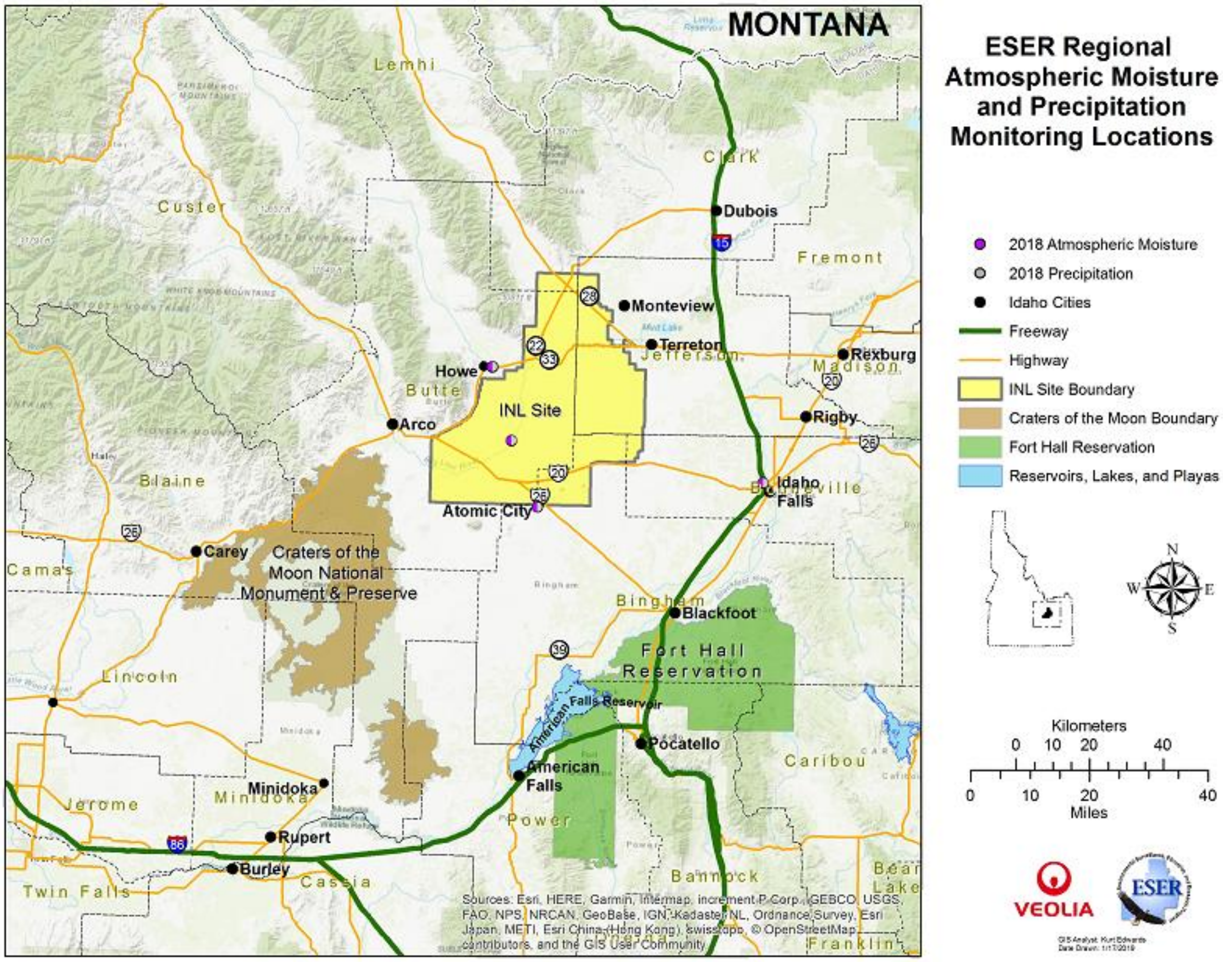

Figure 11. Moisture and precipitation monitoring locations.

4. Precipitation and Water Sampling

4.1 Precipitation Sampling

Precipitation samples are gathered when enough precipitation occurs to allow for the collection of the minimum sample volume of approximately 50 mL (Figure 11). Samples are taken of monthly composites from Idaho Falls, and weekly (when available) from the EFS on the INL Site and Atomic City and Howe on the INL Site boundary. These are the same locations where atmospheric moisture samples are collected. Precipitation samples are analyzed for tritium. Storm events in the fourth quarter of 2018 produced sufficient amounts of precipitation to yield 17 samples.

Tritium was measured above the 3s values in five of the 17 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. Long-term data collected around the globe since 1961 by the International Atomic Energy Agency suggest that that tritium levels have steadily decreased since the Nuclear Test Ban Treaty in 1963 and are close to their pre-nuclear test values (Cauquoin et al. 2015) and that there are no longer 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 2019). 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 175 pCi/L in an EFS sample collected on October 10.

4.2 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 detected in four of the nine drinking water samples and in one of the four surface water samples. Gross beta activity was detected in seven of the nine drinking water samples (all except the control and Howe), 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 7.74 pCi/L in the sample from Alpheus Spring near Twin Falls. This location has historically shown the highest levels of natural activity.

Tritium was not detected in any of the nine drinking water samples but was found in one of the four surface water samples. The concentration of 82 pCi/L was similar to those found in atmospheric moisture and precipitation samples and were consistent with previous results The result was well below the DCS of 1.9 x 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 third or 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 waterfowl samples available during the fourth quarter of 2018.

5.1 Milk Sampling

Milk samples were collected weekly at Idaho Falls and Terreton. Monthly samples were collected at four other locations around the INL Site (Figure 12) during the fourth quarter of 2018. 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 ^{131}I. Semi-annual samples were collected and analyzed for ^{90}Sr and tritium during the fourth quarter.

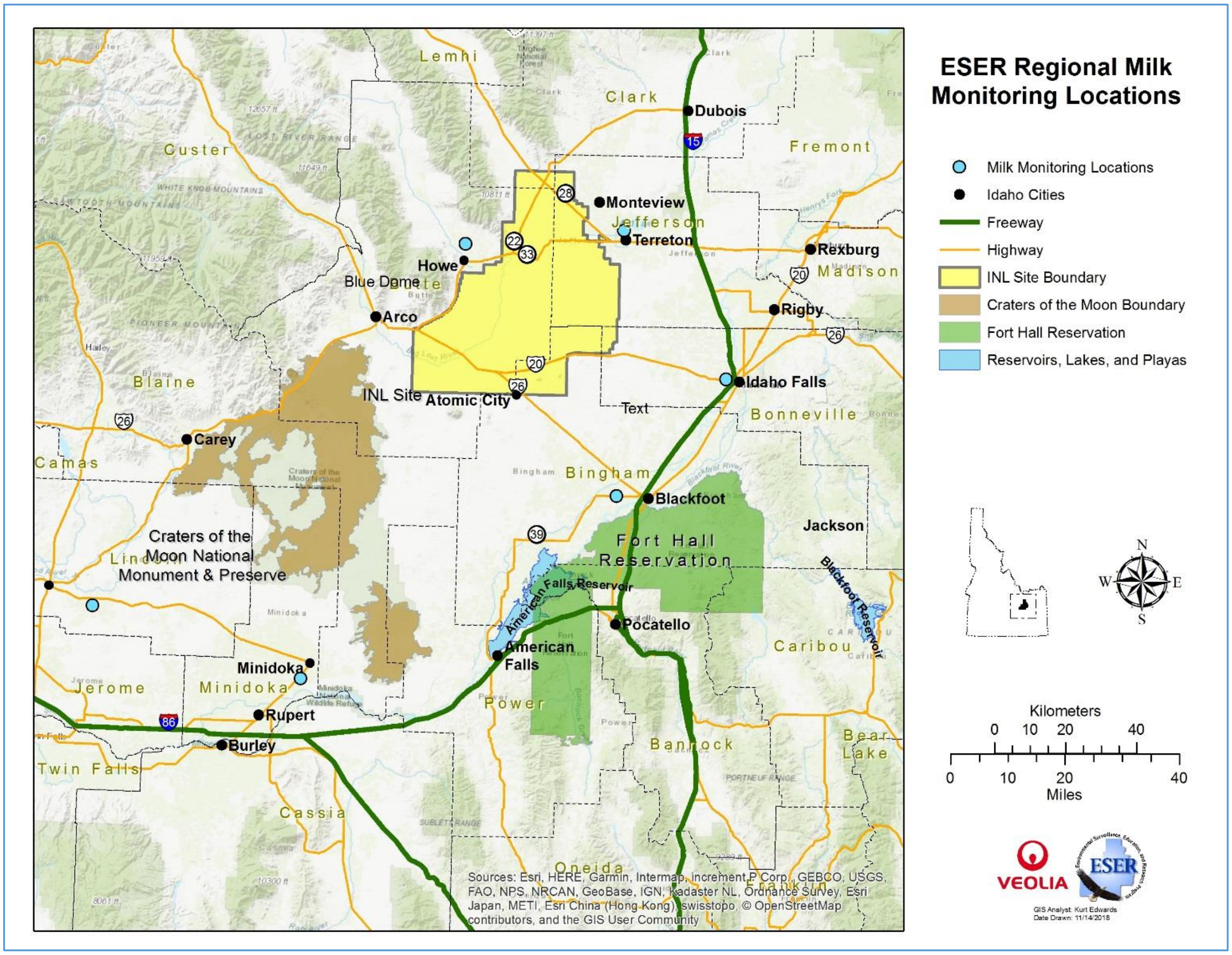

Figure 12. ESER milk monitoring locations.

Neither ^{131}I nor ^{137}Cs was 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.

Results for ^{90}Sr and tritium are listed in Appendix C, Table C-8. Strontium-90 was not detected in any of the samples analyzed this quarter.

Tritium was detected in one of seven samples analyzed, with a value of 88 pCi/L in the sample from Dietrich at a concentration similar to those previously measured and 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 x 10^6 pCi/L).

5.2 Large Game Animal Sampling

No large game animals were sampled during the fourth quarter.

5.3 Waterfowl

Waterfowl are collected each year by the ESER contractor at a wastewater pond on the INL Site and at a location off the INL Site. Four waterfowl were collected from a pond located at the Advanced Test Reactor (ATR) Complex. Two control waterfowl were collected from the Market Lake area near Roberts. Each sample was divided into the following three sub-samples: 1) edible tissue (muscle, gizzard, heart, and liver), 2) external portion (feathers, feet, and head), and 3) all remaining tissue. All samples were analyzed for gamma-emitting radionuclides, ^{90}Sr, and actinides (americium-241 [^{241}Am], plutonium-238 [^{238}Pu], and plutonium-239/240 [$^{239/240}$Pu]). These radionuclides were selected because they have historically been measured in liquid effluents from some INL Site facilities.

A total of four human-made radionuclides were detected in edible, exterior, and remainder sub-samples from ducks collected at the ATR Complex ponds (Table 1). These were cobalt-60 (^{60}Co), zinc-65 (^{65}Zn), ^{90}Sr, and ^{137}Cs. Of these four nuclides, all but ^{90}Sr were found in the edible tissues (Appendix C, Table C-9). During the summer of 2020, a review of Appendix C, Table C-9 determined the activity concentration values reported for the media were correct, however, the unit of concentration [(x10^{-5}) pCi/g] listed in one of the column headings was incorrect. Prior to 2010, concentrations were reported in either pCi/g or pCi/kg. In 2010, the concentration unit of pCi/kg was adopted for reporting radionuclide concentrations in soil and biota (vegetation and animals). The reasons for doing this include: 1) the use of one unit (pCi/kg) ensures consistency and comparability in reporting concentrations in various media, 2) the use of one unit (pCi/kg) minimizes mistakes (due to confusion about units) in data entry into the database, and 3) the unit of pCi/kg was selected because it is the unit associated with models that are used for dose calculations and the results tend to be whole numbers (e.g. 14 pCi/kg versus 0.014 pCi/g). The column heading has been updated to the correct units of concentration [(x10^{-2}) Bq/kg]. No human-made radionuclides were detected in either of the control ducks.

Table 1. Radionuclide Concentrations Detected in Waterfowl Collected in 2018.

