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Westinghouse Hanford Company Operational Environmental Monitoring Annual Report, CY 1992

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RECOGNITION

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**WESTINGHOUSE HANFORD COMPANY OPERATIONAL ENVIRONMENTAL
MONITORING ANNUAL REPORT**

Calendar Year 1992

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ABSTRACT

This document presents the results of the Westinghouse Hanford Company near-facility operational environmental monitoring for 1992 in the 100, 200/600, and 300/400 Areas of the Hanford Site, in south-central Washington State in 1992. Surveillance activities included sampling and analyses of ambient air, surface water, groundwater, sediments, soil, and biota. Also, external radiation measurements and radiological surveys were taken at waste disposal sites, radiologically controlled areas, and roads. These activities were conducted to assess and to control the impacts of nuclear facilities and waste sites on the workers and the local environment. Additionally, diffuse sources were monitored to determine compliance with Federal, State, and/or local regulations. In general, although impacts from nuclear facilities are still seen on the Hanford Site and are slightly elevated when compared to offsite, these impacts are less than in previous years.

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EXECUTIVE SUMMARY

During 1992, near-facility environmental monitoring of the Operations areas of the Hanford Site, in south-central Washington State, was performed by Westinghouse Hanford Company (WHC) to assess and monitor the impacts of nuclear facilities and radiological waste sites on the local environment and to monitor diffuse sources. These data are used for determining compliance and when necessary for improving containment and control systems design. The results and conclusions of this monitoring program are presented in this report.

Operational environmental monitoring activities on the Hanford Site include sampling and analyses of ambient air, surface water, groundwater, sediments, soil, and biota, at or adjacent to, nuclear facilities and radiological waste sites. Also, external radiation measurements and radiological surveys were performed at radiological waste disposal sites and their perimeters, at radiologically controlled areas, and along Site roads. This report summarizes the results for sampling and testing for radioactivity in air, soil, vegetation, and water. Nonradioactive parameters sampled and tested are pH, nitrate, and water temperature. The 1992 data are summarized below and explained in detail in the following sections of this report.

REGULATORY CONTROLS

Radiation exposure to workers and the offsite population is regulated by a tiered system of controls. The U.S. Department of Energy (DOE) has established a stochastic occupational annual effective dose equivalent (EDE) at 5,000 mrem/yr and a non-stochastic occupational annual EDE of 15 or 50 rem, depending on the organ of interest (DOE 5480.11). The DOE set the dose limits

for any member of the public at 100 mrem/yr for exposures expected to last longer than 5 years and at 500 mrem/yr for occasional annual exposures (DOE 5400.5). An administrative action level of 25 mrem/yr exposure to the maximum hypothetical individual member of the public has been identified by WHC to ensure that these exposure limits are not exceeded. The air emission of radionuclides from the combined discharge of all WHC managed facilities and all other facilities on the Hanford Site shall not exceed those amounts that would cause an EDE of 10 mrem/yr to any member of the public during any 12-month period.

Derived concentration guides (DCG) corresponding to the 100 mrem/yr EDE standard are used in this report for comparison only. It should be noted that the DCGs are applicable at the point of potential exposure to members of the public offsite the Hanford Site and therefore are not applicable onsite. When measuring gross alpha emitting activity, the more stringent DCG for measuring ^{239}Pu is used. When measuring gross beta emitting activity, the more stringent DCG for ^{90}Sr is used. To comply with the philosophy to keep exposures to workers and the public as low as reasonably achievable (ALARA), WHC establishes ALARA requirements called administrative control values (ACV), which are used as guidance in maintaining releases below applicable regulatory standards.

AIR MONITORING

Near-facility air sampling provides data for determining the effectiveness of waste management and effluent treatment and controls in reducing effluents and emissions; it also monitors diffuse source emissions.

Radiological Results

Of the radionuclide analyses performed, ^{90}Sr , ^{137}Cs , $^{239,240}\text{Pu}$, and uranium were consistently detectable in the 200 Areas; ^{60}Co was also detectable in the 100-N Area. Air concentrations for these radionuclides were elevated near facilities when compared to the concentrations measured offsite. The concentrations show a large degree of variance. In general, the samples collected from air samplers located on or directly adjacent to the waste disposal and other nuclear facilities had significantly higher concentrations than those further away. The data also show, as expected, that certain radionuclides had higher concentrations within different operational areas. Generally speaking, the predominant radionuclides are activation products/gamma emitters in the 100 Areas and fission products in the 200/600 Areas.

100-N Area

Analytical results from air samples taken in the 100-N Area were on a downward trend for most radionuclides as a result of facility shutdowns, better effluent controls, and improved waste management practices. These levels were well below the DCG; however, they were above concentrations measured offsite as expected.

200 Areas

Analytical results from air samples taken in the 200/600 Areas were on a downward trend for most radionuclides as a result of facility shutdowns, better effluent controls, and improved waste management practices. These levels, although well below the DCG, were above those measured offsite and were higher for ^{90}Sr , $^{239,240}\text{Pu}$, and uranium when compared to levels in the 100-N Area.

SURFACE-WATER DISPOSAL UNITS AND SEEP MONITORING

Surface-water disposal units used by the operating facilities, and their seeps, are monitored to assess the effectiveness of effluent and contamination controls.

Radiological analysis of water from surface-water disposal units included gross alpha, gross beta, ^3H , $^{239,240}\text{Pu}$, and gamma-emitting radionuclides. Alpha and beta measurements provided a general indication of radioactive contamination. Radiological analysis of sediment and aquatic vegetation included ^{90}Sr , $^{239,240}\text{Pu}$, uranium, and gamma-emitting radionuclides. Nonradiological analysis performed included pH, temperature, and nitrates. Analytes of interest were selected based on their presence in effluent discharges, their importance in verifying effluent control, and determining compliance with applicable standards. Surface-water disposal units that receive potentially radioactively contaminated effluents are within posted radiological control areas.

Radiological Results

Surface-Water Disposal Units

In all cases, radionuclide concentrations in surface-water disposal units in the 200/600 Area were less than the applicable DCG and in most cases equal to or less than the analytical detection limit. However, the maximum gross beta concentration for one of the samples approached the DCG (using ^{90}Sr DCG of 1,000 pCi/L for comparison). This was a new sample location for the 216-U-14 Ditch in the 200 West Area. The sampling location had been changed in early 1992 as a result of the stabilization (the placement of fill material

over contaminated soils) at the original sampling location near the lower portion of the 216-U-14 Ditch. This surface-water disposal unit had received radioactively contaminated waste in the past.

Although some elevated levels can be seen in both aquatic vegetation and sediment, in all cases the radiological analytical results were well below the standards for radiological control.

Seeps

Groundwater seeps along the 100-N Area shoreline were sampled annually to verify reported radionuclide releases to the Columbia River from the past operation of the N Reactor. Release reporting utilizes conservatively based radionuclide concentrations, multiplied by the estimated groundwater flow to the river. The results of the radionuclide concentrations in the seeps along the shoreline could be compared to the concentrations measured in the effluent monitoring well 199-N-8T.

In 1992, the concentrations detected in the seep samples were highest in those seeps in the area nearest well 199-N-8T, although the seep concentrations were considerably lower than those measured in the well.

Nonradiological Results for Surface-Water Disposal Units

The results for pH were well within the pH of 2.0 and 12.5 standard for liquid effluent discharges based on the discharge limits listed in *Resource Conservation and Recovery Act of 1976 (RCRA)*. The analytical results for nitrates were all less than the detection limit except for those samples from the 216-T-4 Ditch. The average nitrate result for that location was 2.0 mg/L,

which was slightly greater than the analytical detection limit of 1.4 mg/L and is less than the 45 mg/L drinking water standard for public water supplies.

RADIOLOGICAL SURVEYS

Another aspect of the near-facility environmental monitoring program is radiological surveying, which monitors and helps direct the reduction of the radiologically controlled areas on the Hanford Site. There are two types of radiologically controlled areas that are posted: underground radioactive materials (URM) and surface contamination areas (SCA).

URM areas are posted areas with contamination contained below the soil surface. These areas are typically "interim stabilized" cribs, burial grounds, covered ponds, trenches, and ditches. Barriers over the contamination sources are used to inhibit radionuclide transport to the surface environs. Waste sites are routinely surveyed (at least annually) to document the current radiological status.

SCAs may or may not have been associated with an underground radioactive material structure. A breach in the barrier of an URM may have resulted in the growth of contaminated vegetation. Insects or animals might have burrowed into an URM and brought contamination to the surface. Vent pipes or risers from an underground structure could have been a source of contamination. Fallout from stacks or unplanned releases from previously operating facilities may have caused an area of surface contamination that was not related to a subsurface structure. All types of SCA are susceptible to contamination migration.

There were approximately 1,200 ha (3,000 acres) of posted outdoor SCA and 400 ha (1,000 acres) of posted URM, not including active facilities, on the Hanford Site in 1992. The number of SCA acres is three times larger than the URM acres primarily because of the BC Controlled Area located south of the 200 East Area. This area was posted as a Radiologically Controlled Area in 1959 because of widespread speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) and it encompassed approximately 1,000 ha (2,500 acres). Ten ha (22 acres) were reclassified from SCA to URM, and 7 ha (16 acres) were sampled and unconditionally released.

The area of posted surface contamination varied because of an ongoing effort to clean, stabilize, and remediate areas of known contamination while new areas of contamination were being identified. Newly identified areas may be from contamination migration or the result of an increased effort to investigate outdoor areas for radiological contamination. Vehicles equipped with radiation detection devices and the Ultrasonic Ranging and Data System (USRADS) have identified areas of contamination that were previously undetected.

It was estimated that 80 percent of the identified outdoor surface contamination would result in an external dose rate of less than 1 mrem/h, although the dose rate from isolated specks could be considerably higher. Contamination levels of this magnitude would not significantly add to dose rate calculations for the public or employees.

SOIL AND VEGETATION SAMPLING FROM OPERATIONAL AREAS

Soil and vegetation samples were collected on or adjacent to waste disposal units and from locations downwind and near or within the boundaries of the operating facilities. Samples were collected to detect potential migration and deposition of facility effluents. Migration can occur as the result of resuspension from radioactively contaminated surface areas, absorption of radionuclides by the roots of vegetation growing on or near underground and surface-water disposal units, or by waste site intrusion by animals. Special samples were also taken where physical or biological transport problems were identified. Radiological analysis of soil and vegetation samples included ^{90}Sr , $^{239,240}\text{Pu}$, uranium, and gamma-emitting radionuclides.

Radiological Results

Soil

Of the radionuclide analyses performed, ^{60}Co , ^{90}Sr , ^{137}Cs , $^{239,240}\text{Pu}$, and uranium were elevated near and within facility boundaries when compared to the concentrations measured offsite as expected. In general, the samples collected on, or directly adjacent to, the waste disposal facilities had significantly higher concentrations than those farther away. The data also show, as expected, that certain radionuclides have higher concentrations within different operational areas. Generally speaking, the predominant radionuclides were activation products/gamma emitters in the 100 Areas, fission products in the 200/600 Areas, and uranium in the 300 Areas.

100 Areas. Analytical results from soil samples collected in the 100 Areas were on a downward trend, showing effects of the shutdown of the

production reactors and the effectiveness of effluent controls that have been implemented in recent years. However, these levels were greater than those measured offsite, and the concentration of ^{60}Co was greater than that measured in the 200/600 and 300/400 Areas as expected. The ^{60}Co in the 100 Areas was the result of past discharges to waste disposal structures, primarily the 1301-N Liquid Waste Disposal Facility. Measures have been taken in recent years to identify and minimize the migration of contamination from these structures.

200/600 Areas. Analytical results from soil samples taken in the 200/600 Areas were on a downward trend for most radionuclides as a result of physical and radioactive decay, facility shutdowns, better effluent controls, and waste management practices. However, these levels were greater than those measured offsite, and were shown to be higher for ^{90}Sr , ^{137}Cs , and $^{239,240}\text{Pu}$ when compared to the 100 and 300/400 Areas. Uranium levels were slightly higher than those measured in 1991.

300/400 Areas. This was the second sampling year for the 300/400 Areas near-facility environmental monitoring program. The data for these areas were compared to results for other operational areas and those measured offsite. The levels measured for uranium were higher than those from the 100 and 200/600 Areas. This difference was expected because of past uranium fuel fabrication operations conducted in the 300 Area.

Vegetation

Of the radionuclide analyses performed on vegetation, ^{60}Co , ^{90}Sr , ^{137}Cs , $^{239,240}\text{Pu}$, and uranium were consistently detectable. Vegetation concentrations

for these radionuclides were elevated near and within facility boundaries compared to the concentrations measured offsite. In general, the samples collected on, or directly adjacent to, the waste disposal facilities had significantly higher concentrations than those farther away. As with the soil samples, the data show that certain radionuclides will be found in vegetation in higher concentrations within different operational areas. Except for ^{90}Sr (a fission product) detected in vegetation from the N Springs, predominant radionuclides are generally activation products/gamma emitters in the 100 Areas, fission products in the 200/600 Areas, and uranium in the 300 Areas.

100 Areas. Analytical results from vegetation samples collected in the 100 Areas were all on a downward trend except for those for ^{90}Sr , which increased to the levels seen in 1989. The maximum values were from samples collected from the N Springs area located at the 100-N Area. The reason for this increase may be related to the time of year for sampling, and there were no N Springs vegetation results for 1990 that contributed to the average concentration of ^{90}Sr in the 100 Areas vegetation. However, these levels were greater than those measured offsite and were higher for ^{60}Co and ^{90}Sr compared to the 200/600 and 300/400 Areas.

200/600 Areas. Analytical results from vegetation samples taken in the 200/600 Areas were on a downward trend for most radionuclides as a result of facility shutdowns, better effluent controls, and improved waste management practices. Before 1992, these levels were greater than those measured offsite and were higher for ^{137}Cs and $^{239,240}\text{Pu}$ compared to the 100 and 300/400 Areas.

During 1992, the average concentrations onsite, offsite, and within the various operational areas were similar for these two radionuclides.

300/400 Areas. This was the second sampling year for the 300/400 Areas near-facility environmental monitoring program. Generally, most of the levels in the 300 Area were greater than those measured offsite and were higher for uranium compared to the 100 and 200/600 Areas. This difference was expected because uranium was released during past fuel fabrication operations conducted in the 300 Area. The levels measured in the 400 Area were at or near those measured offsite.

INVESTIGATIVE SAMPLING

The purpose of investigative sampling was to determine whether effluent controls and waste containment were adequate. An important part of the near-facility program, investigative monitoring was conducted and special samples were taken in the operations areas to confirm the absence of or to detect the presence of radioactive contaminants. This investigative sampling took place near facilities such as storage and disposal sites for at least one of the following reasons:

- Radiological surface surveys had indicated that radioactive contamination was present
- To quantify the radiological condition of a site before facility construction or operation
- To quantify the radiological condition of a site before remediation

- To determine if biotic intrusion (e.g., animal burrows or deep-rooted vegetation) had created a potential for the spread of contaminants
- To determine the integrity of waste containment systems
- To assist in setting priorities for stabilization.

Because of the diverse operations historically conducted at each of the operating areas (100, 200, and 300 Areas), radionuclide concentrations in samples from the different areas were generally predictable.

Special samples in 1992 included soil, tumbleweeds, gopher snakes, pigeon feces, cliff swallow nests, house mice, deer mice, a black-tailed jackrabbit, and a Nuttall's cottontail rabbit.

Results

Special samples were collected where known or suspected radioactive contamination was present. A direct relationship between the general status of the different media within the operating areas to contamination levels reported for special samples cannot be drawn.

Soil

In 1992, 30 investigative soil samples were taken. The radionuclides in maximum concentration were ^{60}Co from D Island near the 100-D Area (11,000,000 pCi/sample); ^{90}Sr (1,000,000 pCi/g) and ^{137}Cs (1,900 pCi/g), both from near 221-B Stack in the 200 East Area; and ^{234}Th (730 pCi/g),

^{234m}Pa (1,100 pCi/g), and ^{235}U (38 pCi/g) from near the 300 Area (Table ES-8). Note that the D Island sample analyses result was for a single speck of contamination (probably about 0.001 g) and if collected as a typical sample (~500 g), the radioactivity concentration would be reduced to several hundred or perhaps thousand picocuries per gram. Further discussion of the shoreline radiological survey may be found in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The number of contamination incidents, the radioactivity levels, and the range of radionuclide concentrations were not unusual. Areas of special soil sampling that were outside radiological control areas and that had levels greater than WHC radiological control limits were posted as surface contamination areas.

Vegetation

There were 13 instances of contaminated vegetation detected in operational areas in 1992. Only one sample (i.e., from 100-F Area and reading 1,500 cpm) was analyzed at a laboratory before disposal, and the radionuclides at the maximum concentrations were ^{137}Cs (<0.96 pCi/g) and total uranium (0.04 pCi/g). The remaining 12 instances of contaminated tumbleweeds were found during remedial operations and disposed of so that only field-instrument readings of radioactivity are available. Field-instrument readings ranged from 350 to 40,000 cpm, which are within the ranges reported for the past 3 years. The number of plants found to be contaminated with radioactivity was not unusual. The greatest number of contaminated vegetation (42) submitted for analyses was in 1978. In the 200 Areas before 1980, when vegetation control was limited or nonexistent, contaminated vegetation was counted in acres rather than individual specimens.

Vegetation control in 1992, as in 1991, was noticeably more effective than in 1990 and 1989 and is indicating a return to an improving trend. An improving trend had been evident from 1981 up to 1989, when resistance to the herbicide in use was first noted. Improved vegetation control was probably the result of better program administration, improved equipment, and use of more effective herbicides.

Wildlife

Animals were collected as a result of an aggressive pest control program designed to limit the exposure and potential contamination of animals to radioactive material. Animals were collected directly from or near facilities to identify problems in preventive systems designed to inhibit animal intrusion. Radiological surveys were performed after collection to determine if an animal was radioactively contaminated. If an animal was found free of contamination, it would be taken to a suitable habitat area and released. If an animal was contaminated, a decision was made to collect a sample or dispose of the animal. This decision was based on the level of contamination, sampling facility, and frequency of occurrence.

There were 26 special animal or nest samples analyzed in 1992. The radionuclides found at the maximum concentrations were ^{60}Co (74,000 pCi/g), ^{90}Sr (3,100 pCi/g), ^{106}Ru (4,200 pCi/g), ^{137}Cs (7,900 pCi/g), and $^{154,155}\text{Eu}$ (1,700 pCi/g) (see Table ES-7). The total number of animals found to be contaminated with radioactivity, the radioactivity levels, and the range of radionuclides concentrations were not unusual. However, the number of incidents decreased slightly compared to 32 in 1991. The greatest number of

contaminated animals were found in 1982 (44, mostly pigeons); however, before 1981 fewer representative samples were submitted for radionuclide analyses.

Special Characterization Projects

Special characterization projects were conducted to verify the status of contaminated soil at 216-U-14 Ditch in the 200 West Area before stabilizing the lower end, around B Stack in the 200 East Area, and on D Island in the Columbia River, which was the site of the old liquid effluent outfall from D Reactor. Radionuclides found at the maximum concentrations at these sites were ^{137}Cs (1,600 pCi/g), ^{90}Sr (1,000,000 pCi/g), and ^{137}Cs (1,900 pCi/g); and ^{60}Co (11,000,000 pCi/sample), respectively. Note that the D Island sample analyses result was for a single speck of contamination (probably about 0.001 g) and if collected as a typical sample (~500 g), the radioactivity concentration would be reduced to about 20 pCi/g.

GROUNDWATER MONITORING

100 Area

The annual average for the concentration of ^{90}Sr at the N Springs was seven times the DCG in 1992, but similar to the concentrations reported during 1986 through 1989. The quantity of ^{90}Sr being released to the Columbia River in the N Springs is significantly less than during previous years because of reduction and elimination of effluents being discharged to the 100-N liquid waste disposal facilities (LWDF).

The unconfined groundwater beneath two waste sites in the 100 Area exceed the ACV for ^{90}Sr . These were beneath the 1301-N and the 1325-N LWDF.

200/600 Area

The unconfined groundwater beneath one inactive waste site in the 200 Areas exceeded the DCG on an annual average. This site is inactive and does not have a projected offsite dose that exceeds the DOE limits.

- The annual average for the concentration of ^{90}Sr beneath the inactive 216-B-5 Reverse Well was five times the DCG in 1992.
- The annual average for the concentration of ^3H beneath the inactive 216-A-10 Crib and the active 216-A-36B Crib exceeded the DCG in 1992.

The groundwater beneath five sites exceeded the ACVs on an annual average.

- Uranium isotopes and ^{99}Tc in the groundwater exceeded the ACV at the active 216-U-17 Crib.
- The ^{239}Pu and ^{90}Sr concentrations in the groundwater exceeded the ACV beneath the inactive 216-B-5 Reverse Well.
- The Uranium isotope concentration was greater than the ACV in the groundwater beneath the inactive 216-T-33, 2116-S-13, and 216-U1/2 cribs and the active 216-U-14 Ditch.

300/400 Area

The unconfined groundwater in two wells in the 300 Area, 399-1-10 and 399-1-16A, exceeded the DCG for alpha. The results are higher than previous years and correspond with the higher uranium concentrations.

