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Idaho National Engineering and Environmental Laboratory Offsite Environmental Surveillance Program Report: First Quarter 2000

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EXECUTIVE SUMMARY

This report for the first quarter, 2000, consists of results from the Environmental Surveillance, Education, and Research (ESER) Program's monitoring of the Department of Energy's Idaho National Engineering and Environmental Laboratory's (INEEL) offsite environment. All sample types (media) and the sampling schedule followed during 2000 are listed in Appendix A. Specifically, this report contains the results for the following:

- Air sampling, including particulate filters and charcoal cartridges, atmospheric moisture, precipitation, and;
- Foodstuff sampling, including milk and large game animal collection.

Air monitors were operated continuously at 15 locations, plus 2 replicate samplers, with particulate filters and charcoal cartridges sampled weekly. In only two weeks, those ending January 5, 2000, and February 9, 2000, were the average gross alpha concentrations at INEEL locations significantly different from Boundary or Distant averages. In both cases, Distant samples were higher than the INEEL average. It is not unusual for distant locations to have a higher gross alpha or gross beta concentration in air due to a higher concentration of particulates from fuel burning for heat in populated areas and from agricultural activities in more rural areas. There were no statistically significant differences in weekly gross beta concentration averages at INEEL, Boundary, or Distant locations. No ^{131}I was detected in any of the weekly charcoal cartridges during the first quarter, 2000.

Quarterly particulate filters were composited and analyzed for gamma emitting radionuclides with a subset analyzed for ^{90}Sr, ^{238}Pu, $^{239/240}$Pu, and ^{241}Am. ^{137}Cs was found at a level greater than its 2s uncertainty in the sample from the FAA Tower location. ^{90}Sr was found at a level greater than its 2s uncertainty in the sample from Rexburg and in the sample from Atomic City. ^{241}Am was found at a level greater than its 2s uncertainty in the sample from Monteview and Arco. All sample results were less than the minimum detectable concentration (MDC) except for ^{241}Am on the Monteview composite sample. A replicate sample was collected at the same location in which no ^{241}Am was detected. All radionuclides detected were at low concentrations indistinguishable from those present in the environment from historical atmospheric testing of nuclear weapons. No specific radionuclides were detected in composited particulate filter samples from locations on the INEEL.

An atmospheric moisture sample was obtained from each of the Rexburg, Blackfoot, and Atomic City sampling locations during the First Quarter of 2000. The Rexburg atmospheric moisture sample had a tritium result greater than its 2s uncertainty [$(7.17 \pm 7.09) \times 10^{-14}$ µCi/mL of air, or $(2.65 \pm 2.62) \times 10^{-9}$ Bq/mL of air]. This result is slightly over the 2s uncertainty value and was over 50 times lower than the minimum detectable concentration. There is a high probability that this value is a false positive. Regardless, it is a very low concentration. For comparison, the sample from Rexburg was over one million times lower than DOE's Derived Concentration Guide (DCG) for tritium in air, which is a comparison value used to ensure dose limits are not exceeded.

Three monthly composite precipitation samples were collected at Idaho Falls and at the Central Facilities Area (CFA) on the INEEL. Also, there was enough precipitation to collect six weekly samples at the Experimental Field Station (EFS) on the INEEL. One precipitation sample collected at the EFS in March yielded a tritium result greater than its 2s uncertainty [(5.5 ± 0.78) x 10^{-4} µCi/L, or (20.5 ± 2.9) Bq/L]. Immediate reanalysis of this sample gave a result less than its 2s uncertainty [(-9.4 ± 6.9) x 10^{-5} µCi/L, or –3.5 ± 2.6 Bq/L]. No tritium was detected in composite samples at CFA or at Idaho Falls during the month of March, however, an INEEL source cannot be discounted for contributing to the detection on the INEEL. There is no DCG for precipitation, but in drinking water it is 0.08 µCi/L (2,960 Bq/L). The level of tritium detected in the first analysis of the EFS sample was 145 times lower than the DCG value for drinking water.

Of the 34 milk samples collected over the first quarter 2000, none of the samples contained detectable concentrations of ^{131}I. Only one sample, from Howe, had a ^{137}Cs concentration greater than its 2s uncertainty [(2.6 ± 2.2) x 10^{-9} µCi/mL, or (9.6 ± 8.2) x 10^{-5} Bq/mL].

Of the 3 big game animals sampled on the INEEL, one liver sample, from a mule deer, yielded a ^{137}Cs level greater than the 2s uncertainty level [(3.7 ± 2.0) x 10^{-9} µCi/g wet weight, or (1.4 ± 0.8) x 10^{-4} Bq/g wet weight]. Similar levels of ^{137}Cs are commonly detected in wild game tissues throughout the Northern Hemisphere. For example, big game animals sampled in Colorado, Montana, Oregon, Utah, and Wyoming, 1998 – 1999, had average ^{137}Cs concentrations in muscle tissue of 20 x 10^{-9} µCi/g wet weight (range: -10 to 152 µCi/g wet weight).

All concentrations of radioactivity found in samples collected by the ESER program during the first quarter, 2000, were consistent with concentrations which have been found in samples taken during recent years. No measured concentrations could be directly attributed to operations at the INEEL. Concentrations in all of the samples collected and analyzed over the first quarter 2000 were below guidelines set by both the DOE and the EPA for protection of human health.

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LIST OF ABBREVIATIONS

AEC	Atomic Energy Commission
Bq	becquerel
CFA	Central Facilities Area
CMS	community monitoring station
Ci	curie
DCG	Derived Concentration Guide
DOE – ID	U.S. 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 Program	Environmental Surveillance, Education, and Research Program
g	gram
INEEL	Idaho National Engineering and Environmental Laboratory
ISU	Idaho State University
L	liter
MDA	minimum detectable activity
MDC	minimum detectable concentration
mi	mile
mL	milliliter
mR	milliroentgens
mrem	millirem
μCi	microcurie
PM_{10}	particulate matter less than 10 micrometers in diameter
R	roentgen
rem	roentgen-equivalent-man
s	standard deviation
SI	Systeme International d'Unites
Sv	seivert
μSv	microseiverts
y	year

HELPFUL INFORMATION

Elements That Make Up Our World

Atoms make up everything in our world. The basic parts of an atom are protons, neutrons, and electrons (Figure 1). Different atoms may have different numbers of each of these parts. An element is a substance that is made up of only atoms with the same number of protons. Elements with different numbers of neutrons are referred to as isotopes of that element. Elements are sometimes expressed with the one- or two-letter chemical symbol for that element. The atomic weight, shown as a superscript number, is equal to the number of protons and neutrons in its nucleus and is used to identify the isotope of that element. Some isotopes of some elements are radioactive, including many naturally occurring elements. Radioactive isotopes, when taken as a whole for more than one element, are collectively referred to as radionuclides. All human-made radionuclides detected during this quarter are listed in this report. A list of common human-made radionuclides, along with their chemical symbol, are listed below.

Symbol		Radionuclide
^{3}H	-	Tritium
^{90}Sr	-	Strontium-90
^{131}I	-	Iodine-131
^{137}Cs	-	Cesium-137
^{238}Pu	-	Plutonium-238
$^{239/240}Pu$	-	Plutonium-239/240
^{241}Am	-	Americium-241

Helium Atom

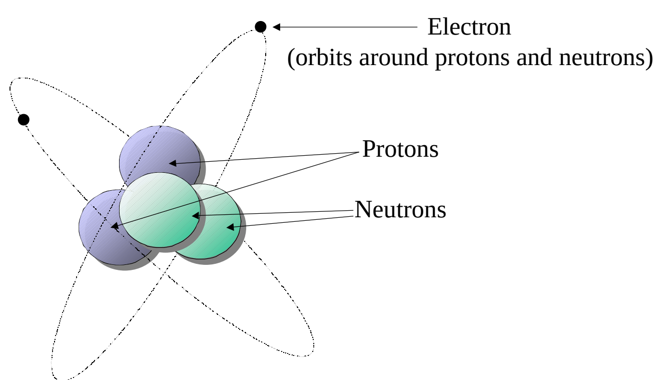

FIGURE 1. An atom of the element Helium. An element is a substance that is made up of only atoms with the same number of protons.

Radiation

Radioactive atoms are unstable and, in an effort to become stable, release energy. This release of energy comes from the release of particles or electromagnetic waves as the radioactive atom “decays,” or “disintegrates.” The three main types of radiation are alpha, beta, and gamma radiation (Figure 2). Alpha and beta are particles emitted from an atom. Alpha particles consist of two protons and two neutrons (equal to the nucleus of a helium atom). Alpha particles do not travel very far (only centimeters in air) and are easily stopped. They will not penetrate paper or the outer layer of your skin so they are not an external hazard to the body. Internally, however, they are of more concern. Beta particles are electrons emitted from the nucleus of an atom. Beta particles can have enough energy to penetrate paper or skin but not materials like wood or plastic. Gamma rays are short-wavelength electromagnetic waves (photons) emitted from the nucleus of an atom following radioactive decay. Gamma ray radiation has a penetration ability greater than alpha or beta radiation. In fact, X-rays are the same as gamma radiation except they are produced from the orbital electrons of atoms rather than the nucleus. The rate at which a given amount of a particular radioactive isotope decays is measured by its half-life. The half-life is the time required for half of the amount present to decay.

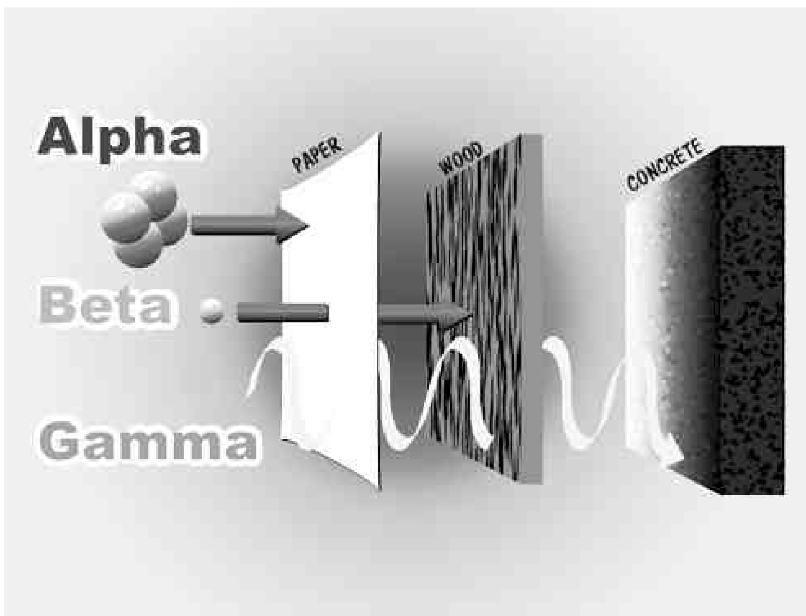

FIGURE 2. Three main types of radiation are alpha, beta, & gamma. Alpha and beta are particles emitted from an atom. Gamma radiation is short-wavelength electromagnetic waves (photons) emitted from atoms.

Units Used to Express the Amount of Radioactivity

Radioactivity is measured by the number of atoms that disintegrate per unit time. The conventional unit for activity is the curie (Ci). A curie is defined as the activity in one gram of naturally occurring Radium-226 and equals 37,000,000,000 disintegrations per second (Figure 3). The Systeme International d'Unites (SI) is the recognized international standard for describing measurable quantities and their units. The standard SI unit for radioactivity is the becquerel (Bq). A becquerel is equal to one disintegration per second (Figure 3).

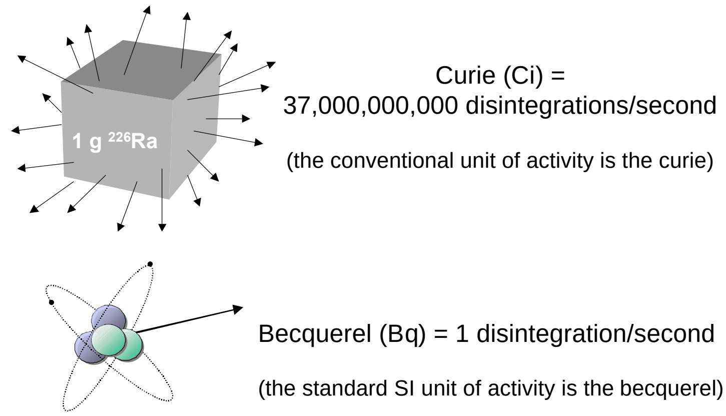

FIGURE 3. Units used to express the amount of radioactivity.

Radiation Exposure and Dose

The primary concern regarding radioactivity is the amount of energy deposited by particles or gamma radiation to the surrounding environment. It is possible that the energy from radiation may damage living tissue. When radiation interacts with the atoms of a given substance, it can alter the number of electrons associated with those atoms (usually removing orbital electrons). This is called ionization.

The term “exposure” is used to express the amount of ionization produced in air by electromagnetic (gamma and X-ray) radiation. The unit of exposure from gamma or X-ray radiation is the roentgen (R). The average exposure rate from natural radioactivity in southeast Idaho is about 0.130 R per year.

Radiation absorbed dose describes the amount of energy from ionizing radiation absorbed by any kind of matter. When absorbed dose is adjusted to account for the amount of biological damage a particular type of radiation causes, it is known as dose equivalent. The unit for dose equivalence is called the rem (“roentgen-equivalent-man”). The SI unit for dose equivalent is called the seivert (Sv). One seivert is equivalent to 100 rem.

Unit Prefixes

The range of numbers experienced in many scientific fields, like that of environmental monitoring for radioactivity, is huge and units for very small and very large numbers are commonly expressed by scientists as a prefix that modifies the unit of measure. One example is the prefix *kilo*, abbreviated k, which means 1,000 of a given unit. A kilometer is therefore equal to 1,000 meters. Prefixes used in this report include:

Prefix	Abbreviation	Meaning
Mega	M	1,000,000 (= 1×10^{6})
milli	m	0.001 (= 1×10^{-3})
micro	µ	0.000001 (1×10^{-6})
pico	p	0.000000000001 (= 1×10^{-12})

Scientific Notation

Scientific notation is used to express numbers which are very small or very large. A very small number will be expressed with a negative exponent, e.g., 1.2×10^{-6}. To convert this number to the more commonly used form, the decimal point must be moved left by the number of places equal to the exponent (in this case, six). Thus the number 1.2×10^{-6} is equal to 0.0000012. A large number will be expressed with a positive exponent, e.g. 1.2×10^{6}. To convert this number, the decimal point must be moved right by the number of places equal to the exponent. For example, the number 1.2×10^{6} is equal to 1,200,000.

Concentrations of Radioactivity

The amount of radioactivity in a substance of interest is described by its concentration. The concentration is the amount of radioactivity per unit volume or weight of that substance. Air, milk, and atmospheric moisture samples are expressed as activity per milliliter (mL). Concentrations in surface water, drinking water, and precipitation samples are expressed as activity per liter (L). Radioactivity in foodstuff and soil are expressed as activity per gram (g). Exposure, as measured by environmental dosimeters, is expressed in units of milliRoentgens (mR). This is sometimes expressed in terms of dose as millirem (mrem) or microseiverts (:Sv).

Gross versus Specific Analyses

Some analyses are designed to detect specific radionuclides (specific analyses) while other analyses are designed to measure radiation from a large number of sources (gross analyses). Gamma emitting radionuclides are determined by a specific analyses technique called gamma spectroscopy, for example. Analyses for specific alpha and beta emitting radionuclides, on the other hand, require more difficult and expensive radiochemical analyses. Low cost, but very sensitive, gross measurements are often substituted for the more expensive specific analyses as a screening procedure. The gross analyses are generally made first to determine the total amount of radioactivity that is present. The more expensive specific analyses of beta- and alpha-emitting radionuclides are only made if the gross measurements are above background levels. When gross beta or gross alpha measurements are made, it simply means all beta activity or all alpha activity is measured. There is no distinction between which beta-emitting or alpha-emitting radionuclides are present, just how much beta or alpha activity there is present. Gross measurements are used as a method to screen samples for relative levels of radioactivity.