Radionuclides Detected in Waterfowl Tissue (pCi/kg dry weight)				
Location	**Species**	**Portion**	**Radionuclide**	**Concentration**
ATR Complex Ponds	Green-winged Teal	Edible	^{60}Co	963 ± 17
			^{65}Zn	2,120 ± 119
			^{137}Cs	579 ± 38
		Exterior	^{60}Co	612 ± 36
			^{90}Sr	42 ± 4
			^{65}Zn	1330 ± 92
			^{137}Cs	264 ± 22
		Remainder	^{60}Co	982 ± 14
			^{65}Zn	3030 ± 159
			^{90}Sr	326 ± 10
			^{137}Cs	453 ± 29
	Green-winged Teal	Edible	^{60}Co	19 ± 5
		Exterior	^{60}Co	18 ± 5
		Remainder	^{60}Co	129 ± 8
			^{65}Zn	169 ± 21
			^{90}Sr	15 ± 8
	Bufflehead	Remainder	^{90}Sr	16 ± 4
	Bufflehead	Exterior	^{60}Co	109 ± 9
			^{90}Sr	62 ± 5

The maximum potential dose from eating 225 g (8 oz) of duck meat collected in 2018 was calculated. Doses from consuming waterfowl are conservatively based on the assumption that ducks are eaten immediately after leaving the pond and no radioactive decay occurs. The maximum potential dose of 0.016 mrem from these waterfowl samples is much lower than the doses estimated for 2015 (0.49 mrem) and somewhat lower than those in 2017 (0.046 mrem). The Hypalon™ liner was replaced in the west disposal pond in 2016 and associated debris was removed with the liner and is no longer available to waterfowl.

6. Environmental Radiation

An array of thermoluminescent dosimeters (TLDs) is distributed throughout the Eastern Snake River Plain to monitor for environmental radiation. Beginning in November 2011, the ESER Program also maintains optically stimulated luminescent dosimeters (OSLDs) in the same locations (Figure 13) as the TLDs to run a side-by-side comparison of the two dosimeter technologies. Two OSLDs are in place at each location. TLDs and OSLDs are changed out at the beginning of May and again at the beginning of November after six months in the field. Both sets of dosimeters are currently analyzed by the ISU Environmental Assessment Laboratory.

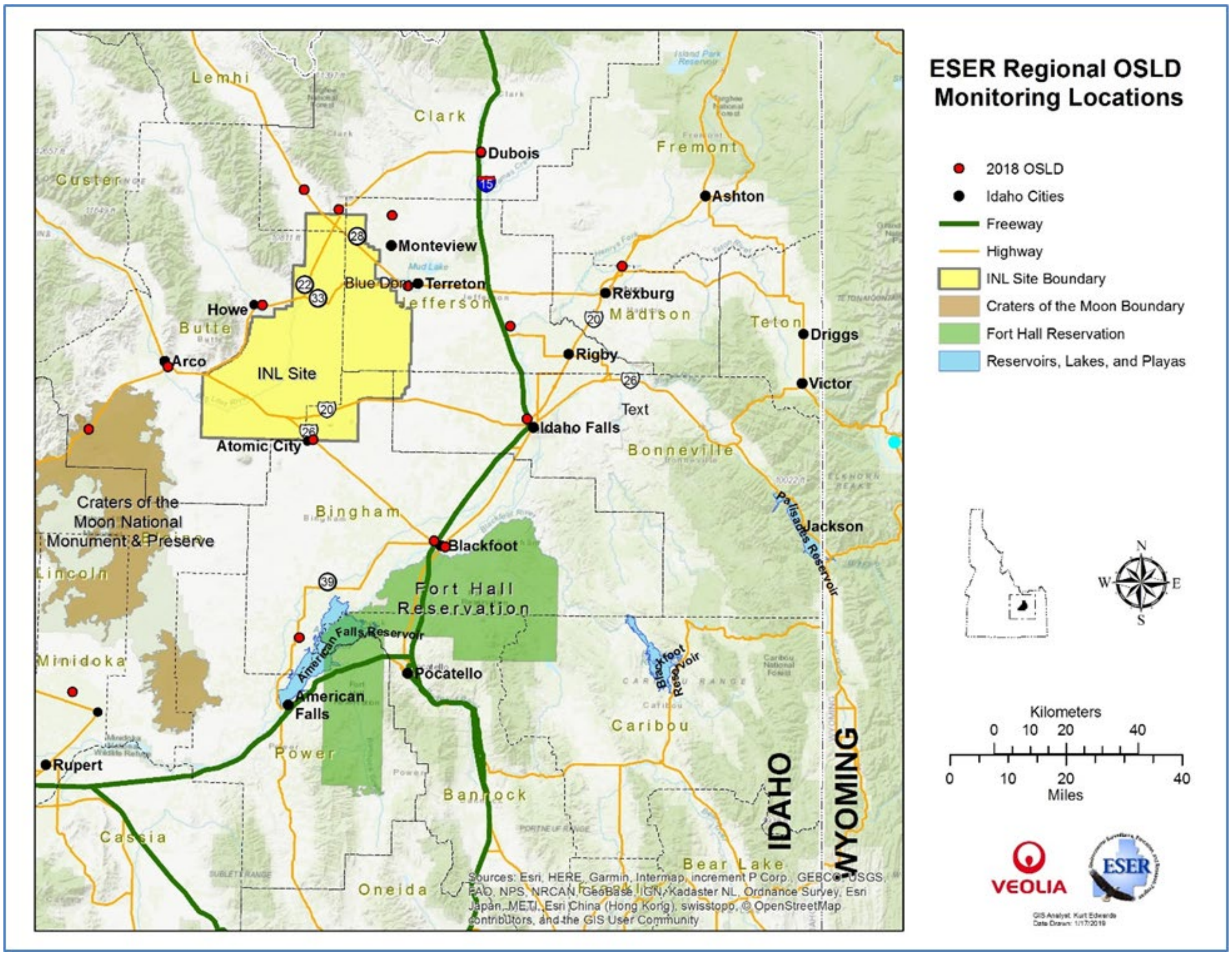

Figure 13. ESER optically stimulated luminescent dosimeter (OSLD) locations.

Thermoluminescent dosimeters were read by the ICP contractor through 2015. In 2016 ISU assumed responsibility for the TLD analysis effort with the transfer of the TLD readers to the ISU radiological sciences laboratory. When the device was operated by the ICP contractor, they employed a proprietary software package that was not transferred to ISU. Idaho State University personnel located commercially available software (WINREMS) and successfully installed it at the end of 2016. They spent most of 2017 developing a set of operational procedures applicable to the WINREMS software. At the time several side by side experimental measurements were made and evaluated to compare TLD results with OSLD results. To accomplish this effort, several TLDs and OSLDs were sent to the DOE Radiological and Environmental Sciences Laboratory (RESL) to be irradiated at predetermined exposures and calibration geometries. The results were evaluated by Dr. Craig Yoder[1] and he made four main observations:

1. The two systems do not measure the same radiological quantity. The TLD system is calibrated to measure the quantity exposure, measured in units of Roentgen. The OSLD system is calibrated to measure the quantity ambient dose equivalent (H*(1)), expressed in units of rem.
2. The OSLD system measured its intended quantity (i.e., reference irradiation dose) to within 1%.
3. The TLD system exhibited a negative bias (~11%) for the quantity for which it was calibrated. This calibration bias needs to be assessed further.
4. The OSLD reader uses software which employs a control dose of 6.4 mrem, which is subtracted from the final semiannual doses. The control dose should only be about 1 or 2 mrem. It is recommended that a control dose of 1.4 mrem be used so that the results reported to ESER will need to be increased by 5 mrem.

Based on these observations, the TLD system will be studied further in 2019 to verify that the negative bias exists and possible sources of this bias. The TLD results will not be reported until this study is completed.

OSLD results from the fourth quarter are reported in Appendix C, Table C-10). OSLDs are presented in dose units of millirem (mrem). Boundary OSLD values ranged from 56.01 mrem at Blue Dome to 68.46 mrem at Mud Lake, with an overall average of 60.99 mrem. Distant results varied from 51.37 mrem at Dubois to 78.25 mrem at Sugar City. The Distant average was 60.81 mrem. The results are about 5 mrem higher than the 2017 results due to the fact the OSLD reader output was adjusted by 5 mrem, to account for a change in the control dose (see bullet #4 above). The second quarter results were also adjusted, and the report was revised.

7. Quality Assurance

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

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[1] Dr. Yoder is a member of National Council on Radiation Protection and former President of the Council on Ionizing Radiation Measurements and Standards. He has served on several national and international committees to develop dosimetry standards. He was a member of a National Research Council committee that examined the accuracy of film badge measurements made during atmospheric nuclear weapons testing. Dr. Yoder directed Landauer's technical activities relating to radiation dosimetry, particularly for applications in radiation protection, from 1983 through his retirement in 2015. An internationally known expert in radiation monitoring, Dr. Yoder led Landauer's transition from film and thermoluminescent dosimetry technology to optically stimulated luminescence.

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 (VNSFS 2018). 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 2018 (VNSFS 2019).

8. References

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VNSFS, 2019, Environmental Quality Assurance Report for the 4th Quarter 2018, Environmental Surveillance, Education, and Research Program.

APPENDIX A

SUMMARY OF SAMPLING SCHEDULE

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

Sample Type and 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	Idaho Falls	Atomic City, Howe	EFS
PRECIPITATION				
Tritium	monthly	Idaho Falls	None	None
Tritium	weekly	None	Atomic City, Howe	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, 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
FOODSTUFF SAMPLING				
MILK				
Gamma Spec (^{131}I)	weekly	Idaho Falls	Terreton	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	Idaho Falls	Howe, 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 2018

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)
Air (particulate filter)[e]	Gross alpha[c]	5.0×10^{-16} µCi/mL	3.4×10^{-14} µCi/mL
	Gross beta[d]	1.1×10^{-15} µCi/mL	2.5×10^{-11} µCi/mL
	^{137}Cs	1.1×10^{-16} µCi/mL	9.8×10^{-11} µCi/mL
	^{90}Sr	3.4×10^{-17} µCi/mL	2.5×10^{-11} µCi/mL
	^{241}Am	1.0×10^{-17} µCi/mL	4.1×10^{-14} µCi/mL
	^{238}Pu	1.0×10^{-17} µCi/mL	3.7×10^{-14} µCi/mL
	$^{239/240}Pu$	1.0×10^{-17} µCi/mL	3.4×10^{-14} µCi/mL
Air (charcoal cartridge)[e]	^{131}I	7.6×10^{-16} µCi/mL	2.3×10^{-19} µCi/mL
Air (atmospheric moisture)	^{3}H	92.2 pCi/L_{water} 3.7×10^{-13} $\mu Ci/mL_{air}$	2.1×10^{-7} $\mu Ci/mL_{air}$
Air (precipitation)	^{3}H	89.4 pCi/L	1.9×10^{-3} µCi/mL
Drinking/Surface Water	Gross alpha[c]	0.9 pCi/L	170 pCi/L
	Gross beta[d]	1.4 pCi/L	1,100 pCi/L
	^{3}H	94.6 pCi/L	1,900,000 pCi/L
Milk	^{131}I	0.5 pCi/L	--[f]
	^{137}Cs	1.0 pCi/L	--
	^{3}H	91.3 pCi/L	--
	^{90}Sr	0.10 pCi/L	--
	^{90}Sr	63.6 pCi/kg	--
Waterfowl	^{137}Cs	6.1 pCi/kg	--
	^{90}Sr	10.0 pCi/kg	--
	^{241}Am	9.2 pCi/kg	--
	^{238}Pu	11.8 pCi/kg	--
	$^{239/240}Pu$	13.5 pCi/kg	--

Sample Type	Analysis	Average Minimum Detectable Concentration[a] (MDC)	Derived Concentration Standard[b] (DCS)

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 for air is based on an average filtered air volume (pressure corrected) of 445 m^3/week. The MDCs for lettuce, potatoes, grain and soil are per dry weight.
f. No appropriate DCS available