The groundwater in three wells; 399-1-10, 399-1-16A, and 399-2-1, exceeded the DCG for uranium. These wells show higher concentrations relative to previous results. These results may be attributed to seasonal water stage changes in the Columbia River.

The concentrations of radionuclides in the groundwater beneath the 400 Area are below the DCGs. The data indicate that the concentrations have remained relatively stable. The elevated concentrations of tritium are attributed to the plume emanating from the 200 Areas.

EXTERNAL RADIATION

External radiation fields were measured near operations facilities and waste handling, storage, and disposal sites to measure, assess, and control the impacts of operations.

Sample Collection and Analysis

Two methods of measurement are employed, one being hand-held μ R meters used to survey multiple points and the other being thermoluminescent dosimeters (TLD).

Results

Radiation Measurements

Hand-held μ R meters were used to survey points near and within three waste disposal facility locations in the 100-N Area: the N Springs area, 1301-N LWDF, and 1325-N LWDF. These radiation measurements were taken at a height of approximately 1 m (3.28 ft) to assess the effects of changes in operations of these facilities and are not necessarily a true measurement of exposure rate. The hand-held μ R meters are known to over-respond to low-energy gamma radiation. The radiation rate measured along the 100-N Area shoreline was still declining in 1992. The shift in the dose rate levels show the effects of the decreased discharges to the 1301-N LWDF and the continuing decay of ^{60}Co and ^{137}Cs , the principal residual radionuclides. The radiation measurements taken at the 1301-N LWDF in 1992, as in previous years, continue to show the decay of ^{60}Co . The radiation measurements taken at the 1325-N LWDF in 1992 and in the previous year were elevated, compared to earlier years. This increase indicates the effect of decreased discharges of liquid waste to that facility. The decreased discharges resulted in the loss of the water that normally provided shielding from the gamma-emitting radionuclides contained in the sediments of the LWDF, principally ^{60}Co and ^{137}Cs resulting in higher dose rates.

TLDs

100 Areas. All TLDs in the 100 Areas were located in the 100-N Area. The 1992 TLD results indicate that direct radiation levels were highest near facilities that had contained or received liquid effluent from N Reactor. These facilities primarily include the 1325-N LWDF and the 1301-N LWDF, which contributed the primary increase in dose rates. While the results were

noticeably higher than those for other 100-N Area TLD locations, the overall trend for these two facilities decreased in exposure rate of approximately 5 percent when compared to 1991.

In 1992, three TLD locations were moved from previously occupied buildings to other locations. Measurements were initiated at two locations between the 1301-N LWDF and the Columbia River shoreline (N Springs).

200/600 Areas. The highest dose rates in the 200/600 Areas were measured near waste-handling facilities such as tank farms. The highest dose rate was measured at the 241-A Tank Farm complex located in the 200 East Area. The average dose rate measured in 1992 by TLDs in the 200/600 Areas was 130 mrem/yr, which was an increase of 8 percent over the average dose rate of 120 mrem/yr measured in 1991.

300/400 Areas. The highest dose rates in the 300 Area were measured near waste-handling facilities, such as the 340 Waste Handling Facility. The average dose rate measured in 1992 by TLDs in the 300 Areas was 160 mrem/yr, which was a decrease of 10 percent of the average dose rate of 180 mrem/yr measured in 1991.

The highest dose rates, although not significantly elevated above background, measured in the 400 Area was near the 4718 Building. The average dose rate measured in 1992 by TLDs in the 400 Area was 90 mrem/yr, which was a decrease of 20 percent over the average dose rate of 110 mrem/yr measured in 1991.

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REPORT SUMMARY

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REGULATORY CONTROLS

Radiation exposure to workers and the offsite population is regulated by a tiered system of controls. The U.S. Department of Energy (DOE) has established a stochastic occupational annual effective dose equivalent (EDE) limit at 5,000 mrem/yr (DOE 5480.11) and a non-stochastic occupational annual

EDE of 15 or 50 rem, depending on organ of interest. The DOE set the dose limits for any member of the public at 100 mrem/yr for exposures expected to last longer than 5 years and at 500 mrem/yr for occasional annual exposures. An administrative action level of 25 mrem/yr exposure to the maximum hypothetical individual member of the public has been identified by WHC to ensure that these exposure limits are not exceeded. The emission of radionuclides in air from the combined discharge of all WHC managed facilities and all other facilities on the Hanford Site shall not exceed those amounts that would cause an EDE of 10 mrem/yr to any member of the public during any 12-month period.

Derived concentration guides (DCG) corresponding to the 100 mrem/yr EDE standard are used in this report for comparison only. It should be noted that the DCGs are applicable at the point of potential exposure to members of the public off the Hanford Site and therefore are not applicable onsite. When measuring gross alpha emitting activity, the more stringent DCG for measuring ^{239}Pu is used. When measuring gross beta emitting activity, the more stringent DCG for ^{90}Sr is used. To comply with the philosophy to keep exposures to workers and the public as low as reasonably achievable (ALARA), WHC establishes ALARA requirements called administrative control values (ACVs), which are used as guidance in maintaining releases below applicable regulatory standards.

AIR MONITORING

Near-facility air sampling provides data for determining the effectiveness of waste management and effluent treatment and controls in reducing effluents and emissions; it also monitors diffuse source emissions.

Sample Collection and Analysis

Ambient air sampling (near-facility) is accomplished by a network of continuously operated samplers at 40 locations near nuclear facilities including 4 located in the 100-N Area, 33 in the 200/600 Areas, and 3 background stations collocated with samplers operated by Pacific Northwest Laboratory (PNL) and the Washington State Department of Health (WDOH) at the Yakima and Wye Barricades and the old Hanford townsite. To avoid duplication of sampling, the near-facility environmental monitoring program used existing PNL air samplers in the 300 and 400 Areas (results reported in Section 5.2, "Air Surveillance" of the *Hanford Site Environmental Report for Calendar Year 1992* [Woodruff and Lundgren 1993]). Air samplers were primarily located at or near (within ~500 m or 1,500 ft) sites and/or facilities having the potential for, or history of, release, with appropriate consideration of the prevailing downwind directions.

Samples were collected according to a schedule established before the monitoring year. Airborne particulates were sampled at each of these stations by drawing air through a glass-fiber filter. The filters were collected weekly, field surveyed for gross radioactivity to detect any unusual trends or off-normal occurrences, held for at least 7 days, and then analyzed for gross alpha and beta activity. The 7-day holding period was necessary to allow for the decay of naturally occurring radionuclides that would otherwise obscure detection of longer-lived radionuclides associated with emissions from nuclear facilities. The total radioactivity measurements were used to indicate changes in trends in the near-facility environment.

For most radionuclides, the amount of radioactive material collected on a filter during a 1-week sampling period was too small to be measured accurately. The accuracy of the sample analysis was increased by compositing the samples into a semiannual composite for each location. Each semiannual composite was then sent to International Technology Corporation to be analyzed for strontium, plutonium, uranium, and specific gamma-emitting radionuclides.

Radiological Results

Of the radionuclide analyses performed, ^{90}Sr , ^{137}Cs , $^{239,240}\text{Pu}$, and uranium were consistently detectable in the 200 Areas; ^{60}Co was also detectable in the 100-N Area. Air concentrations for these radionuclides were elevated near facilities when compared to the concentrations measured offsite. Figure RS-1 shows average values for 1992 and the preceding five years compared to the DCGs and the background air concentration as measured by PNL. As the data indicate, the concentrations show a large degree of variance. In most cases, the samples collected from air samplers located on or directly adjacent to the waste disposal and other nuclear facilities had significantly higher concentrations than those farther away. The data also show, as expected, that certain radionuclides had higher concentrations within different operational areas. Generally speaking, the predominant radionuclides are activation products/gamma emitters in the 100 Areas and fission products in the 200/600 Areas. A more detailed data summary may be found in Section 2.0, "Ambient Air Monitoring."

100-N Area

Analytical results from air samples taken in the 100-N Area were on a downward trend for most radionuclides as a result of facility shutdowns,

Figure RS-1. Radionuclide Concentrations ($\pm 2\text{SEM}^1$) in Near-Facility Air Samples Compared to Background Locations, 1987 through 1992. As a result of figure scale, some uncertainties (error bars) are concealed by data point symbols.

¹A standard error of the mean (SEM).

better effluent controls, and improved waste management practices. These levels were well below the DCG; however, they were above concentrations measured offsite as expected.

A sudden drop in ^{137}Cs concentrations beginning in 1991 is likely attributable to the change in sample collection initiated that year. Previously, air sample filters were collected monthly, analyzed, and disposed. In 1991, the filters were collected weekly, analyzed for gross radioactivity only, and held for 6-month isotopic analyses. Radionuclides with extremely low concentrations may not exhibit enough activity even after compositing to be detectable. To derive an ambient air concentration based on the radioactivity measured on a filter, the radioactivity measured on the filter is divided by the volume of air that passed through the sampling system during the sample collection period. Sample compositing for 6 months increases the volume of air used in this calculation, thereby decreasing the concentration because the total activity measured on the filter remained unchanged (i.e., at or below minimum detection levels).

200 Areas

Analytical results from air samples taken in the 200/600 Areas were on a downward trend for most radionuclides as a result of facility shutdowns, better effluent controls, and improved waste management practices. These levels, although well below the DCG, were above those measured offsite and were higher for ^{90}Sr , $^{239,240}\text{Pu}$, and uranium when compared to levels in the 100-N Area.

SURFACE-WATER DISPOSAL UNITS AND SEEP MONITORING

Surface-water disposal units used by the operating facilities, and their seeps, are monitored to assess the effectiveness of effluent and contamination controls.

Sample Collection and Analysis

Samples from surface-water disposal units and Columbia River shoreline seeps were collected from various locations in the operational areas. A more detailed description of sample locations is given in Section 6.0, "Surface Water Disposal Units and Seeps." Sampling of surface-water disposal units included water, sediment, and aquatic vegetation. Samples taken at river shoreline seeps included water only. The sampling methods are discussed in detail in the manual, *Operational Environmental Monitoring* (WHC 1991). To avoid duplication of sampling, the near-facility environmental monitoring program used PNL surface-water sample data for the 400 Areas (as reported in Section 5.3, "Surface-Water Surveillance" of the *Hanford Site Environmental Report for Calendar Year 1992* [Woodruff and Lundgren 1993]).

Radiological analyses of water from surface-water disposal units included gross alpha, gross beta, ^3H , $^{239,240}\text{Pu}$, and gamma-emitting radionuclides. Alpha and beta measurements provided a general indication of radioactive contamination. Radiological analyses of sediment and aquatic vegetation included ^{90}Sr , $^{239,240}\text{Pu}$, uranium, and gamma-emitting radionuclides. Temperature, pH, and nitrate concentrations were also taken. Radionuclides and other analytes of interest were selected based on their presence in effluent discharges and

their importance in verifying effluent control and determining compliance with applicable standards. Surface-water disposal units that receive potentially radioactively contaminated effluents are within posted radiological control areas (RCAs).

Radiological Results

Surface-Water Disposal Units

Radiological analytical results for individual surface-water disposal units in the 200/600 Areas are summarized in Table RS-1. In all cases, radionuclide concentrations in surface-water disposal units were less than the applicable DCG and in most cases equal to or less than the analytical detection limit. However, the maximum gross beta concentration for one of the samples approached the DCG (using ^{90}Sr DCG of 1,000 pCi/L for comparison). This was a new sample location for the 216-U-14 Ditch in the 200 West Area. The sampling location had been changed in early 1992 as a result of the stabilization (the placement of fill material over contaminated soils) at the original sampling location near the lower portion of the 216-U-14 Ditch. This surface-water disposal unit had received radioactively contaminated waste in the past.

Radiological analytical results for aquatic vegetation and sediment samples taken from surface-water disposal units located in the 200/600 Areas are summarized in Tables RS-2 and RS-3, respectively. Although some elevated levels can be seen in both aquatic vegetation and sediment, in all cases the radiological analytical results were well below the standards for radiological control (Appendix J).

Table RS-1. Radiological Results for Liquid Samples from Surface-Water Disposal Units, 200/600 Areas, 1992 (pCi/L).

Sample locations ^a	Number of samples		Gross alpha	Gross beta	³ H	⁹⁰ Sr	¹³⁷ Cs
200 West Area Ditches	21	Mean Maximum	5.5 29	32 920	450 450	9.6 28	43 75
200 West Area Ponds	24	Mean Maximum	0.29 0.88	1.5 6.2	600 1,600	11 78	41 48
200 East Area Ditches	12	Mean Maximum	0.31 0.83	5.5 40	1,200 2,100	7.1 10	42 49
200 East Area Ponds	60	Mean Maximum	0.71 12	3.1 21	770 2,100	10 64	42 92
		DCG	30 ^b	1,000 ^c	2,000,000	1,000	3,000

^a200 West Area Ditches: 216-T-4, 216-U-14.

200 West Area Ponds: 216-Z-21 Basin, Powerhouse Pond.

200 East Area Ditches: 216-B-3-3.

200 East Area Ponds: 216-B-3 (East), 216-B-3 (South), 216-B-3 (overflow), 216-B-3 (3rd overflow), Powerhouse Pond.

^bUsing ²³⁹Pu DCG for comparison.

^cUsing ⁹⁰Sr DCG for comparison.

Table RS-2. Radiological Results for Aquatic Vegetation Samples from Surface-Water Disposal Units, 200/600 Areas, 1992 (pCi/g dry weight).

Sample locations ^a	Number of samples		⁹⁰ Sr	¹³⁷ Cs	^{239,240} Pu	U total (g/g)
200 West Area Ditches	2	Mean Maximum	0.97 1.2	<2.9 <4.9	6.7 13	5.4 E-08 2.4 E-07
200 West Area Ponds	2	Mean Maximum	<0.58 <0.69	<0.83 <0.86	<0.48 <0.48	5.4 E-08 8.6 E-08
200 East Area Ditches	1	Mean Maximum	1.4 1.4	7.8 7.8	<0.38 <0.38	3.6 E-08 3.6 E-08
200 East Area Ponds	5	Mean Maximum	<1.8 5.6	<2.8 <5.3	<0.42 <0.46	4.5 E-08 7.7 E-08

^a200 West Area Ditches: 216-T-4, 216-U-14.

200 West Area Ponds: 216-Z-21 Basin, Powerhouse Pond.

200 East Area Ditches: 216-B-3-3.

200 East Area Ponds: 216-B-3 (East), 216-B-3 (South), 216-B-3 (overflow), 216-B-3 (3rd overflow), Powerhouse Pond.

Table RS-3. Radiological Results for Sediment Samples from Surface-Water Disposal Units, 200/600 Areas, 1992 (pCi/g).

Sample locations ^a	Number of samples		⁹⁰ Sr	¹³⁷ Cs	^{239,240} Pu	U total (g/g)
200 West Area Ditches	2	Mean Maximum	0.43 0.55	19 34	0.79 1.2	6.1 E-06 1.2 E-05
200 West Area Ponds	2	Mean Maximum	<0.35 <0.58	<0.14 <0.15	<0.43 <0.50	4.7 E-07 6.3 E-07
200 East Area Ditches	1	Mean Maximum	1.1 1.1	110 110	14 14	7.9 E-07 7.9 E-07
200 East Area Ponds	5	Mean Maximum	0.89 2.3	8.1 16	2.3 7.5	8.0 E-07 1.7 E-06

^a200 West Area Ditches: 216-T-4, 216-U-14.

200 West Area Ponds: 216-Z-21 Basin, Powerhouse Pond.

200 East Area Ditches: 216-B-3-3.

200 East Area Ponds: 216-B-3 (East), 216-B-3 (South), 216-B-3 (overflow), 216-B-3 (3rd overflow), Powerhouse Pond.

Seeps

Groundwater seeps along the 100-N Area shoreline were sampled annually to verify reported radionuclide releases to the Columbia River from the past operation of the N Reactor. Release reporting utilizes conservatively based radionuclide concentrations, multiplied by the estimated groundwater flow to the river. The radionuclide concentrations in the seeps along the shoreline could be compared to the concentrations measured in the effluent monitoring well 199-N-8T.

In 1992, the concentrations detected in the seep samples were highest in those seeps in the area nearest well 199-N-8T, although the seep concentrations were considerably lower than those measured in the well. The data from seep sampling are summarized in Table RS-4.

Nonradiological Results for Surface-Water Disposal Units

Nitrate concentrations and pH results for water samples taken from surface-water disposal units located in the 200 and 600 Areas are summarized

Table RS-4. Concentrations of Radionuclides in 100-N Area Shoreline Seeps, 1992 (results in pCi/L).

Radionuclide	Well 199-N-8T (average)	Seeps		
		Maximum	Mean	DCG ^a
³ H	43,000	770	390	2,000,000
⁶⁰ Co	7.8	5.2	1.2	5,000
⁹⁰ Sr	6,500	150	49	1,000

^aDCG = Derived Concentration Guide (see Appendix J).

in Table RS-5. The results for pH were well within the pH of 2.0 and 12.5 standard for liquid effluent discharges based on the discharge limits listed in *Resource Conservation and Recovery Act of 1976* (RCRA). The analytical results for nitrates were all less than the detection limit except for those samples from the 216-T-4 Ditch. The average nitrate result for that location was 2.0 mg/L, which was slightly greater than the analytical detection limit of 1.4 mg/L and is less than the 45 mg/L drinking water standard for public water supplies.

Table RS-5. Nonradiological Results for Liquid Samples from Surface-Water Disposal Units, 1992.

Sample locations ^a	pH				Nitrate (NO ₃)		
	Number of samples	Mean	Maximum	Minimum	Number of samples	Mean, mg/L	Maximum, mg/L
200 West Area Ditches	86	7.3	9.5	6.5	8	1.7	3.9
200 West Area Ponds	100	8.9	10.3	7.1	8	<1.4	<1.4
200 East Area Ditches	50	8.1	8.7	7.4	4	<1.4	<1.4
200 East Area Ponds	255	8.8	9.7	7.8	20	<1.4	<1.4

^a200 West Area Ditches: 216-T-4, 216-U-14.

200 West Area Ponds: 216-Z-21 Basin, Powerhouse Pond.

200 East Area Ditches: 216-B-3-3.

200 East Area Ponds: 216-B-3 (East), 216-B-3 (South), 216-B-3 (overflow), 216-B-3 (3rd overflow), Powerhouse Pond.

RADIOLOGICAL SURVEYS

Another aspect of the near-facility environmental monitoring program is radiological surveying, which monitors and helps direct the reduction of the radiologically controlled areas on the Hanford Site. There are two types of radiologically controlled areas that are posted: underground radioactive materials (URM) and surface contamination areas (SCA).

URM areas are posted areas with contamination contained below the soil surface. These areas are typically cribs, burial grounds, covered ponds, trenches, and ditches. Barriers over the contamination sources are used to inhibit radionuclide transport to the surface environs. Waste sites are routinely surveyed (at least annually) to document the current radiological status.

SCAs may or may not have been associated with an underground radioactive material structure. A breach in the barrier of an URM may have resulted in the growth of contaminated vegetation. Insects or animals might have burrowed into an URM and brought contamination to the surface. Vent pipes or risers from an underground structure could have been a source of contamination. Fallout from stacks or unplanned releases from previously operating facilities may have caused an area of surface contamination that was not related to a subsurface structure. All types of SCA are susceptible to contamination migration.

There were approximately 1,200 ha (3,000 acres) of posted outdoor SCA and 400 ha (1,000 acres) of posted URM, not including active facilities, on the Hanford Site in 1992. The number of SCA acres is three times larger than the

URM acres primarily because of the BC Controlled Area located south of the 200 East Area. This area was posted as a RCA in 1959 because of widespread speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation), and it encompassed approximately 1,000 ha (2,500 acres). Table RS-6 contains the acreage for SCA and URM areas showing the net change from 1991 to 1992. Table RS-7 summarizes the number of contaminated acres that changed status in 1992. Ten hectares (22 acres) were reclassified from SCA to URM, and 7 ha (16 acres) were sampled and unconditionally released.

Table RS-6. Outdoor Contamination Status, 1992 (approximate surface area in hectares).

Hanford Site area	Surface contamination ^a	Net change ^b	Underground radioactive material ^c	Net change ^b
100 Areas	72 (160)	-3 (-6)	207 (460)	2 (5)
200 Areas	148 (329)	-14 (-32)	165 (366)	8 (17)
600 Area	54 (120)	0	104 (230)	0
BC Control Area	1,125 (2,500) ^d	0	14 (30)	0
300 Area	20 (45)	0	14 (30)	0
Totals	1,419 (3,154)	-17 (-38)	504 (1,116)	10 (22)

^aIncludes areas posted as "Surface Contamination Areas" or as "Radiologically Controlled Areas" and areas that had both underground and surface contamination.

^bNumbers indicate a decrease (-) or increase from 1991.

^cIncludes areas with only underground contamination. Does not include areas that had surface as well as underground radioactive material.

^dRadiologically Controlled Area located south of the 200 East Area.

Table RS-7. Zone Status Change by Area, 1992
(acres).

Location	Zone change	Area
100 Areas	SCA ^a to Released	1
200 East Area	SCA to Released	15
100 Areas	SCA to URM ^b	5
200 East Area	SCA to URM	5
200 West Area	SCA to URM	12

^aSCA = Surface contamination area.

^bURM = Underground radioactive material.