Detecting Radioactivity

All measurements have uncertainties. Uncertainty arises from variations in detection equipment and analysis procedures, natural background radiation, the random nature of radioactive decay, variances in the distribution of the compound targeted for analysis in the media being analyzed, and other sources. The analysis uncertainty is reported with radioactive analyses. This uncertainty exists because radioactive atoms disintegrate in a random way. That is to say not all of the particles/energy released strike the detector. If the number of radioactive disintegrations from one sample are counted multiple times, each for the same duration, that number will vary around some average value. Background radiation makes this true even for a sample that has no radioactivity. If a sample containing no radioactivity was analyzed multiple times, the net result should vary around an average of zero (Figure 4). Therefore, samples with radioactivity levels very close to zero will have results that are negative values approximately 50% of the time. In order to avoid censoring data, these negative values, rather than "not detectable" or "zero," are reported for radionuclides of interest. This provides more information than merely truncating to the detection limits for results near background activities and allows for improved statistical analyses and measures of trends in the data.

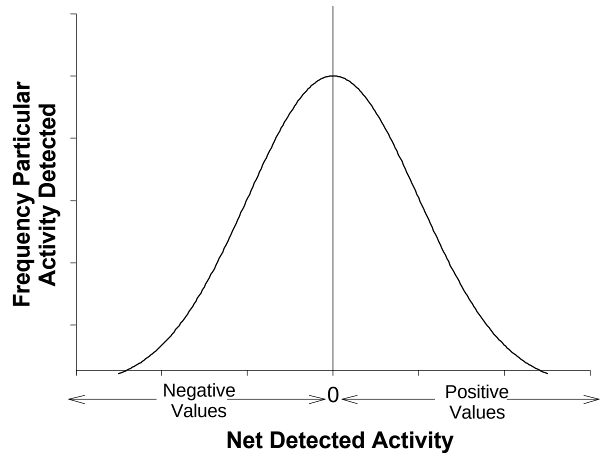

FIGURE 4. Expected frequency distribution for a sample with no radioactivity. If a sample containing no radioactivity was analyzed multiple times, a distribution of net values with an average of zero would result. Samples with radioactivity levels very close to zero are expected to have net results that are negative values approximately 50% of the time after background is subtracted.

Confidence in Detections

There are two main types of errors that may be made when reporting levels of contaminants:

- reporting something as not present when it actually is, and;
- reporting something as present when it actually is not.

It is the goal of the ESER program to minimize the error of saying something is not present when it actually is. To do this, a two standard deviation (2s) reporting level is used. The standard deviation is a measurement of the variation from the mean. In a distribution of results for one sample, the average result, plus or minus (±) two standard deviations (2s) of that average, approximates the 95% confidence interval for that average. When a net sample analysis result is greater than 2s from zero, we have about 95% confidence[1] the value came from a distribution with an average greater than zero (Figure 5). The uncertainty of measurements in this report are denoted by following the result with a "±" 2s uncertainty term and all results that are greater than 2s from zero are reported in the text (all data are reported in Appendix C).

By using a 2s value as a reporting level (i.e. reporting net results that are greater than two times their uncertainty), we are controlling the error rate for saying something is not there when it is, to less than 5% (we have 95% confidence the value is greater than zero). However, there is a relatively high error rate for false detections (reporting something as present when it actually is not) for results near their 2s uncertainty. This is because there is variability around a net activity of zero for samples with no radioactivity which may substantially overlap the variability

[1] 95% confidence interval is equal to 1.96s.

around the sample result (Figure 5). Variability associated with current analysis techniques were used to calculate the level at which we are 95% certain the sample result is greater than the *distribution* of values for a sample with no radioactivity. This level is known as the minimum detectable activity (MDA). When sample net results are greater than the MDA, (Figure 6) we have 95% confidence the results are not false detections. The MDA per sample weight or volume is called the minimum detectable concentration (MDC). All results with measured levels greater than the MDC will be specifically highlighted in this report.

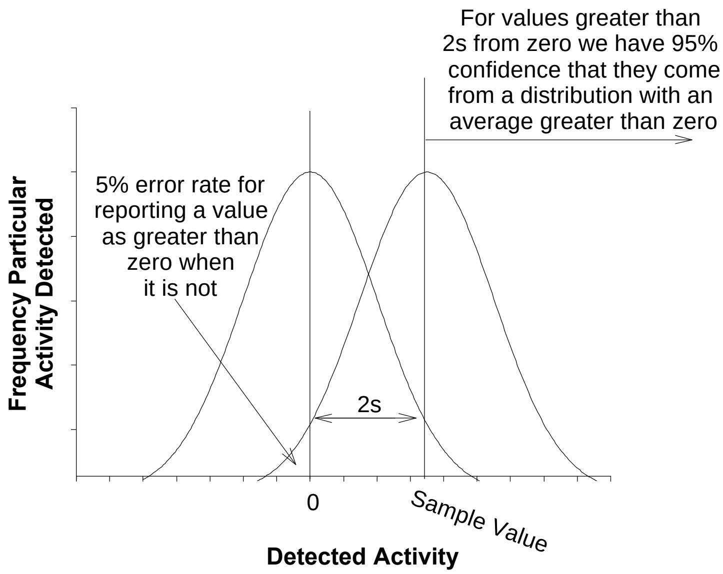

FIGURE 5. Radioactivity is reported when the result is greater than 2s from a net activity of zero. However, because there is variability around a net activity of zero for a sample with no radioactivity and variability around some value for a sample with radioactivity, there is a high rate for false detections for results near 2s.

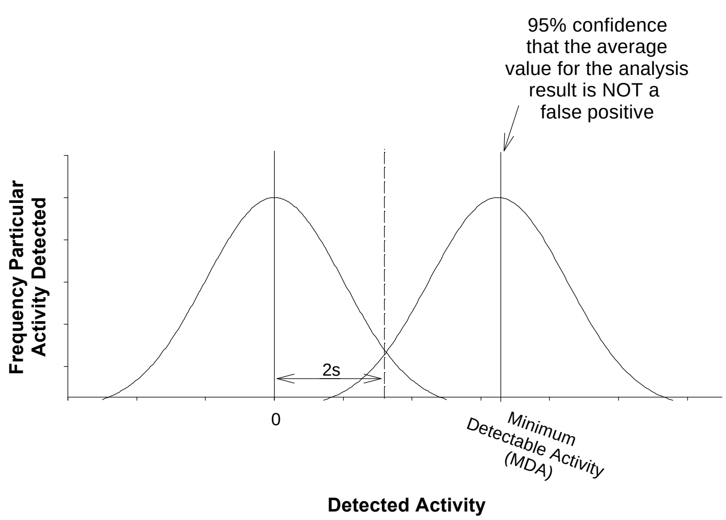

FIGURE 6. 95% confidence level that a sample result is not a false positive (95% confidence the sample result is greater than 2s from zero) is obtained when the sample result is greater than the MDA.

Determining Statistical Differences

When radiological measurements are made, it is often of interest to determine whether concentrations are different between locations or periods of time. For example, if the INEEL were a significant source of offsite contamination, concentrations of contaminants would be higher at INEEL locations compared to Boundary locations which, in turn, would be higher than at Distant locations, this, due to dispersal. To investigate this, statistical tests are used. Specifically, an independent samples t-test is used to test if there are significant differences between the average gross alpha and gross beta concentrations at INEEL, Boundary, and Distant locations. Groups are considered significantly different if the 95% confidence interval for their averages overlap (t-test with $\alpha = 0.05$).

Radioactivity In Our World

Radiation has always been a part of the natural environment in the form of cosmic radiation, cosmogenic radionuclides [carbon-14 (^{14}C), Beryllium-7 (^{7}Be), and tritium (^{3}H)], and naturally occurring radionuclides, such as potassium-40 (^{40}K), and the thorium, uranium, and actinium series radionuclides which have very long half lives. Additionally, human-made radionuclides were distributed throughout the world beginning in the early 1940s. Atmospheric testing of nuclear weapons from 1945 through 1980 and nuclear power plant accidents, such as the Chernobyl accident in the former Soviet Union during 1986, have resulted in fallout of detectable radionuclides around the world. This natural and global fallout radioactivity is referred to as background radiation.

The radionuclides present in our environment can give both internal and external doses (Table 1). Internal dose is received as a result of the intake of radionuclides. The major routes of intake of radionuclides for members of the public are ingestion and inhalation. Ingestion includes the intake of the radionuclides from drinking milk and water, and consumption of food products. Inhalation includes the intake of radionuclides through breathing dust particles containing radioactive materials.

We sample the air at 15 locations on and around the INEEL; surface water at 4 locations on the Snake River; drinking water at 14 locations around the INEEL; foodstuff which includes milk at 9 dairies around the INEEL, potatoes from at least 5 local producers, wheat from 11 local producers, lettuce from 8 home-owned gardens around the INEEL, sheep from 2 operators which graze their sheep on the INEEL, and various numbers of wildlife (game animals) which include big game (pronghorn, mule deer, and elk), waterfowl, and fish sampled on and near the INEEL. Table A-1 in Appendix A lists samples, sampling locations and collection frequency for the ESER Program.

Regulatory Limits

During the last 100 years, research has been conducted in an attempt to understand the effects of radiation on humans and the environment. Much of this research was done using standard epidemiological and toxicological approaches to characterize the response of populations and individuals to high radiation doses. A good understanding of risks associated with high radiation doses was achieved. At low exposures to radiation, however, healing of cells does occur so the risks from these levels are less known. This problem is compounded because scientists are searching for effects from exposure to low levels of radiation in the midst of exposures to much larger amounts of natural radiation. The only measurable increased cancer incidence has occurred following high radiation doses. Mathematical models have been used to predict risks from low radiation doses. Regulatory dose limits are set well below levels where measurable health effects have been observed. The total radiation dose limit for individual members of the public as defined by the Code of Federal Regulations (10 CFR 20.1301) is 1 mSv/y (100 mrem/y), not including the dose contribution from background radiation. Limits on emissions of radionuclides to the air from DOE facilities are set such that they will not result in a dose greater than 0.1 mSv/y (10 mrem/y) to any member of the public (40 CFR 61.92). DOE drinking water criterion have set limits of 0.04 mSv/y (4 mrem/y) for the ingestion of drinking water (DOE Order 5400.5,), and EPA limits on drinking water supplies specify low allowable limits for radioactive constituents (40 CFR Parts 9, 141, and 142). DOE Order 5400.5 lists Derived Concentration Guide (DCG) values which are the concentrations in air and water that a person exposed to continuously (ingested and inhaled given certain assumptions) will result in the dose limit. DCG values are used as a reference to ensure observed concentrations are lower than concentrations that would result in a dose near the limit. ESER Program laboratories analyze for radionuclides at levels ranging from 10 to over one million times lower than those that would result in a dose near the limits (Table B-1, Appendix B).

TABLE 1. Annual estimated average dose received by a member of the population of the United States from natural radiation sources. (data source NCRP 1987)[a].

	Average Annual Effective Dose Equivalent	
SOURCE	**(mSv)[b]**	**(mrem)[c]**
Inhaled (Radon and Decay Products)	2	200
Other Internally Deposited Radionuclides	0.39	39
Terrestrial Radiation	0.28	28
Cosmic Radiation	0.27	27
Cosmogenic Radioactivity	.01	1
Rounded Total From Natural Sources	3	300

[a] Natural radiation doses vary based on local geology and elevation.
[b] milliseiverts
[c] millirem

1. ESER PROGRAM DESCRIPTION

Operations at the Idaho National Engineering and Environmental Laboratory (INEEL) 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 Clean Water Act). The requirements imposed by DOE are specified in the DOE Orders. These requirements include those to monitor the effects, of DOE activities onsite and offsite of the INEEL (DOE Order 5400.1). During calendar year 2000, environmental monitoring within the INEEL boundaries was primarily the responsibility of the INEEL Management and Operating (M&O) contractor, while the program for monitoring outside the INEEL boundaries was conducted under the Environmental Surveillance, Education, and Research (ESER) Program by an independent contractor. Samples for the first portion of the year, 2000, were collected by the Environmental Science and Research Foundation (Idaho Falls, ID) that formerly held the ESER contract. This report was prepared by the new ESER Team (receiving the ESER contract from DOE-ID in October, 2000) lead by the S.M. Stoller Corporation and includes the University of Idaho and Washington State University for research, Montgomery Watson Harza for technical support, and Idaho State University (ISU) for analytical services. This report contains the monitoring results from the ESER Program for the third quarter of 2000 (July 1 – September 20, 2000).

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 INEEL;
- Assess the potential radiation dose to members of the public from INEEL effluents, and;
- Present program results clearly and concisely through the use of reports, presentations, newsletter articles, and press releases.

The INEEL ESER Program's primary responsibility is to monitor a number of different pathways by which pollutants from the INEEL could reach members of the public. The constituents of primary concern are radionuclides and the surveillance program focuses on these constituents. The goal of the surveillance program is to monitor several different media points within these potential pathways, including air, water, foodstuff, and soil, that could potentially contribute to the dose received by the public. A comprehensive list of the annual sample collection schedule is presented in Appendix A.

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

The ESER Program used two laboratories to perform analyses on environmental samples for 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 ^{90}Sr , ^{238}Pu, $^{239/240}Pu$, and ^{241}Am are performed under contract with Severn-Trent, Inc. (formerly Quanterra Environmental Services). The Operational Dosimetry unit of the INEEL M&O contractor evaluates environmental dosimeters. Samples collected by the ESER Program on behalf of the EPA are sent to the EPA's Eastern Environmental Radiation Facility.

In the event of non-routine occurrences, such as suspected releases of radioactive material, the ESER Program may increase either the frequency of sampling or the number of sampling locations based on the nature of the release and wind distribution patterns. In the event of any suspected worldwide nuclear incidents, like the Chernobyl accident, the EPA may request additional sampling be performed through the Environmental Radiation Ambient Monitoring System (ERAMS) network of which the ESER Program operates air and precipitation sampling equipment in Idaho Falls. The EPA established the ERAMS network in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. ERAMS is comprised of a nationwide network of sampling stations that provide air, precipitation, surface water, drinking water, and milk samples. Any data found to be outside historical norms in the ESER Program are thoroughly investigated to determine if an INEEL origin is likely. Investigation may include re-sampling and/or re-analysis of prior samples.

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

2. THE INEEL

The Idaho National Engineering and Environmental Laboratory (INEEL) is a nuclear energy research and environmental management facility, owned and administered by the U.S. Department of Energy, Idaho Operations Office (DOE-ID). It occupies about 2,300 km^2 (890 mi^2) of the upper Snake River Plain in Southeastern Idaho. The history of the INEEL began during World War II when the U.S. Naval Ordnance Station was located in Pocatello, Idaho. This station, one of just two such installations in the U.S., retooled large guns from U.S. Navy ships. The facility tested the retooled guns on the nearby-uninhabited plain, known as the Naval Proving Ground. In the aftermath of the war, as the nation worked to tame atomic power, the Atomic Energy Commission (AEC), predecessor to the DOE, became interested in the Naval Proving Ground and developed 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 electricity. The facility evolved into an assembly of 52 reactors, associated research centers, and waste handling areas. The NRTS was renamed the Idaho National Engineering Laboratory in 1974 and Idaho National Engineering and Environmental Laboratory in January 1997. Only two reactors are operable today with most activities on the INEEL centered around environmental restoration and waste management activities.

3. AIR SAMPLING

Surface water does not flow off of the INEEL so the primary pathway by which radionuclides can move off-site is through the air. Consequently, air is a primary focus of monitoring on and around the INEEL. Particulates and ^{131}I in air are measured at 15 locations, three on the INEEL with the rest at Boundary and Distant locations using low-volume air samplers. Moisture in the atmosphere is sampled at four locations around the INEEL and analyzed for tritium. Concentrations of particulates in the air are measured using PM_{10} samplers at three locations. Air sampling activities and results for the first quarter, 2000 are discussed below.

3.1 Low-Volume Air Sampling

Radioactivity associated with airborne particulates was monitored continuously by 17 ESER Program air samplers at 15 locations during the first quarter of 2000 (Figure 7). Three of these samplers were located on the INEEL, seven were located off the INEEL near the boundary, and five were at locations distant the INEEL. One replicate sampler was placed at an FAA Tower (boundary location) and one at Monteview (boundary location) during all of 2000. An average of 17,853 ft^3 (506 m^3) of air was sampled at each location, each week, at an average flow rate of 1.8 ft^3/min (0.05 m^3/min). Particulates in air were collected on filters (1.2 µm pore size), while gases were pulled through activated charcoal cartridges.