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 (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s	GROSS BETA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
BOUNDARY															
ARCO	10/3/2018	0.94	±	0.23	3.49	±	0.86	Yes	30.20	±	0.70	111.74	±	2.59	Yes
	10/10/2018	1.14	±	0.18	4.22	±	0.66	Yes	21.60	±	0.61	79.92	±	2.27	Yes
	10/17/2018	0.68	±	0.20	2.52	±	0.75	Yes	28.60	±	0.67	105.82	±	2.48	Yes
	10/24/2018	1.43	±	0.29	5.29	±	1.08	Yes	40.50	±	0.82	149.85	±	3.02	Yes
	10/31/2018	1.71	±	0.24	6.33	±	0.90	Yes	23.60	±	0.63	87.32	±	2.35	Yes
	11/7/2018	0.98	±	0.22	3.63	±	0.82	Yes	17.10	±	0.58	63.27	±	2.13	Yes
	11/14/2018	1.30	±	0.23	4.81	±	0.85	Yes	27.70	±	0.67	102.49	±	2.49	Yes
	11/21/2018	2.61	±	0.28	9.66	±	1.04	Yes	48.40	±	0.86	179.08	±	3.17	Yes
	11/28/2018	0.50	±	0.21	1.86	±	0.77	No	25.00	±	0.66	92.50	±	2.44	Yes
	12/5/2018	1.22	±	0.22	4.51	±	0.81	Yes	27.80	±	0.69	102.86	±	2.54	Yes
	12/13/2018	1.70	±	0.23	6.29	±	0.86	Yes	36.00	±	0.74	133.20	±	2.73	Yes
	12/19/2018	1.61	±	0.27	5.96	±	1.01	Yes	24.20	±	0.73	89.54	±	2.68	Yes
	12/26/2018	0.99	±	0.22	3.66	±	0.81	Yes	24.40	±	0.66	90.28	±	2.43	Yes
ATOMIC CITY	10/3/2018	0.50	±	0.21	1.85	±	0.79	No	26.90	±	0.66	99.53	±	2.45	Yes
	10/10/2018	0.82	±	0.16	3.03	±	0.61	Yes	24.90	±	0.64	92.13	±	2.38	Yes
	10/17/2018	1.37	±	0.24	5.07	±	0.88	Yes	28.70	±	0.69	106.19	±	2.55	Yes
	10/24/2018	1.50	±	0.29	5.55	±	1.05	Yes	43.70	±	0.82	161.69	±	3.05	Yes
	10/31/2018	1.60	±	0.24	5.92	±	0.89	Yes	25.00	±	0.66	92.50	±	2.42	Yes
	11/7/2018	0.83	±	0.21	3.06	±	0.79	Yes	16.20	±	0.56	59.94	±	2.08	Yes
	11/14/2018	1.31	±	0.23	4.85	±	0.87	Yes	29.10	±	0.70	107.67	±	2.57	Yes
	11/21/2018	2.16	±	0.27	7.99	±	1.00	Yes	56.40	±	0.92	208.68	±	3.41	Yes
	11/28/2018	0.95	±	0.24	3.52	±	0.88	Yes	23.50	±	0.67	86.95	±	2.48	Yes
	12/5/2018	1.03	±	0.20	3.81	±	0.75	Yes	21.70	±	0.61	80.29	±	2.25	Yes
	12/13/2018	1.09	±	0.20	4.03	±	0.74	Yes	35.00	±	0.71	129.50	±	2.61	Yes
	12/19/2018	1.07	±	0.25	3.96	±	0.93	Yes	30.70	±	0.79	113.59	±	2.93	Yes
	12/26/2018	0.63	±	0.21	2.31	±	0.77	Yes	18.80	±	0.61	69.56	±	2.26	Yes
QA-1	10/3/2018		a			a				a			a		
(ATOMIC CITY)	10/10/2018	1.57	±	0.13	5.81	±	0.47	Yes	28.30	±	0.46	104.71	±	1.69	Yes
	10/17/2018	1.34	±	0.23	4.96	±	0.86	Yes	26.70	±	0.66	98.79	±	2.43	Yes
	10/24/2018	1.22	±	0.28	4.51	±	1.04	Yes	40.00	±	0.81	148.00	±	2.98	Yes
	10/31/2018	1.94	±	0.25	7.18	±	0.91	Yes	22.40	±	0.61	82.88	±	2.26	Yes
	11/7/2018	0.82	±	0.21	3.02	±	0.76	Yes	14.80	±	0.53	54.76	±	1.96	Yes
	11/14/2018	1.47	±	0.23	5.44	±	0.86	Yes	27.50	±	0.66	101.75	±	2.46	Yes
	11/21/2018	1.73	±	0.25	6.40	±	0.91	Yes	49.60	±	0.85	183.52	±	3.16	Yes
	11/28/2018	0.40	±	0.21	1.47	±	0.77	No	21.10	±	0.63	78.07	±	2.35	Yes
	12/5/2018	1.17	±	0.22	4.33	±	0.81	Yes	21.30	±	0.63	78.81	±	2.32	Yes
	12/13/2018	1.52	±	0.22	5.62	±	0.83	Yes	38.70	±	0.75	143.19	±	2.77	Yes
	12/19/2018	1.24	±	0.27	4.59	±	1.00	Yes	29.60	±	0.81	109.52	±	3.00	Yes
	12/26/2018	1.01	±	0.23	3.74	±	0.84	Yes	18.30	±	0.61	67.71	±	2.27	Yes
BLUE DOME	10/3/2018	0.26	±	0.21	0.97	±	0.77	No	20.10	±	0.60	74.37	±	2.23	Yes
	10/10/2018	0.46	±	0.15	1.71	±	0.55	Yes	19.10	±	0.59	70.67	±	2.20	Yes
	10/17/2018	0.82	±	0.22	3.03	±	0.80	Yes	23.40	±	0.64	86.58	±	2.37	Yes
	10/24/2018	0.10	±	0.25	0.38	±	0.91	No	32.30	±	0.76	119.51	±	2.80	Yes
	10/31/2018	0.92	±	0.21	3.40	±	0.78	Yes	19.00	±	0.59	70.30	±	2.19	Yes
	11/7/2018	0.92	±	0.23	3.41	±	0.84	Yes	14.50	±	0.56	53.65	±	2.09	Yes
	11/14/2018	1.10	±	0.24	4.07	±	0.90	Yes	23.50	±	0.69	86.95	±	2.54	Yes
	11/21/2018	1.83	±	0.26	6.77	±	0.97	Yes	43.70	±	0.85	161.69	±	3.15	Yes
	11/28/2018	0.79	±	0.24	2.94	±	0.88	Yes	24.00	±	0.69	88.80	±	2.56	Yes
	12/5/2018	0.84	±	0.19	3.09	±	0.70	Yes	24.00	±	0.61	88.80	±	2.26	Yes
	12/13/2018	0.71	±	0.20	2.64	±	0.73	Yes	22.60	±	0.64	83.62	±	2.37	Yes

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			GROSS ALPHA Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			GROSS ALPHA Result > 3s	GROSS BETA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			GROSS BETA Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			GROSS BETA Result > 3s
	12/19/2018	1.26	±	0.37	4.66	±	1.36	Yes	28.20	±	1.03	104.34	±	3.81	Yes
	12/26/2018	0.79	±	0.22	2.94	±	0.81	Yes	17.60	±	0.60	65.12	±	2.23	Yes
QA-2	10/3/2018	0.84	±	0.24	3.11	±	0.88	Yes	25.70	±	0.68	95.09	±	2.50	Yes
(BLUE DOME)	10/10/2018	0.74	±	0.16	2.75	±	0.60	Yes	22.90	±	0.63	84.73	±	2.32	Yes
	10/17/2018	1.13	±	0.23	4.18	±	0.85	Yes	28.70	±	0.69	106.19	±	2.55	Yes
	10/24/2018	0.82	±	0.27	3.05	±	0.99	Yes	40.20	±	0.81	148.74	±	2.99	Yes
	10/31/2018	1.03	±	0.22	3.81	±	0.80	Yes	26.30	±	0.66	97.31	±	2.46	Yes
	11/7/2018	0.64	±	0.22	2.37	±	0.81	No	19.90	±	0.63	73.63	±	2.33	Yes
	11/14/2018	1.56	±	0.25	5.77	±	0.92	Yes	26.80	±	0.69	99.16	±	2.54	Yes
	11/21/2018	2.18	±	0.27	8.07	±	1.00	Yes	44.50	±	0.84	164.65	±	3.12	Yes
	11/28/2018	0.86	±	0.23	3.18	±	0.86	Yes	22.50	±	0.66	83.25	±	2.43	Yes
	12/5/2018	0.92	±	0.21	3.40	±	0.77	Yes	27.30	±	0.69	101.01	±	2.54	Yes
	12/13/2018	0.84	±	0.21	3.12	±	0.77	Yes	35.60	±	0.76	131.72	±	2.82	Yes
	12/19/2018	1.13	±	0.24	4.18	±	0.90	Yes	23.20	±	0.69	85.84	±	2.56	Yes
	12/26/2018	1.03	±	0.22	3.81	±	0.83	Yes	16.30	±	0.58	60.31	±	2.14	Yes
FAA Tower	10/3/2018	1.17	±	0.24	4.33	±	0.89	Yes	27.40	±	0.68	101.38	±	2.51	Yes
	10/10/2018	0.95	±	0.18	3.51	±	0.67	Yes	25.90	±	0.69	95.83	±	2.56	Yes
	10/17/2018	1.60	±	0.25	5.92	±	0.94	Yes	28.40	±	0.70	105.08	±	2.60	Yes
	10/24/2018	0.92	±	0.28	3.40	±	1.04	Yes	40.10	±	0.83	148.37	±	3.06	Yes
	10/31/2018	1.99	±	0.26	7.36	±	0.94	Yes	24.90	±	0.65	92.13	±	2.41	Yes
	11/7/2018	1.32	±	0.27	4.88	±	0.98	Yes	16.60	±	0.63	61.42	±	2.34	Yes
	11/14/2018	1.17	±	0.23	4.33	±	0.86	Yes	25.10	±	0.67	92.87	±	2.48	Yes
	11/21/2018	1.89	±	0.26	6.99	±	0.97	Yes	48.40	±	0.88	179.08	±	3.26	Yes
	11/28/2018	0.45	±	0.21	1.66	±	0.78	No	18.60	±	0.61	68.82	±	2.25	Yes
	12/5/2018	0.83	±	0.21	3.07	±	0.77	Yes	17.70	±	0.61	65.49	±	2.24	Yes
	12/13/2018	1.20	±	0.21	4.44	±	0.77	Yes	31.90	±	0.69	118.03	±	2.55	Yes
	12/19/2018	1.64	±	0.28	6.07	±	1.05	Yes	26.10	±	0.77	96.57	±	2.84	Yes
	12/26/2018	1.12	±	0.24	4.14	±	0.87	Yes	16.70	±	0.60	61.79	±	2.22	Yes
HOWE	10/3/2018	2.07	±	0.28	7.66	±	1.04	Yes	29.30	±	0.73	108.41	±	2.68	Yes
	10/10/2018	0.98	±	0.17	3.63	±	0.63	Yes	19.90	±	0.59	73.63	±	2.18	Yes
	10/17/2018	0.89	±	0.21	3.30	±	0.79	Yes	28.50	±	0.67	105.45	±	2.49	Yes
	10/24/2018	1.22	±	0.29	4.51	±	1.07	Yes	43.40	±	0.85	160.58	±	3.14	Yes
	10/31/2018	1.54	±	0.25	5.70	±	0.91	Yes	24.40	±	0.67	90.28	±	2.46	Yes
	11/7/2018	1.24	±	0.24	4.59	±	0.87	Yes	20.20	±	0.61	74.74	±	2.27	Yes
	11/14/2018	1.74	±	0.28	6.44	±	1.03	Yes	28.00	±	0.75	103.60	±	2.77	Yes
	11/21/2018	1.83	±	0.27	6.77	±	1.00	Yes	44.00	±	0.87	162.80	±	3.23	Yes
	11/28/2018	1.30	±	0.26	4.81	±	0.96	Yes	25.30	±	0.70	93.61	±	2.60	Yes
	12/5/2018	0.51	±	0.19	1.87	±	0.70	No	26.50	±	0.68	98.05	±	2.50	Yes
	12/13/2018	1.39	±	0.21	5.14	±	0.79	Yes	35.10	±	0.71	129.87	±	2.62	Yes
	12/19/2018	1.38	±	0.27	5.11	±	1.00	Yes	27.10	±	0.77	100.27	±	2.85	Yes
	12/26/2018	1.01	±	0.23	3.74	±	0.86	Yes	19.10	±	0.63	70.67	±	2.34	Yes
MONTEVIEW	10/3/2018	0.56	±	0.22	2.06	±	0.80	No	28.50	±	0.68	105.45	±	2.50	Yes
	10/10/2018	0.88	±	0.17	3.26	±	0.61	Yes	23.00	±	0.62	85.10	±	2.31	Yes
	10/17/2018	1.75	±	0.25	6.48	±	0.93	Yes	26.90	±	0.67	99.53	±	2.48	Yes
	10/24/2018	1.43	±	0.29	5.29	±	1.07	Yes	37.30	±	0.79	138.01	±	2.92	Yes
	10/31/2018	2.09	±	0.27	7.73	±	0.99	Yes	22.90	±	0.65	84.73	±	2.41	Yes
	11/7/2018	1.62	±	0.26	5.99	±	0.95	Yes	21.40	±	0.64	79.18	±	2.38	Yes
	11/14/2018	1.27	±	0.25	4.70	±	0.91	Yes	24.90	±	0.69	92.13	±	2.56	Yes
	11/21/2018	2.78	±	0.29	10.29	±	1.08	Yes	43.00	±	0.84	159.10	±	3.09	Yes
	11/28/2018	1.57	±	0.28	5.81	±	1.02	Yes	26.10	±	0.73	96.57	±	2.69	Yes
	12/5/2018	1.50	±	0.24	5.55	±	0.90	Yes	25.60	±	0.70	94.72	±	2.57	Yes