The area of posted surface contamination varied because of an ongoing effort to clean, stabilize, and remediate areas of known contamination while new areas of contamination were being identified. Table RS-7 indicates the changes resulting from stabilization activities during 1992. Newly identified areas may be from contamination migration or the result of an increased effort to investigate outdoor areas for radiological contamination. Vehicles equipped with radiation detection devices and the Ultrasonic Ranging and Data System (USRADS) have identified areas of contamination that were previously undetected.

It was estimated that 80 percent of the identified outdoor surface contamination would result in an external dose rate of less than 1 mrem/h, although the dose rate from isolated specks could be considerably higher. Contamination levels of this magnitude would not significantly add to dose rate calculations for the public or employees. A more detailed summary may be found in Section 7.0, "Radiological Surveys."

SOIL AND VEGETATION SAMPLING FROM OPERATIONAL AREAS

Soil and vegetation samples were collected on or adjacent to waste disposal units and from locations downwind and near or within the boundaries of the operating facilities. Samples were collected to detect potential migration and deposition of facility effluents. Migration can occur as the result of resuspension from radioactively contaminated surface areas, absorption of radionuclides by the roots of vegetation growing on or near underground and surface-water disposal units, or by waste site intrusion by animals. Special samples were also taken where physical or biological transport problems were identified. The results of sampling efforts are discussed below.

Sample Collection and Analysis

The sampling methods and locations used are discussed in detail in the manual, *Operational Environmental Monitoring* (WHC 1991). Radiological analysis of soil and vegetation samples included ^{90}Sr , $^{239,240}\text{Pu}$, uranium, and gamma-emitting radionuclides.

Radiological Results

Soil

Of the radionuclide analyses performed, ^{60}Co , ^{90}Sr , ^{137}Cs , $^{239,240}\text{Pu}$, and uranium were elevated near and within facility boundaries when compared to the concentrations measured offsite as expected. Figure RS-2 shows average values for 1992 and the preceding 5 years. In general, the samples collected on or directly adjacent to the waste disposal facilities had significantly higher concentrations than those farther away. The data also show, as expected, that certain radionuclides have higher concentrations within different operational

Figure RS-2. Mean Annual Radionuclide Concentrations (pCi/g dry weight $\pm 2\text{SEM}$) in Near-Facility Soil Samples Compared to Background Concentrations, 1987 through 1992. As a result of figure scale, some uncertainties (error bars) are concealed by data point symbols.

areas. Generally speaking, the predominant radionuclides were activation products/gamma emitters in the 100 Areas, fission products in the 200/600 Areas, and uranium in the 300 Areas. A more detailed data summary may be found in Section 4.0, "Soil and Vegetation Monitoring."

100 Areas. Analytical results from soil samples collected in the 100 Areas were on a downward trend, showing effects of the shutdown of the production reactors and the effectiveness of effluent controls that have been implemented in recent years. However, these levels were greater than those measured offsite, and the concentration of ^{60}Co was greater than that measured in the 200/600 and 300/400 Areas as expected. The ^{60}Co in the 100 Areas was the result of past discharges to waste disposal structures, primarily the 1301-N Liquid Waste Disposal Facility (LWDF). Measures have been taken in recent years to identify and minimize the migration of contamination from these structures.

200/600 Areas. Analytical results from soil samples taken in the 200/600 Areas were on a downward trend for most radionuclides as a result of physical and radioactive decay, facility shutdowns, better effluent controls, and waste management practices. However, these levels were greater than those measured offsite and were shown to be higher for ^{90}Sr , ^{137}Cs , and $^{239,240}\text{Pu}$ when compared to the 100 and 300/400 Areas. Uranium levels were slightly increased over those measured in 1991.

300/400 Areas. This was the second sampling year for the 300/400 near-facility environmental monitoring program. The data for these areas were compared to results for other operational areas and those measured offsite.

The levels measured for uranium were higher than those from the 100 and 200/600 Areas. This difference was expected because of past uranium fuel fabrication operations conducted in the 300 Area.

Vegetation

Of the radionuclide analyses performed on vegetation, ^{60}Co , ^{90}Sr , ^{137}Cs , $^{239,240}\text{Pu}$, and uranium were consistently detectable. Vegetation concentrations for these radionuclides were elevated near and within facility boundaries compared to the concentrations measured offsite. Figure RS-3 shows average values for 1992 and the preceding 5 years. In general, the samples collected on or directly adjacent to the waste disposal facilities had significantly higher concentrations than those farther away. As with the soil samples, the data show that certain radionuclides will be found in vegetation in higher concentrations within different operational areas. Except for ^{90}Sr (a fission product) detected in vegetation from the N Springs, the predominant radionuclides are generally activation products/gamma emitters in the 100 Areas, fission products in the 200/600 Areas, and uranium in the 300 Areas. A more detailed data summary may be found in Section 4.0, "Soil and Vegetation Monitoring."

100 Areas. Analytical results from vegetation samples collected in the 100 Areas were all on a downward trend except for those for ^{90}Sr , which increased to the levels seen in 1989. The maximum values were from samples collected from the N Springs area located at the 100-N Area. The reason for this increase may be related to the time of year for sampling (i.e., amount of time available for the vegetation to uptake the contaminants). There were no N Springs vegetation results for 1990 that contributed to the concentration of

Figure RS-3. Radionuclide Concentrations (pCi/g dry weight ± 2 SEM) in Near-Facility Vegetation Compared to Background Concentrations, 1987 through 1992. As a result of figure scale, some uncertainties (error bars) are concealed by data point symbols.

⁹⁰Sr in the 100 Area vegetation. However, these levels were greater than those measured offsite and were higher for ⁶⁰Co and ⁹⁰Sr compared to the 200/600 and 300/400 Areas.

200/600 Areas. Analytical results from vegetation samples taken in the 200/600 Areas were on a downward trend for most radionuclides as a result of facility shutdowns and improved waste management practices. Before 1992, these levels were greater than those measured offsite and were higher for ¹³⁷Cs and ^{239,240}Pu compared to the 100 and 300/400 Areas. During 1992, the average concentrations onsite, offsite, and within the various operational areas were similar for these two radionuclides.

300/400 Areas. This was the second sampling year for the 300/400 Areas near-facility environmental monitoring program. Generally, the levels in the 300 Area were greater than those measured offsite and were higher for uranium compared to the 100 and 200/600 Areas. This difference is expected because of past uranium fuel fabrication operations conducted in the 300 Area. The levels measured in the 400 Area were at or near those measured offsite.

INVESTIGATIVE SAMPLING

The purpose of investigative sampling was to determine whether effluent controls and waste containment were adequate. An important part of the near-facility program, investigative sampling was conducted and special samples were taken in the operations areas to confirm the absence of or to detect the

presence of radioactive contaminants. This investigative sampling took place near facilities such as storage and disposal sites for at least one of the following reasons:

- Radiological surface monitoring had indicated that radioactive contamination was present
- To quantify the radiological condition of a site before facility construction or operation
- To quantify the radiological condition of a site before remediation
- To determine if biotic intrusion (e.g., animal burrows or deep-rooted vegetation) had created a potential for the spread of contaminants
- To determine the integrity of waste containment systems
- Assist in setting stabilization priorities.

Because of the diverse operations historically conducted at each of the operating areas (i.e., 100, 200, 300, and 400 Areas), radionuclide concentrations in samples from the different areas were generally predictable.

Sample Collection and Analysis

Types of investigative samples over the years have included air; water; snow; sediments; soil; vegetation (such as grasses, tumbleweeds, sagebrush,

trees, and fruits); and various animals (such as spiders, termites, ants, fish, toads, snakes, birds, mice, rabbits, coyotes, and bobcats).

Special samples in 1992 included soil; tumbleweeds; gopher snakes; pigeon feces; cliff swallow nests; house mice; deer mice; a black-tailed jackrabbit; and a Nuttall's cottontail rabbit.

Methods for collecting or otherwise obtaining investigative samples are found in the manual, *Operational Environmental Monitoring* (WHC 1991). Field monitoring results, expressed as counts per minute (cpm), were obtained using a Geiger-Mueller Counter equipped with a P-11 Probe. Laboratory sample analysis results are expressed in pCi/g or pCi/sample.

Results

Special samples were collected where known or suspected radioactive contamination was present. A direct relationship to the general status of the different media within the operating areas to contamination levels reported for special samples cannot be drawn. A more detailed data summary may be found in Section 8.0, "Special Projects, Sampling, and Investigative Surveillance."

Soil

In 1992, 30 investigative soil samples were taken (Table RS-8). The radionuclides in maximum concentration were speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) of ^{60}Co from D Island near the 100-D Area (11,000,000 pCi/sample or 20 pCi/g);

Table RS-8. Special Samples Collected from the Operations Areas, 1992.
(sheet 1 of 2)

Sample type (number)	Area (number)	Elevated radionuclides	Maximum concentration (pCi/g) ^a
Soil (30)	100 (2)	⁶⁰ Co	11,000,000 ^b
	200 (26)	¹³⁷ Cs ⁹⁰ Sr	1,900 1,000,000
	300 (2)	²³⁴ Th ^{234m} Pa ²³⁵ U	730 1,100 38
Tumbleweed (13)	100 (3)	¹³⁷ Cs U Total	<0.96 0.31
	200 (10)	NA ^c	NA
Gopher snake (2)	200 (2)	¹³⁷ Cs ⁹⁰ Sr	7,900 300
Pigeon feces (1)	200 (1)	¹³⁷ Cs	280
Cliff swallow nest (2)	200 (2)	⁶⁰ Co ¹³⁷ Cs ⁹⁰ Sr ⁵⁴ Mn ¹⁵⁴ Eu ¹⁵⁵ Eu ²³⁸ Pu ²³⁹ Pu	74,000 2,300 340 160 470 180 8 47
House mouse (9)	200 (9)	¹³⁷ Cs ⁹⁰ Sr ^{239,240} Pu U Total	1,500 3,100 <5.0 1.3
Deer mouse (10)	100 (2)	¹³⁷ Cs ^{239,240} Pu	100 <1
	200 (6)	¹³⁷ Cs ^{239,240} Pu	<25 <5
Deer mouse (cont)	300 (2)	⁶⁰ Co ¹³⁷ Cs ⁹⁰ Sr ¹⁰⁶ Ru/Rh ¹²⁵ Sb ¹⁴⁴ Ce/Pr ¹⁵⁴ Eu ¹⁵⁵ Eu ¹³⁹ Pu	97 5,500 63 4,200 1,600 38,000 650 1,700 18

Table RS-8. Special Samples Collected from the Operations Areas, 1992.
(sheet 2 of 2)

Sample type (number)	Area (number)	Elevated radionuclides	Maximum concentration (pCi/g)
Black-tailed jackrabbit (1)	200 (1)	¹³⁷ Cs ⁹⁰ Sr ¹⁵⁴ Eu ¹³⁹ Pu	56 1,100 15 19
Nuttall's cottontail (1)	200 (1)	^{234,240} Pu U Total	5 <5

^aPicocuries per gram.^bpCi/sample.^cNA = Not analyzed.

⁹⁰Sr (1,000,000 pCi/g) and ¹³⁷Cs (1,900 pCi/g), both from near 221-B Stack in the 200 East Area; and ²³⁴Th (730 pCi/g), ^{234m}Pa (1,100 pCi/g), and ²³⁵U (38 pCi/g) from near the 300 Area (Table RS-8). Note that the D Island sample analyses result was for a single speck of contamination (probably about 0.001 g) and, if collected as a typical sample (~500 g), the radioactivity concentration would be about 20 pCi/g. Further discussion of the shoreline radiological survey may be found in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The number of contamination incidents, the radioactivity levels, and the range of radionuclide concentrations were not unusual. Areas of special soil sampling that were outside radiological control areas and that had levels greater than WHC radiological control limits were posted as SCAs.

Vegetation

There were 13 instances of contaminated vegetation detected in operations areas in 1992 (Table RS-8). Only one sample (i.e., from 100-F Area and reading 1,500 cpm) was analyzed at a laboratory before disposal, and the

radionuclides at the maximum concentrations were ^{137}Cs (<0.96 pCi/g) and total uranium (0.04 pCi/g). The remaining 12 instances of contaminated tumbleweeds were found during remedial operations and disposed of so that only field-instrument readings of radioactivity are available. Field-instrument readings ranged from 350 to 40,000 cpm, within the ranges reported for the past 3 years. The number of plants found to be contaminated with radioactivity was not unusual. The greatest number of contaminated vegetation samples (42) submitted for analyses was in 1978. In the 200 Areas before 1980, when vegetation control was limited or nonexistent, contaminated vegetation was counted in acres rather than individual specimens. Vegetation control in 1992, as in 1991, was noticeably more effective than in 1990 and 1989 and appears to be indicating a return to an improving trend. An improving trend had been evident from 1981 up to 1989 (Conklin et al. 1985), when resistance to the herbicide in use was first noted. Improved vegetation control was probably the result of improved equipment, better program administration, and use of more effective herbicides.

Wildlife

Animals were collected as a result of an aggressive pest control program designed to limit the exposure and potential contamination of animals to radioactive material. Animals were collected directly from or near facilities to identify problems in preventive systems designed to inhibit animal intrusion. Radiological surveys were performed after collection to determine if an animal was radioactively contaminated. If an animal was free of contamination, it was taken to a suitable habitat area away from sources of contamination and released.

There were 26 special animal or nest samples analyzed in 1992. The maximum radionuclide concentrations found were ^{60}Co (74,000 pCi/g), ^{90}Sr (3,100 pCi/g), ^{106}Ru (4,200 pCi/g), ^{137}Cs (7,900 pCi/g), and ^{155}Eu (1,700 pCi/g) (see Table RS-8). The total number of animals found to be contaminated with radioactivity, the radioactivity levels, and the range of radionuclides concentrations were not unusual. However, the number of incidents decreased slightly compared to 32 in 1991. The greatest number of contaminated animals was found in 1982 (44, mostly pigeons). Before 1981, fewer representative samples were submitted for radionuclide analyses.

Special Characterization Projects

Special characterization projects were conducted to verify the status of contaminated soil at 216-U-14 Ditch in the 200 West Area before stabilizing the lower end, around B Stack in the 200 East Area, and on D Island in the Columbia River, which was the site of the old liquid effluent outfall from D Reactor. The maximum radionuclide concentrations found at these sites were ^{137}Cs (1,600 pCi/g), ^{90}Sr (1,000,000 pCi/g) and ^{137}Cs (1,900 pCi/g); and ^{60}Co (11,000,000 pCi/sample or 20 pCi/g) respectively.

GROUNDWATER MONITORING

100 Area

The annual average for the concentration of ^{90}Sr at the N Springs was seven times the DCG in 1992, but similar to the concentrations reported during 1986 through 1989. The quantity of ^{90}Sr being released to the Columbia River in the N Springs is significantly less than during previous years because of reduction and elimination of effluents being discharged to the 100-N LWDF.

The unconfined groundwater beneath two waste sites in the 100 Area exceed the ACV for ^{90}Sr . These were beneath the 1301-N and the 1325-N LWDF.

200/600 Area

The unconfined groundwater beneath one inactive waste site in the 200 Areas exceeded the DCG on an annual average. This site is inactive and does not have a projected offsite dose that exceeds the DOE limits.

- The annual average for the concentration of ^{90}Sr beneath the inactive 216-B-5 Reverse Well was five times the DCG in 1992.
- The annual average for the concentration of ^3H beneath the inactive 216-A-10 Crib and the active 216-A-36B Crib exceeded the DCG in 1992.

The groundwater beneath five sites exceeded the ACVs on an annual average.

- Uranium isotopes and ^{99}Tc in the groundwater exceeded the ACV at the active 216-U-17 Crib.
- The ^{239}Pu and ^{90}Sr concentrations in the groundwater exceeded the ACV beneath the inactive 216-B-5 Reverse Well.
- The Uranium isotope concentration was greater than the ACV in the groundwater beneath the inactive 216-T-33, 2116-S-13, and 216-U1/2 cribs and the active 216-U-14 Ditch.

300/400 Area

The unconfined groundwater in two wells in the 300 Area, 399-1-10 and 399-1-16A, exceeded the DCG for alpha. The results are higher than previous years and correspond with the higher uranium concentrations.

The groundwater in three wells; 399-1-10, 399-1-16A, and 399-2-1, exceeded the DCG for uranium. These wells show higher concentrations relative to previous results. These results may be attributed to seasonal water stage changes in the Columbia River.

The concentrations of radionuclides in the groundwater beneath the 400 Area are below the DCGs. The data indicate that the concentrations have remained relatively stable. The elevated concentrations of tritium are attributed to the plume emanating from the 200 Areas.

EXTERNAL RADIATION

External radiation fields were measured near operations facilities and waste handling, storage, and disposal sites to measure, assess, and control the impacts of operations.

Sample Collection and Analysis

Two methods of measurement are employed, one being hand-held μ R meters used to survey multiple points and the other being thermoluminescent dosimeters (TLD). The measurement methods used for external radiation measurements and sample locations are discussed in detail in the manual, *Operational Environmental Monitoring* (WHC 1991).

Results

Radiation Measurements

Hand-held μ R meters were used to survey points near and within three waste disposal facility locations in the 100-N Area: the N Springs area, 1301-N LWDF, and 1325-N LWDF. These radiation measurements were taken at a height of approximately 1 m (3.28 ft) to assess the effects of changes in operations of these facilities and are not necessarily a true measurement of exposure rate. The hand-held μ R meters are known to over-respond to low-energy gamma radiation. The radiation rate measured along the 100-N Area shoreline was still declining in 1992 and is compared to rates during the past 5 years in Figure RS-4. The shift in the measured radiation levels shows the effects of the decreased discharges to the 1301-N LWDF and the continuing decay of ^{60}Co and ^{137}Cs , the principal residual radionuclides. The radiation measurements taken at the 1301-N LWDF in 1992, as in previous years, continue to show the decay of ^{60}Co (Table RS-9). The radiation measurements taken at the 1325-N LWDF in 1992 and in the previous year were elevated, compared to the earlier years. This increase indicates the effect of decreased discharges of liquid waste to that facility (see Table RS-9). The decreased discharges resulted in the loss of the water that normally provided shielding from the gamma-emitting radionuclides contained in the sediments of the LWDF, principally ^{60}Co and ^{137}Cs resulting in higher dose rates. A more detailed data summary can be found in Section 5.0, "External Radiation Monitoring."

TLDs

100 Areas. All TLDs in the 100 Areas were located in the 100-N Area; results are presented in Table RS-10. The 1992 TLD results indicate that direct radiation levels were highest near facilities that had contained or

Figure RS-4. Radiation Survey Measurements Along the 100-N Area Shoreline, 1987 through 1992.

Table RS-9. 100-N Liquid Waste Disposal Facilities (LWDF) Direct Radiation Measurements, 1991 and 1992 ($\mu\text{R/h}$).

LWDF	1991 Average	1992 Average
1301-N	2,100	2,000
1325-N	950	940

Table RS-10. Thermoluminescent Dosimeter (TLD) Results for Waste-Handling Facilities in the Operating Areas, 1991 and 1992 (mrem/yr, based on 24 h/day).

Area	Number of samples	1991		1992		% Change ^a
		Maximum	Mean	Maximum	Mean	
100-N	41	14,260	1,210	13,280	1,200	-1
200/600	62	840	120	700	130	8
300	8	720	180	610	160	-10
400	7	190	110	110	90	-20

^aNumbers indicate a decrease (-) or increase from 1991.

received liquid effluent from N Reactor. These facilities primarily include the 1325-N LWDF and the 1301-N LWDF, which contributed the primary increase in dose rates. While the results were noticeably higher than those for other 100-N Area TLD locations, the overall trend for these two facilities decreased in exposure rate of approximately 5 percent when compared to 1991.

In 1992, three TLD locations were moved from previously occupied buildings to other locations. Measurements were initiated at two locations between the 1301-N LWDF and the Columbia River shoreline (N Springs).

200/600 Areas. TLD results for 1992 are compared to those of 1991 for the 200/600 Areas in Table RS-10. The highest dose rates were measured near waste-handling facilities, such as tank farms. The highest dose rate was

measured at the 241-A Tank Farm complex located in the 200 East Area. The average dose rate measured in 1992 by TLDs in the 200/600 Areas was 130 mrem/yr, which was an increase of 8 percent over the average dose rate of 120 mrem/yr measured in 1991.

300/400 Areas. A comparison of 1992 TLD results to those of 1991 for the 300/400 Areas are presented in Table RS-10. The highest dose rates in the 300 Area were measured near waste-handling facilities, such as the 340 Waste Handling Facility. The average dose rate measured in 1992 by TLDs in the 300 Areas was 160 mrem/yr, which was a decrease of 10 percent of the average dose rate of 180 mrem/yr measured in 1991.

The highest dose rates measured in the 400 Area, although not significantly elevated above background, was near the 4718 Building. The average dose rate measured in 1992 by TLDs in the 400 Area was 90 mrem/yr, which was a decrease of 20 percent over the average dose rate of 110 mrem/yr measured in 1991. A more detailed data summary of radiation surveys and TLD measurements can be found in Section 5.0, "External Radiation Monitoring."