Filters and charcoal cartridges were changed weekly at each station. Each filter was screened 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 thoron to decay. For more information concerning gross alpha and beta radioactivity, see the *Gross versus Specific Analyses* portion of the *Helpful Information* section of this report. Charcoal cartridges were analyzed for gamma emitting radionuclides, specifically ^{131}I. Iodine-131 is of great interest because it is produced in relatively large quantities by nuclear fission and has a half-life of only eight days. This means any ^{131}I that is detected would be from a recent release of fission products. Finally, a composite of the 13 filters, one for each week, for each location was analyzed for gamma-emitting radionuclides with a subset analyzed for ^{90}Sr, ^{238}Pu, $^{239/240}$Pu, and ^{241}Am.

Weekly average gross alpha concentrations in air for INEEL, Boundary, and Distant locations are shown in Figure 8. In two of the thirteen weeks (those ending January 5, 2000 and February 9, 2000), average gross alpha concentrations at INEEL locations were significantly different from Boundary or Distant averages (using independent samples T-tests and $\alpha = 0.05$). In both cases, distant samples were higher than the INEEL average.

Weekly average gross beta concentrations in air for INEEL, Boundary, and Distant locations are shown in Figure 9. There were no statistically significant differences in weekly gross beta concentration averages at INEEL, Boundary, or Distant locations.

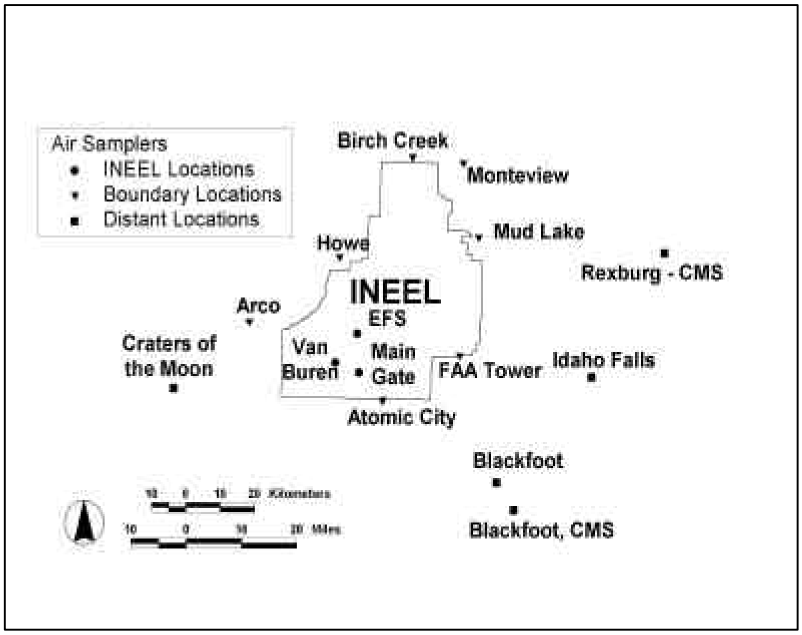

FIGURE 7. Continuous air sampling locations.

It is not unusual for distant locations to have a higher gross alpha or beta concentration in air due to a higher concentration of particulates from fuel burning for heat in populated areas and from agricultural activities in more rural areas. A summary of approximate minimum detectable concentrations for radiological analyses data is provided in Appendix B, while results for individual filters are listed in Table C-1 of Appendix C.

Monthly average gross alpha and beta concentrations in air at each sampling location are shown in Figures 10 – 15. No ^{131}I was detected in any of the weekly charcoal cartridges during the first quarter. Weekly ^{131}I results for each location are listed in Table C-2 of Appendix C.

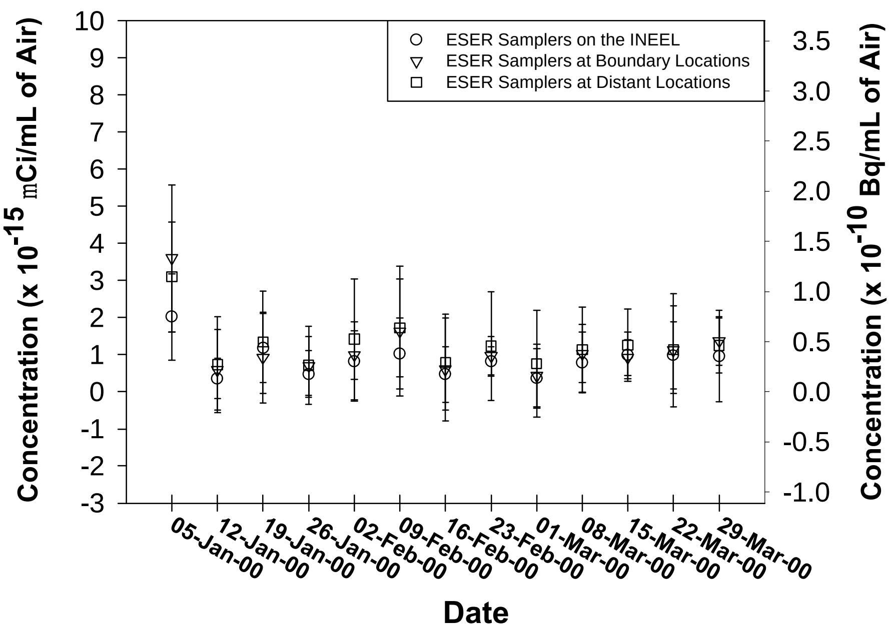

FIGURE 8. Weekly average gross alpha concentrations in air at ESER Program INEEL, Boundary, and Distant locations (error bars equal ± 2 standard deviations).

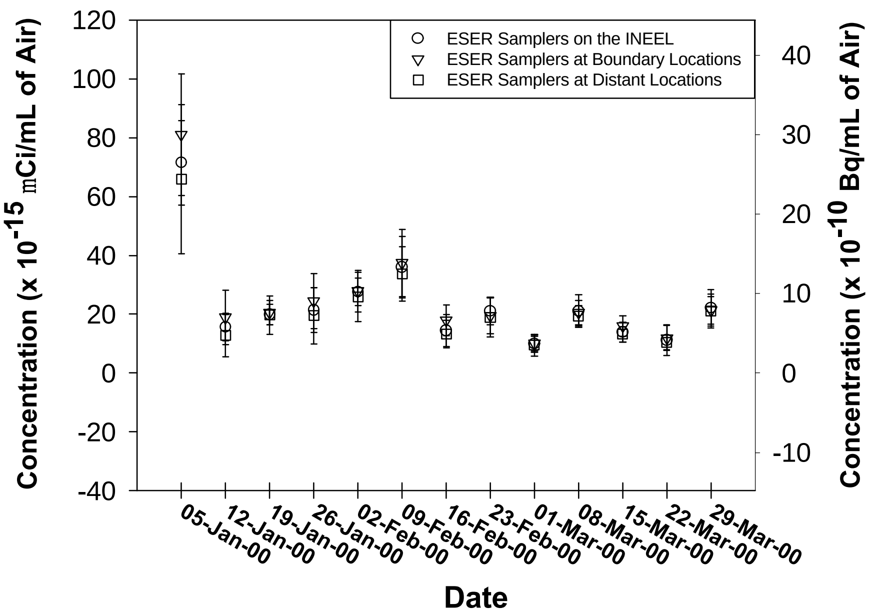

FIGURE 9. Weekly Average gross beta concentrations in air at ESER Program INEEL, Boundary, and Distant locations (error bars equal ± 2 standard deviations).

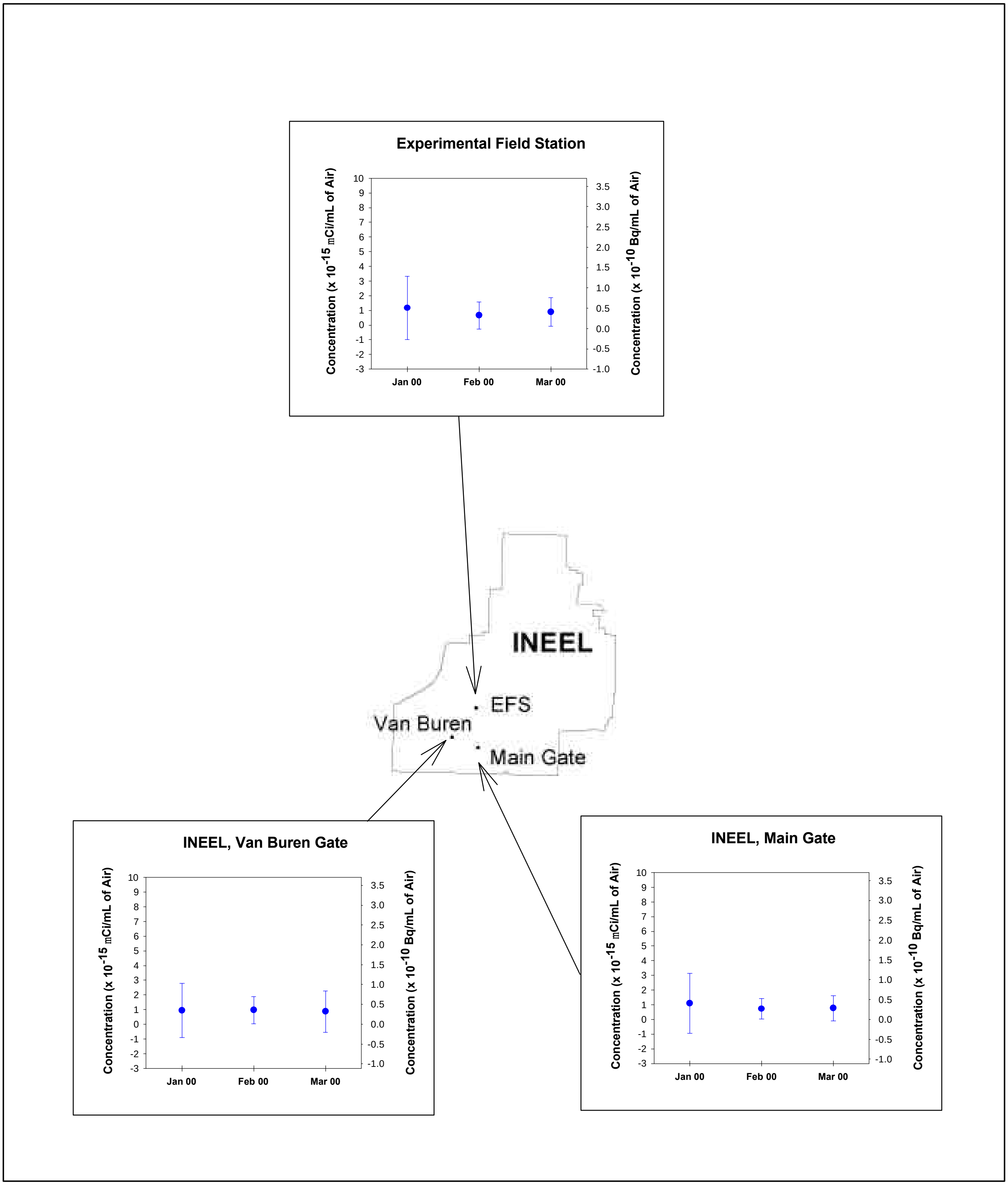

FIGURE 10. Monthly average gross alpha concentrations in air at ESER Program INEEL Locations.

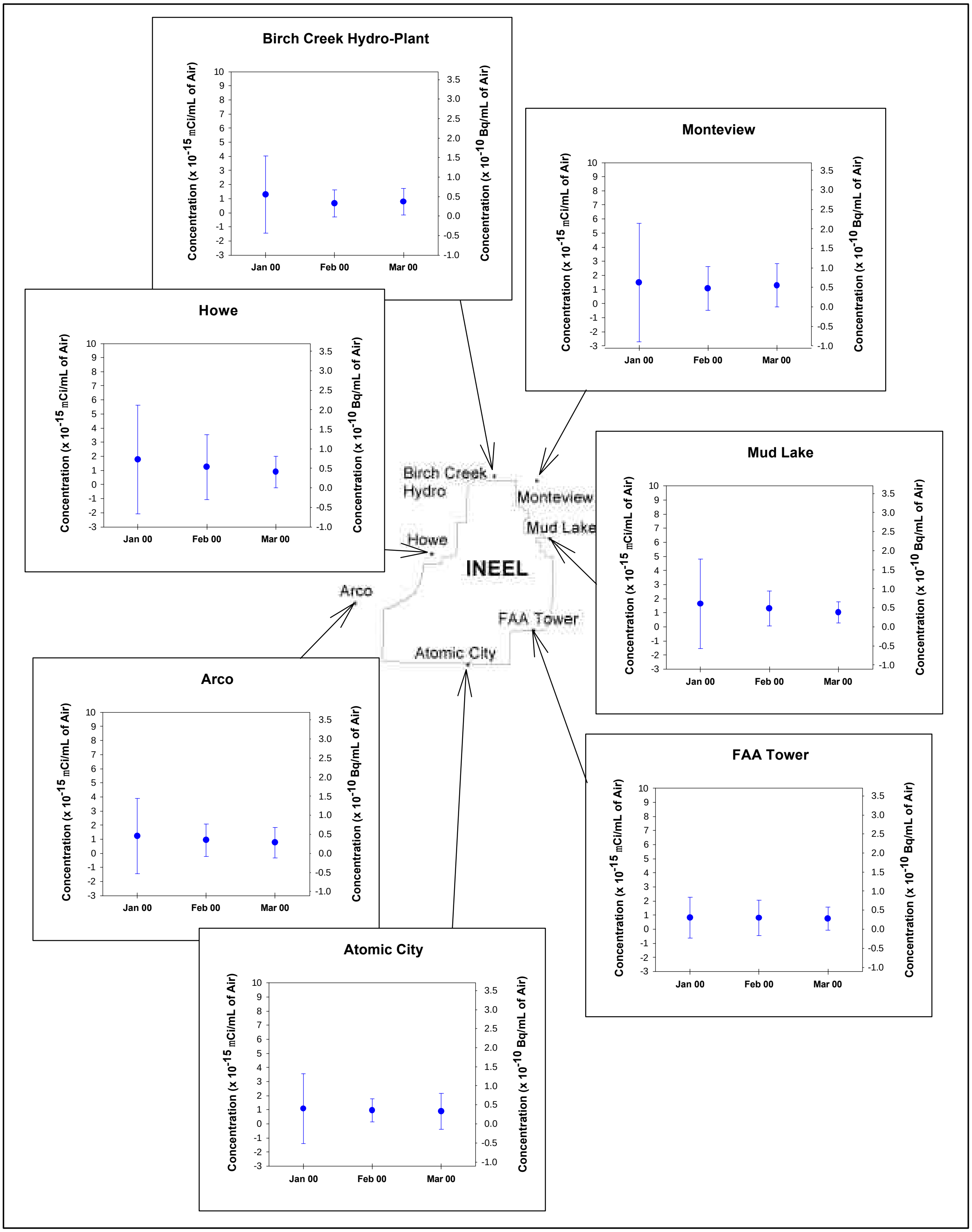

FIGURE 11. Monthly average gross alpha concentrations in air at ESER Program Boundary Locations.