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s	GROSS BETA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	12/13/2018	1.21	±	0.21	4.48	±	0.77	Yes	36.50	±	0.73	135.05	±	2.69	Yes
	12/19/2018	1.11	±	0.26	4.11	±	0.95	Yes	25.30	±	0.75	93.61	±	2.79	Yes
	12/26/2018	0.92	±	0.23	3.42	±	0.85	Yes	17.80	±	0.62	65.86	±	2.29	Yes
MUD LAKE	10/3/2018	0.75	±	0.22	2.79	±	0.83	Yes	29.10	±	0.68	107.67	±	2.53	Yes
	10/10/2018	1.01	±	0.17	3.74	±	0.63	Yes	24.10	±	0.63	89.17	±	2.34	Yes
	10/17/2018	1.62	±	0.24	5.99	±	0.89	Yes	29.90	±	0.68	110.63	±	2.52	Yes
	10/24/2018	1.73	±	0.30	6.40	±	1.12	Yes	48.00	±	0.88	177.60	±	3.24	Yes
	10/31/2018	1.67	±	0.24	6.18	±	0.89	Yes	26.40	±	0.66	97.68	±	2.45	Yes
	11/7/2018	1.65	±	0.26	6.11	±	0.95	Yes	26.20	±	0.68	96.94	±	2.53	Yes
	11/14/2018	1.43	±	0.23	5.29	±	0.85	Yes	26.20	±	0.65	96.94	±	2.41	Yes
	11/21/2018	2.63	±	0.28	9.73	±	1.04	Yes	56.10	±	0.91	207.57	±	3.36	Yes
	11/28/2018	1.15	±	0.26	4.26	±	0.95	Yes	27.10	±	0.73	100.27	±	2.70	Yes
	12/5/2018	1.12	±	0.23	4.14	±	0.85	Yes	27.20	±	0.72	100.64	±	2.66	Yes
	12/13/2018	1.67	±	0.23	6.18	±	0.84	Yes	37.60	±	0.73	139.12	±	2.71	Yes
	12/19/2018	1.90	±	0.29	7.03	±	1.09	Yes	31.90	±	0.82	118.03	±	3.05	Yes
	12/26/2018	1.19	±	0.24	4.40	±	0.88	Yes	18.70	±	0.62	69.19	±	2.29	Yes
DISTANT															
BLACKFOOT	10/3/2018	0.69	±	0.22	2.53	±	0.83	Yes	30.00	±	0.70	111.00	±	2.58	Yes
	10/10/2018	0.31	±	0.15	1.13	±	0.56	No	25.50	±	0.69	94.35	±	2.54	Yes
	10/17/2018	1.47	±	0.24	5.44	±	0.88	Yes	27.60	±	0.67	102.12	±	2.47	Yes
	10/24/2018	1.47	±	0.28	5.44	±	1.03	Yes	35.70	±	0.75	132.09	±	2.78	Yes
	10/31/2018	1.24	±	0.22	4.59	±	0.80	Yes	24.90	±	0.63	92.13	±	2.33	Yes
	11/7/2018	0.75	±	0.20	2.77	±	0.73	Yes	13.10	±	0.50	48.47	±	1.84	Yes
	11/14/2018	1.81	±	0.25	6.70	±	0.91	Yes	26.60	±	0.66	98.42	±	2.43	Yes
	11/21/2018	1.86	±	0.24	6.88	±	0.90	Yes	41.70	±	0.78	154.29	±	2.88	Yes
	11/28/2018	0.72	±	0.22	2.68	±	0.80	Yes	21.00	±	0.62	77.70	±	2.28	Yes
	12/5/2018	1.08	±	0.21	4.00	±	0.76	Yes	17.10	±	0.56	63.27	±	2.09	Yes
	12/13/2018	1.29	±	0.20	4.77	±	0.74	Yes	40.30	±	0.72	149.11	±	2.67	Yes
	12/19/2018	1.18	±	0.24	4.37	±	0.88	Yes	26.50	±	0.71	98.05	±	2.62	Yes
	12/26/2018	0.84	±	0.21	3.09	±	0.77	Yes	14.80	±	0.55	54.76	±	2.02	Yes
CRATERS OF THE MOON	10/3/2018	0.92	±	0.24	3.40	±	0.87	Yes	26.50	±	0.67	98.05	±	2.49	Yes
	10/10/2018	0.42	±	0.15	1.57	±	0.54	No	18.90	±	0.59	69.93	±	2.20	Yes
	10/17/2018	1.36	±	0.24	5.03	±	0.89	Yes	31.00	±	0.72	114.70	±	2.65	Yes
	10/24/2018	1.21	±	0.29	4.48	±	1.07	Yes	41.70	±	0.83	154.29	±	3.08	Yes
	10/31/2018	1.05	±	0.22	3.89	±	0.80	Yes	24.30	±	0.64	89.91	±	2.38	Yes
	11/7/2018	0.79	±	0.21	2.92	±	0.76	Yes	14.30	±	0.53	52.91	±	1.95	Yes
	11/14/2018	1.77	±	0.25	6.55	±	0.92	Yes	28.20	±	0.68	104.34	±	2.52	Yes
	11/21/2018	1.74	±	0.25	6.44	±	0.91	Yes	42.40	±	0.81	156.88	±	2.99	Yes
	11/28/2018	1.15	±	0.24	4.26	±	0.88	Yes	18.90	±	0.61	69.93	±	2.24	Yes
	12/5/2018	0.85	±	0.19	3.13	±	0.72	Yes	18.40	±	0.57	68.08	±	2.12	Yes
	12/13/2018	0.79	±	0.19	2.92	±	0.70	Yes	25.20	±	0.63	93.24	±	2.34	Yes
	12/19/2018	1.05	±	0.26	3.89	±	0.94	Yes	19.30	±	0.69	71.41	±	2.55	Yes
	12/26/2018	0.85	±	0.21	3.14	±	0.77	Yes	18.40	±	0.59	68.08	±	2.17	Yes
DUBOIS	10/3/2018	0.14	±	0.21	0.52	±	0.76	No	24.10	±	0.64	89.17	±	2.38	Yes
	10/10/2018	0.66	±	0.16	2.42	±	0.58	Yes	24.00	±	0.64	88.80	±	2.36	Yes
	10/17/2018	1.15	±	0.22	4.26	±	0.82	Yes	23.00	±	0.62	85.10	±	2.28	Yes
	10/24/2018	0.95	±	0.28	3.53	±	1.04	Yes	39.10	±	0.82	144.67	±	3.04	Yes
	10/31/2018	1.82	±	0.25	6.73	±	0.92	Yes	23.90	±	0.64	88.43	±	2.38	Yes
	11/7/2018	1.12	±	0.24	4.14	±	0.87	Yes	19.70	±	0.62	72.89	±	2.31	Yes
	11/14/2018	1.33	±	0.23	4.92	±	0.85	Yes	21.20	±	0.61	78.44	±	2.26	Yes
	11/21/2018	1.55	±	0.25	5.74	±	0.93	Yes	40.20	±	0.82	148.74	±	3.04	Yes