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LIST OF ACRONYMS

2SEM	2 Standard Error of the Mean
ACV	administrative control value
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
AMU	aqueous make-up
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
CAM	continuous air monitor
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
cpm	counts per minute
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DCG	derived concentration guides
DCRT	double-contained receiver tanks
DOE	U.S. Department of Energy
DST	double-shell tank
DWS	drinking water standard
Ecology	Washington State Department of Ecology
EDE	effective dose equivalent
EDT	effluent discharge trench
EML	Environmental Measurements Laboratory
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
HEHF	Hanford Environmental Health Foundation
HEPA	high-efficiency particulate air
HGP	Hanford Generation Plant
HPT	Health Physics Technologist
HVAC	heating, ventilation, and air conditioning
ITAS-RL	International Technologies Analytical Services-Richland
LWDF	liquid waste disposal facility
MSCM	mobile surface contamination monitor
MW	mixed waste
NCRPM	National Council on Radiation Protection and Measurements
OEC	Operations and Engineering Contractor
OEMP	Operational Environmental Monitoring Program
PCB	polychlorinated biphenyl
PEDF	Protective Equipment Decontamination Facility
PFP	Plutonium Finishing Plant
PNL	Pacific Northwest Laboratory
PPF	Plutonium Processing Facility
PRF	Plutonium Reclamation Facility
PUREX	Plutonium/Uranium Extraction (Plant)
PWR	pressurized water reactor
QA	quality assurance
RCA	radiological control areas
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RL	U.S. Department of Energy, Richland Operations Office
RMA	Remote Mechanical A
RMC	Remote Mechanical C
RPS	retention process sewer

LIST OF ACRONYMS (cont)

RWC	radioactive waste container
SCA	surface contamination area
SEM	standard error of the mean
SNM	special nuclear material
SST	single-shell tank
TLD	thermoluminescent dosimeters
TRU	transuranic
TRUSAF	Transuranic Waste Storage and Assay Facility
UNH	uranyl-nitrate-hexahydrate
UO ₃	uranium trioxide
URM	underground radioactive material
USRADS	Ultrasonic Ranging and Data System
UST	United States Testing Company
WAC	waste acceptance criteria
WESF	Waste Encapsulation and Storage Facility
WHC	Westinghouse Hanford Company
WDOH	Washington State Department of Health
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION

1.1 BACKGROUND

The Hanford Site, consisting of 1,450 km² (560 mi²), is located within the Pasco Basin in south-central Washington State, approximately 270 km (170 mi) southeast of Seattle and 200 km (120 mi) southwest of Spokane. As shown in Figure 1-1, the 100 Area is located in the north-central part of the Hanford Site, along the southern (right) bank of the Columbia River. The locations of facilities within the 100 Area are shown in Figure 1-2. The 200 Areas are almost in the center of the Hanford Site, 11 km (7 mi) south of the Columbia River. The locations of facilities, tank farms, solid waste burial grounds, and liquid disposal sites in the 200 Areas are shown in Figures 1-3 and 1-4. The 300 and 400 Areas are located in the southwest part of the Hanford Site, as shown in Figure 1-5.

Westinghouse Hanford Company (WHC) conducts the Operational Environmental Monitoring Program in the 100, 200/600, 300, and 400 Areas at the Hanford Site to monitor diffuse sources and the impact of effluent releases and waste management practices at and near the facilities and waste disposal sites.

1.2 OPERATIONAL ENVIRONMENTAL MONITORING PROGRAM OBJECTIVES

The objectives of the Operational Environmental Monitoring Program (OEMP) are to evaluate the following:

- Compliance with U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), Washington State Department of Health (WDOH), and internal WHC radiation protection requirements and guidelines
- Performance of radioactive waste confinement systems
- Trends of radioactive materials in the environment at, and adjacent to, nuclear facilities and waste disposal sites so that appropriate control actions can be taken in a timely manner.

Environmental protection requirements have been developed by WHC using administrative control values (ACVs) (Appendix J) to establish operating limits for radionuclide concentrations. These control limits were established to implement a DOE policy to maintain occupational radiation exposures to levels that are as low as reasonably achievable (ALARA) (DOE 1986) and to ensure that offsite limits are not exceeded by establishing operating limits well below regulatory limits. Operational monitoring is an essential component to demonstrate compliance with these requirements and policies. For these reasons, the scope of the WHC OEMP has been designed to meet the site-specific needs of the Hanford Site.

Figure 1-1. The Hanford Site.

29104018.1

Figure 1-2. The 100 Area.

Figure 1-5. Location of 300/400 Areas.

This report presents and interprets the results of the operational environmental monitoring activities performed by WHC at the Hanford Site during 1992.

1.3 DIFFUSE EMISSIONS

The Hanford Site consists of semiarid shrub-steppe land, of which approximately 6 percent has been disturbed and actively used for processing nuclear material. This 6 percent of land [about 82.9 km² (32 mi²), or 8,090 ha (20,000 acres)] is divided into large operational areas; the 100, 200, 300, 400, and 1100 Areas. Radioactive emissions from the Site are grouped into two broad categories for regulatory purposes, point source emissions and diffuse source emissions. Point sources are easily defined and recognized as facilities with effluent emission structures such as "smoke" stacks and are typically equipped with filtering and monitoring systems. Diffuse sources are extremely varied, do not have or cannot have direct monitoring systems and are measured through the near-facility monitoring program. A facility may be considered a point source and still contribute to diffuse emissions. The 600 Area designates the remaining land outside the operational areas. Almost all point and diffuse sources of radionuclide emissions are within the five operational areas; two minor point sources are in the 600 Area. Emissions from point sources, such as stacks and vents, are measured directly or calculated from process knowledge. Diffuse emissions are measured through a network of monitoring systems near and/or adjacent to active and inactive waste sites.

The Hanford Site was acquired in 1943 and dedicated to producing plutonium for national defense and managing the resulting production wastes. Restoring the Hanford Site environment is the new mission that has largely supplanted the previous operational objectives. The environmental restoration effort will entail activities such as decontaminating and decommissioning more than 100 facilities and cleaning up and restoring about 1,500 waste sites. Until the restoration and cleanup work is completed, diffuse radioactive emissions potentially may be released from hundreds of sources, in addition to the 127 point-source stacks and vents registered with the WDOH. Emissions and offsite doses to the public are reported annually to the EPA (see DOE/RL-93-36 [WHC 1993]).

1.3.1 Sources of Diffuse Emissions

The presently identified actual or potential sources of diffuse radionuclide emissions to the environment at the Hanford Site are described in this section. Among the sources that could contribute diffuse radionuclide emissions are several kinds of waste handling and disposal facilities used at the Hanford Site such as cribs, ponds, ditches, trenches, retention basins, valve pits, French drains, reverse wells, tanks, and burial grounds. Operating facilities or facilities on standby or that are inactive also could contribute diffuse emissions. Tables 1-1 and 1-2 show the types of waste sites and the sources of diffuse emissions, respectively. Each site or facility usually has one or more unique features or characteristics that may enhance the contribution to diffuse emissions. Features may include structures such as passive vents, risers, equipment access doors, personnel

Table 1-1. Types of Waste and Number of Waste Sites at the Hanford Site.

Types of waste	Number of waste sites
Nonhazardous	184
Hazardous	142
Radioactive	146
Mixed	949
Total	1,421

Table 1-2. Sources of Diffuse Emissions.

Types of diffuse emission sources	Active	Inactive
Tanks (tank farms)	28	149
Cribs	16	115
Trenches, ponds, ditches, retention basins	21	120
Reverse or injection wells	0	11
French drains	21	47
Unplanned spill sites	0	229
Burial grounds	9	68
Total	95	739

access doors, and exhausters on facilities that are point sources and monitored at the stack or main point of effluent release. Characteristics may include an undetected leak, unburied waste, or an absence of intrusion barriers. A variety of environmental conditions such as changing atmospheric pressures, wind speed, erosion, evaporation, percolation, biotic intrusion, and/or resuspension influence rates of diffuse emissions.

1.3.2 General Types of Facilities

The following sections (1.3.2.1 through 1.3.2.12) briefly describe general types of sites and facilities and the potential primary sources of diffuse emissions from each.

1.3.2.1 Crib. Low-level liquid waste is discharged to the ground via structures called cribs. These are generally subsurface systems, similar to sanitary drain fields, that allow the liquid component of the waste to

percolate into the soil. The natural properties of the soil are used to remove radioactive material from the effluent through filtration, ion-exchange, precipitation reactions, absorption, and adsorption.

Many cribs are vented to the atmosphere through engineered structures called vents and pipe risers. These engineered structures promote downward flow of liquids disposed of in the cribs, but also provide a pathway to the surface and atmosphere. Secondary routes for diffuse emissions include erosion, biotic uptake, and intrusion followed by wind-caused resuspension.

1.3.2.2 Pond. Ponds were used to manage the large quantities of water (i.e., cooling water and chemical-sewer wastewater) associated with chemical processing operations. Normally, these liquid effluents are nonradioactive. The ponds allow percolation of the liquid effluent into the soil column. Diffuse emissions from ponds are primarily caused by wind resuspension.

1.3.2.3 Ditch. A ditch is an open, unlined excavation that was used for disposing of liquid effluents or transporting liquid effluents to ponds for disposal. The primary route for diffuse emissions from ditches is wind-caused resuspension. Ponds and ditches now receive cooling water from operations facilities.

1.3.2.4 Trench. Early disposal practices included disposing of liquid effluents into unlined trenches and filling them with soil over time. These were replaced by cribs such as the BC-cribs where both structures can be found. Diffuse emissions from trenches are primarily a result of erosion, biotic uptake, or intrusion followed by wind-caused resuspension.

1.3.2.5 Retention Basin. Retention basins generally were lined with concrete and used to hold liquids before routing them to ditches, ponds, trenches, or the Columbia River. Diffuse emissions from retention basins are primarily caused by wind resuspension.

1.3.2.6 Diversion Box. A diversion box is usually an underground, concrete structure formed around a junction of transfer lines carrying liquid effluent. Diffuse emissions from diversion boxes may occur when they are opened for maintenance.

1.3.2.7 Valve Pit. A valve pit is similar in structure to a diversion box, but contains piping valves. The primary source of diffuse emissions from valve pits is when the pit is opened for maintenance.

1.3.2.8 French Drain and Reverse or Injection Well. A French drain is a rock-filled encasement inserted in the ground. A reverse or injection well is an ordinary well used for mixing liquid waste with groundwater. These subsurface systems manage potentially contaminated liquid waste by promoting percolation into the soil. The natural filtration properties of the soil remove radioactive material from effluent water. Diffuse airborne emissions from French drains and reverse wells could occur from erosion, biotic uptake or intrusion followed by wind resuspension.

1.3.2.9 Tank. A tank generally is a large, reinforced, metal structure that receives liquid effluent for storage. Examples are the double-shell tanks (DST) and single-shell tanks (SST) in the 200 Areas, which are typically

arrayed in clusters called tank farms. Sources of diffuse emissions from tanks include vents and exhausters direct to the atmosphere plus deposition and resuspension from surface soil contamination. A significant proportion of surface soil contamination incidents is conterminous to the tank farms and associated transfer systems.

1.3.1.10 Burial Ground. Burial grounds are trenches in which contaminated solid waste is buried. This waste is generated by various activities on the Hanford Site. Waste packaging procedures and burial practices depend on the type of waste. Sources of diffuse emissions from burial grounds include direct emission to the atmosphere until the waste is buried, then erosion, biotic uptake or intrusion followed by resuspension.

1.3.1.11 Decontamination and Decommissioning Activities. WHC activities also involve decontaminating and decommissioning (D&D) retired facilities, equipment, and waste disposal sites. These activities are aimed at preventing the release or spread of contamination and reducing the number of acres of surface contamination. In some cases, contaminated material may be exposed to the atmosphere, but steps to isolate and reduce spreading of contamination are taken as it is identified. Sources of diffuse emissions are primarily the result of exposing certain mated surfaces such as walls and floors; however, planning and procedures minimize these exposures. Monitoring is also increased at the time of demolition to detect any increased radioactivity. To date there have been no significant increases.

1.3.1.12 Radioactively Contaminated Surface Areas. All radioactive burial grounds, cribs, trenches, retention basins, and unplanned release sites are surveyed routinely. The surveys are performed at least annually but may be done more frequently when needed. The number of surface-contaminated acres varies. The number is not fixed because there is a continuing effort to clean, stabilize, or remediate known contaminated areas while new areas of contamination are continuing to be identified. Newly identified contamination may be because of preexisting contamination that has migrated, by way of wind or biological intrusion, to previously uncontaminated areas or because the radiological criteria have become more stringent. Eighty percent of all areas of surface contamination are estimated to have dose rates less than 1 mrem/h.

Contaminated areas are posted as Surface Contamination Area (SCA), Radiologically Controlled Area (RCA), or Underground Radioactive Material (URM). RCAs are large areas with a potential for speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation). SCAs are areas (large and small) with identified contamination. URM signs mark cribs, burial grounds, covered trenches, and ponds. If an area has surface and underground contamination, such as the surface above a crib, it will have both postings. Table 1-3 shows the general location (by area) the approximate area of surface contamination and volume of underground contamination. Sources of diffuse emissions from surface contamination areas include erosion, biotic uptake or intrusion, followed by resuspension by wind.

A more detailed description of specific sites and facilities can be found in the *Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1992*, DOE/RL-93-36 (WHC 1993), and in the Facility Effluent Monitoring Plans for major facilities, which are referenced in this report.

Table 1-3. Hanford Site Surface and Underground Contamination.

Hanford Site area	Surface contamination, ^a ha (acres)	Underground radioactive material, ^b ha (acres)
100 Areas	65 (160)	186 (460)
200 Areas	133 (329)	148 (366)
600 Area	1,060 (2,620) ^c	105 (260)
300 Area (north)	18 (45)	12 (30)
Total	1,276 (3,154)	451 (1,116)

^aIncludes areas posted as SCAs or RCAs and areas that have both underground and surface contamination.

^bOnly includes areas with URM.

^cIncludes BC RCA south of the 200 East Area.

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2.0 AMBIENT AIR MONITORING

2.1 INTRODUCTION

Ambient air monitoring is conducted (1) to determine baseline concentrations of radionuclides in the operations areas, (2) to assess the impact of operations on the local environment, and (3) to monitor diffuse emissions from sources located within the operations area. These measurements also provide an indication of the WHC-managed facility performance and are used to demonstrate compliance with the environmental protection criteria. The WHC air monitoring program in the 100 and 200 Areas, as illustrated in Figures C-1, C-2, C-3, and C-4 of Appendix C, takes into consideration prevailing and high wind directions, as well as potential source terms. Air monitoring within the 300 and 400 Areas is performed by Pacific Northwest Laboratory (PNL) as part of the Site Environmental Surveillance Program. Results for ambient air monitoring in these areas are summarized in this report. A more detailed discussion of the ambient air monitoring results for the 300 and 400 Areas can be found in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). Meteorological conditions are monitored continuously by PNL meteorology stations, which are strategically positioned around the Hanford Site.

All Hanford Site air samplers in the 100 and 200/600 Areas operate at a flow rate of $.056 \text{ m}^3/\text{min}$ ($2 \text{ ft}^3/\text{min}$), drawing a sample through a 47-mm, open-faced filter about 1 m aboveground. Changes are being made to the sample height to achieve conformance with the *DOE Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*, DOE/EH-0173T (DOE 1991).

All sample filters were exchanged weekly, held 1 week (to allow for decay of the short-lived natural radioactivity), and then sent to the 222-S Laboratory for initial analysis of gross alpha and gross beta activity. These initial analyses serve as an indicator of potential environmental problems. The filters were stored until the end of the 6 month sampling period and were then composited by sample location (or as deemed appropriate) and sent to an offsite laboratory for specific radionuclide analysis.

The compositing of air filters by site provides a larger sample size and, thus, a more sensitive accurate measurement of the concentration of airborne radionuclides.

To help assess the impact of Site operations, the results obtained are compared to background data. WHC set up the three distant stations, located onsite, used to obtain background data using sampling techniques identical to the rest of the program.

The ten highest annual average air concentrations for the 100-N and 200 Areas are presented in Tables 2-1 through 2-7. These results, although above background, were well below the DCGs.

Table 2-1. Ten Highest Air Sample Concentrations of ^{60}Co for 1992 (pCi/m^3).

Site	Area	Concentration	$\pm$	Counting error
N-105	100-N	3.0 E-03	$\pm$	7.2 E-04
N-101	100-N	1.5 E-03	$\pm$	5.3 E-04
N-102	100-N	3.4 E-04	$\pm$	3.7 E-04
N-978	200-E	1.7 E-04	$\pm$	2.9 E-04
N-977	200-E	1.5 E-04	$\pm$	2.1 E-04
N-965	200-W	1.4 E-04	$\pm$	2.0 E-04
N-984	200-E	1.4 E-04	$\pm$	1.9 E-04
N-967	200-E	1.3 E-04	$\pm$	2.1 E-04
N-305	200-E	1.2 E-04	$\pm$	2.5 E-04
N-019	200-E	1.1 E-04	$\pm$	3.4 E-04
N-961 (Background)	Yakima Barricade	-1.7 E-04	$\pm$	2.7 E-04
DCG		8.0 E+01		

- = Negative value indicates results at or near background levels of radioactivity.

Table 2-2. Ten Highest Air Sample Concentrations of ^{137}Cs for 1992 (pCi/m^3).

Site	Area	Concentration	$\pm$	Counting error
N-973	200-E	6.9 E-04	$\pm$	3.0 E-04
N-956	200-W	6.1 E-04	$\pm$	3.0 E-04
N-984	200-E	4.0 E-04	$\pm$	2.2 E-04
N-155	200-W	4.0 E-04	$\pm$	2.8 E-04
N-105	100-N	2.7 E-04	$\pm$	3.0 E-04
N-101	100-N	2.3 E-04	$\pm$	2.9 E-04
N-985	200-E	2.0 E-04	$\pm$	2.3 E-04
N-967	200-E	2.0 E-04	$\pm$	2.6 E-04
N-978	200-E	1.5 E-04	$\pm$	1.8 E-04
N-977	200-E	1.3 E-04	$\pm$	2.2 E-04
N-961 (Background)	Yakima Barricade	1.1 E-04	$\pm$	2.7 E-04
DCG		4.0 E+02		

- = Negative value indicates results at or near background levels of radioactivity.

Table 2-3. Ten Highest Air Sample Concentrations of $^{239/240}\text{Pu}$ for 1992 (pCi/m^3).

Site	Area	Concentration	±	Counting error
N-165	200-W	1.1 E-04	±	1.3 E-05
N-973	200-E	2.8 E-05	±	6.0 E-06
N-161	200-W	2.2 E-05	±	4.1 E-06
N-972	200-E	1.8 E-05	±	4.6 E-06
N-963	200-W	1.2 E-05	±	3.6 E-06
N-155	200-2	1.0 E-05	±	2.9 E-06
N-975	200-W	8.0 E-06	±	2.9 E-06
N-168	200-W	7.9 E-06	±	2.7 E-06
N-965	200-W	7.3 E-06	±	2.7 E-06
N-101	100-N	6.4 E-06	±	2.7 E-06
N-961 (Background)	Yakima Barricade	4.4 E-07	±	7.2 E-07
DCG		2.0 E-02		

Table 2-4. Ten Highest Air Sample Concentrations of ^{90}Sr for 1992 (pCi/m^3).

Site	Area	Concentration	±	Counting error
N-985	200-E	2.7 E-04	±	6.3 E-05
N-984	200-E	2.6 E-04	±	6.6 E-05
N-158	200-E	1.6 E-04	±	4.7 E-05
N-963	200-W	1.4 E-04	±	4.2 E-05
N-956	200-W	9.1 E-05	±	3.6 E-05
N-973	200-E	8.7 E-05	±	3.6 E-05
N-977	200-E	8.7 E-05	±	3.2 E-05
N-980	200-E	8.3 E-05	±	3.3 E-05
N-155	200-W	4.0 E-05	±	2.5 E-05
N-101	100-N	3.8 E-05	±	2.6 E-05
N-961 (Background)	Yakima Barricade	-1.1 E-05	±	1.5 E-05
DCG		9.0 E+00		

- = Negative value indicates results at or near background levels of radioactivity.

Table 2-5. Ten Highest Air Sample Concentrations of ^{234}U for 1992 (pCi/m³).

Site	Area	Concentration	±	Counting error
N-168	200-W	2.0 E-05	±	4.6 E-06
N-019	200-E	1.7 E-05	±	9.2 E-06
N-968	200-E	1.5 E-05	±	3.6 E-06
N-974	200-W	1.5 E-05	±	4.8 E-06
N-973	200-E	1.4 E-05	±	3.6 E-06
N-963	200-W	1.2 E-05	±	3.4 E-06
N-964	200-W	1.2 E-05	±	3.4 E-06
N-991	200-E	1.1 E-05	±	4.1 E-06
N-966	200-W	1.1 E-05	±	2.9 E-06
N-155	200-W	9.4 E-06	±	3.5 E-06
N-961 (Background)	Yakima Barricade	3.9 E-06	±	2.1 E-06
DCG		9.0 E+02		

Table 2-6. Ten Highest Air Sample Concentrations of ^{235}U for 1992 (pCi/m³).