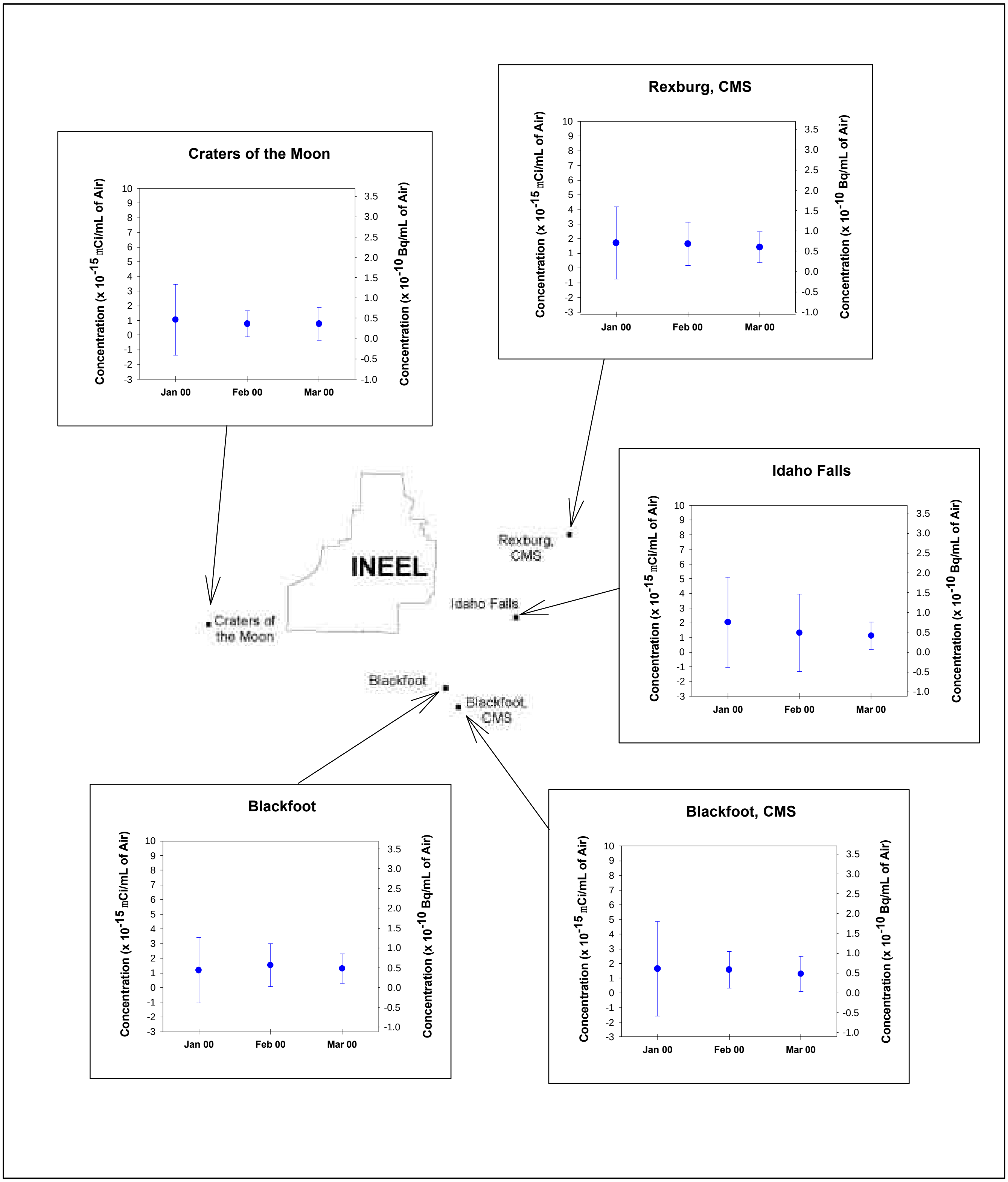

FIGURE 12. Monthly average gross alpha concentrations in air at ESER Program Distant Locations.

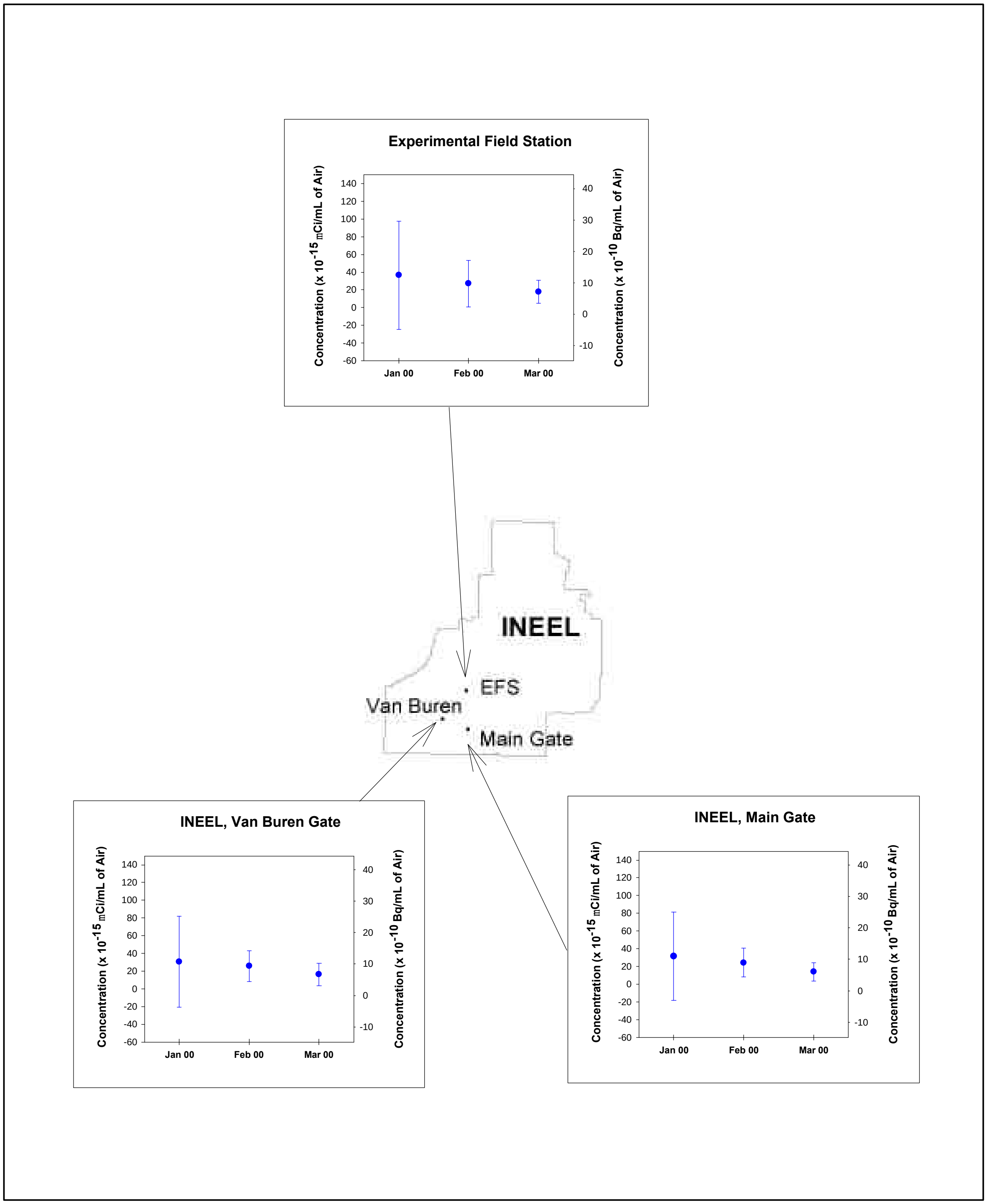

FIGURE 13. Monthly average gross beta concentrations in air at ESER Program INEEL Locations.

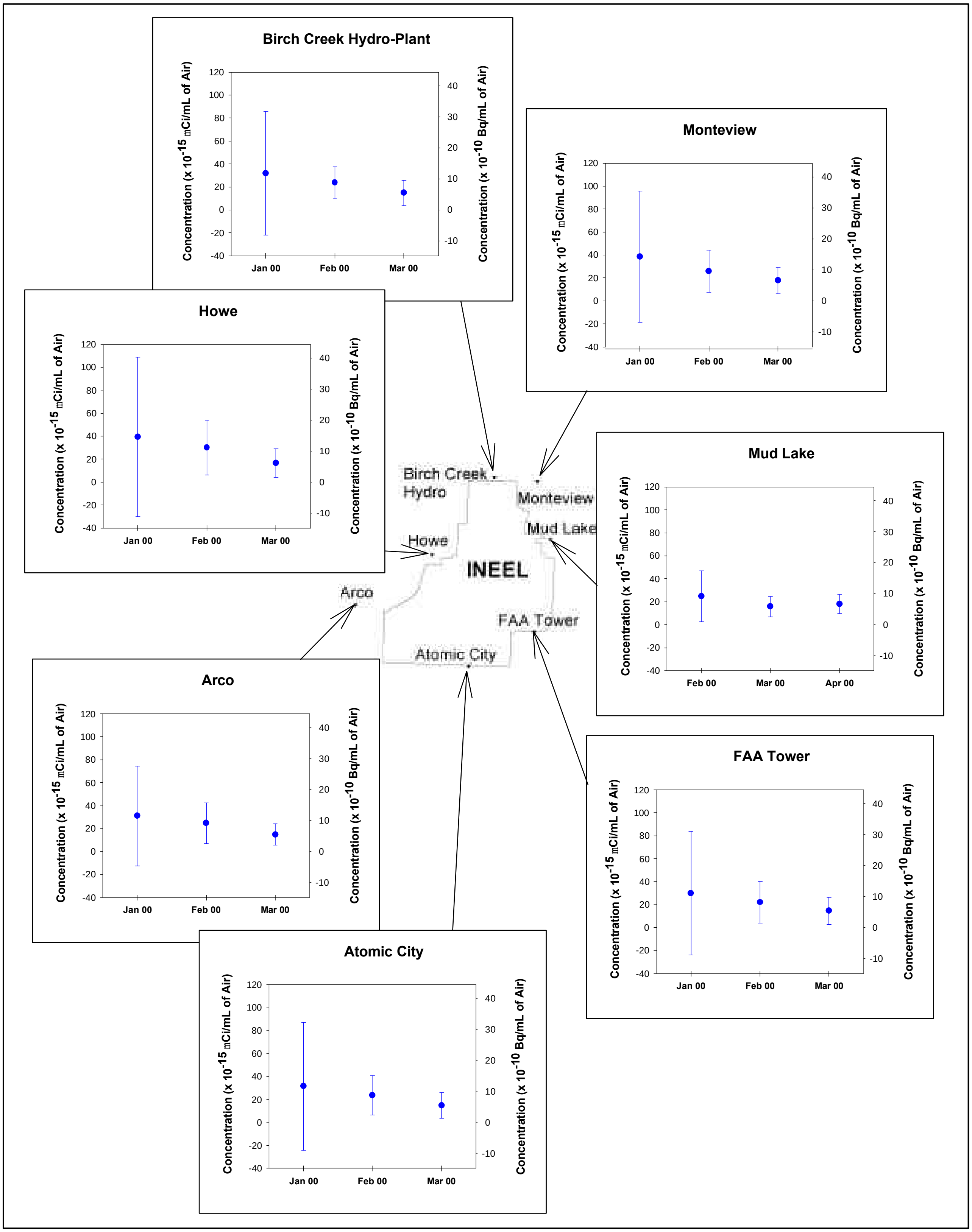

FIGURE 14. Monthly average gross beta concentrations in air at ESER Program Boundary Locations.

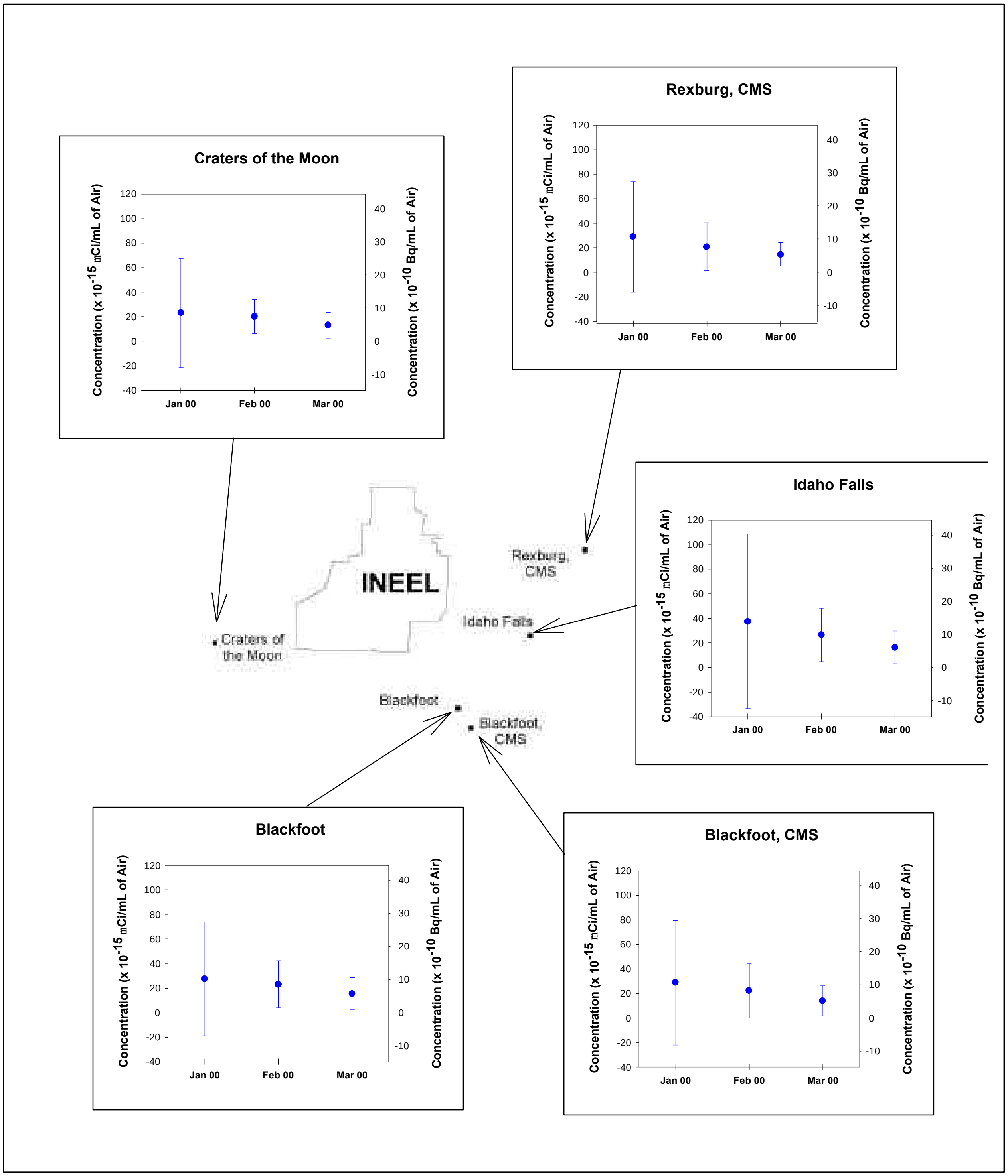

FIGURE 15. Monthly average gross beta concentrations in air at ESER Program Distant Locations.

Selected quarterly composited filters were analyzed for the gamma emitting radionuclides, ^{90}Sr, ^{238}Pu, $^{239/240}Pu$, and ^{241}Am. No plutonium was detected in any sample. The only human-made gamma-emitting radionuclide detected was ^{137}Cs. The ^{137}Cs result for the sample from the FAA Tower location was greater than its associated 2s uncertainty. The ^{90}Sr result for samples from Rexburg and from Atomic City were also greater than their 2s uncertainty, as were the ^{241}Am results for samples from Monteview and Arco. Sample results for all radionuclides were less than the minimum detectable concentration (MDC) except for ^{241}Am on the Monteview composite sample. The composite sample collected at the replicate sampler located at Monteview had no ^{241}Am detected. Results that were greater than their associated 2s uncertainty are listed in Table 2. The 2s uncertainty and MDC values are also listed. No specific radionuclides were detected in composited filter samples from locations on the INEEL. Levels of radionuclides in composited filter samples were consistent with levels associated with worldwide fallout from atmospheric weapons testing and were between 9,000 and 1.5 million times lower than DCG values set to ensure dose limits are not exceeded (compare sample results with DCG values listed in Table B-1, Appendix B). Results for all composite filter samples are shown in Table C-3 of Appendix C.

TABLE 2. Specific radionuclides with results > 2s in composite air filters for First Quarter 2000.