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

Sampling Group and Location	Sampling Date	GROSS ALPHA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s	GROSS BETA Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	11/28/2018	0.85	±	0.24	3.16	±	0.88	Yes	20.00	±	0.65	74.00	±	2.39	Yes
	12/5/2018	0.68	±	0.21	2.53	±	0.76	Yes	22.70	±	0.67	83.99	±	2.46	Yes
	12/13/2018	1.17	±	0.21	4.33	±	0.78	Yes	31.90	±	0.70	118.03	±	2.59	Yes
	12/19/2018	1.02	±	0.25	3.77	±	0.93	Yes	20.70	±	0.70	76.59	±	2.59	Yes
	12/26/2018	0.86	±	0.23	3.19	±	0.84	Yes	16.10	±	0.60	59.57	±	2.22	Yes
IDAHO FALLS	10/3/2018	2.14	±	0.29	7.92	±	1.06	Yes	29.30	±	0.73	108.41	±	2.71	Yes
	10/10/2018	2.24	±	0.23	8.29	±	0.87	Yes	21.60	±	0.65	79.92	±	2.42	Yes
	10/17/2018	2.08	±	0.27	7.70	±	1.00	Yes	28.90	±	0.70	106.93	±	2.60	Yes
	10/24/2018	1.74	±	0.31	6.44	±	1.16	Yes	43.10	±	0.86	159.47	±	3.19	Yes
	10/31/2018	1.50	±	0.24	5.55	±	0.89	Yes	26.80	±	0.68	99.16	±	2.52	Yes
	11/7/2018	0.78	±	0.21	2.89	±	0.78	Yes	14.00	±	0.53	51.80	±	1.97	Yes
	11/14/2018	1.28	±	0.25	4.74	±	0.91	Yes	24.40	±	0.68	90.28	±	2.52	Yes
	11/21/2018	2.56	±	0.29	9.47	±	1.07	Yes	45.60	±	0.87	168.72	±	3.20	Yes
	11/28/2018	0.81	±	0.25	3.00	±	0.92	Yes	17.70	±	0.65	65.49	±	2.39	Yes
	12/5/2018	0.74	±	0.20	2.72	±	0.74	Yes	17.30	±	0.59	64.01	±	2.19	Yes
	12/13/2018	1.64	±	0.25	6.07	±	0.91	Yes	21.00	±	0.64	77.70	±	2.38	Yes
	12/19/2018	1.54	±	0.28	5.70	±	1.04	Yes	26.80	±	0.78	99.16	±	2.87	Yes
	12/26/2018	1.84	±	0.27	6.81	±	0.99	Yes	19.50	±	0.64	72.15	±	2.37	Yes
JACKSON	10/3/2018	0.39	±	0.23	1.44	±	0.86	No	30.60	±	0.74	113.22	±	2.75	Yes
	10/10/2018	0.65	±	0.16	2.41	±	0.60	Yes	21.20	±	0.62	78.44	±	2.31	Yes
	10/21/2018	0.95	±	0.19	3.53	±	0.69	Yes	28.30	±	0.52	104.71	±	1.93	Yes
	10/24/2018	1.11	±	0.54	4.11	±	1.98	No	36.90	±	1.26	136.53	±	4.66	Yes
	10/31/2018	2.12	±	0.25	7.84	±	0.94	Yes	30.20	±	0.69	111.74	±	2.53	Yes
	11/8/2018	0.80	±	0.19	2.95	±	0.71	Yes	10.50	±	0.45	38.85	±	1.67	Yes
	11/14/2018	1.28	±	0.25	4.74	±	0.91	Yes	24.10	±	0.68	89.17	±	2.52	Yes
	11/21/2018	2.08	±	0.25	7.70	±	0.92	Yes	30.70	±	0.69	113.59	±	2.56	Yes
	11/28/2018	1.20	±	0.24	4.44	±	0.87	Yes	26.40	±	0.67	97.68	±	2.48	Yes
	12/5/2018	1.23	±	0.21	4.55	±	0.78	Yes	18.00	±	0.57	66.60	±	2.11	Yes
	12/12/2018	1.70	±	0.24	6.29	±	0.90	Yes	44.20	±	0.82	163.54	±	3.05	Yes
	12/19/2018	1.49	±	0.24	5.51	±	0.87	Yes	23.90	±	0.65	88.43	±	2.39	Yes
	12/26/2018	1.96	±	0.25	7.25	±	0.91	Yes	20.60	±	0.60	76.22	±	2.21	Yes
SUGAR CITY	10/3/2018	0.40	±	0.28	1.47	±	1.02	No	37.80	±	0.90	139.86	±	3.34	Yes
	10/10/2018	1.12	±	0.20	4.14	±	0.75	Yes	32.20	±	0.79	119.14	±	2.92	Yes
	10/17/2018	1.48	±	0.26	5.48	±	0.95	Yes	32.90	±	0.76	121.73	±	2.80	Yes
	10/24/2018	2.59	±	0.39	9.58	±	1.42	Yes	51.00	±	1.02	188.70	±	3.77	Yes
	10/31/2018	1.63	±	0.23	6.03	±	0.84	Yes	27.50	±	0.64	101.75	±	2.37	Yes
	11/7/2018	1.26	±	0.23	4.66	±	0.86	Yes	17.80	±	0.58	65.86	±	2.15	Yes
	11/14/2018	1.82	±	0.25	6.73	±	0.93	Yes	25.60	±	0.66	94.72	±	2.43	Yes
	11/21/2018	2.37	±	0.27	8.77	±	0.98	Yes	38.50	±	0.77	142.45	±	2.85	Yes
	11/28/2018	0.70	±	0.22	2.60	±	0.83	Yes	15.80	±	0.58	58.46	±	2.16	Yes
	12/5/2018	0.80	±	0.20	2.97	±	0.73	Yes	19.70	±	0.60	72.89	±	2.20	Yes
	12/13/2018	1.47	±	0.22	5.44	±	0.80	Yes	37.20	±	0.72	137.64	±	2.68	Yes
	12/19/2018	1.01	±	0.25	3.74	±	0.93	Yes	23.30	±	0.72	86.21	±	2.67	Yes
	12/26/2018	1.02	±	0.22	3.77	±	0.80	Yes	14.80	±	0.55	54.76	±	2.02	Yes
INL SITE															
EFS	10/3/2018	0.91	±	0.23	3.38	±	0.87	Yes	26.60	±	0.67	98.42	±	2.49	Yes
	10/10/2018	0.70	±	0.16	2.58	±	0.60	Yes	21.30	±	0.62	78.81	±	2.29	Yes
	10/17/2018	1.28	±	0.24	4.74	±	0.89	Yes	29.00	±	0.70	107.30	±	2.60	Yes
	10/24/2018	1.08	±	0.28	4.00	±	1.05	Yes	47.00	±	0.88	173.90	±	3.24	Yes
	10/31/2018	0.68	±	0.20	2.52	±	0.73	Yes	21.20	±	0.61	78.44	±	2.26	Yes
	11/7/2018	0.93	±	0.23	3.46	±	0.84	Yes	18.10	±	0.61	66.97	±	2.24	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 ($x 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($x 10^{-11}$ Bq/mL)			Result > 3s	Result ± 1s Uncertainty ($x 10^{-15}$ µCi/mL)			Result ± 1s Uncertainty ($x 10^{-11}$ Bq/mL)			Result > 3s
	11/14/2018	0.86	±	0.21	3.17	±	0.78	Yes	26.90	±	0.67	99.53	±	2.46	Yes
	11/21/2018	2.31	±	0.27	8.55	±	1.00	Yes	53.80	±	0.89	199.06	±	3.30	Yes
	11/28/2018	0.49	±	0.21	1.81	±	0.79	No	23.60	±	0.66	87.32	±	2.44	Yes
	12/5/2018	1.47	±	0.24	5.44	±	0.88	Yes	27.40	±	0.71	101.38	±	2.61	Yes
	12/13/2018	1.33	±	0.22	4.92	±	0.80	Yes	36.20	±	0.73	133.94	±	2.69	Yes
	12/19/2018	0.98	±	0.25	3.61	±	0.93	Yes	29.30	±	0.79	108.41	±	2.92	Yes
	12/26/2018	0.74	±	0.22	2.73	±	0.80	Yes	18.80	±	0.62	69.56	±	2.28	Yes
MAIN GATE	10/3/2018	0.60	±	0.22	2.23	±	0.81	No	27.70	±	0.67	102.49	±	2.49	Yes
	10/10/2018	0.62	±	0.17	2.29	±	0.62	Yes	24.50	±	0.68	90.65	±	2.52	Yes
	10/17/2018	1.48	±	0.24	5.48	±	0.88	Yes	28.00	±	0.67	103.60	±	2.48	Yes
	10/24/2018	1.22	±	0.30	4.51	±	1.10	Yes	46.40	±	0.89	171.68	±	3.29	Yes
	10/31/2018	1.60	±	0.24	5.92	±	0.87	Yes	22.40	±	0.62	82.88	±	2.29	Yes
	11/7/2018	0.82	±	0.22	3.03	±	0.82	Yes	15.40	±	0.57	56.98	±	2.11	Yes
	11/14/2018	1.41	±	0.24	5.22	±	0.90	Yes	28.90	±	0.70	106.93	±	2.59	Yes
	11/21/2018	1.72	±	0.26	6.36	±	0.98	Yes	54.00	±	0.94	199.80	±	3.47	Yes
	11/28/2018	0.73	±	0.23	2.72	±	0.84	Yes	23.70	±	0.67	87.69	±	2.48	Yes
	12/5/2018	1.08	±	0.23	4.00	±	0.83	Yes	23.60	±	0.68	87.32	±	2.50	Yes
	12/13/2018	1.27	±	0.22	4.70	±	0.81	Yes	28.50	±	0.68	105.45	±	2.52	Yes
	12/19/2018	1.51	±	0.30	5.59	±	1.11	Yes	26.30	±	0.82	97.31	±	3.03	Yes
	12/26/2018	1.16	±	0.23	4.29	±	0.85	Yes	18.80	±	0.61	69.56	±	2.24	Yes
VAN BUREN GATE	10/3/2018	0.72	±	0.22	2.66	±	0.83	Yes	31.10	±	0.71	115.07	±	2.62	Yes
	10/10/2018	1.02	±	0.18	3.77	±	0.66	Yes	25.00	±	0.66	92.50	±	2.45	Yes
	10/17/2018	1.40	±	0.23	5.18	±	0.86	Yes	29.90	±	0.68	110.63	±	2.53	Yes
	10/24/2018	1.15	±	0.28	4.26	±	1.03	Yes	48.40	±	0.87	179.08	±	3.20	Yes
	10/31/2018	1.24	±	0.22	4.59	±	0.83	Yes	24.40	±	0.64	90.28	±	2.36	Yes
	11/7/2018	1.37	±	0.25	5.07	±	0.91	Yes	18.40	±	0.61	68.08	±	2.24	Yes
	11/14/2018	1.69	±	0.25	6.25	±	0.93	Yes	30.90	±	0.72	114.33	±	2.66	Yes
	11/21/2018	2.45	±	0.29	9.07	±	1.07	Yes	56.70	±	0.95	209.79	±	3.52	Yes
	11/28/2018	0.81	±	0.23	2.99	±	0.86	Yes	26.30	±	0.70	97.31	±	2.58	Yes
	12/5/2018	0.94	±	0.22	3.47	±	0.81	Yes	28.50	±	0.72	105.45	±	2.67	Yes
	12/13/2018	1.01	±	0.50	3.74	±	1.84	No	24.40	±	1.35	90.28	±	5.00	Yes
	12/19/2018	0.66	±	0.22	2.42	±	0.81	Yes	25.50	±	0.71	94.35	±	2.61	Yes
	12/26/2018	0.90	±	0.22	3.34	±	0.83	Yes	19.00	±	0.62	70.30	±	2.30	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 (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
BOUNDARY								
ARCO	10/03/18	-0.06	±	0.96	-0.23	±	3.53	No
	10/10/18	-0.51	±	1.40	-1.88	±	5.18	No
	10/17/18	1.29	±	1.56	4.77	±	5.77	No
	10/24/18	-0.70	±	0.92	-2.60	±	3.40	No
	10/31/18	0.73	±	1.00	2.68	±	3.70	No
	11/07/18	-0.05	±	0.99	-0.17	±	3.67	No
	11/14/18	2.59	±	1.16	9.58	±	4.29	No
	11/21/18	0.17	±	1.10	0.61	±	4.07	No
	11/28/18	-1.18	±	0.96	-4.37	±	3.56	No
	12/05/18	-0.96	±	1.08	-3.57	±	4.00	No
	12/13/18	1.13	±	0.95	4.18	±	3.53	No
	12/19/18	0.45	±	1.14	1.65	±	4.22	No
	12/26/18	0.78	±	1.08	2.89	±	4.00	No
ATOMIC CITY	10/03/18	-0.06	±	0.94	-0.23	±	3.47	No
	10/10/18	-0.50	±	1.38	-1.86	±	5.11	No
	10/17/18	1.34	±	1.62	4.96	±	5.99	No
	10/24/18	-0.68	±	0.88	-2.51	±	3.27	No
	10/31/18	0.74	±	1.02	2.73	±	3.77	No