Site	Area	Concentration	±	Counting error
N-974	200-W	1.7 E-06	±	1.4 E-06
N-155	200-W	1.1 E-06	±	1.1 E-06
N-968	200-E	8.6 E-07	±	7.9 E-07
N-964	200-W	7.5 E-07	±	8.1 E-07
N-304	200-W	7.4 E-07	±	8.9 E-07
N-992	200-E	6.7 E-07	±	8.8 E-07
N-956	200-W	6.6 E-07	±	8.6 E-07
N-963	200-W	6.4 E-07	±	7.3 E-07
N-957	200-E	6.3 E-07	±	8.5 E-07
N-973	200-E	6.2 E-07	±	7.0 E-07
N-961 (Background)	Yakima Barricade	4.0 E-07	±	6.2 E-07
DCG		1.0 E-01		

- = Negative value indicates results at or near background levels of radioactivity.

Table 2-7. Ten Highest Air Sample Concentrations of ^{238}U for 1992 (pCi/m³).

Site	Area	Concentration	±	Counting error
N-168	200-W	1.5 E-05	±	3.8 E-06
N-974	200-W	1.5 E-05	±	4.6 E-06
N-019	200-E	1.4 E-05	±	7.6 E-06
N-964	200-W	1.2 E-05	±	3.4 E-06
N-973	200-E	1.2 E-05	±	3.3 E-06
N-985	200-E	9.9 E-06	±	3.6 E-06
N-968	200-E	9.8 E-06	±	2.8 E-06
N-304	200-W	9.4 E-06	±	3.0 E-06
N-155	200-W	8.8 E-06	±	3.3 E-06
N-963	200-W	8.5 E-06	±	2.7 E-06
N-961 (Background)	Yakima Barricade	3.2 E-06	±	1.8 E-06
DCG		1.0 E-01		

2.2 AIR SAMPLING RESULTS, 1992

2.2.1 Summary

2.2.1.1 100 Area. The concentrations of airborne radionuclides measured at the 100-N Area were many times less than the DCG. The 1992 air sampling results are presented in Table C-1 of Appendix C. The annual average concentrations of ^{60}Co detected in the 100-N Area ambient air samples since 1981 are presented in Figure 2-1. Annual average concentrations of ^{60}Co detected near the 1301-N LWDF since 1982 are presented in Figure 2-2. The increased ^{60}Co concentrations in 1987 were due to structural modifications to the inlet portion of the 1301-N facility between October and December of that year. Disturbance of the surface of the crib during construction caused resuspension of radionuclides in the vicinity. After completion, the area was stabilized through the addition of several feet of clean soil and gravel. The sudden drop indicated in Figure 2-1, beginning in 1991, is likely attributable to the change in sample collection initiated that year. Previously, air sample filters were collected monthly, analyzed and disposed. In 1991, the filters were collected weekly, analyzed for gross radioactivity only, and held for 6 month isotopic analyses. Radionuclides with extremely low concentrations may not exhibit enough activity even after compositing to be detectable. To derive an ambient air concentration based on the radioactivity measured on a filter, the radioactivity measured on the filter is divided by the volume of air that passed through the sampling system during the sample collection period. Sample compositing for 6 months increases the volume of air used in this calculation, thereby decreasing the concentration because the

Figure 2-1. Average Concentrations of ^{60}Co Detected in 100-N Area Ambient Air from 1981 to 1992.

Figure 2-2. Average Concentrations of ^{60}Co Detected in 1301-N Air Samples from 1982 to 1992.

total activity measured on the filter remained unchanged (i.e., at or below minimum detection levels). The results of the isotopic analyses are detailed in the following subsections.

2.2.1.1.1 Cobalt-60. The highest result for ^{60}Co was at site N-105 at the 1325-N LWDF site (Table 2-8). The air concentration was $3.0 \text{ E-03} \pm 7.2 \text{ E-04 pCi/m}^3$, which was much less than the DCG. For comparison purposes, this value was 18 times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-8. ^{60}Co in Air, 100-N Area, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$3.0 \text{ E-03} \pm 7.2 \text{ E-04}$	$1.2 \text{ E-03} \pm 8.9 \text{ E-04}$	8.0 E+01	$-1.7 \text{ E-04} \pm 2.7 \text{ E-04}$

NOTE: Negative value indicates results at or near background levels of radioactivity.

2.2.1.1.2 Strontium-90. The highest result for ^{90}Sr was at site N-101 at the 1301-N LWDF site (Table 2-9). The air concentration was $3.8 \text{ E-05} \pm 2.6 \text{ E-05 pCi/m}^3$, which was less than 0.1 percent of the DCG. For comparison purposes, this value was three times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-9. ^{90}Sr in Air, 100-N Area, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$3.8 \text{ E-05} \pm 2.6 \text{ E-05}$	$1.9 \text{ E-05} \pm 1.2 \text{ E-05}$	9.0 E+00	$-1.1 \text{ E-05} \pm 1.5 \text{ E-05}$

NOTE: Negative value indicates results at or near background levels of radioactivity.

2.2.1.1.3 Cesium-137. The highest result for ^{137}Cs was at site N-105 at the 1325-N LWDF site (Table 2-10). The air concentration was $2.7 \text{ E-04} \pm 3.0 \text{ E-04 pCi/m}^3$, which was less than 0.1 percent of the DCG. For comparison purposes, this value was three times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-10. ^{137}Cs in Air, 100-N Area, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$2.7 \text{ E-04} \pm 3.0 \text{ E-04}$	$1.2 \text{ E-04} \pm 1.3 \text{ E-04}$	4.0 E+02	$-1.1 \text{ E-04} \pm 2.1 \text{ E-04}$

NOTE: Negative value indicates results at or near background levels of radioactivity.

2.2.1.1.4 Plutonium 239/240. The highest result for $^{239/240}\text{Pu}$ was at site N-101 at the 1301-N LWDF site (Table 2-11). The air concentration was $6.4 \text{ E-06} \pm 2.7 \text{ E-06} \text{ pCi}/\text{m}^3$, which was less than 0.1 percent of the DCG. For comparison purposes, this value was 14 times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-11. $^{239/240}\text{Pu}$ in Air, 100-N Area, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$6.4 \text{ E-06} \pm 2.7 \text{ E-06}$	$3.4 \text{ E-06} \pm 2.2 \text{ E-06}$	2.0 E-02	$4.4 \text{ E-07} \pm 7.2 \text{ E-07}$

2.2.1.2 200/600 Area. The concentrations of airborne radionuclides measured in 1992 in the 200 Areas were many times less than the DCG. The 1992 air sampling results are summarized in Table C-2 of Appendix C. The annual average concentrations since 1979 are illustrated in Figures 2-3 through 2-5. All sites were well below the applicable DOE guidelines (see Appendix J) in 1992. There continues to be a decline in radionuclide concentrations detected in the ambient air within the 200/600 Areas. Increasing trends seen in the past are associated with the operation of nuclear facilities such as Plutonium/Uranium Extraction (PUREX). The results of the isotopic analyses are detailed in the following subsections.

2.2.1.2.1 Strontium-90. The highest air concentration for ^{90}Sr was at site N-985, west of the 241-AW Tank Farm in 200 East Area (Table 2-12). The result was $2.7 \text{ E-04} \pm 6.3 \text{ E-05} \text{ pCi}/\text{m}^3$, which was less than 0.1 percent of the DCG. For comparison purposes, this value was 24 times greater than the annual average background measured at N-961, located at the Yakima Barricade.

2.2.1.2.2 Cesium-137. The highest air concentration for ^{137}Cs was at Site N-973, east of the 241-B Tank Farm in the 200 East Area (Table 2-13). The result was $6.9 \text{ E-04} \pm 3.0 \text{ E-04} \text{ pCi}/\text{m}^3$, which was less than 0.1 percent of the DCG. For comparison purposes, this value was three times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Figure 2-3. Annual Average ^{137}Cs Concentration in Air for the 200/600 Areas.

Figure 2-4. Annual Average ^{90}Sr Concentration in Air for the 200/600 Areas.

Figure 2-5. Annual Average $^{239/240}\text{Pu}$ Concentration in Air for the 200/600 Areas.

Table 2-12. ^{90}Sr in Air, 200 Areas, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$2.7 \text{ E-04} \pm 6.3 \text{ E-05}$	$4.4 \text{ E-05} \pm 1.2 \text{ E-05}$	9.0 E+00	$-1.1 \text{ E-05} \pm 1.5 \text{ E-05}$

NOTE: Negative value indicates results at or near background levels of radioactivity.

Table 2-13. ^{137}Cs in Air, 200 Area, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$6.9 \text{ E-04} \pm 3.0 \text{ E-04}$	$1.3 \text{ E-04} \pm 8.8 \text{ E-06}$	4.0 E+02	$-1.1 \text{ E-04} \pm 2.1 \text{ E-04}$

NOTE: Negative value indicates results at or near background levels of radioactivity.

2.2.1.2.3 Plutonium. The highest air concentration for $^{239/240}\text{Pu}$ was at site N-165, near the 216-Z-19 Ditch in the 200 West Area (Table 2-14). The result was $1.1 \text{ E-04} \pm 1.3 \text{ E-05} \text{ pCi}/\text{m}^3$, which was less than 0.1 percent of the DCG. For comparison purposes, this value was 29 times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-14. $^{239/240}\text{Pu}$ in Air, 200 Area, 1992 (pCi/m^3).

Maximum result $\pm$ overall error	Annual average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
$1.1 \text{ E-04} \pm 1.3 \text{ E-05}$	$8.7 \text{ E-06} \pm 3.2 \text{ E-06}$	2.0 E-02	$4.4 \text{ E-07} \pm 7.2 \text{ E-07}$

2.2.1.2.4 Uranium. The highest air concentration for uranium was at site N-168, near the U-Plant stack in the 200 West Area (Table 2-15). The result was $3.5 \text{ E-05} \pm 9.2 \text{ E-06} \text{ pCi}/\text{m}^3$ (the sum of the uranium isotopes), which was less than 0.1 percent of the DCG. For comparison purposes, this value was five times greater than the annual average background measured at N-961, located at the Yakima Barricade (see Table 2-4).

Table 2-15. Uranium in Air, 200 Area, 1992 (pCi/m³).

	Maximum result $\pm$ overall error	Average $\pm$ 2SEM	DCG	Background $\pm$ overall error (from site N-961)
²³⁴ U	2.0 E-05 $\pm$ 4.6 E-06		9.0 E+02	3.9 E-06 $\pm$ 2.1 E-06
²³⁵ U	4.8 E-07 $\pm$ 8.5 E-07		1.0 E-01	4.0 E-07 $\pm$ 6.2 E-07
²³⁸ U	1.5 E-05 $\pm$ 3.8 E-06		1.0 E-01	3.2 E-06 $\pm$ 1.8 E-06
Total U	3.5 E-05 $\pm$ 9.2 E-06	1.6 E-05 $\pm$ 1.3 E-06		7.5 E-06 $\pm$ 4.5 E-06

2.2.1.3 300/400 Area. The concentrations of airborne radionuclides measured during 1992 in the 300/400 Areas were many times less than the DCG. Air monitoring near the operating facilities in the 300/400 Areas is provided by PNL and the data transferred to WHC after review and validation. For a more detailed discussion, refer to the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993).

2.2.1.4 Strontium-90. The air concentration for ⁹⁰Sr for the 300 Area was 4.0 E-06 $\pm$ 5.8 E-06 pCi/m³ and 1.2 E-06 $\pm$ 5.8 E-06 pCi/m³ for the 300-NE Area, which were many times less than the DCG. For comparison purposes, this value was three times less than the annual average background measured at N-961, located at the Yakima Barricade.

The air concentration for ⁹⁰Sr for the 400 Area was 2.6 E-06 $\pm$ 2.9 E-06 pCi/m³, which was many times less than the DCG. For comparison purposes, this value was four times less than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-16. ⁹⁰Sr in Air, 300/400 Area, 1992 (pCi/m³).

Area	Average $\pm$ overall error	DCG	Background $\pm$ overall error (from site N-961)
300	4.0 E-06 $\pm$ 5.8 E-06	9.0 E+00	-1.1 E-05 $\pm$ 1.5 E-05
300-NE	1.2 E-06 $\pm$ 5.8 E-06		
400	2.6 E-06 $\pm$ 2.9 E-06		

NOTE: Negative value indicates results at or near background levels of radioactivity.

2.2.1.5 Plutonium. The air concentration for ^{239/240}Pu for the 300 Area was 2.9 E-06 $\pm$ 9.6 E-07 pCi/m³ and 2.1 E-06 $\pm$ 8.6 E-07 pCi/m³ for the 300-NE Area, which were many times less than the DCG. For comparison purposes, this value was seven times greater than the annual average background measured at N-961, located at the Yakima Barricade.

The air concentration for $^{239/240}\text{Pu}$ for the 400 Area was $2.5 \text{ E-06} \pm 6.1 \text{ E-07 pCi/m}^3$, which was many times less than the DCG. For comparison purposes, this value was six times greater than the annual average background measured at N-961, located at the Yakima Barricade.

Table 2-17. $^{239/240}\text{Pu}$ in Air, 300/400 Area, 1992 (pCi/m^3).

Area	Average $\pm$ overall error	DCG	Background $\pm$ overall error (from site N-961)
300	$2.9 \text{ E-06} \pm 9.6 \text{ E-07}$	2.0 E-02	$4.4 \text{ E-07} \pm 7.2 \text{ E-07}$
300-NE	$2.1 \text{ E-06} \pm 8.6 \text{ E-07}$		
400	$2.5 \text{ E-06} \pm 6.1 \text{ E-07}$		

2.2.1.6 Uranium. The air concentration for total uranium for the 300 Area was $2.5 \text{ E-05} \pm 2.1 \text{ E-06 pCi/m}^3$ and $6.1 \text{ E-05} \pm 3.9 \text{ E-06 pCi/m}^3$ for the 300-NE Area, which were many times less than the DCG. For comparison purposes, this value was three times greater than the annual average background measured at N-961, located at the Yakima Barricade.

The total uranium for the 400 Area was not reported in 1992.

Table 2-18. Total Uranium in Air, 300/400 Areas, 1992 (pCi/m^3).

Area	Average $\pm$ overall error	DCG	Background $\pm$ overall error (from site N-961)
300	$2.5 \text{ E-05} \pm 2.1 \text{ E-06}$	9.0 E-02	$7.5 \text{ E-06} \pm 4.5 \text{ E-06}$
300-NE	$6.1 \text{ E-05} \pm 3.9 \text{ E-06}$		
400	NA		

NA = Not analyzed.

2.3 CONCLUSIONS

Operational activities in the 100, 200/600, and the 300/400 Areas contributed to average air radionuclide concentrations that were above background. Over the past 11 years, the average ambient air concentrations generally have decreased because of overall improvement in the operational environmental controls and reduced Site operations. All radionuclide concentrations of radionuclides in air were below the DCG in 1992. All individual stations showed a general downward trend for all measured radionuclides.

One instance of an airborne release was detected during the review of the gross beta activity results. The air sample removed during the week of October 20, 1992, east of the 241-S/SX/SY Tank Farms in the 200 West Area showed elevated beta activity of 3.3 E-01 pCi/m^3 , which was 10 to 100 times normal for this location. An investigation of the activities indicated that during the sampling week, an air lance was being removed from tank 101-SY, which is located to the northwest of the air sampler. Wind direction for the week of October 20, 1992, was from the northwest for 5 of the 7 days and of moderate wind speed (less than 15 mph). Walking stick surveys of the surrounding area discovered old contamination not associated with the high beta activity found on the air sample.

Follow-up checks of this sampling station indicated that air concentrations have returned to and remain normal.

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3.0 GROUNDWATER MONITORING

3.1 INTRODUCTION

This section presents the status of the groundwater beneath the operations areas and associated waste sites in comparison with the WHC ACVs and the DCGs. The ACVs and DCGs for the separations area facilities and operations are contained in WHC-CM-7-5, *Environmental Compliance* (WHC 1989) and listed in Table 3-1. Included are a brief description of WHC's groundwater monitoring program, concentration summaries for active and inactive waste sites, and a summary of significant concentration trends that began in, or continued into 1992. Comprehensive data from all monitored wells within the Hanford Site appear in separate annual reports for *Resource Conservation and Recovery Act of 1976 (RCRA)*, *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)*, and operational groundwater monitoring projects at Hanford Site facilities for 1992, issued by the Geosciences Group.

Table 3-1. Administrative Control Values (ACVs) for Radionuclide Concentrations in the Groundwater (pCi/L).

Radionuclide	200 East	200 West	All other	DCG ^a
³ H	None	None	None	2,000,000
⁶⁰ Co	5,000	5,000	5,000	5,000
⁹⁰ Sr	74	480	40	1,000
⁹⁹ Tc	4,000	4,000	4,000	100,000
¹⁰⁶ Ru	6,000	6,000	240	6,000
¹²⁵ Sb	2,000	2,000	2,000	50,000
¹²⁹ I	20	20	20	500
¹³⁷ Cs	210	1,200	120	3,000
¹⁵⁴ Eu	800	800	800	20,000
²³⁴ U	20	20	20	500
^{235/238} U	24	24	24	600
Uranium (gross)	20	20	20	500
²³⁸ Pu	2	3.6	1.6	40
^{239/240} Pu	1.2	1.2	1.2	30
Alpha	1.2	1.2	1.2	30
Beta	40	40	40	1,000

^aDCG = Derived concentration guide.

WHC conducts the operational groundwater monitoring program to determine the compliance status of 100, 200, 300, 400, and 600 Area facilities and operations with WHC's administrative controls pertaining to groundwater quality. The objectives of the program are:

- Evaluate the quality of groundwater beneath the Hanford Site operations areas
- Determine the impact of waste disposal operations on the groundwater
- Assess the performance of disposal and storage sites on the Hanford Site
- Provide data for hydrologic analysis and model application.

3.2 MONITORING PROGRAM DESCRIPTION

The operational groundwater monitoring network for the Hanford Site consisted of 123 wells during 1992. Of these, 20 wells in the 100 Area, 93 wells in the 200/600 areas, 8 wells in the 300 Area, and 2 wells in the 400 Area were monitored during 1992. The groundwater monitoring well locations are shown in Figures D-1 through D-6 and consist of existing wells constructed before 1986 and RCRA/CERCLA wells.

Samples were collected for WHC by PNL and transported to International Technologies Analytical Services-Richland (ITAS-RL) for analysis. Wells for the operational groundwater monitoring program are sampled monthly, quarterly, or semiannually, depending on the operating history and/or the level of contamination and its rate of change. Most wells are equipped with dedicated submersible pumps; the remainder are sampled by bailing.

The analytical parameters in 1992 included gross alpha, gross beta, gamma analysis, ^{90}Sr , ^{99}Tc , ^{129}I , ^3H , total uranium, and $^{238,239,240}\text{Pu}$. Water samples from wells were selectively analyzed for these parameters based on effluent inventories and historical groundwater monitoring results. Sampling quality control is discussed in *The Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993).

Analytical results were reported by ITAS-RL to the Geosciences Group. The data is analyzed and reported annually by the Geosciences Group and summarized by Environmental Engineering Studies in this report.

WHC has established ACVs pertaining to radionuclide concentrations in groundwater, which are specified in WHC-CM-7-5 (WHC 1989). The intent of these ACVs is to ensure that, at the end of institutional control and before migration to the Site boundary, the groundwater beneath the site will meet the 0.04 DCG corresponding to 4 mrem/yr EDE for radioactivity from current or future operations. It should be recognized that past occurrences and practices may preclude meeting this standard with regard to some isotopes. The ACVs serve as operating limits regulating discharges to liquid disposal sites and, as such, may be more restrictive than the DCGs. Inactive liquid-waste disposal sites (i.e., those no longer receiving wastewater) continue to be monitored to detect changes that could indicate a potential problem.

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3.3 GROUNDWATER MONITORING SUMMARY - 100 AREAS

3.3.1 Radiological Groundwater Sampling - 100-N Area

The 100-N Area groundwater sampling is performed to monitor radionuclide concentrations in the groundwater beneath the 1301-N Liquid Waste Disposal Facility (LWDF), the 1325-N LWDF, and other 100-N Area facilities. Groundwater samples are also collected to monitor the integrity of underground piping, basins, and tanks. The locations of the groundwater sampling wells are shown in Figure D-4. Samples of groundwater were collected by PNL and analyzed for gamma-emitting radionuclides, tritium, and $^{89,90}\text{Sr}$.

Radionuclide concentrations detected in the groundwater samples are presented in Tables D-2 through D-6. The samples contain radionuclides attributable to liquid effluents discharged to the 1301-N and 1325-N LWDFs (Rokkan 1986). Radionuclides that are not retained in the soil column beneath the LWDFs ultimately are released to the Columbia River via the N Springs shoreline. This discharge is monitored at well N-8T. Detailed discussions of these sampling results are reported in annual effluent release reports. The entire length (about 3.4 km) of the shoreline between the 100-N and 100-D/DR Areas also is characterized annually. Discussion of this sampling effort is found in the Spring, Pond, and Ditch Monitoring in Section 6.0 of this report covering liquid waste disposal units. The only radionuclide with concentrations above the DCG at the N Springs is ^{90}Sr .

The average concentrations of ^{60}Co , ^{90}Sr , and ^{131}I detected in Well N-33 from 1981 to 1992 are presented in Figure D-7. These radionuclides are useful as indicators of groundwater contamination and migration. This well was selected because of its position relative to the 1325-N LWDF.