		Sample Results		MDC	
Location	**Radionuclide**	**x 10^{-16} µCi/mL " 2s**	**x 10^{-12} Bq/mL " 2s**	**x 10^{-16} µCi/mL**	**x 10^{-12} Bq/mL**
FAA Tower	^{137}Cs	2.63 ± 1.73	9.73 ± 6.40	3.0	11.1
Monteview	^{241}Am	0.022 ± 0.018	0.083 ± 0.068	0.02	0.074
Arco	^{241}Am	0.012 ± 0.011	0.044 ± 0.040	0.02	0.074
Rexburg	^{90}Sr	0.27 ± 0.26	0.99 ± 0.96	0.6	2.22
Atomic City	^{90}Sr	0.40 ± 0.26	1.47 ± 0.96	0.6	2.22

3.2 Atmospheric Moisture Sampling

An atmospheric moisture sample was obtained from each of the Rexburg, Blackfoot (CMS), and Atomic City sampling locations during the first quarter, 2000. Atmospheric moisture was collected by continuously drawing air through a column of silica gel that absorbs water vapor. The water was then extracted from the silica gel by distillation. The resulting atmospheric moisture samples were then analyzed for tritium using liquid scintillation. The Rexburg sample (January 5 through April 4), had a tritium result greater than its 2s uncertainty [(7.17 ± 7.09) x 10^{-14} µCi/mL of air, or (2.65 ± 2.62) x 10^{-9} Bq/mL of air]. This result is slightly over the 2s uncertainty value and was over 50 times lower than the minimum detectable concentration. There is a high probability that this value is a false positive (see the *Confidence in Detections* section in the *Helpful Information* section of this report). For comparison, the Derived Concentration Guides (DCG), which are limits set to protect human health, are set at 1 x 10^{-7} µCi/mL (3.7 x 10^{-3} Bq/mL) for tritium in air. The tritium result measured at Rexburg during the first quarter of 2000 was over one million times lower than this limit. Tritium results for all atmospheric moisture samples are listed in Table C-4 (Appendix C).

3.3 PM_{10} Air Sampling

The EPA began using a standard for concentrations of airborne particulate matter (PM) less than 10 micrometers in diameter in 1987 (40 CFR 50.6). Particles of this size can reach the lungs and are considered to be responsible of most of the adverse health effects associated with airborne particulate pollution. The air quality standards for fine particulates, generally referred to as PM_{10}, are an annual average of 50 µg/m^3, with a maximum 24-hour concentration of 150 µg/m^3.

The ESER Program operates three PM_{10} samplers, one each at Rexburg, Blackfoot (CMS), and Atomic City. Twenty-four hour sampling periods were conducted once every six days for a total of 15 samples collected at each of the three locations during the first quarter, 2000. PM_{10} concentrations were well below all health standard levels for all samples. The maximum 24-hour concentration was 34.1 µg/m^3 on January 30, 2000, in Rexburg. Results for all PM_{10} samples are listed in Table C-5, Appendix C.

4. WATER SAMPLING

Water that is sampled by the ESER program includes surface and drinking water and precipitation. Surface and/or drinking water are sampled twice each year at 18 locations around the INEEL (see Appendix B). This occurs during the second and fourth quarters. Monthly composite precipitation samples are collected from Idaho Falls and the Central Facilities Area (CFA) on the INEEL. Weekly precipitation samples are collected from the Experimental Field Station (EFS) on the INEEL.

4.1 Precipitation Sampling

Monthly precipitation samples were collected from Idaho Falls, and CFA. There was enough precipitation at EFS for the collection of six weekly samples. Of all the precipitation samples collected, only one from EFS (collected March 14, 2000), yielded a tritium result greater than its 2s uncertainty [(5.5 ± 0.78) x 10^{-4} µCi/L, or (20.5 ± 2.9) Bq/L]. Immediate re-analysis of this sample gave a result less than its 2s uncertainty [(-9.4 ± 6.9) x 10^{-5} µCi/L, or –3.5 ± 2.6 Bq/L]. The average of the two results, propagating the uncertainty, was (2.3 ± 1.1) x 10^{-4} µCi/L, or 8.5 ± 3.9 Bq/mL, a value higher than the MDC for tritium [1.0 x 10^{-4} µCi/L (3.7 Bq/L)]. No tritium was detected in composite precipitation samples at CFA, on the INEEL, or at Idaho Falls during the month of March. There is no DCG for precipitation, but in drinking water it is 0.08 µCi/L (2,960 Bq/L). The level of tritium detected in the first analysis of the EFS sample was 145 times lower than the DCG value for drinking water.

While there appeared to be tritium detected in precipitation from EFS in March and an INEEL source cannot be discounted for contributing to this, the measured level was within the range of background tritium that exists throughout the world. Low levels of tritium exist in the environment at all times. The major natural source of tritium is cosmic ray reactions in the upper atmosphere. During 1997, the EPA, as part of it's Environmental Radiation Ambient Monitoring System (ERAMS), measured tritium from –8.6 x 10^{-5} to 2.9 x 10^{-4} µCi/L (–3.2 to 11 Bq/L) in precipitation from across the United States (EPA 1997). Data for all precipitation samples collected by the ESER Program, first quarter 2000, are listed in Table C-6 (Appendix C).

5. FOODSTUFF SAMPLING

Another potential pathway for contaminants to reach humans is through the food chain. The ESER Program samples multiple important agricultural products, game animals, and garden lettuce around the INEEL and Southeast Idaho. Specifically, milk, wheat, potatoes, sheep, garden lettuce, big game, waterfowl and fish are sampled. Milk is sampled throughout the year. Sheep are sampled during the second quarter. Lettuce and wheat are sampled during the third quarter while potatoes and waterfowl are collected during the fourth quarter. Big game and fish are sampled as they come available. See Table B-1, Appendix B, for more details on foodstuff sampling.

5.1 Milk Sampling

Milk samples were collected weekly in Idaho Falls and monthly at eight other locations around the INEEL (Figure 16). All samples were analyzed for gamma emitting radionuclides. A total of 34 milk samples were collected during the first quarter, 2000. None of the samples contained detectable concentrations of ^{131}I. One sample, collected on January 3 in Howe, had a ^{137}Cs concentration greater than its 2s uncertainty [(2.6 ± 2.2) x 10^{-9} µCi/mL, or (9.6 ± 8.2) x 10^{-5} Bq/mL], but it was less than the MDC for milk [3.0 x 10^{-9} µCi/mL (1.0 x 10^{-4} Bq/mL)]. No ^{137}Cs was detected in air samples taken in Howe nor from sampling locations on the INEEL during the first quarter, 2000. This, coupled with the fact Howe is generally in a cross wind direction from the INEEL, implies the ^{137}Cs was not from a current INEEL release but more likely came from ^{137}Cs in soil from historical fallout events (e.g. from nuclear weapons tests and Chernobyl). ^{137}Cs is globally available and can occur in milk. For comparison, the EPA reported concentrations of ^{137}Cs in pasteurized milk during 1997 to range from below detection limits to (8.6 ± 2.0) x 10^{-9} µCi/mL [(3.2 ± 0.7) x 10^{-4} Bq/mL] from locations around the United States and its provinces (EPA 1997). Data for all ESER milk samples, first quarter 2000, are listed in Table C-7 (Appendix C).

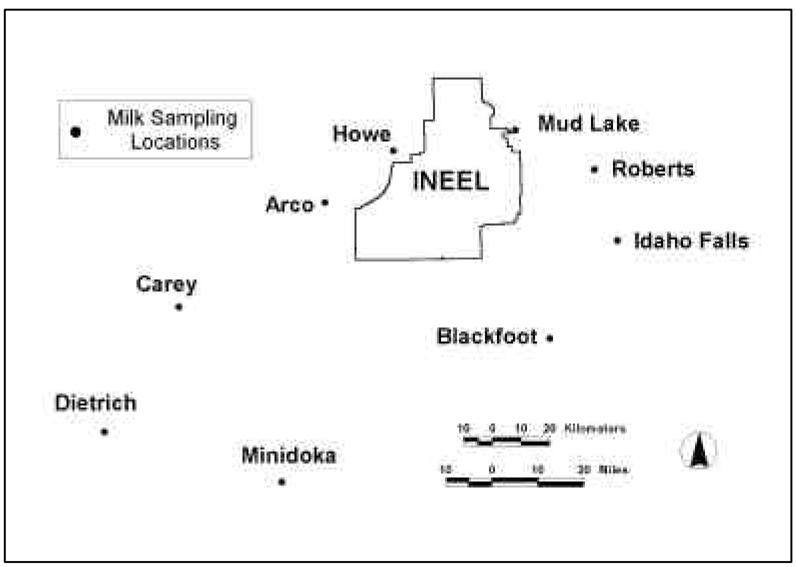

FIGURE 16. ESER Program milk sampling locations.

5.2 Large Game Animal Sampling

One mule deer and two elk that died on the INEEL were sampled during the first quarter, 2000. The two elk were killed by collisions with vehicles and the deer died from apparent age-related malnutrition. Thyroid, muscle, and liver tissue were collected from each and analyzed for gamma emitting radionuclides. The ^{137}Cs result for the liver sample from the mule deer was greater than its 2s uncertainty level [(3.7 ± 2.0) x 10^{-9} µCi/g wet weight, or (1.4 ± 0.8) x 10^{-4} Bq/g wet weight]. No other human-made radionuclides were detected in big game tissue samples. ^{137}Cs is an analog of potassium and is readily incorporated in muscle and organ tissues. ^{137}Cs is also available throughout the world from fallout from nuclear weapons tests. Similar levels of ^{137}Cs are commonly detected in wild game tissues throughout the Northern Hemisphere. For example, big game animals sampled in Colorado, Idaho (distant the INEEL), Montana, Oregon, Utah, and Wyoming, 1998 – 1999, had average ^{137}Cs concentrations in muscle tissue of 20 x 10^{-9} µCi/g wet weight [range: (-10 to 152) x 10^{-9} µCi/g wet weight]. Concentrations in big game taken from Idaho, distant the Data for all big game samples are listed in Table C-8 (Appendix C).

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EPA. 1997. Environmental Radiation Data. Report 91. United States Environmental Protection Agency, Office of Radiation and Indoor Air, Montgomery, AL.

NCRP. 1987. Exposure of the population in the United States and Canada from natural background. Report 94, National Council on Radiation Protection and Measurements, Bethesda, MD.

NRC. 1999. The biological effects of radiation. Web-page http://www.nrc.gov/NRC/EDUCATE/REACTOR/06-BIO/fig05.html. U.S. Nuclear Regulatory Commission, Washington, D.C.

APPENDIX A

SUMMARY OF SAMPLING MEDIA & SCHEDULE

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

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INEEL
AIR SAMPLING				
LOW-VOLUME AIR				
Gross Alpha Gross Beta ^{131}I	weekly	Blackfoot, Craters of the Moon, Idaho Falls, Rexburg	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Reno Ranch	Main Gate, EFS, Van Buren
Gamma Spec	quarterly	Blackfoot, Craters of the Moon, Idaho Falls, Rexburg	Arco, Atomic City, FAA Tower, Howe, Monteview, Mud Lake, Reno Ranch	Main Gate, EFS, Van Buren
^{90}Sr Transuranics	quarterly	Rotating schedule	Rotating schedule	Rotating schedule
ATMOSPHERIC MOISTURE				
Tritium	4 to 13 weeks	Idaho Falls	Atomic City	None
PRECIPITATION				
Tritium	monthly	Idaho Falls	None	CFA
Tritium	weekly	None	None	EFS
PM-10				
Particulate Mass	every 6th day	Rexburg, Blackfoot	Atomic City	None
WATER SAMPLING				
SURFACE WATER				
Gross Alpha, Gross Beta, ^{3}H	semi-annually	Twin Falls, Buhl, Hagerman Idaho Falls, Bliss	None	None
DRINKING WATER				
Gross Alpha Gross Beta, ^{3}H	semi-annually	Aberdeen, Blackfoot, Carey, Idaho Falls, Fort Hall, Minidoka, Roberts, Shoshone	Arco, Atomic City, Howe, Monteview, Mud Lake, Reno Ranch	None
ENVIRONMENTAL RADIATION SAMPLING				
TLDs				
Gamma Radiation	semiannual	Aberdeen, Blackfoot, Craters of the Moon, Idaho Falls, Minidoka, Rexburg, Roberts	Arco, Atomic City, Howe, Monteview, Mud Lake, Reno Ranch	None
SOIL SAMPLING				
SOIL				
Gamma Spec ^{90}Sr Transuranics	biennially	Carey, Crystal Ice Caves, Blackfoot, St. Anthony	Butte City, Monteview, Atomic City, FAA Tower, Howe, Mud Lake (2), Reno Ranch	None

TABLE A-1 cont.

Sample Type Analysis	Collection Frequency	LOCATIONS		
		Distant	Boundary	INEEL
FOODSTUFF SAMPLING				
MILK				
Gamma Spec (^{131}I)	weekly	Idaho Falls	None	None
Gamma Spec (^{131}I)	monthly	Blackfoot, Carey, Dietrich, Minidoka, Roberts, Moreland	Howe, Terreton, Arco	None
Tritium ^{90}Sr	Semi-annually	Blackfoot, Carey, Dietrich, Idaho Falls, Minidoka, Roberts, Moreland	Howe, Terreton, Arco	None
POTATOES				
Gamma Spec ^{90}Sr	annually	Blackfoot, Idaho Falls, Rupert, occasional samples across the U.S.	Arco, Mud Lake	None
WHEAT				
Gamma Spec ^{90}Sr	annually	Am. Falls, Blackfoot, Dietrich, Idaho Falls, Minidoka, Carey	Arco, Monteview, Mud Lake, Tabor, Terreton	None
LETTUCE				
Gamma Spec ^{90}Sr	annually	Blackfoot, Carey, Idaho Falls, Pocatello	Arco, Atomic City, Howe, Mud Lake	None
BIG GAME				
Gamma Spec	varies	Occasional samples across the U.S.	varies	INEEL roads
SHEEP				
Gamma Spec	annually	Blackfoot or Dubois, N. INEEL, S. INEEL	None	INEEL
WATERFOWL				
Gamma Spec ^{90}Sr Transuranics	annually	Fort Hall	None	Waste disposal ponds
FISH				
Gamma Spec	annually or as available	None	None	Big Lost River

APPENDIX B

MINIMUM DETECTABLE CONCENTRATIONS

Table B-1. Summary of Approximate Minimum Detectable Concentrations for Radiological Analyses

Sample Type	Analysis	Approximate Minimum Detectable Concentration[a] (MDC)	Derived Concentration Guide[b] (DCG)	Drinking Water Detection Limits[c]
Air (particulate filter)[d]	Gross alpha	1×10^{-15} µCi/mL	2×10^{-14} µCi/mL	--
	Gross beta	3×10^{-15} µCi/mL	3×10^{-12} µCi/mL	--
	Specific gamma (^{137}Cs)	3×10^{-16} µCi/mL	4×10^{-10} µCi/mL	
	^{238}Pu	2×10^{-18} µCi/mL	3×10^{-14} µCi/mL	
	$^{239/240}$Pu	3×10^{-18} µCi/mL	2×10^{-14} µCi/mL	
	^{241}Am	2×10^{-18} µCi/mL	2×10^{-14} µCi/mL	--
	^{90}Sr	6×10^{-17} µCi/mL	9×10^{-12} µCi/mL	--
Air (charcoal cartridge)[d]	^{131}I	4×10^{-15} µCi/mL	4×10^{-10} µCi/mL	--
Air (atmospheric moisture)[e]	^{3}H	3.7×10^{-12} µCi/mL	1×10^{-7} µCi/mL	--
Air (precipitation)	^{3}H	1×10^{-7} µCi/mL	2×10^{-3} µCi/mL	--
Water (drinking & surface)	Gross alpha	3 pCi/L	30 pCi/L	3 pCi/L
	Gross beta	2 pCi/L	100 pCi/L	4 pCi/L
	^{3}H	100 pCi/L	2×10^{6} pCi/L	1000 pCi/L
Milk	^{131}I	3×10^{-9} µCi/mL	--	--
Wheat	Specific gamma (^{137}Cs)	4×10^{-9} µCi/g	--	--
	^{90}Sr	5×10^{-9} µCi/g	--	--
Lettuce	Specific gamma (^{137}Cs)	1×10^{-7} µCi/g	--	--
	^{90}Sr	2×10^{-7} µCi/g	--	--

[a] The MDC is an estimate of the concentration of radioactivity in a given sample type that can be identified with a 95% level of confidence and precision of plus or minus 100% under a specified set of typical laboratory measurement conditions.
[b] DCGs, set by the DOE, represent reference values for radiation exposure. They are based on a radiation dose of 100 mrem/yr for exposure through a particular exposure mode such as direct exposure, inhalation, or ingestion of water.
[c] These limits are required by the National Primary Drinking Water Regulations (40 CFR 141). The “detection limit” is the terminology used by the EPA and means the same as the MDC defined above.
[d] The approximate MDC is based on an average filtered air volume (pressure corrected) of 570 m^3/week.
[e] The approximate MDC is expressed for tritium (as tritiated water) in air, and is based on an average filtered air volume of 39 m^3, assuming an average sampling period of eight weeks.