	11/07/18	-0.05	±	0.99	-0.17	±	3.65	No
	11/14/18	2.65	±	1.19	9.81	±	4.40	No
	11/21/18	0.17	±	1.11	0.62	±	4.11	No
	11/28/18	-1.25	±	1.02	-4.63	±	3.77	No
	12/05/18	-0.93	±	1.04	-3.43	±	3.85	No
	12/13/18	1.07	±	0.90	3.96	±	3.34	No
	12/19/18	0.45	±	1.14	1.65	±	4.22	No
	12/26/18	0.81	±	1.12	3.01	±	4.14	No
QA-1	10/03/18		a			a		
(ATOMIC CITY)	10/10/18	-0.50	±	1.37	-1.85	±	5.07	No
	10/17/18	1.31	±	1.58	4.85	±	5.85	No
	10/24/18	-0.70	±	0.91	-2.58	±	3.36	No
	10/31/18	0.70	±	0.97	2.60	±	3.59	No
	11/07/18	-0.04	±	0.94	-0.16	±	3.49	No
	11/14/18	2.54	±	1.14	9.40	±	4.22	No
	11/21/18	0.16	±	1.08	0.60	±	4.00	No
	11/28/18	-1.22	±	1.00	-4.51	±	3.68	No
	12/05/18	-0.99	±	1.10	-3.64	±	4.07	No
	12/13/18	1.11	±	0.93	4.11	±	3.44	No
	12/19/18	0.47	±	1.21	1.75	±	4.48	No
	12/26/18	0.83	±	1.15	3.07	±	4.26	No
BLUE DOME	10/03/18	-0.77	±	0.90	-2.85	±	3.34	No
	10/10/18	1.00	±	0.95	3.70	±	3.53	No
	10/17/18	0.41	±	0.95	1.50	±	3.52	No
	10/24/18	-1.71	±	1.57	-6.33	±	5.81	No
	10/31/18	-0.66	±	0.95	-2.45	±	3.51	No
	11/07/18	-0.54	±	0.97	-2.00	±	3.57	No
	11/14/18	0.39	±	1.13	1.43	±	4.18	No
	11/21/18	0.05	±	1.01	0.18	±	3.74	No
	11/28/18	1.47	±	1.00	5.44	±	3.70	No
	12/05/18	1.02	±	0.95	3.77	±	3.51	No
	12/13/18	-0.33	±	0.91	-1.20	±	3.35	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	12/19/18	-2.54	±	1.66	-9.40	±	6.14	No
	12/26/18	1.50	±	1.01	5.55	±	3.74	No
QA-2	10/03/18	-0.80	±	0.94	-2.95	±	3.46	No
(BLUE DOME)	10/10/18	0.98	±	0.94	3.63	±	3.46	No
	10/17/18	0.40	±	0.93	1.47	±	3.44	No
	10/24/18	-1.63	±	1.50	-6.03	±	5.55	No
	10/31/18	-0.65	±	0.93	-2.39	±	3.42	No
	11/07/18	-0.54	±	0.97	-2.01	±	3.59	No
	11/14/18	0.36	±	1.04	1.32	±	3.85	No
	11/21/18	0.05	±	0.97	0.17	±	3.60	No
	11/28/18	1.40	±	0.96	5.18	±	3.54	No
	12/05/18	1.14	±	1.05	4.22	±	3.89	No
	12/13/18	-0.32	±	0.90	-1.20	±	3.33	No
	12/19/18	-1.54	±	1.00	-5.70	±	3.70	No
	12/26/18	1.46	±	0.98	5.40	±	3.62	No
FAA TOWER	10/03/18	-0.77	±	0.90	-2.85	±	3.33	No
	10/10/18	1.07	±	1.02	3.96	±	3.77	No
	10/17/18	0.41	±	0.96	1.52	±	3.56	No
	10/24/18	-0.73	±	1.56	-2.69	±	5.77	No
	10/31/18	-0.64	±	0.92	-2.38	±	3.42	No
	11/07/18	-0.60	±	1.07	-2.23	±	3.96	No
	11/14/18	0.36	±	1.04	1.32	±	3.85	No
	11/21/18	0.05	±	0.99	0.17	±	3.65	No
	11/28/18	1.39	±	0.95	5.14	±	3.50	No
	12/05/18	1.21	±	1.12	4.48	±	4.14	No
	12/13/18	-0.29	±	0.81	-1.08	±	3.01	No
	12/19/18	-1.69	±	1.10	-6.25	±	4.07	No
	12/26/18	1.52	±	1.02	5.62	±	3.77	No
HOWE	10/03/18	-0.82	±	0.96	-3.03	±	3.55	No
	10/10/18	0.96	±	0.92	3.55	±	3.39	No
	10/17/18	0.38	±	0.90	1.42	±	3.32	No
	10/24/18	-1.68	±	1.54	-6.22	±	5.70	No
	10/31/18	-0.68	±	0.97	-2.51	±	3.60	No
	11/07/18	-0.51	±	0.92	-1.90	±	3.39	No
	11/14/18	0.40	±	1.16	1.47	±	4.29	No
	11/21/18	0.05	±	1.04	0.18	±	3.85	No
	11/28/18	1.46	±	1.00	5.40	±	3.68	No
	12/05/18	1.13	±	1.05	4.18	±	3.89	No
	12/13/18	-0.29	±	0.80	-1.06	±	2.95	No
	12/19/18	-1.66	±	1.08	-6.14	±	4.00	No
	12/26/18	1.54	±	1.03	5.70	±	3.81	No
MONTEVIEW	10/03/18	-0.75	±	0.87	-2.76	±	3.23	No
	10/10/18	0.97	±	0.92	3.58	±	3.42	No
	10/17/18	0.40	±	0.93	1.46	±	3.43	No
	10/24/18	-1.65	±	1.51	-6.11	±	5.59	No
	10/31/18	-0.68	±	0.97	-2.51	±	3.60	No
	11/07/18	-0.54	±	0.96	-1.98	±	3.54	No
	11/14/18	0.38	±	1.10	1.39	±	4.07	No
	11/21/18	0.05	±	0.98	0.17	±	3.63	No
	11/28/18	1.51	±	1.03	5.59	±	3.81	No
	12/05/18	1.21	±	1.12	4.48	±	4.14	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	12/13/18	-0.29	±	0.81	-1.08	±	3.00	No
	12/19/18	-1.67	±	1.09	-6.18	±	4.03	No
	12/26/18	1.54	±	1.04	5.70	±	3.85	No
MUD LAKE	10/03/18	-0.75	±	0.88	-2.78	±	3.26	No
	10/10/18	0.96	±	0.92	3.55	±	3.39	No
	10/17/18	0.38	±	0.88	1.39	±	3.27	No
	10/24/18	-1.64	±	1.51	-6.07	±	5.59	No
	10/31/18	-0.64	±	0.91	-2.35	±	3.37	No
	11/07/18	-0.52	±	0.93	-1.92	±	3.43	No
	11/14/18	0.33	±	0.96	1.22	±	3.55	No
	11/21/18	0.04	±	0.93	0.16	±	3.44	No
	11/28/18	1.49	±	1.02	5.51	±	3.77	No
	12/05/18	1.23	±	1.14	4.55	±	4.22	No
	12/13/18	-0.29	±	0.80	-1.07	±	2.97	No
	12/19/18	-1.67	±	1.09	-6.18	±	4.03	No
	12/26/18	1.51	±	1.01	5.59	±	3.74	No
DISTANT								
BLACKFOOT	10/03/18	-0.06	±	0.95	-0.23	±	3.53	No
	10/10/18	-0.55	±	1.52	-2.05	±	5.62	No
	10/17/18	1.31	±	1.58	4.85	±	5.85	No
	10/24/18	-0.67	±	0.87	-2.46	±	3.21	No
	10/31/18	0.70	±	0.96	2.58	±	3.56	No
	11/07/18	-0.04	±	0.91	-0.16	±	3.38	No
	11/14/18	2.55	±	1.14	9.44	±	4.22	No
	11/21/18	0.16	±	1.04	0.58	±	3.85	No
	11/28/18	-1.17	±	0.96	-4.33	±	3.54	No
	12/05/18	-0.94	±	1.06	-3.49	±	3.92	No
	12/13/18	1.00	±	0.84	3.70	±	3.12	No
	12/19/18	0.41	±	1.04	1.51	±	3.85	No
	12/26/18	0.78	±	1.07	2.87	±	3.96	No
CRATERS	10/03/18	-0.06	±	0.98	-0.24	±	3.61	No
	10/10/18	-0.53	±	1.44	-1.94	±	5.33	No
	10/17/18	1.36	±	1.64	5.03	±	6.07	No
	10/24/18	-0.72	±	0.93	-2.65	±	3.45	No
	10/31/18	0.73	±	1.01	2.71	±	3.74	No
	11/07/18	-0.04	±	0.95	-0.16	±	3.51	No
	11/14/18	2.61	±	1.17	9.66	±	4.33	No
	11/21/18	0.17	±	1.10	0.61	±	4.07	No
	11/28/18	-1.21	±	0.98	-4.48	±	3.63	No
	12/05/18	-0.93	±	1.04	-3.44	±	3.85	No
	12/13/18	1.12	±	0.95	4.14	±	3.50	No
	12/19/18	0.47	±	1.20	1.73	±	4.44	No
	12/26/18	0.77	±	1.07	2.86	±	3.96	No
DUBOIS	10/03/18	-0.77	±	0.90	-2.85	±	3.33	No
	10/10/18	0.98	±	0.93	3.61	±	3.45	No
	10/17/18	0.38	±	0.90	1.42	±	3.32	No
	10/24/18	-1.71	±	1.57	-6.33	±	5.81	No
	10/31/18	-0.65	±	0.93	-2.41	±	3.44	No
	11/07/18	-0.53	±	0.95	-1.98	±	3.53	No
	11/14/18	0.34	±	0.99	1.25	±	3.66	No
	11/21/18	0.05	±	1.01	0.18	±	3.74	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	11/28/18	1.46	±	1.00	5.40	±	3.70	No
	12/05/18	1.22	±	1.13	4.51	±	4.18	No
	12/13/18	-0.30	±	0.84	-1.11	±	3.10	No
	12/19/18	-1.67	±	1.09	-6.18	±	4.03	No
	12/26/18	1.55	±	1.04	5.74	±	3.85	No
IDAHO FALLS	10/03/18	-0.83	±	0.98	-3.09	±	3.61	No
	10/10/18	1.08	±	1.03	4.00	±	3.81	No
	10/17/18	0.41	±	0.95	1.50	±	3.52	No
	10/24/18	-1.73	±	1.59	-6.40	±	5.88	No
	10/31/18	-0.66	±	0.95	-2.46	±	3.52	No
	11/07/18	-0.51	±	0.91	-1.88	±	3.35	No
	11/14/18	0.37	±	1.09	1.38	±	4.03	No
	11/21/18	0.05	±	1.00	0.18	±	3.70	No
	11/28/18	1.55	±	1.06	5.74	±	3.92	No
	12/05/18	1.18	±	1.10	4.37	±	4.07	No
	12/13/18	-0.34	±	0.95	-1.26	±	3.50	No
	12/19/18	-1.69	±	1.10	-6.25	±	4.07	No
	12/26/18	1.54	±	1.04	5.70	±	3.85	No
JACKSON	10/03/18	-0.07	±	1.05	-0.25	±	3.89	No
	10/10/18	-0.53	±	1.46	-1.96	±	5.40	No
	10/21/18	0.04	±	0.98	0.14	±	3.64	No
	10/24/18	-3.54	±	1.97	-13.10	±	7.29	No
	10/31/18	0.70	±	0.96	2.57	±	3.55	No
	11/08/18	-0.04	±	0.88	-0.15	±	3.26	No
	11/14/18	2.90	±	1.30	10.73	±	4.81	No
	11/21/18	0.16	±	1.06	0.59	±	3.92	No
	11/28/18	-1.16	±	0.95	-4.29	±	3.50	No
	12/05/18	-0.93	±	1.04	-3.45	±	3.85	No
	12/12/18	1.18	±	0.99	4.37	±	3.67	No
	12/19/18	0.37	±	0.95	1.37	±	3.51	No
	12/26/18	0.74	±	1.02	2.73	±	3.77	No
SUGAR CITY	10/03/18	-1.01	±	1.18	-3.74	±	4.37	No
	10/10/18	1.15	±	1.10	4.26	±	4.07	No
	10/17/18	0.42	±	0.99	1.57	±	3.67	No
	10/24/18	-2.03	±	1.86	-7.51	±	6.88	No
	10/31/18	-0.59	±	0.84	-2.16	±	3.10	No
	11/07/18	-0.51	±	0.90	-1.88	±	3.34	No
	11/14/18	0.34	±	0.99	1.25	±	3.67	No
	11/21/18	0.04	±	0.93	0.16	±	3.43	No
	11/28/18	1.41	±	0.96	5.22	±	3.57	No
	12/05/18	1.11	±	1.03	4.11	±	3.81	No
	12/13/18	-0.28	±	0.79	-1.05	±	2.93	No
	12/19/18	-1.64	±	1.07	-6.07	±	3.96	No
	12/26/18	1.40	±	0.94	5.18	±	3.48	No
INL SITE								
EFS	10/03/18	-0.06	±	0.97	-0.24	±	3.60	No
	10/10/18	-0.52	±	1.44	-1.93	±	5.33	No
	10/17/18	1.38	±	1.67	5.11	±	6.18	No
	10/24/18	-0.71	±	0.93	-2.64	±	3.44	No
	10/31/18	0.74	±	1.01	2.72	±	3.74	No
	11/07/18	-0.05	±	1.03	-0.18	±	3.81	No