The concentrations of radionuclides depicted in Well N-33 showed a continued decrease. These reduced values are attributable to the decreased liquid effluent discharged to the 1325-N LWDF associated with the lay-up status of N Reactor. Average ^{90}Sr concentrations in Well N-33 remained below the DCG in 1992, and ^{131}I concentrations were below analytical detection limits. Cobalt-60 concentrations decreased during this period, with the 1992 average value falling below the historic range of well N-33.

3.3.2 Radiological Groundwater Sampling - 100-K Area

A leak was detected in the 100-KE Reactor Fuel Storage Basin during the 1970's. The leak was repaired in 1980, and water levels in the basin are now monitored continuously and reveal no detectable leakage during 1992. In addition, WHC samples four groundwater wells located near the 105-KE Reactor Building to provide detection of leakage from the storage basin.

Samples (4-L) were collected by PNL and analyzed for gamma-emitting radionuclides and tritium. The sampling locations for the groundwater monitoring wells are shown in Appendix D, Figure D-2. Radionuclide concentrations detected in the 100-K Area groundwater samples are presented in

Appendix D, Tables D-2 through D-6. The concentrations of ^{125}Sb detected in samples from wells K-27 and K-28 indicate residual contamination from past leaks of storage basin water.

Average radionuclide concentrations detected in well K-27 from 1982 through 1992 are presented in Table 3-2. The data indicate that concentrations of ^{125}Sb (2.7-yr half-life) in well K-27 have stabilized.

Tritium concentrations detected in well K-30 have exceeded those of any other 100 Area groundwater monitoring well since 1982. The range of tritium concentrations at this well peaked in 1988 but still remain high though below the DCG. Well K-27 showed a large increase in tritium concentrations during 1989 and still remains high in 1992. Wells K-28 and K-29, located between K-27 and K-30, showed relatively stable concentrations.

One possible source of tritium in the K Area wells is from the nearby 115-KE Crib (Figure D-2), which received significant amounts of tritium from the dryer room concentrate. This concentrate came from the 115-KE Reactor Air Recirculation Facility (operated from 1955 to 1971). Table 3-3 lists average tritium concentrations in each of these 100-K Area wells from 1982 through 1992. Another possible source is the 105-KE fuel basin, which currently is under investigation to determine if there is another leak.

Table 3-2. Average Radionuclide Concentrations Detected in Well K-27* from 1982 Through 1992 (pCi/L).

Year	^{60}Co	^{103}Ru	^{124}Sb	^{125}Sb
1982	1.4 E+00	NR	1.1 E+02	1.0 E+02
1983	7.3 E+00	NR	NR	6.4 E+02
1984	9.7 E+00	NR	NR	5.2 E+02
1985	1.4 E+01	3.1 E+00	NR	4.0 E+02
1986	6.6 E+00	6.8 E+00	<8.7 E+00	3.3 E+02
1987	5.0 E+00	<8.0 E+00	<8.8 E+00	4.2 E+02
1988	8.0 E+00	<7.0 E+00	<8.9 E+00	2.0 E+02
1989	9.7 E+00	<1.4 E+01	<1.4 E+01	1.6 E+02
1990	<8.6 E-01	1.3 E+01	NR	NR
1991	<1.1 E-01	<1.0 E+01	NR	8.9 E+01
1992	7.1 E+00	NR	NR	5.1 E+01
DCG	5.0 E+03	5.0 E+04	2.0 E+04	6.0 E+04

*Location is identified in Figure D-2.

NR = Not reported.

Table 3-3. Average Tritium Concentrations Detected in 100-KE Area Groundwater (pCi/L) from 1982 Through 1992.

Year	Well K-27	Well K-28	Well K-29	Well K-30
1982	4.5 E+03	3.4 E+03	8.5 E+03	8.8 E+05
1983	3.1 E+03	2.1 E+03	2.0 E+04	6.8 E+05
1984	3.0 E+03	2.5 E+03	4.9 E+04	4.3 E+05
1985	1.8 E+03	3.6 E+03	4.9 E+04	4.2 E+05
1986	1.5 E+03	3.1 E+03	3.7 E+04	6.5 E+05
1987	1.5 E+03	4.2 E+03	9.9 E+03	8.3 E+05
1988	2.3 E+03	3.2 E+03	1.4 E+04	1.2 E+06
1989	9.2 E+04	2.3 E+03	1.0 E+04	6.8 E+05
1990	7.8 E+04	2.0 E+03	7.2 E+03	7.8 E+05
1991	5.0 E+04	2.1 E+03	5.9 E+03	7.5 E+05
1992	5.1 E+04	1.6 E+03	1.6 E+04	7.0 E+05

Note: Derived Concentration Guide (DCG) = 2.0 E+06 pCi/L.

3.4 RADIOLOGICAL GROUNDWATER MONITORING SUMMARY FOR THE 200/600 AREAS

The annual average concentration of radionuclides in groundwater beneath the waste sites was compared to the ACV, as well as the DCG. Table 3-1 presents a comparison of the current WHC-CM-7-5 (WHC 1989) ACVs and the DCGs. Liquid-waste disposal sites that exceeded the ACVs or the DCGs are summarized below according to the contaminant involved. The well locations and the facilities that they monitor are shown in Appendix D, Figures D-3 through D-5.

3.4.1 Tritium

Wells beneath the active 216-A-36B Crib exceeded the DCG for tritium in 1992. The elevated concentration of ^3H in this crib was attributed to past practices in this area. Wells at the inactive 216-A-10 Crib in the vicinity of this crib also showed ^3H concentrations in excess of the DCG in 1992 but were below the DCG in 1991. A tritium plume map for the separations area can be found in separate groundwater monitoring annual report issued by the Geosciences Group when published and the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993).

3.4.2 Strontium-90

No active waste sites exceeded the ACV or DCG for ^{90}Sr in 1992.

One inactive waste site had elevated concentrations of ^{90}Sr in the groundwater. The groundwater beneath the inactive 216-B-5 Reverse (injection) Well had an annual average ^{90}Sr concentration of approximately five times the DCG. The elevated ^{90}Sr concentration at this site is because of the direct discharge of contaminants to the water table. Except for 216-B-5, all reverse wells previously discharged into the vadose zone. This site, however, discharged directly into the water table from 1945 through 1947 (Law and Allen 1984). The high ^{90}Sr concentration is due to residual contamination from that period of operation. Characterization has demonstrated that the majority of the radionuclide inventory is sorbed on the sediments and that the contamination is localized (Smith 1980).

3.4.3 Technetium-99

One active site (216-U-17 Crib) exceeded the ACV for ^{99}Tc during 1992. This site has exceeded the ACV since monitoring began in 1988 when construction of the crib was completed. The high concentrations of ^{99}Tc , approximately four times the ACV, are from past disposal practices. The elevated ^{99}Tc in the 200 West Area coincides with the elevated concentrations of uranium. These elevated concentrations of ^{99}Tc have remained constant since the first analysis was performed.

3.4.4 Iodine-129

No wells exceeded the ACV for ^{129}I during 1992. Eleven wells were analyzed for ^{129}I in 1991. Only one well exceeded the ACV in 1991, and the concentration of ^{129}I in groundwater has remained below the ACV in the other wells since 1988.

3.4.5 Cesium-137

One of the wells sampled exceeded the ACV for ^{137}Cs in 1992. This well monitors the 216-B-5 Reverse Well.

3.4.6 Plutonium

One inactive waste site, the 216-B-5 Reverse Well, exceeded the ACV for ^{239}Pu in 1992. This was first noted in 1988 because of more restrictive control limits being implemented internally by WHC at the end of 1988. There has been an erratic fluctuation in the concentrations since the wells were first noted to exceed the ACV in 1988. This fluctuation can possibly be attributed to the colloidal nature of the radionuclides contained within the groundwater. The high concentrations of radionuclides are not present in the samples when they are filtered. The wells around the 216-B-5 Reverse Well will continue to be monitored and the results evaluated to determine if there are any trends developing.

3.4.7 Uranium

The groundwater beneath two active sites (216-U-17 Crib and 216-U-14 Ditch) exceeded the ACV for uranium in 1992. Three of the inactive waste sites (216-T-33 Crib, 216-S-13 Crib, and 216-U-1/2 Crib) exceeded the ACVs for uranium in 1992. These elevated concentrations of uranium have remained relatively constant since the wells were first sampled in January 1988.

The concentrations of uranium beneath the 216-U-17 Crib, which is scheduled to receive the Uranium-Trioxide (UO_3) Plant process condensate effluent during future operations, was above the ACVs. The contamination is from other waste sites within the 200 West Area. The characterization of the plume was begun in 1989 with the drilling of three groundwater monitoring wells. A total of six wells have been drilled, two upgradient and four downgradient, and monitoring of the groundwater is continuing. Results of characterization to date can be found in WHC-EP-0367, *Liquid Effluent Study Final Project Report* (WHC 1990).

3.4.8 Other Radionuclides

No other radionuclides were detected in excess of the ACVs or DCGs in any groundwater wells monitoring the separations area waste sites.

3.5 RADIOLOGICAL GROUNDWATER MONITORING SUMMARY - 300 AREA

The groundwater beneath the 300 Area Process Trenches is monitored by a RCRA interim-status groundwater quality well network, which has been in operation since 1985.

The 300 Area Process Trenches consist of two unlined trenches, which were originally constructed in 1975. The trenches received effluent from the 300 Area process facilities until these operations were terminated in 1987 and 1988. The Process Trenches currently receive liquid effluent from water cooling systems, steam condensate from the heating, ventilation, and air-conditioning system, process sewer discharge, laboratory wastes, and process water and other aqueous solutions not designated as dangerous wastes by Washington Administrative Code (WAC)-173-303.

Eight wells have been selected for operational groundwater monitoring of the 300 Area (see Figure D-6 for location). The samples were analyzed for the gross alpha, gross beta, tritium, and uranium activities in 1992.

3.5.1 Uranium

Wells 399-1-10 and 399-1-16A exceeded the DCG for uranium concentrations in the groundwater. These wells show higher concentrations relative to previous results. The elevated results may be attributed to seasonal water stage changes in the Columbia River.

3.5.2 Tritium

None of the wells sampled exceeded the concentration limits for tritium in 1992.

3.5.3 Alpha Radiation

Wells 399-1-10 and 316-1-16A exceeded the DCG in the groundwater for gross alpha. The results are higher than previous years and correspond with the higher uranium concentrations reported.

3.5.4 Beta Radiation

None of the wells sampled exceeded the concentration limits for gross beta in 1992.

3.6 GROUNDWATER MONITORING SUMMARY - 400 AREA

The 400 Area consists of the Fast Flux Test Facility (FFTF) and ancillary buildings and equipment. The FFTF is a sodium-cooled, fast-neutron-flux reactor plant designed for irradiation testing of nuclear reactor fuels and materials for liquid metal fast breeder reactors. The plant was placed on hot standby in 1992. Radioactive liquid waste effluents from reactor operations have been collected in rail tankcars and shipped to the 200 Areas for disposal since operations began in 1982.

The groundwater beneath the 400 Area has been monitored for ^{60}Co , ^{137}Cs , ^3H , and ^{106}Ru . The concentration of radionuclides in the groundwater are below the DCGs. Average radionuclide concentrations detected in water supply wells 499-S0-7 and 499-S0-8 can be found in Tables 3-4 and 3-5. The data indicate that the concentrations have remained relatively stable. The higher than background concentrations of tritium are attributed to the plume emanating from the 200 Areas.

3.7 GROUNDWATER STATUS

All groundwater data are analyzed to determine compliance with internal guidelines for trends to detect potential problems, and to demonstrate the effectiveness of waste site decommissioning.

For comparison purposes only, the groundwater beneath five waste sites exceeded the DCG values on an annual average basis for 1992.

- The annual average for the concentration of ^{90}Sr at the N Springs was seven times the DCG in 1992, but similar to the concentrations reported during 1986 through 1989. The quantity of ^{90}Sr being released to the Columbia River in the N Springs is significantly less than during previous years because of the reduction and elimination of effluents being discharged to the 100 N LWDFs.

Table 3-4. Average Radionuclide Concentrations Detected in Well 499-S0-7 from 1982 Through 1992 (pCi/L).

Year	⁶⁰ Co	¹³⁷ Cs	³ H	¹⁰⁶ Ru
1982	1.4 E+01	1.7 E+01	3.0 E+04	NR
1983	3.5 E+00	NR	2.6 E+04	NR
1984	6.7 E+00	NR	3.1 E+00	NR
1985	9.2 E+00	NR	2.6 E+04	NR
1986	1.0 E+01	NR	2.9 E+04	NR
1987	5.1 E+00	4.4 E+00	3.0 E+04	2.3 E+01
1988	2.7 E+00	2.8 E+00	3.9 E+04	3.7 E+01
1989	NR	NR	NR	NR
1990	3.6 E+00	NR	2.8 E+04	3.3 E+00
1991	NR	NR	2.7 E+04	NR
1992	NR	NR	2.6 E+04	NR
DCG	5.0 E+03	3.0 E+03	2.0 E+06	6.0 E+03

NR = No sample taken/recorded.

Table 3-5. Average Radionuclide Concentrations Detected in Well 499-S0-8 from 1982 Through 1992 (pCi/L).

Year	⁶⁰ Co	¹³⁷ Cs	³ H	¹⁰⁶ Ru
1982	NR	NR	2.4 E+04	NR
1983	2.2 E+00	NR	4.5 E+04	NR
1984	6.0 E+00	NR	6.8 E+00	NR
1985	8.6 E+00	NR	3.2 E+04	NR
1986	1.0 E+01	NR	1.1 E+04	NR
1987	3.4 E+00	3.9 E+00	4.3 E+04	1.9 E+01
1988	3.7 E+00	2.9 E+00	2.8 E+04	3.5 E+01
1989	NR	NR	NR	NR
1990	NR	NR	2.5 E+04	NR
1991	NR	NR	3.5 E+04	NR
1992	NR	NR	1.1 E+04	NR
DCG	5.0 E+03	3.0 E+03	2.0 E+06	6.0 E+03

NR = No sample taken/recorded.

- The annual average for the concentration of ^{90}Sr beneath the inactive 216-B-5 Reverse Well was five times the DCG in 1992.
- The annual average for the concentration of ^3H beneath the inactive 216-A-10 crib was 1.1 times the DCG and the active 216-A-36B crib was 2 times the DCG in 1992.
- The concentrations of uranium in groundwater exceeded the DCG beneath the 300 Area Process Ponds.

The groundwater beneath two waste sites in the 100 Area, five waste sites in the 200/600 Areas, and two sites in the 300 Area exceeded the ACVs on an annual average basis.

- The ^{90}Sr concentrations beneath the 1301-N and 1325-N LWDFs exceeded the ACV.
- Uranium isotopes and ^{99}Tc concentrations in the groundwater beneath the active 216-U-17 Crib exceeded the ACV.
- The ^{239}Pu and ^{90}Sr concentrations in the groundwater exceeded the ACV beneath the inactive 216-B-5 Reverse Well.
- The U concentration was greater than the ACV in the groundwater beneath the inactive 216-T-33, 216-S-13, and 216-U-1/2 Cribs and the active 216-U-14 Ditch.

4.0 SOIL AND VEGETATION MONITORING

4.1 INTRODUCTION

The radionuclide content of soil and vegetation was measured to evaluate long-term trends in environmental accumulation of radioactivity in the 100, 200/600, and 300/400 Areas. Soil and vegetation samples were collected on or near facilities that store, handle, or dispose of radioactive waste. A total of 157 soil samples (32 in the 100 Areas, 110 in the 200/600 Areas, and 15 in the 300/400 Areas); and 95 vegetation samples (40 in the 100 Areas, 40 in the 200/600 Areas, and 15 in the 300/400 Areas) were collected from locations listed in Appendix E, Tables E-1 through E-3, and shown in Figures E-1 through E-6.

Each soil sample represents a composite of five plugs of soil 2.5 cm in depth and 10 cm in diameter collected from each site. Each vegetation sample consists of new growth leaf cuttings taken from the available species of interest at each sample location. Often, the sample collected is a composite of several like members of the sampling site community to avoid decimation of any individual plant through over-harvesting.

Early in the summer of each year, soil and vegetation samples are collected and submitted for radioanalyses. The analyses include those radionuclides expected to be found in the areas sampled (i.e., gamma-emitting radionuclides, strontium isotopes, uranium, and/or plutonium isotopes). The results were compared to regional background levels, which were derived from PNL offsite monitoring data, to determine the difference between contributions from site operations and contributions from natural causes and worldwide fallout. The results also were compared to soil contamination standards (Appendix J) developed for use by WHC at the Hanford Site.

For the purposes of soil disposal, two sets of standards were used by WHC at the Hanford Site. The first is a threshold limit, below which soil can be disposed of without the controls of a low-level waste burial ground. The intent of this threshold limit is to ensure that an individual effective dose equivalent (EDE) does not exceed 25 mrem/yr total under any reasonable scenario. The second limit defines when an area needs to be posted as a radiological control area. The range between the two limits does not need posting, but, when disposing of such contaminated soil, the soil needs to be treated as radioactive. The soil standards are intended for use only at the Hanford Site. These soil standards may be found in Appendix J, Tables J-3 and J-4.

Special investigative soil and biota (plant and animal) samples were collected for site-specific monitoring or whenever radiological contamination was known or suspected to have occurred. These special samples are discussed in Section 8.0 of this report.

4.2 SOIL SAMPLING RESULTS, 1992

4.2.1 Soil Sampling

4.2.1.1 100 Area. Surface soil samples collected near the 1301-N LWDF contain radionuclides that were typically present in the effluent stream discharge. Generally, the samples collected near this facility exhibit relatively higher radionuclide concentrations than those collected at the seven other locations at 100-N. Average radionuclide concentrations detected in the surface soil samples near the 1301-N LWDF from 1980 through 1992 are presented in Table 4-1. Average radionuclide concentrations detected in the surface soil samples collected in the 100-N Area from 1980 through 1992 are presented in Table 4-2.

Environmental samples of surface soil collected near the retired 100 Area reactor facilities indicated similar levels of radionuclides when compared to the Hanford Site average concentrations. Average radionuclide concentrations detected in the surface soil samples collected in the retired 100 Areas from 1980 through 1992 are presented in Tables 4-3 through 4-7. Maximum, average, distant community, and DCG are compared in Table 4-8. The individual radionuclide concentrations results are listed in Appendix E, Table E-1.

4.2.1.1.1 Cobalt-60. The highest ^{60}Co result was found at site N3, located west of 1301-N LWDF. The ^{60}Co concentration was 18 ± 1.80 pCi/g. The distant community average for ^{60}Co pCi/g was not reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{60}Co in soils in the 100 Areas was 0.21 ± 0.13 pCi/g.

4.2.1.1.2 Cesium-137. The highest ^{137}Cs result was found at site N2, located southwest of 1301-N LWDF. The ^{137}Cs concentration was 2.2 ± 0.23 pCi/g, or five times greater than the distant community measured concentration of 0.43 ± 0.03 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{137}Cs in soils in the 100 Areas was 0.57 ± 0.18 pCi/g.

4.2.1.1.3 Strontium-90. The highest ^{90}Sr result was found at site K2, located east of 116-K-1 Crib. The ^{90}Sr concentration was 0.7 ± 0.14 pCi/g, or 17.5 times greater than the distant community measured concentration of 0.04 ± 0.007 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{90}Sr in soil in the 100 Areas was 0.17 ± 0.059 pCi/g.

4.2.1.1.4 Plutonium 239/240. The highest $^{239/240}\text{Pu}$ result was found at site N3, located west of 1301-N LWDF. The $^{239/240}\text{Pu}$ concentration was 0.06 ± 0.008 pCi/g, or 7.8 times greater than the distant community measured concentration of 0.008 ± 0.00008 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of $^{239/240}\text{Pu}$ in soil in the 100 Areas was 0.013 ± 0.006 pCi/g.

Table 4-1. Average Radionuclide Concentrations (pCi/g) Detected in Soil Samples Near the 1301-N Liquid Waste Disposal Facility from 1980 through 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1980	1.3 E+01	3.5 E-01	4.1 E+00	NR	2.5 E-02
1981	4.0 E+00	7.0 E-01	6.1 E+00	NR	4.4 E-02
1982	6.3 E+00	2.7 E-01	2.7 E+00	NR	1.8 E-02
1983	5.4 E+00	1.3 E+00	3.8 E+00	NR	4.3 E-02
1984	2.8 E+00	2.1 E-01	1.1 E+00	NR	1.7 E-02
1985	1.3 E+01	6.5 E-01	3.9 E+00	NR	3.2 E-02
1986	4.5 E+00	2.2 E-01	2.5 E+00	NR	1.7 E-02
1987	5.1 E+00	3.4 E-01	1.6 E+00	5.4 E-03	2.2 E-02
1988	7.8 E+00	3.5 E-01	2.0 E+00	2.3 E-03	1.7 E-02
1989	2.3 E+00	1.5 E-01	5.0 E-01	6.4 E-03	4.0 E-02
1990	4.7 E+00	3.2 E-01	1.7 E+00	4.6 E-03	3.5 E-02
1991	1.3 E+01	2.7 E-01	1.3 E+00	7.7 E-03	5.3 E-02
1992	6.7 E+00	2.2 E-01	1.1 E+00	3.5 E-03	2.3 E-02

NR = Not reported.