APPENDIX C

SUMMARY OF SAMPLE ANALYSIS RESULTS

TABLE C-1: Weekly Gross Alpha & Gross Beta Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Gross Alpha Concentration ± 2s* 10^{-15} μCi/mL*	*Gross Alpha Concentration ± 2s 10^{-10} Bq†/mL*	*Gross Beta Concentration ± 2s 10^{-15} μCi/mL*	*Gross Beta Concentration ± 2s 10^{-10} Bq/mL*
BOUNDARY					
ARCO	01/05/2000	2.9 ± 0.8	1.1 ± 0.3	61.9 ± 2.6	22.9 ± 1.0
	01/12/2000	0.1 ± 0.3	0.0 ± 0.1	13.3 ± 1.4	4.9 ± 0.5
	01/19/2000	1.0 ± 0.5	0.4 ± 0.2	22.4 ± 1.6	8.3 ± 0.6
	01/26/2000	0.9 ± 0.5	0.3 ± 0.2	26.4 ± 1.8	9.8 ± 0.7
	02/02/2000	1.0 ± 0.5	0.4 ± 0.2	29.0 ± 1.9	10.7 ± 0.7
	02/09/2000	1.5 ± 0.9	0.6 ± 0.3	33.2 ± 2.3	12.3 ± 0.9
	02/16/2000	0.5 ± 0.6	0.2 ± 0.2	13.9 ± 1.5	5.1 ± 0.5
	02/23/2000	0.7 ± 0.5	0.3 ± 0.2	22.9 ± 1.8	8.5 ± 0.6
	03/01/2000	0.2 ± 0.4	0.1 ± 0.2	10.1 ± 1.3	3.7 ± 0.5
	03/08/2000	0.5 ± 0.5	0.2 ± 0.2	19.8 ± 1.5	7.3 ± 0.6
	03/15/2000	0.7 ± 0.5	0.3 ± 0.2	13.5 ± 1.3	5.0 ± 0.5
	03/22/2000	0.9 ± 0.4	0.3 ± 0.2	11.8 ± 1.3	4.4 ± 0.5
	03/29/2000	1.4 ± 0.5	0.5 ± 0.2	19.0 ± 1.5	7.0 ± 0.6
ATOMIC CITY	01/05/2000	2.5 ± 0.7	0.9 ± 2.6	72.2 ± 2.9	26.7 ± 1.1
	01/12/2000	-0.1 ± 0.3	0.0 ± 0.6	13.6 ± 1.4	5.0 ± 0.5
	01/19/2000	1.0 ± 0.5	0.4 ± 0.7	20.0 ± 1.7	7.4 ± 0.6
	01/26/2000	0.9 ± 0.6	0.3 ± 0.8	20.2 ± 2.0	7.5 ± 0.8
	02/02/2000	1.2 ± 0.6	0.4 ± 0.9	28.2 ± 2.2	10.4 ± 0.8
	02/09/2000	1.2 ± 0.8	0.4 ± 1.2	32.5 ± 2.2	12.0 ± 0.8
	02/16/2000	0.7 ± 0.6	0.3 ± 0.7	14.8 ± 1.6	5.5 ± 0.6
	02/23/2000	0.8 ± 0.5	0.3 ± 0.7	19.1 ± 1.7	7.1 ± 0.6
	03/01/2000	0.1 ± 0.4	0.0 ± 0.3	9.2 ± 1.2	3.4 ± 0.5
	03/08/2000	0.7 ± 0.5	0.3 ± 0.7	18.5 ± 1.4	6.8 ± 0.5
	03/15/2000	0.9 ± 0.5	0.3 ± 0.5	14.7 ± 1.4	5.4 ± 0.5
	03/22/2000	1.3 ± 0.5	0.5 ± 0.4	10.3 ± 1.3	3.8 ± 0.5
	03/29/2000	1.4 ± 0.6	0.5 ± 0.8	21.4 ± 1.6	7.9 ± 0.6
BIRCH CREEK HYDRO-PLANT	01/05/2000	3.1 ± 0.8	1.1 ± 3.0	71.3 ± 2.9	26.4 ± 1.1
	01/12/2000	0.9 ± 0.5	0.3 ± 0.8	15.8 ± 1.5	5.8 ± 0.5
	01/19/2000	0.8 ± 0.5	0.3 ± 0.8	18.7 ± 1.5	6.9 ± 0.6
	01/26/2000	0.3 ± 0.4	0.1 ± 1.1	21.6 ± 1.7	8.0 ± 0.6
	02/02/2000	0.8 ± 0.5	0.3 ± 1.0	24.0 ± 1.7	8.9 ± 0.6
	02/09/2000	0.7 ± 0.7	0.3 ± 1.4	32.8 ± 2.1	12.1 ± 0.8
	02/16/2000	0.2 ± 0.6	0.1 ± 0.7	19.2 ± 1.7	7.1 ± 0.6
	02/23/2000	1.0 ± 0.4	0.4 ± 0.7	18.4 ± 1.3	6.8 ± 0.5
	03/01/2000	0.3 ± 0.3	0.1 ± 0.4	8.4 ± 1.0	3.1 ± 0.4
	03/08/2000	0.7 ± 0.4	0.3 ± 0.8	19.7 ± 1.3	7.3 ± 0.5
	03/15/2000	1.0 ± 0.5	0.4 ± 0.6	14.3 ± 1.3	5.3 ± 0.5
	03/22/2000	0.7 ± 0.5	0.3 ± 0.5	11.0 ± 1.5	4.1 ± 0.5
	03/29/2000	1.2 ± 0.6	0.5 ± 0.9	20.3 ± 1.8	7.5 ± 0.7

***** s = Standard Deviation
μCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Gross Alpha Concentration ± 2s** 10^{-15} *µCi*□*/mL*	*Gross Alpha Concentration ± 2s* 10^{-10} *Bq*†*/mL*	*Gross Beta Concentration ± 2s* 10^{-15} *µCi/mL*	*Gross Beta Concentration ± 2s* 10^{-10} *Bq/mL*
BOUNDARY					
FAA TOWER	01/05/2000	1.6 ± 0.8	0.6 ± 2.6	69.4 ± 3.4	25.7 ± 1.2
	01/12/2000	0.5 ± 0.5	0.2 ± 0.8	14.5 ± 1.7	5.4 ± 0.6
	01/19/2000	0.9 ± 0.6	0.3 ± 0.9	18.4 ± 1.9	6.8 ± 0.7
	01/26/2000	0.3 ± 0.4	0.1 ± 1.0	17.2 ± 1.4	6.4 ± 0.5
	02/02/2000	0.7 ± 0.4	0.3 ± 1.0	25.4 ± 1.6	9.4 ± 0.6
	02/09/2000	1.4 ± 0.7	0.5 ± 1.3	32.2 ± 2.0	11.9 ± 0.7
	02/16/2000	0.2 ± 0.6	0.1 ± 0.7	12.2 ± 1.5	4.5 ± 0.5
	02/23/2000	0.8 ± 0.5	0.3 ± 0.7	18.3 ± 1.5	6.8 ± 0.5
	03/01/2000	0.2 ± 0.4	0.1 ± 0.3	9.1 ± 1.1	3.4 ± 0.4
	03/08/2000	1.0 ± 0.4	0.4 ± 0.7	18.6 ± 1.3	6.9 ± 0.5
	03/15/2000	1.0 ± 0.5	0.4 ± 0.6	13.1 ± 1.2	4.8 ± 0.5
	03/22/2000	0.8 ± 0.5	0.3 ± 0.5	9.8 ± 1.6	3.6 ± 0.6
	03/29/2000	0.8 ± 0.6	0.3 ± 0.8	21.9 ± 2.1	8.1 ± 0.8
HOWE	01/05/2000	4.2 ± 1.1	1.6 ± 2.1	90.1 ± 3.9	33.3 ± 1.5
	01/12/2000	0.5 ± 0.6	0.2 ± 0.3	19.1 ± 2.0	7.1 ± 0.8
	01/19/2000	1.7 ± 0.8	0.6 ± 0.6	19.6 ± 2.0	7.3 ± 0.7
	01/26/2000	0.7 ± 0.6	0.3 ± 0.5	29.0 ± 2.4	10.7 ± 0.9
	02/02/2000	1.2 ± 0.6	0.5 ± 0.8	32.4 ± 2.3	12.0 ± 0.9
	02/09/2000	2.4 ± 1.2	0.9 ± 1.0	45.0 ± 3.0	16.7 ± 1.1
	02/16/2000	0.1 ± 0.8	0.0 ± 0.4	19.2 ± 2.2	7.1 ± 0.8
	02/23/2000	1.2 ± 0.7	0.4 ± 0.8	24.1 ± 2.2	8.9 ± 0.8
	03/01/2000	0.5 ± 0.6	0.2 ± 0.3	10.3 ± 1.6	3.8 ± 0.6
	03/08/2000	1.2 ± 0.7	0.5 ± 0.7	23.0 ± 2.0	8.5 ± 0.7
	03/15/2000	1.1 ± 0.7	0.4 ± 0.4	17.3 ± 1.9	6.4 ± 0.7
	03/22/2000	0.4 ± 0.5	0.2 ± 0.4	11.2 ± 1.7	4.1 ± 0.6
	03/29/2000	1.3 ± 0.7	0.5 ± 0.7	21.3 ± 2.1	7.9 ± 0.8
MONTEVIEW	01/05/2000	4.4 ± 1.1	1.6 ± 3.0	80.1 ± 3.6	29.6 ± 1.3
	01/12/2000	0.7 ± 0.6	0.2 ± 0.7	22.9 ± 2.0	8.5 ± 0.7
	01/19/2000	0.4 ± 0.5	0.2 ± 0.8	22.1 ± 2.0	8.2 ± 0.7
	01/26/2000	0.6 ± 0.6	0.2 ± 0.9	28.9 ± 2.2	10.7 ± 0.8
	02/02/2000	0.9 ± 0.6	0.3 ± 1.1	27.6 ± 2.2	10.2 ± 0.8
	02/09/2000	1.9 ± 1.0	0.7 ± 1.6	37.6 ± 2.7	13.9 ± 1.0
	02/16/2000	0.5 ± 0.6	0.2 ± 0.5	19.9 ± 1.8	7.4 ± 0.7
	02/23/2000	0.9 ± 0.5	0.3 ± 0.8	18.7 ± 1.6	6.9 ± 0.6
	03/01/2000	0.7 ± 1.3	0.3 ± 0.4	11.1 ± 3.0	4.1 ± 1.1
	03/08/2000	1.3 ± 0.5	0.5 ± 0.9	21.3 ± 1.4	7.9 ± 0.5
	03/15/2000	0.7 ± 0.5	0.3 ± 0.6	16.6 ± 1.5	6.1 ± 0.6
	03/22/2000	2.1 ± 0.9	0.8 ± 0.5	14.8 ± 2.2	5.5 ± 0.8
	03/29/2000	1.7 ± 0.7	0.6 ± 0.9	24.3 ± 2.0	9.0 ± 0.7

* s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Gross Alpha Concentration ± 2s** 10^{-15} *μCi/mL*			*Gross Alpha Concentration ± 2s* 10^{-10} *Bq†/mL*			*Gross Beta Concentration ± 2s* 10^{-15} *μCi/mL*			*Gross Beta Concentration ± 2s* 10^{-10} *Bq/mL*		
BOUNDARY													
MUD LAKE	01/05/2000	3.8	±	0.9	1.4	±	0.3	91.5	±	3.4	33.9	±	1.3
	01/12/2000	1.0	±	0.5	0.4	±	0.2	23.2	±	1.6	8.6	±	0.6
	01/19/2000	0.7	±	0.5	0.3	±	0.2	22.6	±	1.6	8.4	±	0.6
	01/26/2000	1.0	±	0.5	0.4	±	0.2	22.2	±	1.6	8.2	±	0.6
	02/02/2000	0.8	±	0.4	0.3	±	0.2	26.6	±	1.7	9.8	±	0.6
	02/09/2000	1.9	±	0.8	0.7	±	0.3	39.3	±	2.2	14.5	±	0.8
	02/16/2000	1.5	±	0.7	0.5	±	0.2	16.5	±	1.5	6.1	±	0.6
	02/23/2000	1.0	±	0.5	0.4	±	0.2	17.2	±	1.4	6.4	±	0.5
	03/01/2000	0.6	±	0.4	0.2	±	0.2	10.8	±	1.2	4.0	±	0.4
	03/08/2000	1.2	±	0.4	0.4	±	0.2	19.8	±	1.3	7.3	±	0.5
	03/15/2000	0.9	±	0.5	0.3	±	0.2	17.2	±	1.4	6.4	±	0.5
	03/22/2000	1.2	±	0.5	0.4	±	0.2	12.1	±	1.3	4.5	±	0.5
	03/29/2000	1.2	±	0.6	0.5	±	0.2	19.2	±	1.6	7.1	±	0.6
QA-1 (FAA TOWER)	01/05/2000	3.5	±	1.1	1.3	±	0.4	63.0	±	3.6	23.3	±	1.3
	01/12/2000	0.2	±	0.7	0.1	±	0.3	13.4	±	2.3	5.0	±	0.9
	01/19/2000	0.6	±	0.5	0.2	±	0.2	16.5	±	1.5	6.1	±	0.6
	01/26/2000	1.1	±	0.5	0.4	±	0.2	16.5	±	1.4	6.1	±	0.5
	02/02/2000	0.3	±	0.4	0.1	±	0.1	22.2	±	1.6	8.2	±	0.6
	02/09/2000	1.7	±	0.7	0.6	±	0.3	31.3	±	2.0	11.6	±	0.7
	02/16/2000	0.2	±	0.6	0.1	±	0.2	11.7	±	1.5	4.3	±	0.5
	02/23/2000	0.5	±	0.4	0.2	±	0.2	17.4	±	1.5	6.4	±	0.5
	03/01/2000	0.2	±	0.4	0.1	±	0.1	8.9	±	1.2	3.3	±	0.4
	03/08/2000	0.3	±	0.4	0.1	±	0.1	18.4	±	1.3	6.8	±	0.5
	03/15/2000	0.7	±	0.4	0.2	±	0.2	13.5	±	1.3	5.0	±	0.5
	03/22/2000	0.3	±	0.3	0.1	±	0.1	9.7	±	1.3	3.6	±	0.5
	03/29/2000	0.5	±	0.4	0.2	±	0.2	20.4	±	1.7	7.5	±	0.6
QA-2 (MONTEVIEW)	01/05/2000	3.8	±	0.9	1.4	±	0.3	70.0	±	3.0	25.9	±	1.1
	01/12/2000	0.8	±	0.5	0.3	±	0.2	21.6	±	1.7	8.0	±	0.6
	01/19/2000	0.7	±	0.5	0.2	±	0.2	23.4	±	1.7	8.7	±	0.6
	01/26/2000	1.0	±	0.5	0.4	±	0.2	27.8	±	1.9	10.3	±	0.7
	02/02/2000	1.2	±	0.5	0.4	±	0.2	26.6	±	1.8	9.8	±	0.7
	02/09/2000	1.4	±	0.8	0.5	±	0.3	35.4	±	2.3	13.1	±	0.8
	02/16/2000	0.1	±	0.6	0.0	±	0.2	17.9	±	1.7	6.6	±	0.6
	02/23/2000	0.7	±	0.5	0.3	±	0.2	17.6	±	1.5	6.5	±	0.6
	03/01/2000	-0.5	±	0.8	-0.2	±	0.3	8.8	±	2.3	3.2	±	0.9
	03/08/2000	0.6	±	0.4	0.2	±	0.1	18.9	±	1.3	7.0	±	0.5
	03/15/2000	0.9	±	0.5	0.4	±	0.2	16.9	±	1.3	6.3	±	0.5
	03/22/2000	0.9	±	0.8	0.3	±	0.3	12.3	±	2.3	4.6	±	0.9
	03/29/2000	1.1	±	0.6	0.4	±	0.2	20.9	±	1.9	7.7	±	0.7