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

Sampling Group and Location	Sampling Date	Result ± 1s Uncertainty (x 10^{-15} µCi/mL)			Result ± 1s Uncertainty (x 10^{-11} Bq/mL)			Result > 3s
	11/14/18	2.60	±	1.16	9.62	±	4.29	No
	11/21/18	0.17	±	1.09	0.61	±	4.03	No
	11/28/18	-1.22	±	1.00	-4.51	±	3.69	No
	12/05/18	-1.02	±	1.14	-3.77	±	4.22	No
	12/13/18	1.10	±	0.93	4.07	±	3.43	No
	12/19/18	0.45	±	1.16	1.68	±	4.29	No
	12/26/18	0.83	±	1.14	3.06	±	4.22	No
MAIN GATE	10/03/18	-0.06	±	0.95	-0.23	±	3.50	No
	10/10/18	-0.56	±	1.54	-2.07	±	5.70	No
	10/17/18	1.31	±	1.58	4.85	±	5.85	No
	10/24/18	-0.74	±	0.96	-2.74	±	3.57	No
	10/31/18	0.72	±	0.99	2.66	±	3.67	No
	11/07/18	-0.05	±	1.03	-0.18	±	3.81	No
	11/14/18	2.70	±	1.21	9.99	±	4.48	No
	11/21/18	0.18	±	1.19	0.67	±	4.40	No
	11/28/18	-1.25	±	1.01	-4.63	±	3.74	No
	12/05/18	-1.05	±	1.17	-3.89	±	4.33	No
	12/13/18	1.17	±	0.98	4.33	±	3.64	No
	12/19/18	0.51	±	1.31	1.90	±	4.85	No
	12/26/18	0.80	±	1.11	2.97	±	4.11	No
VAN BUREN GATE	10/03/18	-0.06	±	0.95	-0.23	±	3.52	No
	10/10/18	-0.53	±	1.45	-1.94	±	5.37	No
	10/17/18	1.29	±	1.55	4.77	±	5.74	No
	10/24/18	-0.69	±	0.90	-2.54	±	3.31	No
	10/31/18	0.72	±	1.00	2.67	±	3.69	No
	11/07/18	-0.05	±	1.02	-0.18	±	3.77	No
	11/14/18	2.69	±	1.20	9.95	±	4.44	No
	11/21/18	0.18	±	1.17	0.65	±	4.33	No
	11/28/18	-1.25	±	1.02	-4.63	±	3.77	No
	12/05/18	-1.03	±	1.16	-3.81	±	4.29	No
	12/13/18	3.59	±	3.03	13.28	±	11.21	No
	12/19/18	0.42	±	1.06	1.54	±	3.92	No
	12/26/18	0.83	±	1.15	3.07	±	4.26	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 (x 10^{-18} µCi/mL)			Result ± 1s Uncertainty (x 10^{-14} Bq/mL)			Result > 3s
BOUNDARY									
ARCO	12/26/2018	CESIUM-137	-103.00	±	104.00	-381.10	±	384.80	No
		STRONTIUM-90	2.72	±	6.46	10.06	±	23.90	No
ATOMIC CITY	12/26/2018	CESIUM-137	67.40	±	98.20	249.38	±	363.34	No
		STRONTIUM-90	-9.30	±	9.72	0.00	±	0.00	No
QA-1 (ATOMIC CITY)	12/26/2018	CESIUM-137	-139.00	±	86.00	-514.30	±	318.20	No
		STRONTIUM-90	4.83	±	10.40	17.87	±	38.48	No
BLUE DOME	12/26/2018	AMERICIUM-241	-10.50	±	3.80	-38.85	±	14.06	No
		CESIUM-137	138.00	±	105.00	510.60	±	388.50	No
		PLUTONIUM-238	0.32	±	2.35	1.18	±	8.70	No
		PLUTONIUM-239/240	-3.19	±	2.84	-11.80	±	10.51	No
QA-2 (BLUE DOME)	12/26/2018	AMERICIUM-241	-7.45	±	4.55	-27.57	±	16.84	No
		CESIUM-137	102.00	±	81.00	377.40	±	299.70	No
		PLUTONIUM-238	-7.62	±	3.89	-28.19	±	14.39	No
		PLUTONIUM-239/240	-10.90	±	5.08	9.35	±	18.80	No
FAA TOWER	12/26/2018	CESIUM-137	-66.00	±	99.10	-244.20	±	366.67	No
		STRONTIUM-90	2.72	±	9.32	10.06	±	34.48	No
HOWE	12/26/2018	CESIUM-137	-124.00	±	103.00	-458.80	±	381.10	No
MONTEVIEW	12/26/2018	AMERICIUM-241	0.00	±	3.87	0.00	±	14.32	No
		CESIUM-137	7.67	±	78.40	28.38	±	290.08	No
		PLUTONIUM-238	-1.25	±	4.21	-4.63	±	15.58	No
		PLUTONIUM-239/240	2.81	±	2.21	10.40	±	8.18	No
MUD LAKE	12/26/2018	CESIUM-137	-48.20	±	96.20	-178.34	±	355.94	No
DISTANT									
BLACKFOOT	12/26/2018	CESIUM-137	90.30	±	73.30	334.11	±	271.21	No
CRATERS	12/26/2018	CESIUM-137	-8.04	±	95.70	-29.75	±	354.09	No
		STRONTIUM-90	-12.20	±	8.83	-45.14	±	32.67	No
DUBOIS	12/26/2018	CESIUM-137	-244.00	±	106.00	-902.80	±	392.20	No
IDAHO FALLS	12/26/2018	CESIUM-137	-149.00	±	109.00	-551.30	±	403.30	No

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 (x 10^{-18} µCi/mL)			Result ± 1s Uncertainty (x 10^{-14} Bq/mL)			Result > 3s
JACKSON	12/26/2018	AMERICIUM-241	-0.29	±	2.18	-1.06	±	8.07	No
		CESIUM-137	-83.70	±	97.90	-309.69	±	362.23	No
		PLUTONIUM-238	2.02	±	1.41	7.47	±	5.22	No
		PLUTONIUM-239/240	-2.01	±	1.95	-7.44	±	7.22	No
SUGAR CITY	12/26/2018	AMERICIUM-241	-0.45	±	2.11	-1.66	±	7.81	No
		CESIUM-137	-25.50	±	76.70	-94.35	±	283.79	No
		PLUTONIUM-238	1.09	±	2.72	4.03	±	10.06	No
		PLUTONIUM-239/240	-2.17	±	2.78	-8.03	±	10.29	No
INL SITE									
EFS	12/26/2018	AMERICIUM-241	-2.51	±	2.37	-9.29	±	8.77	No
		CESIUM-137	28.80	±	77.40	106.56	±	286.38	No
		PLUTONIUM-238	0.00	±	1.79	0.00	±	6.62	No
		PLUTONIUM-239/240	-0.91	±	2.71	-3.36	±	10.03	No
MAIN GATE	12/26/2018	CESIUM-137	-136.00	±	103.00	-503.20	±	381.10	No
		STRONTIUM-90	2.36	±	10.50	8.73	±	38.85	No
VAN BUREN GATE	12/26/2018	AMERICIUM-241	3.03	±	1.87	11.21	±	6.92	No
		CESIUM-137	42.70	±	85.70	157.99	±	317.09	No
		PLUTONIUM-238	2.51	±	1.58	9.29	±	5.85	No
		PLUTONIUM-239/240	-1.11	±	1.39	-4.11	±	5.14	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	08/29/18	10/10/18	5.52	±	0.98	20.42	±	3.64	**Yes**
ATOMIC CITY	10/10/18	11/14/18	-0.88	±	1.58	-3.26	±	5.85	No
ATOMIC CITY	11/14/18	12/26/18	-0.61	±	1.17	-2.25	±	4.34	No
HOWE	09/26/18	10/24/18	7.01	±	1.25	25.94	±	4.63	**Yes**
HOWE	10/24/18	11/28/18	-2.42	±	1.33	-8.95	±	4.92	No
DISTANT									
IDAHO FALLS	09/12/18	10/10/18	4.39	±	1.08	16.24	±	4.00	**Yes**
IDAHO FALLS	10/10/18	11/07/18	-0.90	±	1.44	-3.34	±	5.33	No
IDAHO FALLS	11/07/18	12/13/18	1.51	±	1.12	5.57	±	4.16	No
INL SITE									
EFS	09/12/18	10/17/18	14.00	±	1.04	51.80	±	3.85	**Yes**
EFS	10/17/18	11/14/18	5.08	±	1.37	18.80	±	5.07	**Yes**
EFS	11/14/18	12/26/18	1.63	±	0.85	6.02	±	3.14	No

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
BOUNDARY									
ATOMIC CITY	10/02/18	10/10/18	61.80	±	24.50	2.29	±	0.91	No
ATOMIC CITY	10/17/18	10/24/18	39.90	±	25.60	1.48	±	0.95	No
ATOMIC CITY	11/21/18	11/28/18	31.60	±	24.10	1.17	±	0.89	No
ATOMIC CITY	11/28/18	12/05/18	101.00	±	25.30	3.74	±	0.94	**Yes**
ATOMIC CITY	12/05/18	12/13/18	42.90	±	24.60	1.59	±	0.91	No
ATOMIC CITY	12/13/18	12/19/18	42.70	±	24.60	1.58	±	0.91	No
HOWE	10/03/18	10/10/18	37.60	±	24.20	1.39	±	0.90	No
HOWE	10/17/18	10/24/18	65.50	±	25.40	2.42	±	0.94	No
HOWE	11/28/18	12/05/18	62.50	±	24.60	2.31	±	0.91	No
DISTANT									
IDAHO FALLS	09/30/18	10/31/18	72.30	±	24.60	2.68	±	0.91	No
IDAHO FALLS	10/31/18	11/30/18	46.10	±	24.30	1.71	±	0.90	No
IDAHO FALLS	11/30/18	12/31/18	63.60	±	24.60	2.35	±	0.91	No
INL SITE									
EFS	10/3/2018	10/10/2018	175.00	±	25.80	6.48	±	0.95	**Yes**
EFS	10/17/2018	10/24/2018	88.40	±	25.60	3.27	±	0.95	**Yes**
EFS	11/14/2018	11/21/2018	169.00	±	25.70	6.25	±	0.95	**Yes**
EFS	11/21/2018	11/28/2018	98.80	±	24.80	3.66	±	0.92	**Yes**
EFS	11/28/2018	12/5/2018	24.70	±	24.10	0.91	±	0.89	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
SURFACE WATER									
Alpheus Spring	11/6/2018	GROSS ALPHA	0.10	±	0.04	0.00	±	0.00	No
		GROSS BETA	7.74	±	0.69	0.29	±	0.03	**Yes**
		TRITIUM	81.70	±	25.10	3.03	±	0.93	**Yes**
Alpheus Spring (Duplicate)	11/06/18	GROSS ALPHA	1.65	±	0.45	0.06	±	0.02	**Yes**
		GROSS BETA	5.72	±	0.49	0.21	±	0.02	**Yes**
		TRITIUM	6.42	±	24.11	0.24	±	0.89	No
Bill Jones, Jr. Trout Farm	11/6/2018	GROSS ALPHA	0.59	±	0.33	0.02	±	0.01	No
		GROSS BETA	2.05	±	0.41	0.08	±	0.02	**Yes**
		TRITIUM	-23.00	±	23.60	-0.85	±	0.87	No
Clear Springs	11/6/2018	GROSS ALPHA	0.41	±	0.40	0.02	±	0.01	No
		GROSS BETA	3.62	±	0.45	0.13	±	0.02	**Yes**
		TRITIUM	-7.13	±	23.80	-0.26	±	0.88	No
DRINKING WATER									
Atomic City	11/07/18	GROSS ALPHA	1.29	±	0.36	0.05	±	0.01	**Yes**
		GROSS BETA	4.02	±	0.44	0.15	±	0.02	**Yes**
		TRITIUM	-73.10	±	24.30	-2.71	±	0.90	No
Control	11/07/18	GROSS ALPHA	0.27	±	0.19	0.01	±	0.01	No
		GROSS BETA	-0.03	±	0.34	0.00	±	0.01	No
		TRITIUM	53.00	±	24.40	1.96	±	0.90	No
Craters of the Moon	11/07/18	GROSS ALPHA	1.55	±	0.32	0.06	±	0.01	**Yes**
		GROSS BETA	1.18	±	0.39	0.04	±	0.01	**Yes**
		TRITIUM	-8.08	±	25.10	-0.30	±	0.93	No
Howe	11/06/18	GROSS ALPHA	2.27	±	0.47	0.08	±	0.02	**Yes**
		GROSS BETA	0.80	±	0.44	0.03	±	0.02	No
		TRITIUM	3.60	±	25.30	0.13	±	0.94	No
Idaho Falls	11/07/18	GROSS ALPHA	0.58	±	0.48	0.02	±	0.02	No
		GROSS BETA	2.65	±	0.46	0.10	±	0.02	**Yes**
		TRITIUM	-11.40	±	24.80	-0.42	±	0.92	No
Minidoka	11/06/18	GROSS ALPHA	1.18	±	0.39	0.04	±	0.01	**Yes**
		GROSS BETA	3.50	±	0.44	0.13	±	0.02	**Yes**
		TRITIUM	-52.80	±	24.20	-1.96	±	0.90	No
Mud Lake	11/05/18	GROSS ALPHA	0.19	±	0.23	0.01	±	0.01	No
		GROSS BETA	1.52	±	0.40	0.06	±	0.01	**Yes**
		TRITIUM	39.50	±	25.40	1.46	±	0.94	No
Rest Area	11/07/18	GROSS ALPHA	0.72	±	0.30	0.03	±	0.01	No
		GROSS BETA	1.30	±	0.41	0.05	±	0.02	**Yes**
		TRITIUM	34.10	±	25.30	1.26	±	0.94	No
Shoshone	11/06/18	GROSS ALPHA	0.85	±	0.34	0.03	±	0.01	No
		GROSS BETA	1.93	±	0.42	0.07	±	0.02	**Yes**
		TRITIUM	17.70	±	23.90	0.66	±	0.89	No