Table 4-2. Average Radionuclide Concentrations (pCi/g) Detected in 100-N Area Surface Soil Samples from 1980 through 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1980	8.5 E-01	1.8 E-01	5.0 E-01	NR	1.8 E-02
1981	1.3 E+00	2.1 E-01	1.0 E+00	NR	1.1 E-02
1982	1.6 E+00	9.9 E-02	3.4 E-01	NR	5.0 E-03
1983	2.7 E+00	2.9 E-01	4.4 E-01	NR	8.5 E-03
1984	8.8 E-01	2.8 E-01	6.2 E-01	NR	1.4 E-02
1985	1.2 E+00	1.3 E-01	5.2 E-01	NR	1.3 E-02
1986	4.1 E-01	8.3 E-02	5.0 E-01	NR	8.2 E-03
1987	4.1 E-01	1.1 E-01	3.9 E-01	1.1 E-03	6.7 E-03
1988	3.4 E-01	1.6 E-01	3.9 E-01	4.5 E-04	9.5 E-03
1989	1.4 E-01	2.1 E-01	1.3 E-01	1.1 E-03	1.3 E-02
1990	3.0 E-01	1.2 E-01	4.4 E-01	6.7 E-04	1.0 E-02
1991	4.3 E-01	1.1 E-01	4.5 E-01	6.2 E-04	7.8 E-03
1992	8.6 E-02	9.5 E-02	3.6 E-01	5.1 E-04	7.6 E-03

NR = Not reported.

Table 4-3. Average Radionuclide Concentrations (pCi/g) Detected in 100-B/C Area Surface Soil Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	5.7 E-01	NR	1.2 E+00	NR	NR
1982	8.2 E-01	NR	1.3 E+00	NR	NR
1983	4.2 E-01	NR	1.5 E+00	NR	NR
1984	5.4 E-01	3.2 E-01	1.9 E+00	1.0 E-03	2.4 E-02
1985	2.7 E-01	2.4 E-02	4.5 E-01	2.9 E-04	8.8 E-04
1986	1.8 E-01	1.2 E-01	6.4 E-01	5.5 E-04	8.3 E-03
1987	2.6 E-01	1.1 E-01	9.2 E-01	6.2 E-04	1.4 E-02
1988	2.7 E-01	3.9 E-01	9.5 E-01	6.2 E-04	3.0 E-02
1989	2.6 E-01	3.5 E-01	7.6 E-01	6.2 E-04	5.5 E-02
1990	1.1 E-01	1.7 E-01	7.4 E-01	6.2 E-04	2.9 E-02
1991	6.4 E-01	1.6 E-01	9.0 E-01	9.0 E-04	1.7 E-02
1992	7.2 E-02	2.7 E-01	1.0 E+00	7.9 E-04	2.9 E-02

NR = Not Reported.

Table 4-4. Average Radionuclide Concentrations (pCi/g) Detected in 100-D/DR Area Surface Soil Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	3.6 E-01	NR	4.0 E-01	NR	NR
1982	4.9 E-01	NR	3.2 E-01	NR	NR
1983	4.2 E-01	NR	1.7 E-01	NR	NR
1984	2.2 E-01	1.4 E-01	1.6 E-01	1.4 E-04	9.8 E-03
1985	2.4 E-01	5.6 E-02	2.7 E-01	2.1 E-04	3.0 E-03
1986	2.6 E-01	7.3 E-02	8.7 E-01	3.2 E-04	5.8 E-03
1987	2.8 E-01	2.0 E-01	1.1 E+00	1.6 E-03	1.8 E-02
1988	1.9 E-01	1.5 E-01	9.4 E-01	6.2 E-04	8.2 E-03
1989	2.2 E-01	8.8 E-02	6.7 E-01	6.2 E-04	1.4 E-02
1990	9.3 E-02	9.8 E-02	9.5 E-01	6.2 E-04	2.9 E-02
1991	1.1 E-01	7.0 E-02	9.8 E-01	3.1 E-04	9.1 E-03
1992	4.7 E-02	6.6 E-02	3.2 E-01	3.0 E-04	6.8 E-03

NR = Not Reported.

Table 4-5. Average Radionuclide Concentrations (pCi/g) Detected in 100-F Area Surface Soil Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	2.9 E-01	NR	6.0 E-01	NR	NR
1982	1.4 E+00	NR	1.7 E+00	NR	NR
1983	2.7 E-01	NR	8.6 E-01	NR	NR
1984	1.1 E+00	4.4 E-01	7.0 E-01	5.0 E-04	1.0 E-02
1985	3.0 E-01	2.9 E-01	8.3 E-01	6.5 E-04	9.8 E-03
1986	2.3 E-01	2.7 E-01	7.4 E-01	3.8 E-04	1.1 E-02
1987	1.9 E-01	2.4 E-01	5.5 E-01	6.4 E-04	9.3 E-03
1988	1.7 E-01	1.6 E-01	6.2 E-01	1.3 E-03	1.4 E-02
1989	1.3 E-01	1.1 E-01	4.3 E-01	8.0 E-04	1.3 E-02
1990	4.4 E-02	1.1 E-01	6.5 E-01	5.2 E-04	1.1 E-02
1991	4.9 E-02	1.6 E-01	8.3 E-01	8.6 E-04	1.4 E-02
1992	3.6 E-02	1.2 E-01	4.0 E-01	6.2 E-04	7.2 E-03

NR = Not Reported.

Table 4-6. Average Radionuclide Concentrations (pCi/g) Detected in 100-H Area Surface Soil Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	1.5 E-01	NR	9.0 E-02	NR	NR
1982	1.8 E-01	NR	3.4 E-01	NR	NR
1983	1.6 E-01	NR	4.7 E-01	NR	NR
1984	3.7 E-01	2.4 E-01	1.7 E+00	6.9 E-04	1.5 E-02
1985	1.4 E-01	9.8 E-02	2.3 E-01	1.9 E-04	5.7 E-03
1986	1.8 E-01	7.1 E-02	8.9 E-01	6.1 E-04	1.0 E-02
1987	2.8 E-01	1.9 E-01	2.0 E+00	8.5 E-04	3.1 E-02
1988	1.6 E-01	7.5 E-02	3.6 E-01	6.2 E-04	6.6 E-03
1989	2.0 E-01	5.0 E-02	5.3 E-01	9.2 E-04	6.5 E-03
1990	1.0 E-01	6.5 E-02	4.5 E-01	3.3 E-04	7.6 E-03
1991	7.8 E-02	8.1 E-02	1.6 E+00	6.0 E-04	1.9 E-02
1992	2.1 E-02	7.9 E-02	3.5 E-01	3.5 E-04	6.9 E-03

NR = Not Reported.

Table 4-7. Average Radionuclide Concentrations (pCi/g) Detected in 100-K Area Surface Soil Samples from 1981 to 1992.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}\text{Pu}$
1981	8.3 E-01	NR	4.4 E+00	NR	NR
1982	2.6 E+01	NR	8.8 E-01	NR	NR
1983	5.5 E+01	NR	5.3 E+01	NR	NR
1984	3.3 E+00	8.4 E-01	1.2 E+01	9.6 E-04	2.9 E-02
1985	7.4 E-01	2.9 E-01	1.1 E+00	1.4 E-03	3.2 E-02
1986	1.0 E+00	1.8 E-01	1.1 E+00	9.1 E-04	2.3 E-02
1987	1.2 E+00	4.3 E-01	1.3 E+00	2.7 E-03	5.5 E-02
1988	3.9 E-01	2.3 E-01	7.3 E-01	7.1 E-04	2.0 E-02
1989	7.7 E-01	6.3 E-01	7.5 E+00	2.8 E-03	7.8 E-02
1990	2.3 E-01	2.3 E-01	9.7 E-01	6.8 E-04	1.4 E-02
1991	2.7 E-01	1.7 E-01	1.2 E+00	8.6 E-04	2.0 E-02
1992	1.3 E-01	2.5 E-01	5.3 E-01	5.7 E-04	1.3 E-02

NR = Not Reported.

Table 4-8. 100 Area Soils (pCi/g).

	^{60}Co		^{137}Cs		^{90}Sr		$^{239/240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
Maximum ± Counting Error	18 ± 1.8	Site N3	2.2 ± 0.23	Site N2	0.7 ± 0.14	Site K2	0.06 ± 0.008	Site N3	1.1 ± 0.1	Site K5	0.04 ± 0.01	Site K5	1.1 ± 0.1	Site K5
Average ± 2SEM	0.21 ± 0.13		0.57 ± 0.18		0.17 ± 0.06		0.01 ± 0.006		0.48 ± 0.06 total uranium					
PNL Distant Community Average ± 2SEM	NR		0.04 ± 0.03		0.04 ± 0.007		0.008 ± 0.00008		0.76 ± 0.17 total uranium					
Guide for posting SCA	5,000		20,000		600		75		100		15		50	

2SEM = 2 standard error of the mean.

SCA = Surface contamination area.

NR = Not reported.

4.2.1.1.5 Uranium. The highest total uranium was found at site K5, located north northwest of 116-K-2 Trench. The uranium concentrations were 1.1 ± 0.1 pCi/g for ^{234}U , 0.04 ± 0.01 pCi/g for ^{235}U , and 1.1 ± 0.1 pCi/g for ^{238}U or 2.2 pCi/g uranium total. The concentration of ^{238}U was 1.4 times greater than the distant community concentration of 0.76 ± 0.17 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). Uranium 234 and ^{235}U were not reported by PNL. The average concentration for total uranium in soil in the 100 Areas was 0.48 ± 0.06 pCi/g.

4.2.1.2 200/600 Area. This was the third year of sampling from locations established to directly monitor facilities and active/inactive waste sites. Soil samples from 110 sample locations were collected in 1992. Radionuclide concentrations are listed in Appendix E, Table E-2. Table 4-22 reports the highest ten sample results and identification numbers for all reported radionuclides. The following sections are a discussion of the highest analytical result for specific radionuclides and a comparison to the offsite average as measured by PNL. Maximum, average, distant community, and DCG are compared in Table 4-9.

4.2.1.2.1 Cobalt-60. The highest ^{60}Co result was found at site 99, located northwest of the BC Control Area. The ^{60}Co concentration was 0.03 ± 0.01 pCi/g. The distant community average for ^{60}Co pCi/g was not reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{60}Co in soils in the 200 Areas was 0.007 ± 0.001 pCi/g.

4.2.1.2.2 Cesium-137. The highest ^{137}Cs result was found at site 54, located at the northeast of the 241-BX/BY Tank Farm. The ^{137}Cs concentration was 160 ± 16 pCi/g, or 380 times greater than the distant community measured concentration of 0.43 ± 0.03 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{137}Cs in soils in the 200 Areas was 4.6 ± 2.9 pCi/g.

4.2.1.2.3 Strontium-90. The highest ^{90}Sr result was found at site 66, located north of the 241-C Tank Farm. The ^{90}Sr concentration was 6.0 ± 1.0 pCi/g, or 150 times greater than the distant community measured concentration of 0.04 ± 0.007 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{90}Sr in soil in the 200/600 Areas was 0.5 ± 0.2 pCi/g.

4.2.1.2.4 Plutonium-239/240. The highest $^{239/240}\text{Pu}$ result was found at site 18, located southwest of the 207-T Basin. The $^{239/240}\text{Pu}$ concentration was 12 ± 1 pCi/g, or 1,500 times greater than the distant community measured

Table 4-9. 200/600 Area Soils (pCi/g).

	^{60}Co		^{137}Cs		^{90}Sr		$^{239/240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
Maximum ± Counting Error	$0.03 \pm$ 0.01	Site 99	160 ± 16	Site 54	6.0 ± 1.0	Site 66	12 ± 1.0	Site 18	1.2 ± 0.1	Site 97	0.06 ± 0.02	Site 63	8.2 ± 0.7	Site 94
Average ± 2SEM	0.007 ± 0.001		4.6 ± 2.9		0.5 ± 0.2		0.2 ± 0.2		1.5 ± 0.13 total uranium					
PNL Distant Community Average ± 2SEM	NR		0.04 ± 0.03		0.04 ± 0.007		0.008 ± 0.00008		0.76 ± 0.17 total uranium					
Guide for posting SCA	5,000		20,000		600		75		100		15		50	

2SEM = 2 standard error of the mean.

SCA = Surface contamination area.

NR = Not reported.

concentration of 0.008 ± 0.00008 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of $^{239/240}\text{Pu}$ in soil in the 200/600 Areas was 0.2 ± 0.2 pCi/g.

4.2.1.2.5 Uranium. The highest total uranium was found at site 94, located near the 216-A-37-2 Crib. The uranium concentrations were 0.8 ± 0.1 pCi/g for ^{234}U , 0.03 ± 0.01 pCi/g for ^{235}U , and 8.2 ± 0.7 pCi/g for ^{238}U or 9 pCi/g uranium total. The concentration of ^{238}U was 10 times greater than the distant community concentration of 0.76 ± 0.17 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). Uranium 234 and ^{235}U were not reported by PNL. The average concentration for total uranium in soil in the 200/600 Areas was 1.5 ± 0.13 pCi/g.

4.2.1.3 300/400 Area. This was the second year of sampling from locations established to monitor the near-field in the 300/400 Areas. Soil samples from 15 sample locations were collected in 1992. Radionuclide concentrations are listed in Appendix E, Table E-4. Maximum, average, distant community, and DCG are compared in Table 4-10.

4.2.1.3.1 Cobalt-60. The highest ^{60}Co result that was above the overall counting error was found at site S-6, located northeast of 316-2 North Process Pond. The ^{60}Co concentration was 0.13 ± 0.06 pCi/g. The distant community concentration of ^{60}Co was not reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{60}Co in soil in the 300/400 Areas was 0.02 ± 0.02 pCi/g.

4.2.1.3.2 Cesium-137. The highest ^{137}Cs result was found at site S-1, located northeast of 618-4 Burial Ground. The ^{137}Cs concentration was 1.0 ± 0.2 pCi/g, or 2.3 times greater than the distant community measured concentration of 0.43 ± 0.03 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{137}Cs in soil in the 300/400 Areas was 0.3 ± 0.1 pCi/g.

Table 4-10. 300/400 Area Soil Sample (pCi/g).

	^{60}Co		^{137}Cs		^{90}Sr		$^{239/240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
Maximum ± Counting Error	$0.13 \pm$ 0.06	Site S-6	$1.0 \pm$ 0.2	Site S-1	$0.1 \pm$ 0.03	Site S-15	$0.07 \pm$ 0.007	Site S-4	$9.4 \pm$ 0.9	Site S-4	$0.41 \pm$ 0.06	Site S-4	$3.4 \pm$ 0.3	Site S-6
Average ± 2SEM	0.02 ± 0.02		0.3 ± 0.1		0.04 ± 0.02		0.02 ± 0.008		3.5 ± 2.1 total uranium					
PNL Distant Community average ± 2SEM	NR		0.43 ± 0.03		0.04 ± 0.007		0.008 ± 0.00008		0.76 ± 0.17 ^{238}U					
Guide for posting SCA	5,000		20,000		600		75		100		15		50	

2SEM = 2 standard error of the mean.

SCA = Surface contamination area.

NR = Not reported.

4.2.1.3.3 Strontium-90. The highest ^{90}Sr result was found at site S-15, located near the 400 Area Process Pond. The ^{90}Sr concentration was 1.0 ± 0.03 pCi/g, or 23 times greater than the distant community measured concentration of 0.04 ± 0.007 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{90}Sr in soil in the 300/400 Areas was 0.04 ± 0.02 pCi/g.

4.2.1.3.4 Plutonium-239/240. The highest $^{239/240}\text{Pu}$ result was found at site S-4, located northeast of 316-2 North Process Pond. The $^{239/240}\text{Pu}$ concentration was 0.07 ± 0.007 pCi/g, or 8 times greater than the distant community measured concentration of 0.008 ± 0.00008 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of $^{239/240}\text{Pu}$ in soil in the 300/400 Areas was 0.02 ± 0.008 pCi/g.

4.2.1.3.5 Uranium. The highest uranium result was found at site S-4, located northeast of 316-2 North Process Pond. The uranium concentrations were 9.4 ± 0.9 pCi/g for ^{234}U , 0.41 ± 0.06 pCi/g for ^{235}U , and 8.9 ± 0.9 pCi/g for ^{238}U or 19 pCi/g uranium total. The concentration of ^{238}U was 12 times greater than the distant community concentration of 0.76 ± 0.17 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). Uranium 234 and ^{235}U were not reported by PNL. The average concentration of total uranium in soil in the 300/400 Areas was 3.5 ± 2.1 pCi/g.

4.3 VEGETATION SAMPLING RESULTS, 1992

4.3.1 100 Area

Vegetation samples collected near the 1301-N LWDF contain radionuclides that were typically present in the effluent stream discharge. With the exception of the vegetation samples collected along the 100-N Area shoreline, the samples collected near the 1301-N facility exhibit relatively higher radionuclide concentrations than those collected at the other locations at 100-N. Average radionuclide concentrations detected in the vegetation samples near the 1301-N LWDF from 1980 through 1992 are presented in Table 4-11. Average radionuclide concentrations detected in the vegetation samples collected in the 100-N Area from 1980 through 1992 are presented in Table 4-12.

Vegetation samples collected along the 100-N Area shoreline (N Springs) contain radionuclides that were not completely retained in the soil columns beneath the 1301/1325-N LWDFs. Biotransport via root uptake of ^{60}Co , ^{90}Sr , and ^{137}Cs was evident in the reed canary grass and mulberry tree samples collected from this region. Most notable were the average levels of ^{90}Sr , which exhibited concentrations two to four orders of magnitude higher than the offsite average. Average radionuclide concentrations detected in the vegetation samples collected along the N Springs from 1980 through 1992 are presented in Table 4-13.

Table 4-11. Average Radionuclide Concentrations (pCi/g) Detected in Vegetation Samples Near the 1301-N Liquid Waste Disposal Facility from 1980 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1980	4.0 E+00	NR	1.1 E+00	NR	NR
1981	1.2 E+01	1.8 E+00	1.8 E+00	NR	7.1 E-03
1982	1.6 E+00	1.2 E-01	2.6 E-01	NR	2.6 E-03
1983	1.9 E+00	6.0 E-01	3.9 E-01	NR	3.2 E-03
1984	1.0 E+00	1.2 E-01	8.3 E-02	NR	8.5 E-04
1985	1.7 E+00	1.9 E+00	1.0 E-01	NR	1.5 E-03
1986	3.5 E+00	7.3 E-02	6.5 E-01	NR	2.6 E-03
1987	2.8 E+00	6.3 E-02	2.0 E-01	1.2 E-03	5.6 E-03
1988	2.0 E+00	1.2 E-01	1.3 E-01	4.3 E-04	1.7 E-03
1989	1.3 E+00	3.8 E-02	1.5 E-01	2.8 E-04	2.0 E-03
1990	1.3 E+00	3.1 E-02	1.2 E-01	2.7 E-04	1.1 E-03
1991	6.3 E-01	1.5 E-02	6.0 E-01	8.1 E-05	1.2 E-03
1992	2.0 E-01	6.5 E-03	2.0 E-01	<2.8 E-05	1.6 E-04

NR = Not reported.

Table 4-12. Average Radionuclide Concentrations (pCi/g) Detected in 100-N Vegetation Samples from 1980 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1980	1.0 E+00	NR	2.8 E-01	NR	NR
1981	2.5 E+01	5.8 E-01	7.1 E-01	NR	2.1 E-02
1982	1.5 E+00	2.0 E-01	1.3 E-01	NR	7.8 E-03
1983	1.0 E+00	2.9 E-01	9.0 E-02	NR	8.6 E-03
1984	4.6 E-01	8.1 E-02	9.0 E-02	NR	1.3 E-03
1985	1.4 E+00	5.1 E-02	1.6 E-01	NR	8.7 E-04
1986	9.5 E-01	2.2 E-01	7.9 E-01	NR	1.1 E-03
1987	7.0 E-01	2.6 E-01	9.4 E-02	1.3 E-04	5.7 E-04
1988	8.0 E-01	2.5 E-01	1.6 E-01	1.7 E-04	6.6 E-04
1989	3.2 E-01	6.8 E-02	1.5 E-01	1.1 E-04	8.7 E-04
1990	1.1 E-01	9.3 E-03	3.6 E-02	<9.6 E-05	1.7 E-04
1991	1.3 E-01	9.4 E-03	3.4 E-03	1.6 E-04	2.5 E-03
1992	5.6 E-02	5.6 E-02	7.8 E-02	<5.2 E-06	1.3 E-04

NR = Not reported.

Table 4-13. Radionuclide Concentrations (pCi/g) Detected in N Springs Vegetation Samples from 1980 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1980	5.6 E+00	NR	4.4 E-01	NR	NR
1981	3.3 E+00	2.0 E+02	NR	NR	3.7 E-03
1982	2.8 E+00	4.8 E+02	NR	NR	8.3 E-03
1983	3.0 E+00	3.3 E+02	4.0 E-02	NR	8.0 E-03
1984	NS	NS	NS	NS	NS
1985	1.2 E+00	4.2 E+02	1.7 E-01	NR	4.4 E-04
1986	1.1 E+00	2.2 E+02	2.1 E-01	NR	4.2 E-04
1987	9.0 E-01	2.9 E+02	1.1 E-01	<1.3 E-04	7.6 E-04
1988	1.4 E+00	1.2 E+02	2.0 E-01	8.5 E-05	2.0 E-04
1989	4.3 E-01	8.0 E+01	1.5 E-01	1.1 E-03	4.5 E-04
1990	NS	NS	NS	NS	NS
1991	1.5 E-01	3.1 E+01	1.6 E-01	1.2 E-04	2.9 E-03
1992	4.2 E-02	7.8 E+01	3.0 E-01	1.5 E-04	2.9 E-04

NR = Not reported.