* s = Standard Deviation
μCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Gross Alpha Concentration ± 2s** 10^{-15} μCi/mL			*Gross Alpha Concentration ± 2s* 10^{-10} Bq†/mL			*Gross Beta Concentration ± 2s* 10^{-15} μCi/mL			*Gross Beta Concentration ± 2s* 10^{-10} Bq/mL		
DISTANT													
BLACKFOOT	01/05/2000	2.5	±	0.8	0.9	±	0.3	61.1	±	2.8	22.6	±	1.1
	01/12/2000	1.0	±	0.5	0.4	±	0.2	11.9	±	1.5	4.4	±	0.5
	01/19/2000	0.9	±	0.5	0.3	±	0.2	18.0	±	1.6	6.7	±	0.6
	01/26/2000	0.3	±	0.6	0.1	±	0.2	18.4	±	2.1	6.8	±	0.8
	02/02/2000	0.9	±	0.5	0.3	±	0.2	24.6	±	1.8	9.1	±	0.7
	02/09/2000	2.2	±	1.0	0.8	±	0.4	35.2	±	2.5	13.0	±	0.9
	02/16/2000	1.4	±	0.9	0.5	±	0.3	14.8	±	1.8	5.5	±	0.7
	02/23/2000	1.7	±	0.8	0.6	±	0.3	17.5	±	1.9	6.5	±	0.7
	03/01/2000	0.9	±	0.5	0.3	±	0.2	10.9	±	1.3	4.0	±	0.5
	03/08/2000	1.4	±	0.6	0.5	±	0.2	19.4	±	1.6	7.2	±	0.6
	03/15/2000	1.0	±	0.5	0.4	±	0.2	13.2	±	1.4	4.9	±	0.5
	03/22/2000	1.8	±	0.7	0.7	±	0.2	9.9	±	1.4	3.6	±	0.5
	03/29/2000	1.4	±	0.7	0.5	±	0.3	24.2	±	2.3	9.0	±	0.8
BLACKFOOT, CMS	01/05/2000	3.7	±	0.9	1.4	±	0.3	65.8	±	2.9	24.3	±	1.1
	01/12/2000	0.4	±	0.4	0.1	±	0.1	11.0	±	1.3	4.1	±	0.5
	01/19/2000	1.5	±	0.6	0.6	±	0.2	20.1	±	1.7	7.4	±	0.6
	01/26/2000	1.0	±	0.6	0.4	±	0.2	18.7	±	1.7	6.9	±	0.6
	02/02/2000	1.5	±	0.6	0.5	±	0.2	24.2	±	1.7	9.0	±	0.6
	02/09/2000	2.2	±	0.9	0.8	±	0.3	36.4	±	2.3	13.5	±	0.9
	02/16/2000	1.3	±	0.7	0.5	±	0.3	12.6	±	1.5	4.7	±	0.6
	02/23/2000	1.3	±	0.5	0.5	±	0.2	15.7	±	1.4	5.8	±	0.5
	03/01/2000	0.5	±	0.4	0.2	±	0.2	6.9	±	1.0	2.5	±	0.4
	03/08/2000	1.6	±	0.5	0.6	±	0.2	18.1	±	1.4	6.7	±	0.5
	03/15/2000	1.3	±	0.5	0.5	±	0.2	13.8	±	1.4	5.1	±	0.5
	03/22/2000	1.7	±	0.6	0.6	±	0.2	9.5	±	1.2	3.5	±	0.5
	03/29/2000	1.5	±	0.6	0.5	±	0.2	20.9	±	1.7	7.7	±	0.6
CRATERS OF THE MOON	01/05/2000	2.6	±	0.8	1.0	±	0.3	55.5	±	2.6	20.5	±	1.0
	01/12/2000	0.7	±	0.4	0.3	±	0.2	8.6	±	1.2	3.2	±	0.4
	01/19/2000	0.7	±	0.5	0.3	±	0.2	15.1	±	1.5	5.6	±	0.5
	01/26/2000	0.1	±	0.4	0.1	±	0.1	13.0	±	1.4	4.8	±	0.5
	02/02/2000	0.9	±	0.5	0.3	±	0.2	21.6	±	1.7	8.0	±	0.6
	02/09/2000	1.0	±	0.7	0.4	±	0.3	26.4	±	2.0	9.8	±	0.7
	02/16/2000	0.3	±	0.6	0.1	±	0.2	11.0	±	1.5	4.1	±	0.5
	02/23/2000	0.9	±	0.5	0.3	±	0.2	21.4	±	1.6	7.9	±	0.6
	03/01/2000	0.1	±	0.4	0.0	±	0.2	8.0	±	1.2	3.0	±	0.4
	03/08/2000	0.6	±	0.4	0.2	±	0.2	18.3	±	1.4	6.8	±	0.5
	03/15/2000	1.3	±	0.6	0.5	±	0.2	11.2	±	1.3	4.1	±	0.5
	03/22/2000	0.7	±	0.4	0.3	±	0.2	9.6	±	1.2	3.5	±	0.4
	03/29/2000	1.1	±	0.5	0.4	±	0.2	18.4	±	1.6	6.8	±	0.6

***** s = Standard Deviation
μCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Gross Alpha Concentration ± 2s** 10^{-15} *µCi/mL*			*Gross Alpha Concentration ± 2s* 10^{-10} *Bq†/mL*			*Gross Beta Concentration ± 2s* 10^{-15} *µCi/mL*			*Gross Beta Concentration ± 2s* 10^{-10} *Bq/mL*		
DISTANT													
IDAHO FALLS	01/05/2000	3.8	±	1.3	1.4	±	0.5	89.6	±	4.6	33.2	±	1.7
	01/12/2000	1.7	±	0.9	0.6	±	0.3	18.3	±	2.3	6.8	±	0.9
	01/19/2000	1.8	±	1.0	0.7	±	0.4	23.0	±	2.6	8.5	±	1.0
	01/26/2000	0.8	±	0.8	0.3	±	0.3	18.9	±	2.4	7.0	±	0.9
	02/02/2000	2.6	±	1.0	1.0	±	0.4	31.7	±	2.8	11.7	±	1.0
	02/09/2000	1.7	±	1.4	0.6	±	0.5	38.2	±	3.5	14.1	±	1.3
	02/16/2000	0.3	±	1.2	0.1	±	0.4	15.9	±	2.7	5.9	±	1.0
	02/23/2000	0.6	±	0.6	0.2	±	0.2	20.6	±	2.0	7.6	±	0.7
	03/01/2000	1.0	±	0.6	0.4	±	0.2	10.2	±	1.5	3.8	±	0.5
	03/08/2000	1.5	±	0.6	0.6	±	0.2	22.0	±	1.7	8.1	±	0.6
	03/15/2000	1.4	±	0.7	0.5	±	0.2	14.1	±	1.6	5.2	±	0.6
	03/22/2000	0.8	±	0.6	0.3	±	0.2	11.3	±	1.7	4.2	±	0.6
	03/29/2000	0.8	±	0.8	0.3	±	0.3	23.9	±	2.7	8.8	±	1.0
REXBURG, CMS	01/05/2000	3.0	±	0.9	1.1	±	0.3	61.5	±	3.0	22.8	±	1.1
	01/12/2000	0.6	±	0.5	0.2	±	0.2	13.3	±	1.6	4.9	±	0.6
	01/19/2000	2.1	±	0.7	0.8	±	0.3	19.3	±	1.8	7.1	±	0.7
	01/26/2000	1.2	±	0.7	0.4	±	0.2	21.8	±	2.1	8.1	±	0.8
	02/02/2000	1.7	±	0.7	0.6	±	0.2	23.6	±	1.9	8.7	±	0.7
	02/09/2000	1.8	±	0.9	0.7	±	0.3	32.5	±	2.4	12.0	±	0.9
	02/16/2000	0.9	±	0.7	0.3	±	0.3	11.3	±	1.6	4.2	±	0.6
	02/23/2000	2.2	±	0.7	0.8	±	0.3	15.9	±	1.6	5.9	±	0.6
	03/01/2000	1.8	±	0.7	0.7	±	0.2	10.5	±	1.3	3.9	±	0.5
	03/08/2000	1.3	±	0.6	0.5	±	0.2	18.6	±	1.5	6.9	±	0.5
	03/15/2000	1.9	±	0.7	0.7	±	0.2	13.5	±	1.5	5.0	±	0.5
	03/22/2000	0.9	±	0.5	0.3	±	0.2	10.5	±	1.4	3.9	±	0.5
	03/29/2000	1.3	±	0.6	0.5	±	0.2	19.8	±	1.7	7.3	±	0.6

***** s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-1 (cont.): Weekly Gross Alpha & Gross Beta Concentrations in Air (1st Quarter 2000)

Location	Sampling Date	Gross Alpha Concentration ± 2s* 10^{-15} µCi/mL			Gross Alpha Concentration ± 2s 10^{-10} Bq†/mL			Gross Beta Concentration ± 2s 10^{-15} µCi/mL			Gross Beta Concentration ± 2s 10^{-10} Bq/mL		
INEEL													
EFS	01/05/2000	2.5	±	0.8	0.9	±	0.3	81.0	±	3.3	30.0	±	1.2
	01/12/2000	0.4	±	0.5	0.1	±	0.2	18.1	±	1.7	6.7	±	0.6
	01/19/2000	1.0	±	0.6	0.4	±	0.2	21.5	±	1.8	8.0	±	0.7
	01/26/2000	0.8	±	0.5	0.3	±	0.2	25.3	±	1.9	9.4	±	0.7
	02/02/2000	0.4	±	0.4	0.1	±	0.2	29.7	±	2.0	11.0	±	0.7
	02/09/2000	1.0	±	0.8	0.4	±	0.3	42.6	±	2.5	15.8	±	0.9
	02/16/2000	0.5	±	0.9	0.2	±	0.3	12.8	±	2.0	4.7	±	0.8
	02/23/2000	0.7	±	0.5	0.3	±	0.2	22.8	±	1.8	8.4	±	0.6
	03/01/2000	0.8	±	0.5	0.3	±	0.2	11.1	±	1.4	4.1	±	0.5
	03/08/2000	1.0	±	0.5	0.4	±	0.2	23.8	±	1.6	8.8	±	0.6
	03/15/2000	0.7	±	0.5	0.3	±	0.2	15.6	±	1.5	5.8	±	0.6
	03/22/2000	1.4	±	0.9	0.5	±	0.3	14.2	±	2.6	5.3	±	1.0
	03/29/2000	0.5	±	0.9	0.2	±	0.3	24.7	±	3.1	9.1	±	1.1
MAIN GATE	01/05/2000	2.1	±	0.7	0.8	±	0.3	67.7	±	2.9	25.0	±	1.1
	01/12/2000	0.4	±	0.4	0.1	±	0.2	16.0	±	1.6	5.9	±	0.6
	01/19/2000	1.5	±	0.6	0.6	±	0.2	19.7	±	1.7	7.3	±	0.6
	01/26/2000	0.4	±	0.4	0.1	±	0.2	22.2	±	1.8	8.2	±	0.7
	02/02/2000	0.9	±	0.5	0.3	±	0.2	27.0	±	1.9	10.0	±	0.7
	02/09/2000	0.7	±	0.7	0.3	±	0.3	33.2	±	2.3	12.3	±	0.8
	02/16/2000	0.4	±	0.6	0.2	±	0.2	15.3	±	1.6	5.7	±	0.6
	02/23/2000	0.9	±	0.5	0.3	±	0.2	21.3	±	1.7	7.9	±	0.6
	03/01/2000	0.3	±	0.5	0.1	±	0.2	9.5	±	1.3	3.5	±	0.5
	03/08/2000	0.7	±	0.5	0.3	±	0.2	19.6	±	1.5	7.3	±	0.6
	03/15/2000	1.1	±	0.6	0.4	±	0.2	12.7	±	1.4	4.7	±	0.5
	03/22/2000	0.8	±	0.4	0.3	±	0.2	9.4	±	1.3	3.5	±	0.5
	03/29/2000	1.0	±	0.5	0.4	±	0.2	18.7	±	1.7	6.9	±	0.6
VAN BUREN	01/05/2000	1.8	±	0.8	0.7	±	0.3	68.0	±	3.4	25.2	±	1.3
	01/12/2000	0.2	±	0.5	0.1	±	0.2	13.7	±	1.7	5.1	±	0.6
	01/19/2000	1.3	±	0.7	0.5	±	0.3	19.9	±	2.0	7.4	±	0.7
	01/26/2000	0.5	±	0.5	0.2	±	0.2	21.0	±	1.9	7.8	±	0.7
	02/02/2000	1.4	±	0.6	0.5	±	0.2	28.3	±	2.1	10.5	±	0.8
	02/09/2000	0.9	±	0.9	0.3	±	0.3	35.9	±	2.5	13.3	±	0.9
	02/16/2000	0.7	±	0.8	0.3	±	0.3	17.1	±	1.9	6.3	±	0.7
	02/23/2000	0.9	±	0.6	0.3	±	0.2	21.6	±	1.8	8.0	±	0.7
	03/01/2000	0.2	±	0.5	0.1	±	0.2	10.2	±	1.4	3.8	±	0.5
	03/08/2000	0.4	±	0.5	0.2	±	0.2	22.4	±	1.7	8.3	±	0.6
	03/15/2000	1.2	±	0.6	0.4	±	0.2	14.0	±	1.6	5.2	±	0.6
	03/22/2000	1.0	±	0.5	0.4	±	0.2	11.4	±	1.4	4.2	±	0.5
	03/29/2000	1.6	±	0.7	0.6	±	0.3	22.9	±	2.2	8.5	±	0.8

***** s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-2: Weekly Iodine-131 Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Iodine-131 Concentration ± 2s* 10^-6^ µ Ci/mL*			*Iodine-131 Concentration ± 2s 10^-2^ Bq†/mL*		
BOUNDARY							
ARCO	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3
ATOMIC CITY	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3
BIRCH CREEK HYDRO-PLANT	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3

***** s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-2 (cont.): Weekly Iodine-131 Concentrations in Air (1st Quarter 2000)

Location	Sampling Date	Iodine-131 Concentration ± 2s* 10^{-6} µ Ci□/mL			Iodine-131 Concentration ± 2s 10^{-2} Bq†/mL		
BOUNDARY							
FAA TOWER	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8
HOWE	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3
MONTEVIEW	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3

***** s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-2 (cont.): Weekly Iodine-131 Concentrations in Air (1st Quarter 2000)

Location	Sampling Date	Iodine-131 Concentration ± 2s* 10^{-6} µ Ci□/mL			Iodine-131 Concentration ± 2s 10^{-2} Bq†/mL		
BOUNDARY							
MUD LAKE	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3
QA-1 (FAA TOWER)	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8
QA-2 (MONTEVIEW)	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8

***** s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-2 (cont.): Weekly Iodine-131 Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Iodine-131 Concentration ± 2s** 10^{-6} μ Ci[□]/mL			*Iodine-131 Concentration ± 2s* 10^{-2} Bq[†]/mL		
DISTANT							
BLACKFOOT	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3
BLACKFOOT, CMS	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8
CRATERS OF THE MOON	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3

***** s = Standard Deviation
□ μCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-2 (cont.): Weekly Iodine-131 Concentrations in Air (1st Quarter 2000)

Location	*Sampling Date*	*Iodine-131 Concentration ± 2s* 10^{-6} µ Ci /mL*			*Iodine-131 Concentration ± 2s 10^{-2} Bq†/mL*		
DISTANT							
IDAHO FALLS	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8
REXBURG, CMS	01/05/2000	0.2	±	2.3	0.8	±	8.4
	01/12/2000	2.4	±	2.6	8.7	±	9.5
	01/19/2000	-0.1	±	1.7	-0.3	±	6.3
	01/26/2000	-1.4	±	1.8	-5.2	±	6.8
	02/02/2000	0.3	±	1.7	1.2	±	6.2
	02/09/2000	1.1	±	2.1	4.1	±	7.7
	02/16/2000	0.6	±	1.9	2.4	±	6.9
	02/23/2000	0.3	±	1.6	1.0	±	6.1
	03/01/2000	0.7	±	1.6	2.6	±	5.9
	03/08/2000	-1.9	±	2.2	-7.0	±	8.1
	03/15/2000	-0.8	±	1.7	-3.1	±	6.2
	03/22/2000	0.1	±	1.8	0.5	±	6.5
	03/29/2000	-0.3	±	1.7	-1.3	±	6.3

***** s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-2 (cont.): Weekly Iodine-131 Concentrations in Air (1st Quarter 2000)