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

		Iodine-131							Cesium-137						
Location	Sampling Date	Result ± 1s Uncertainty (pCi[†]/L)			Result ± 1s Uncertainty (Bq[‡]/L)			Result > 3s	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
BLACKFOOT	10/14/18	-1.29	±	2.35	-0.05	±	0.09	No	-1.14	±	1.35	-0.04	±	0.05	No
	11/05/18	2.75	±	2.31	0.10	±	0.09	No	2.06	±	1.41	0.08	±	0.05	No
CONTROL	10/02/18	0.20	±	2.15	0.01	±	0.08	No	0.95	±	1.36	0.04	±	0.05	No
	10/30/18	-0.05	±	1.79	0.00	±	0.07	No	0.95	±	0.86	0.04	±	0.03	No
	12/04/18	-2.88	±	2.50	-0.11	±	0.09	No	0.58	±	1.33	0.02	±	0.05	No
DIETRICH	10/02/18	-0.61	±	1.07	-0.02	±	0.04	No	0.30	±	0.83	0.01	±	0.03	No
	11/06/18	4.76	±	8.40	0.18	±	0.31	No	0.37	±	0.98	0.01	±	0.04	No
	12/04/18	-0.63	±	2.00	-0.02	±	0.07	No	1.05	±	1.37	0.04	±	0.05	No
Duplicate	12/04/18	0.92	±	1.29	0.03	±	0.05	No	0.03	±	0.83	0.00	±	0.03	No
HOWE	11/06/18	1.97	±	1.33	0.07	±	0.05	No	-2.63	±	0.90	-0.10	±	0.03	No
	12/04/18	-0.06	±	1.15	0.00	±	0.04	No	0.91	±	0.82	0.03	±	0.03	No
IDAHO FALLS	10/02/18	0.27	±	1.64	0.01	±	0.06	No	0.66	±	1.53	0.02	±	0.06	No
Duplicate	10/02/18	-2.17	±	2.07	-0.08	±	0.08	No	0.23	±	1.34	0.01	±	0.05	No
	10/09/18	-1.42	±	1.66	-0.05	±	0.06	No	-0.10	±	1.35	0.00	±	0.05	No
	10/16/18	-2.49	±	1.77	-0.09	±	0.07	No	0.87	±	1.45	0.03	±	0.05	No
	10/23/18	-1.97	±	1.92	-0.07	±	0.07	No	0.34	±	1.35	0.01	±	0.05	No
	10/30/18	-1.25	±	1.09	-0.05	±	0.04	No	0.56	±	0.84	0.02	±	0.03	No
	11/06/18	-0.60	±	1.10	-0.02	±	0.04	No	0.20	±	0.85	0.01	±	0.03	No
	11/13/18	-0.05	±	1.00	0.00	±	0.04	No	0.22	±	0.82	0.01	±	0.03	No
	11/20/18	-0.39	±	0.96	-0.01	±	0.04	No	-0.07	±	0.85	0.00	±	0.03	No
	12/04/18	0.05	±	1.00	0.00	±	0.04	No	-0.95	±	0.86	-0.04	±	0.03	No
	12/11/18	-1.12	±	2.02	-0.04	±	0.07	No	1.55	±	1.39	0.06	±	0.05	No
	12/18/18	1.64	±	1.02	0.06	±	0.04	No	-0.12	±	0.80	0.00	±	0.03	No
	12/26/18	0.70	±	0.92	0.03	±	0.03	No	0.93	±	0.85	0.03	±	0.03	No
MINIDOKA	10/02/18	2.76	±	1.24	0.10	±	0.05	No	-1.34	±	1.01	-0.05	±	0.04	No
	11/06/18	-0.23	±	2.24	-0.01	±	0.08	No	-0.70	±	1.33	-0.03	±	0.05	No
	12/04/18	-0.02	±	1.07	0.00	±	0.04	No	0.68	±	0.84	0.03	±	0.03	No
TERRETON	10/02/18	1.67	±	1.02	0.06	±	0.04	No	0.89	±	0.83	0.03	±	0.03	No
	10/10/18	0.46	±	1.67	0.02	±	0.06	No	1.07	±	1.33	0.04	±	0.05	No
	10/17/18	-1.60	±	1.74	-0.06	±	0.06	No	-0.15	±	1.31	-0.01	±	0.05	No
	10/24/18	-2.01	±	1.20	-0.07	±	0.04	No	-0.08	±	0.95	0.00	±	0.04	No
	10/31/18	0.75	±	1.71	0.03	±	0.06	No	0.72	±	1.28	0.03	±	0.05	No
	11/05/18	-10.00	±	1.50	-0.37	±	0.06	No	-1.65	±	0.97	-0.06	±	0.04	No
	11/14/18	0.31	±	1.67	0.01	±	0.06	No	-1.89	±	1.36	-0.07	±	0.05	No
	11/21/18	4.23	±	1.81	0.16	±	0.07	No	0.04	±	1.33	0.00	±	0.05	No
	12/04/18	-1.17	±	1.18	-0.04	±	0.04	No	-0.06	±	0.97	0.00	±	0.04	No
	12/13/18	0.31	±	0.93	0.01	±	0.03	No	0.72	±	0.85	0.03	±	0.03	No
	12/19/18	-1.74	±	1.72	-0.06	±	0.06	No	-1.86	±	1.43	-0.07	±	0.05	No
	12/26/18	2.40	±	1.73	0.09	±	0.06	No	-0.44	±	1.35	-0.02	±	0.05	No

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

Location	Sampling Date	Result ± 1s Uncertainty (pCi/L)			Result ± 1s Uncertainty (Bq/L)			Result > 3s
Strontium-90								
CONTROL	10/30/18	-0.18	±	0.04	-0.007	±	0.002	No
DIETRICH	11/06/18	0.05	±	0.04	0.002	±	0.002	No
HOWE	11/06/18	-0.06	±	0.04	-0.002	±	0.001	No
IDAHO FALLS	11/06/18	-0.03	±	0.04	-0.001	±	0.002	No
MINIDOKA	11/06/18	0.01	±	0.04	0.000	±	0.002	No
TERRETON	11/27/18	-0.04	±	0.04	-0.001	±	0.002	No
Tritium								
		Result ± 1s Uncertainty (pCi/L)			**Result ± 1s Uncertainty (Bq/L)**			**Result > 3s**
BLACKFOOT	11/05/18	41.50	±	23.90	1.54	±	0.89	No
CONTROL	10/30/18	35.90	±	25.30	1.33	±	0.94	No
DIETRICH	11/06/18	87.50	±	24.70	3.24	±	0.91	**Yes**
HOWE	11/06/18	20.30	±	24.00	0.75	±	0.89	No
IDAHO FALLS	11/06/18	35.90	±	24.00	1.33	±	0.89	No
MINIDOKA	11/06/18	41.90	±	23.90	1.55	±	0.89	No
TERRETON	11/05/18	25.10	±	23.90	0.93	±	0.89	No

Table C-9. Actinide, Gamma-emitting Radionuclide, and Strontium-90 Concentrations in Edible Tissues of Waterfowl

Location	Sampling Date	Analyte	Result pCi/kg	±	Uncertainty(1s) pCi/kg	Result (x 10^{-2}) Bq/kg[a]	±	Uncertainty(1s) (x 10^{-2}) Bq/kg[a]	Result > 3s
ATR Complex	10/12/2018								
		AMERICIUM-241	4.03	±	2.12	14.93	±	7.85	No
		CESIUM-137	579.00	±	37.80	2144.44	±	140.00	Yes
		CHROMIUM-51	-359.00	±	197.00	-1329.63	±	729.63	No
		COBALT-60	963.00	±	17.10	3566.67	±	63.33	Yes
		PLUTONIUM-238	-2.95	±	2.23	-10.93	±	8.26	No
		PLUTONIUM-239/240	0.84	±	2.94	3.11	±	10.89	No
		STRONTIUM-90	1.25	±	2.96	4.63	±	10.96	No
		ZINC-65	2120.00	±	119.00	7851.85	±	440.74	Yes
ATR Complex	10/13/2018								
		AMERICIUM-241	5.49	±	2.57	20.33	±	9.52	No
		CESIUM-137	2.40	±	7.15	8.89	±	26.48	No
		CHROMIUM-51	-128.00	±	171.00	-474.07	±	633.33	No
		COBALT-60	19.00	±	5.07	70.37	±	18.78	Yes
		PLUTONIUM-238	3.75	±	2.96	13.89	±	10.96	No
		PLUTONIUM-239/240	1.87	±	2.64	6.93	±	9.78	No
		STRONTIUM-90	5.16	±	3.10	19.11	±	11.48	No
		ZINC-65	15.90	±	16.00	58.89	±	59.26	No
ATR Complex	10/20/2018								
		AMERICIUM-241	3.38	±	3.58	12.52	±	13.26	No
		CESIUM-137	0.21	±	6.34	0.79	±	23.48	No
		CHROMIUM-51	-19.80	±	103.00	-73.33	±	381.48	No
		COBALT-60	11.30	±	4.49	41.85	±	16.63	No
		PLUTONIUM-238	4.93	±	3.90	18.26	±	14.44	No
		PLUTONIUM-239/240	-8.48	±	5.09	-31.41	±	18.85	No
		STRONTIUM-90	5.73	±	3.14	21.22	±	11.63	No
		ZINC-65	-35.60	±	15.10	-131.85	±	55.93	No
ATR Complex	10/20/2018								
		AMERICIUM-241	3.05	±	2.64	11.30	±	9.78	No
		CESIUM-137	1.81	±	7.15	6.70	±	26.48	No
		CHROMIUM-51	-115.00	±	128.00	-425.93	±	474.07	No
		COBALT-60	6.23	±	4.72	23.07	±	17.48	No
		PLUTONIUM-238	1.72	±	2.68	6.37	±	9.93	No
		PLUTONIUM-239/240	1.28	±	2.84	4.74	±	10.52	No
		STRONTIUM-90	9.04	±	3.19	33.48	±	11.81	No
		ZINC-65	4.98	±	14.90	18.44	±	55.19	No
Control	11/3/2018								
		AMERICIUM-241	0.85	±	2.54	3.14	±	9.41	No
		CESIUM-137	-2.77	±	5.21	-10.26	±	19.30	No
		CHROMIUM-51	2.23	±	97.20	8.26	±	360.00	No
		COBALT-60	8.54	±	3.77	31.63	±	13.96	No
		PLUTONIUM-238	6.91	±	5.04	25.59	±	18.67	No
		PLUTONIUM-239/240	-12.70	±	5.78	-47.04	±	21.41	No
		STRONTIUM-90	2.90	±	2.87	10.74	±	10.63	No
		ZINC-65	-12.20	±	12.30	-45.19	±	45.56	No
Control	11/3/2018								
		AMERICIUM-241	0.75	±	2.69	2.77	±	9.96	No
		CESIUM-137	1.72	±	2.36	6.37	±	8.74	No
		CHROMIUM-51	-13.00	±	18.70	-48.15	±	69.26	No
		COBALT-60	3.48	±	1.82	12.89	±	6.74	No
		PLUTONIUM-238	-1.34	±	3.16	-4.96	±	11.70	No
		PLUTONIUM-239/240	-0.89	±	2.31	-3.30	±	8.56	No
		STRONTIUM-90	0.53	±	2.69	1.98	±	9.96	No
		ZINC-65	-3.70	±	4.82	-13.70	±	17.85	No

[a] During the summer of 2020, a review of the table determined the activity concentration values reported for the media were correct, however, the (x10-5) Bq/g unit of concentration listed in the column heading was incorrect. The column heading has been updated to the correct unit of concentration (x10^{-2}) Bq/kg. For further discussion see Section 5.3 Waterfowl.

Table C-10. Environmental Radiation Measurements Using OSLDs

Location	Start Date	End Date	Radiation Measurement ± 2s Uncertainty mrem			Dose mrem/day
BOUNDARY						
ARCO	05/09/18	11/07/18	63.74	±	6.37	0.35
ATOMIC CITY	05/09/18	11/07/18	61.27	±	6.13	0.34
BIRCH CREEK	05/09/18	11/07/18	56.12	±	5.61	0.31
BLUE DOME	05/09/18	11/07/18	56.01	±	5.60	0.31
HOWE	05/09/18	11/07/18	59.58	±	5.96	0.33
MONTEVIEW	05/09/18	11/07/18	61.75	±	6.17	0.34
MUD LAKE	05/09/18	11/07/18	68.46	±	6.85	0.38
Boundary Average			**60.99**			**0.34**
DISTANT						
ABERDEEN	05/08/18	11/08/18	63.07	±	6.31	0.34
BLACKFOOT	05/09/18	11/07/18	56.18	±	5.62	0.31
CRATERS	05/09/18	11/07/18	60.47	±	6.05	0.33
DUBOIS	05/09/18	11/07/18	51.37	±	5.14	0.28
IDAHO FALLS	05/14/18	11/09/18	60.13	±	6.01	0.33
JACKSON	05/10/18	11/06/18	57.69	±	5.77	0.32
MINIDOKA	05/09/18	11/07/18	55.03	±	5.50	0.31
ROBERTS	05/08/18	11/05/18	65.10	±	6.51	0.36
SUGAR CITY	05/09/18	11/07/18	78.25	±	7.83	0.43
Distant Average			**60.81**			**0.34**

APPENDIX D

STATISTICAL ANALYSIS RESULTS

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

Parameter	P[a]
Gross Alpha	
Quarter	0.3346
October	0.6394
November	0.6662
December	0.7771
Gross Beta	
Quarter	0.2586
October	0.8011
November	0.2553
December	0.2526

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