Location	Sampling Date	Iodine-131 Concentration ± 2s* 10^{-6} µ Ci□/mL			Iodine-131 Concentration ± 2s 10^{-2} Bq†/mL		
INEEL							
EFS	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8
MAIN GATE	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8
VAN BUREN	01/05/2000	-0.4	±	1.7	-1.5	±	6.3
	01/12/2000	-0.6	±	1.9	-2.2	±	7.0
	01/19/2000	0.4	±	2.2	1.5	±	8.0
	01/26/2000	-0.5	±	2.2	-2.0	±	8.2
	02/02/2000	-0.1	±	2.1	-0.4	±	7.8
	02/09/2000	-1.7	±	2.5	-6.2	±	9.1
	02/16/2000	0.9	±	2.3	3.1	±	8.4
	02/23/2000	-0.8	±	2.0	-3.0	±	7.5
	03/01/2000	0.3	±	2.1	1.1	±	7.7
	03/08/2000	0.0	±	1.8	-0.2	±	6.7
	03/15/2000	-0.7	±	2.0	-2.7	±	7.5
	03/22/2000	1.9	±	2.2	6.9	±	8.3
	03/29/2000	-0.7	±	2.1	-2.6	±	7.8

***** s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-3: Quarterly Cesium-137, Americium-241, Plutonium-238, Plutonium-239/240 & Strontium-90 Concentrations in Composited Air Filters (1st Quarter 2000)

Location	Group	*Cesuim-137* Concentration ± 2s* 10^{-16} µCi□/mL			*Cesuim-137* Concentration ± 2s 10^{-12} Bq†/mL		
ARCO	**BOUNDARY**	0.052	±	1.500	0.192	±	5.550
ATOMIC CITY		-1.260	±	4.760	-4.662	±	17.612
BIRCH CREEK HYDRO		-2.930	±	6.180	-10.841	±	22.866
FAA TOWER		2.630	±	1.730	9.731	±	6.401
HOWE		-0.649	±	2.770	-2.401	±	10.249
MONTEVIEW		-0.542	±	1.880	-2.005	±	6.956
MUD LAKE		-0.145	±	1.730	-0.537	±	6.401
Replicate (FAA TOWER)		-4.490	±	6.850	-16.613	±	25.345
Replicate (MONTEVIEW)		-0.368	±	5.090	-1.362	±	18.833
BLACKFOOT	**DISTANT**	-3.810	±	5.310	-14.097	±	19.647
BLACKFOOT, CMS		-4.250	±	6.640	-15.725	±	24.568
CRATERS OF THE MOON		-5.170	±	6.690	-19.129	±	24.753
IDAHO FALLS		-1.680	±	7.360	-6.216	±	27.232
REXBURG, CMS		-3.620	±	7.670	-13.394	±	28.379
EFS	**INEEL**	0.466	±	1.920	1.724	±	7.104
INEEL MAIN GATE		-5.130	±	7.070	-18.981	±	26.159
VAN BUREN		-1.740	±	5.700	-6.438	±	21.090

Location	Group	*Americium-241* Concentration ± 2s 10^{-16} µCi/mL			*Americium-241* Concentration ± 2s 10^{-12} Bq/mL		
ARCO	**BOUNDARY**	0.012	±	0.011	0.044	±	0.040
MONTEVIEW		0.022	±	0.018	0.083	±	0.068
Replicate (MONTEVIEW)		0.006	±	0.009	0.023	±	0.033
BLACKFOOT	**DISTANT**	0.003	±	0.006	0.010	±	0.021
CRATERS OF THE MOON		0.007	±	0.012	0.024	±	0.046
INEEL MAIN GATE	**INEEL**	0.008	±	0.015	0.029	±	0.055

Location	Group	*Plutonium-238* Concentration ± 2s 10^{-16} µCi/mL			*Plutonium-238* Concentration ± 2s 10^{-12} Bq/mL		
ARCO	**BOUNDARY**	-0.007	±	0.013	-0.024	±	0.049
MONTEVIEW		0.000	±	0.015	0.000	±	0.054
Replicate (MONTEVIEW)		0.001	±	0.011	0.004	±	0.042
BLACKFOOT	**DISTANT**	0.000	±	0.030	0.000	±	0.111
CRATERS OF THE MOON		0.003	±	0.007	0.013	±	0.025
INEEL MAIN GATE	**INEEL**	-0.003	±	0.006	-0.011	±	0.022

* s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-3 (cont.): Quarterly Cesium-137, Americium-241, Plutonium-238, Plutonium-239/240 & Strontium-90 Concentrations in Composited Air Filters (1st Quarter 2000)

Location	Group	Plutonium-239/240 Concentration ± 2s* 10^{-16} µCi□/mL			Plutonium-239/240 Concentration ± 2s 10^{-12} Bq†/mL		
ARCO	***BOUNDARY***	-0.004	±	0.005	-0.014	±	0.020
MONTEVIEW		0.021	±	0.024	0.079	±	0.089
Replicate (MONTEVIEW)		-0.002	±	0.004	-0.007	±	0.015
BLACKFOOT	***DISTANT***	-0.002	±	0.010	-0.009	±	0.036
CRATERS OF THE MOON		0.008	±	0.015	0.030	±	0.054
INEEL MAIN GATE	***INEEL***	0.005	±	0.016	0.017	±	0.060

Location	Group	Strontium-90 Concentration ± 2s 10^{-16} µCi/mL			Strontium-90 Concentration ± 2s 10^{-12} Bq/mL		
ATOMIC CITY	***BOUNDARY***	0.397	±	0.260	1.469	±	0.962
MUD LAKE		0.032	±	0.190	0.117	±	0.703
Replicate (FAA TOWER)		0.239	±	0.240	0.884	±	0.888
IDAHO FALLS	***DISTANT***	0.121	±	0.440	0.448	±	1.628
BLACKFOOT, CMS		0.218	±	0.240	0.807	±	0.888
REXBURG, CMS		0.268	±	0.260	0.992	±	0.962
EFS	***INEEL***	0.230	±	0.280	0.851	±	1.036
FAA TOWER		0.243	±	0.260	0.899	±	0.962

* s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-4: Quarterly Tritium Concentrations in Atmospheric Moisture Columns (1st Quarter 2000)

Location	*Sampling Date*	*Tritium* Concentration ± 2s* 10^{-14} µCi□/mL			*Tritium* Concentration ± 2s 10^{-9} Bq†/mL		
REXBURG, CMS	04/04/2000	7.17	±	7.09	2.65	±	2.62
BLACKFOOT, CMS	04/04/2000	1.79	±	3.08	0.66	±	1.14
ATOMIC CITY	04/04/2000	5.53	±	13.87	2.04	±	5.13

* s = Standard Deviation
□ µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-5: PM_{10} Sampler Concentrations at Atomic City, Blackfoot, CMS, and Rexburg, CMS (1st Quarter 2000)

Location	*Sampling Date*	*Concentration (μg/m³)*
ATOMIC CITY	01/06/2000	8.5
	01/12/2000	4.7
	01/18/2000	3.5
	01/24/2000	6.1
	01/30/2000	6.4
	02/05/2000	8.8
	02/11/2000	4.0
	02/17/2000	4.8
	02/23/2000	6.2
	02/29/2000	4.9
	03/06/2000	4.9
	03/12/2000	4.0
	03/18/2000	4.8
	03/24/2000	10.2
	03/30/2000	7.6
BLACKFOOT, CMS	01/06/2000	7.2
	01/12/2000	6.2
	01/18/2000	9.6
	01/24/2000	11.3
	01/30/2000	11.3
	02/05/2000	19.9
	02/11/2000	5.9
	02/17/2000	5.6
	02/23/2000	6.1
	02/29/2000	7.8
	03/06/2000	6.2
	03/12/2000	4.3
	03/18/2000	7.1
	03/24/2000	8.7
	03/30/2000	15.6
REXBURG, CMS	01/06/2000	11.2
	01/12/2000	4.2
	01/18/2000	15.6
	01/24/2000	12.4
	01/30/2000	34.1
	02/05/2000	19.5
	02/11/2000	9.4
	02/17/2000	9.9
	02/23/2000	6.7
	02/29/2000	7.5
	03/06/2000	3.9
	03/12/2000	6.5
	03/18/2000	4.2
	03/24/2000	11.8
	03/30/2000	13.0

TABLE C-6: Monthly and Weekly Tritium Concentrations in Precipitation (1st Quarter 2000)

Location	*Sampling Date*	*Tritium Concentration ± 2s* 10^{-4} µCi/L*			*Tritium Concentration ± 2s Bq†/L*		
CFA	02/07/2000	-0.57	±	0.70	-2.11	±	2.60
	03/06/2000	-0.73	±	0.71	-2.71	±	2.62
	04/03/2000	-0.01	±	0.70	-0.02	±	2.59
EFS	01/25/2000	0.05	±	0.81	0.18	±	3.01
	02/15/2000	-0.62	±	0.85	-2.30	±	3.14
	02/22/2000	-1.76	±	0.84	-6.51	±	3.09
	03/07/2000	-0.66	±	0.70	-2.45	±	2.06
	03/14/2000	5.53	±	0.78	20.46	±	2.90
EFS (Recount)	03/14/2000	-0.94	±	-0.69	-3.49	±	2.56
IDAHO FALLS	02/07/2000	-1.05	±	0.85	-0.39	±	0.31
	03/06/2000	-1.56	±	0.70	-0.58	±	0.26
	04/03/2000	-0.85	±	0.69	-3.15	±	2.55

* s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-7: Weekly & Monthly Cesium-137 & Iodine-131 Concentrations in Milk (1st Quarter 2000)

Location	Sampling Date	*Cesium-137* Concentration ± 2s* 10^{-9} µCi/mL	*Cesium-137* Concentration ± 2s 10^{-4} Bq†/mL	*Iodine-131* Concentration ± 2s 10^{-9} µCi/mL	*Iodine-131* Concentration ± 2s 10^{-4} Bq/mL
IDAHO FALLS	01/06/2000	5.5 ± 7.7	2.0 ± 2.9	-1.3 ± 5.4	-0.5 ± 2.0
	01/13/2000	-1.3 ± 8.0	-0.5 ± 3.0	-2.5 ± 6.5	-0.9 ± 2.4
	01/20/2000	-0.5 ± 7.9	-0.2 ± 2.9	-1.1 ± 5.6	-0.4 ± 2.1
	01/27/2000	-2.4 ± 7.8	-0.9 ± 2.9	-1.3 ± 5.4	-0.5 ± 2.0
	02/03/2000	-1.7 ± 7.8	-0.6 ± 2.9	1.5 ± 5.2	0.5 ± 1.9
	02/10/2000	0.0 ± 2.3	0.0 ± 0.9	-0.5 ± 2.0	-0.2 ± 0.7
	02/17/2000	0.5 ± 2.4	0.2 ± 0.9	0.8 ± 2.4	0.3 ± 0.9
	02/24/2000	-2.8 ± 8.0	-1.0 ± 3.0	-1.6 ± 5.4	-0.6 ± 2.0
	03/02/2000	0.8 ± 7.7	0.3 ± 2.8	1.6 ± 5.3	0.6 ± 1.9
	03/09/2000	-1.3 ± 2.3	-0.5 ± 0.9	0.1 ± 1.8	0.0 ± 0.7
	03/16/2000	-2.2 ± 8.0	-0.8 ± 3.0	-1.6 ± 5.4	-0.6 ± 2.0
	03/23/2000	-10.4 ± 8.0	-3.8 ± 3.0	-2.8 ± 5.4	-1.0 ± 2.0
	03/30/2000	0.4 ± 7.8	0.1 ± 2.9	1.0 ± 5.2	0.4 ± 1.9
BLACKFOOT	01/03/2000	-0.4 ± 2.2	-0.1 ± 0.8	-0.1 ± 2.0	0.0 ± 0.7
	02/07/2000	2.1 ± 2.5	0.8 ± 0.9	-0.9 ± 3.0	-0.3 ± 1.1
	03/06/2000	-1.6 ± 7.8	-0.6 ± 2.9	-1.3 ± 6.4	-0.5 ± 2.4
CAREY	01/04/2000	1.1 ± 2.5	0.4 ± 0.9	1.4 ± 3.1	0.5 ± 1.1
	02/01/2000	0.0 ± 2.3	0.0 ± 0.8	-0.2 ± 2.1	-0.1 ± 0.8
	03/07/2000	0.2 ± 2.2	0.1 ± 0.8	0.4 ± 1.9	0.1 ± 0.7
DIETRICH	01/04/2000	1.3 ± 7.8	0.5 ± 2.9	-1.5 ± 6.2	-0.5 ± 2.3
	02/01/2000	-1.7 ± 7.8	-0.6 ± 2.9	1.5 ± 6.8	0.6 ± 2.5
	03/07/2000	0.7 ± 2.7	0.3 ± 1.0	-2.6 ± 2.7	-1.0 ± 1.0
HOWE	01/03/2000	2.6 ± 2.2	1.0 ± 0.8	-2.5 ± 3.2	-0.9 ± 1.2
	02/07/2000	-1.6 ± 2.3	-0.6 ± 0.8	0.8 ± 2.1	0.3 ± 0.8
	03/06/2000	1.2 ± 2.3	0.4 ± 0.8	-0.8 ± 2.0	-0.3 ± 0.7
ROBERTS	01/03/2000	-0.5 ± 2.7	-0.2 ± 1.0	-0.5 ± 2.9	-0.2 ± 1.1
	02/07/2000	2.5 ± 2.7	0.9 ± 1.0	-2.3 ± 2.9	-0.8 ± 1.1
	03/06/2000	-6.4 ± 8.0	-2.4 ± 2.9	2.5 ± 5.9	0.9 ± 2.2
RUPERT	01/04/2000	-6.4 ± 7.9	-2.4 ± 2.9	1.9 ± 6.9	0.7 ± 2.5
	02/01/2000	3.0 ± 7.7	1.1 ± 2.8	-1.4 ± 7.6	-0.5 ± 2.8
	03/07/2000	0.1 ± 7.9	0.0 ± 2.9	1.0 ± 6.7	0.4 ± 2.5
TERRETON	01/03/2000	1.0 ± 2.7	0.4 ± 1.0	2.4 ± 2.6	0.9 ± 1.0
	02/07/2000	-0.2 ± 2.9	-0.1 ± 1.1	-1.6 ± 3.3	-0.6 ± 1.2
	03/06/2000	-2.0 ± 2.8	-0.7 ± 1.0	-1.2 ± 3.0	-0.4 ± 1.1

***** s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")

TABLE C-8: Cesium-137 & Iodine-131 Concentrations in Game Animals (1st Quarter 2000)

Location	*Sampling Date*	*Tissue*	*Cesium-137 Concentration ± 2s* 10^{-9}µCi /g wet weight*			*Cesium-137 Concentration ± 2s 10^{-4}Bq†/g wet weight*		
MULE DEER (CFA BLDG 663)	02/02/2000	LIVER	3.7	±	2.0	1.4	±	0.8
		MUSCLE	5.2	±	10.3	1.9	±	1030.0
		THYROID	-502.0	±	1030.0	-185.7	±	381.1
ELKa (HWY. 22/33 MILE 2/3)	02/10/2000	LIVER	2.1	±	2.7	0.8	±	1.0
		MUSCLE	-0.6	±	2.2	-0.2	±	0.8
		THYROID	-174.0	±	458.0	-64.4	±	169.5
ELKb (HWY. 22/33 MILE 2/3)	02/10/2000	LIVER	-0.5	±	1.1	-0.2	±	0.4
		MUSCLE	-8.8	±	10.5	-3.3	±	3.9
		THYROID	-110.0	±	312.0	-40.7	±	115.4

Location	*Sampling Date*	*Tissue*	*Iodine-131 Concentration ± 2s 10^{-7}µCi/g wet weight*			*Iodine-131 Concentration ± 2s 10^{-2}Bq/g wet weight*		
MULE DEER (CFA BLDG 663)	02/02/2000	THYROID	-3.5	±	9.0	-1.3	±	3.3
ELKa (HWY. 22/33 MILE 2/3)	02/10/2000	THYROID	1.0	±	2.4	0.4	±	0.9
ELKb (HWY. 22/33 MILE 2/3)	02/10/2000	THYROID	-0.7	±	2.2	-0.3	±	0.8

s = Standard Deviation
µCi = Standard Units (see "Helpful Information")
† Bq = Systeme International d'Unites (SI) (see "Helpful Information")