NS = No sample results.

Environmental samples of vegetation collected near the retired 100 Area reactor facilities indicate levels of radionuclides generally comparable to the Hanford Site average concentrations. Average radionuclide concentrations detected in the vegetation samples collected in the retired 100 Areas from 1980 through 1992 are presented in Tables 4-14 through 4-18.

4.3.1.1 Cobalt-60. The highest ⁶⁰Co result was found at site N2, located southwest of 1301-N LWDF. The ⁶⁰Co concentration was 0.38 ± 0.10 pCi/g. The distant community average for ⁶⁰Co was not reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ⁶⁰Co in vegetation in the 100 Areas was 0.07 ± 0.03 pCi/g.

4.3.1.2 Cesium-137. The highest ¹³⁷Cs result was found at site NS1, located at the west end of N Springs and is the first of eight sample points beginning at the upstream location. The ¹³⁷Cs concentration was 1.1 ± 0.25 pCi/g, or 27 times greater than the distant community measured concentration of 0.001 ± 0.009 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ¹³⁷Cs in vegetation in the 100 Areas was 0.13 ± 0.62 pCi/g.

Table 4-14. Average Radionuclide Concentrations (pCi/g) Detected in 100-B/C Area Vegetation Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	3.6 E+00	NR	3.6 E-01	NR	NR
1982	1.9 E-01	NR	1.1 E-01	NR	NR
1983	1.8 E-01	NR	8.0 E-02	NR	NR
1984	1.3 E-01	1.4 E+00	8.7 E-02	2.4 E-04	6.0 E-04
1985	4.6 E-01	1.4 E+00	1.2 E-01	2.5 E-04	1.0 E-03
1986	2.5 E-01	2.0 E-01	2.8 E+00	2.5 E-05	6.2 E-04
1987	1.5 E-01	2.3 E-01	1.0 E-01	4.6 E-04	6.5 E-04
1988	3.5 E-01	2.6 E-01	2.1 E-01	1.4 E-04	3.1 E-04
1989	3.2 E-01	1.6 E-01	1.8 E-01	6.5 E-05	2.4 E-04
1990	4.5 E-02	9.1 E-02	6.7 E-02	<2.5 E-05	3.0 E-04
1991	5.7 E-02	8.3 E-02	1.8 E-01	2.9 E-05	1.1 E-03
1992	6.2 E-02	2.5 E-01	9.2 E-02	<6.0 E-05	<4.4 E-05

NR = Not reported.

Table 4-15. Average Radionuclide Concentrations (pCi/g) Detected in 100-D/DR Area Vegetation Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	1.2 E+00	NR	1.6 E-01	NR	NR
1982	1.1 E-01	NR	2.7 E+00	NR	NR
1983	9.5 E-02	NR	1.4 E-01	NR	NR
1984	2.1 E-01	2.8 E-01	1.7 E+00	1.8 E-03	5.8 E-04
1985	2.4 E-01	6.9 E-02	6.8 E-01	1.2 E-04	7.0 E-04
1986	2.7 E-01	1.5 E-01	1.7 E+00	NR	3.1 E-04
1987	2.5 E-01	9.5 E-02	6.3 E-01	1.6 E-04	2.8 E-04
1988	2.8 E-01	1.8 E-01	9.6 E-02	3.8 E-05	1.9 E-04
1989	2.6 E-01	1.5 E-01	2.8 E-01	9.6 E-05	1.2 E-04
1990	6.1 E-02	9.5 E-02	6.2 E-01	<2.4 E-05	2.6 E-04
1991	5.7 E-02	8.3 E-02	1.8 E-01	2.9 E-05	1.1 E-03
1992	4.8 E-02	5.8 E-02	2.3 E-02	<3.9 E-06	<8.1 E-05

NR = Not reported.

Table 4-16. Average Radionuclide Concentrations (pCi/g) Detected in 100-F Area Vegetation Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	9.2 E-01	NR	2.2 E+00	NR	NR
1982	1.6 E-01	NR	7.9 E-01	NR	NR
1983	2.8 E-01	NR	1.0 E+00	NR	NR
1984	2.2 E+00	7.6 E+00	2.0 E+01	4.9 E-04	3.9 E-03
1985	3.3 E-01	1.4 E+00	5.8 E-01	4.9 E-05	5.3 E-04
1986	1.7 E-01	9.3 E-02	1.1 E+00	8.3 E-05	1.2 E-04
1987	2.4 E-01	1.8 E-01	1.8 E-01	3.8 E-04	1.7 E-04
1988	9.9 E-01	8.9 E-02	3.1 E-01	3.3 E-05	1.1 E-04
1989	2.8 E-01	9.6 E-02	2.0 E+00	5.2 E-05	1.4 E-04
1990	5.0 E-02	2.7 E-01	4.2 E-01	<4.9 E-05	3.6 E-04
1991	8.2 E-02	2.9 E-01	3.8 E-01	2.9 E-05	7.0 E-03
1992	3.0 E-02	8.4 E-01	5.9 E-02	<2.5 E-05	3.1 E-04

NR = Not reported.

Table 4-17. Average Radionuclide Concentrations (pCi/g) Detected in 100-H Area Vegetation Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	6.8 E-01	NR	1.5 E-01	NR	NR
1982	NR	NR	NR	NR	NR
1983	1.3 E-01	NR	9.0 E-02	NR	NR
1984	1.8 E-01	2.0 E+00	1.3 E-01	2.0 E-04	1.7 E-03
1985	2.0 E-01	6.0 E-02	4.5 E-02	1.0 E-04	5.1 E-04
1986	2.2 E-01	5.3 E-01	1.3 E+00	1.3 E-04	4.4 E-05
1987	2.6 E-01	2.6 E-01	1.0 E-01	3.5 E-05	2.7 E-04
1988	9.0 E-01	3.9 E-01	1.5 E-01	2.0 E-04	1.5 E-04
1989	6.5 E-01	5.2 E-02	2.1 E-01	8.5 E-05	1.5 E-04
1990	<1.3 E-01	1.1 E-02	6.6 E-02	<1.4 E-04	3.0 E-04
1991	<2.8 E-02	5.7 E-02	3.0 E-02	4.5 E-05	5.7 E-04
1992	<2.0 E-02	6.7 E-02	<7.7 E-03	<1.5 E-06	<1.3 E-04

NR = Not reported.

Table 4-18. Average Radionuclide Concentrations (pCi/g) Detected in 100-K Area Vegetation Samples from 1981 to 1992.

Year	⁶⁰ Co	⁹⁰ Sr	¹³⁷ Cs	²³⁸ Pu	^{239,240} Pu
1981	1.2 E+00	NR	1.0 E-01	NR	NR
1982	2.4 E-01	NR	9.7 E-01	NR	NR
1983	1.5 E-01	NR	2.5 E-01	NR	NR
1984	1.8 E-01	1.3 E+00	1.3 E-01	2.9 E-04	6.9 E-04
1985	4.6 E-01	3.9 E-01	1.3 E-01	1.9 E-04	7.1 E-04
1986	2.8 E-01	4.0 E-01	1.5 E+00	2.5 E-04	7.9 E-04
1987	2.3 E-01	1.3 E+00	1.1 E-01	1.9 E-04	2.2 E-04
1988	4.9 E-01	1.2 E+00	1.8 E-01	5.2 E-05	3.8 E-04
1989	3.1 E-01	1.3 E+00	1.6 E-01	1.1 E-04	1.5 E-04
1990	4.5 E-02	8.0 E+00	4.1 E-02	<1.7 E-04	2.5 E-04
1991	6.3 E-02	4.1 E-01	7.6 E-02	5.2 E-05	5.9 E-04
1992	<4.2 E-02	5.3 E-01	3.8 E-02	<6.5 E-05	9.8 E-05

NR = Not reported.

4.3.1.3 Strontium-90. The highest ⁹⁰Sr result was found at the NS1 site, located at the west end of N Springs and is the first of eight sample points beginning at the upstream location. The ⁹⁰Sr concentration was 330 ± 60 pCi/g, or 40,000 times greater than the distant community measured concentration of 0.008 ± 0.012 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ⁹⁰Sr in vegetation in the 100 Areas was 18.0 ± 17.0 pCi/g.

4.3.1.4 Plutonium 239/240. The highest ^{239/240}Pu result was found at site F3, located at the south end of the 116-F-3 Trench near F Reactor. The ^{239/240}Pu concentration was 0.0012 ± 0.00069 pCi/g, or 12 times the distant community measured concentration of 0.0001 ± 0.000003 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{239/240}Pu in vegetation in the 100 Areas was 0.00023 ± 0.00007 pCi/g.

4.3.1.5 Uranium. The highest total uranium was found at site NS3, located near N Springs and is the third in a series of eight sample points. The uranium concentrations were 0.044 ± 0.0089 pCi/g for ²³⁴U, $<0.0023 \pm 0.0025$ pCi/g for ²³⁵U, and 0.032 ± 0.0072 pCi/g for ²³⁸U or 0.078 pCi/g uranium total. The concentration of ²³⁸U was 4 times the distant community concentration of 0.008 (2SEM not reported) pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). Uranium 234 and ²³⁵U were not reported by PNL. The average concentration for total uranium in vegetation in the 100 Areas was 0.0039 ± 0.036 pCi/g.

4.3.2 200/600 Area

This was the third year of sampling from locations established to more directly monitor facilities and active/inactive waste sites. In 1992, 40 vegetation samples were taken. Radionuclide concentrations for all sites sampled are listed in Table E-2. Table 4-23 lists the top highest ten vegetation analytical results and site identification number for all reported radionuclides. The following sections provide more detailed discussions of the highest results for specific radionuclides.

4.3.2.1 Cobalt-60. The highest ^{60}Co result above the counting error was found at site 95, located near the 216-A-30 Crib. The ^{60}Co concentration was 0.05 ± 0.03 pCi/g. The distant community concentration of ^{60}Co was not reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{60}Co in vegetation in the 200/600 Areas was 0.02 ± 0.004 pCi/g.

4.3.2.2 Cesium-137. The highest ^{137}Cs result was found at site 37, located southwest of UN-216-W-24. The ^{137}Cs concentration was 0.3 ± 0.08 pCi/g, or 300 times greater than the distant community measured concentration of 0.001 ± 0.009 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{137}Cs in vegetation in the 200/600 Areas was 0.07 ± 0.02 pCi/g.

4.3.2.3 Strontium-90. The highest ^{90}Sr result was found at site 2, located north of 216-S-16 Pond. The ^{90}Sr concentration was 0.5 ± 0.1 pCi/g, or 63 times greater than the distant community measured concentration of 0.008 ± 0.012 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{90}Sr in vegetation in the 200/600 Areas was 0.09 ± 0.03 pCi/g.

4.3.2.4 Plutonium-239/240. The highest $^{239/240}\text{Pu}$ result was found at site 105, located northwest of the 216-S-16 Pond. The $^{239/240}\text{Pu}$ concentration was 0.05 ± 0.006 pCi/g, or 500 times greater than the distant community measured concentration of 0.0001 ± 0.000003 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of $^{239/240}\text{Pu}$ in vegetation in the 200/600 Areas was 0.006 ± 0.004 pCi/g.

4.3.2.5 Uranium. The highest uranium result was found at site 85 located near UN-216-E-31. The uranium concentrations were 0.05 ± 0.02 pCi/g for ^{234}U , 0.008 ± 0.008 pCi/g for ^{235}U , and 0.03 ± 0.02 pCi/g for ^{238}U or 0.08 pCi/g total uranium. The ^{238}U concentration was 10 times greater than the distant community measured concentration of 0.008 (2SEM not reported) pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The concentrations of ^{234}U and ^{235}U were not reported. The average concentration of total uranium in vegetation in the 200/600 Areas was 0.02 ± 0.006 pCi/g.

4.3.3 300/400 Area

This was the second year of sampling from locations established to more directly monitor facilities and active/inactive waste sites. In 1992,

14 vegetation samples were taken. Radionuclide concentrations for all sites sampled are listed in Appendix E, Table E-9. The following sections provide more detailed discussions of the highest results for specific radionuclides.

4.3.3.1 Cobalt-60. All ^{60}Co results were less than the reported counting error. The highest ^{60}Co result was found at site V-7, located south of 316-7 Disposal Site. The ^{60}Co concentration was 0.1 ± 0.1 pCi/g. The distant community measured concentration for ^{60}Co was not reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{60}Co in vegetation in the 300/400 Areas was 0.04 ± 0.01 pCi/g.

4.3.3.2 Cesium-137. The highest ^{137}Cs result was found at site V-13, located north of the 618-9 Burial Ground. The ^{137}Cs concentration was 0.8 ± 0.2 pCi/g, or 810 times greater than the distant community measured concentration of 0.001 ± 0.009 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{137}Cs in vegetation in the 300/400 Areas was 0.10 ± 0.09 pCi/g.

4.3.3.3 Strontium-90. The highest ^{90}Sr result was found at site V-14, located north of 618-13 Burial Ground. The ^{90}Sr concentration was 0.3 ± 0.1 pCi/g, or 34 times greater than the distant community measured concentration of 0.008 ± 0.012 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of ^{90}Sr in vegetation in the 300/400 Areas was 0.03 ± 0.03 pCi/g.

4.3.3.4 Plutonium 239/240. The highest $^{239/240}\text{Pu}$ result was found at site V-13, located north of 618-9 Burial Ground. The $^{239/240}\text{Pu}$ concentration was 0.01 ± 0.002 pCi/g, or 90 times greater than the distant community measured concentration of 0.0001 ± 0.000003 pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The average concentration of $^{239/240}\text{Pu}$ in vegetation in the 300/400 Areas was 0.0012 ± 0.0012 pCi/g.

4.3.3.5 Uranium. The highest uranium result was found at site V-13, located north of the 618-9 Burial Ground. The uranium concentrations were 0.14 ± 0.04 pCi/g of ^{234}U , 0.01 ± 0.009 pCi/g of ^{235}U , and 0.16 ± 0.04 pCi/g of ^{238}U or 0.31 pCi/g total uranium. The ^{238}U concentration was 10 times greater than the distant community measured concentration of 0.008 (2SEM not reported) pCi/g reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). The concentrations of ^{234}U and ^{235}U were not reported. The average concentration of total uranium in vegetation in the 300/400 Areas was 0.09 ± 0.04 pCi/g.

4.4 CONCLUSIONS

The impact of past and current operations on the near-field environment, although above the distant community measured concentrations as measured and reported by PNL, were well below the guide for posting surface contamination used by WHC (Tables 4-8 through 4-10 and 4-19 through 4-21). Trending of the

Table 4-19. 100 Area Vegetation (pCi/g).

	⁶⁰ Co		¹³⁷ Cs		⁹⁰ Sr		^{239/240} Pu		²³⁴ U		²³⁵ U		²³⁸ U	
Maximum ± Counting Error	0.38 ± 0.10	Site N2	1.1 ± 0.25	Site NS1	330 ± 60	Site NS1	0.0012 ± 0.00069	Site F3	0.044 ± 0.0089	Site NS3	<0.0023 ± 0.0025	Site NS3	0.032 ± 0.0072	Site NS3
Average ± 2SEM	0.07 ± 0.03		0.13 ± 0.62		18.0 ± 17.0		0.00023 ± 0.00007		total uranium 0.0039 ± 0.036					
PNL Distant Community Average ± 2SEM	NR		0.001 ± 0.009		0.008 ± 0.012		0.0001 ± 0.000003		0.008 ± (2SEM NR) ²³⁸ U					
Guide for posting SCA	5,000		20,000		600		75		100		15		50	

NR = Not Reported.

2SEM = 2 standard error of the mean.

SCA = Surface contamination area.

Table 4-20. 200 Area Vegetation (pCi/g).

	⁶⁰ Co		¹³⁷ Cs		⁹⁰ Sr		^{239/240} Pu		²³⁴ U		²³⁵ U		²³⁸ U	
Maximum	0.05 ± 0.03	Site 95	0.3 ± 0.08	Site 37	0.5 ± 0.1	Site 2	0.05 ± 0.006	Site 105	0.05 ± 0.02	Site 85	0.008 ± 0.007	Site 85	0.05 ± 0.02	Site 92
Average ± 2SEM	0.02 ± 0.004		0.07 ± 0.02		0.09 ± 0.03		0.008 ± 0.004		0.02 ± 0.006 total uranium					
PNL Distant Community Average ± 2SEM	NR		0.001 ± 0.009		0.008 ± 0.012		0.0001 ± 0.000003		0.008 ± (2SEM NR) ²³⁸ U					
Guide for posting surface contamination	5,000		20,000		600		75		100		15		50	

NR = Not Reported.

2SEM = 2 standard error of the mean.

SCA = Surface contamination area.

Table 4-21. 300/400 Area Vegetation (pCi/g).

	⁶⁰ Co		¹³⁷ Cs		⁹⁰ Sr		^{239/240} Pu		²³⁴ U		²³⁵ U		²³⁸ U	
Maximum	0.1 ± 0.1	Site V-07	0.8 ± 0.2	Site V-13	0.3 ± 0.1	Site V-14	0.01 ± 0.002	Site V-1	0.1 ± 0.04	Site V-13	0.01 ± 0.009	Site V-13	0.16 ± 0.04	Site V-13
Average ± 2SEM	0.04 ± 0.01		0.10 ± 0.09		0.03 ± 0.03		0.0012 ± 0.0012		0.09 ± 0.04 total uranium					
PNL distant community measured Average	NR		0.001 ± 0.009		0.008 ± 0.012		0.0001 ± 0.000003		0.008 ± (2SEM NR) ²³⁸ U					
Guide for posting surface contamination	5,000		20,000		600		75		100		15		50	

NR = Not Reported.

2SEM = 2 standard error of the mean.

SCA = Surface contamination area.

average concentrations, contained in the Executive Summary of this report, indicate the decrease in concentrations of certain radionuclides. As the data show, the concentrations have a large degree of variance. In general, the samples collected on or directly adjacent to the waste disposal facilities had significantly higher concentrations of radionuclides than those further away. The data also show, as expected, that certain radionuclides had higher concentrations within different operating areas. Generally speaking, the predominant radionuclides are: activation products/gamma emitters in the 100 Areas, fission products in the 200/600 Areas, and uranium in the 300 Areas. No changes in facility or waste site operations were deemed necessary as a result of the data acquired through this year's monitoring program.

Table 4-22. Top Ten 200/600 Area Soil Sample Results, 1992. (sheet 1 of 2)

Site	⁶⁰ Co			Site	¹³⁷ Cs			Site	¹³⁴ Cs		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
99	3.3 E-02	+/-	1.5 E-02	54	1.6 E+02	+/-	1.6 E+01	85	1.3 E-02	+/-	1.1 E-02
29	2.5 E-02	+/-	1.6 E-02	58	5.0 E+01	+/-	5.0 E+00	5	1.1 E-02	+/-	8.7 E-03
27	2.0 E-02	+/-	1.2 E-02	73	4.0 E+01	+/-	4.0 E+00	8	*8.4 E-03	+/-	9.1 E-03
38	2.0 E-02	+/-	9.5 E-03	66	2.8 E+01	+/-	2.8 E+00	89	*7.9 E-03	+/-	9.2 E-03
54	*1.9 E-02	+/-	1.9 E-02	33	2.7 E+01	+/-	2.7 E+00	33	*7.7 E-03	+/-	1.8 E-02
42	1.6 E-02	+/-	1.2 E-02	29	2.2 E+01	+/-	2.2 E+00	92	*7.4 E-03	+/-	8.9 E-03
39	1.5 E-02	+/-	1.3 E-02	37	1.2 E+01	+/-	1.2 E+00	23	*6.8 E-03	+/-	1.1 E-02
22	1.5 E-02	+/-	1.2 E-02	39	1.1 E+01	+/-	1.1 E+00	83	*6.4 E-03	+/-	8.3 E-03
44	1.4 E-02	+/-	1.3 E-02	30	1.1 E+01	+/-	1.1 E+00	59	*6.3 E-03	+/-	1.0 E-02
95	1.4 E-02	+/-	9.9 E-03	34	8.9 E+00	+/-	8.9 E-01	71	*6.1 E-03	+/-	7.7 E-03

*Result was less than the reported overall analytical error.

Site	¹⁰⁶ Ru			Site	¹²⁵ Sb			Site	¹⁵⁵ Eu		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
66	2.4 E-01	+/-	2.3 E-01	4	6.6 E-02	+/-	4.9 E-02	54	*2.2 E-01	+/-	2.9 E-01
56	1.8 E-01	+/-	9.5 E-02	30	6.2 E-02	+/-	5.8 E-02	67	9.6 E-02	+/-	4.8 E-02
80	1.4 E-01	+/-	1.2 E-01	25	5.0 E-02	+/-	3.7 E-02	21	9.1 E-02	+/-	4.8 E-02
4	1.3 E-01	+/-	1.2 E-01	74	4.7 E-02	+/-	4.3 E-02	107	9.0 E-02	+/-	3.2 E-02
54	*1.3 E-01	+/-	8.6 E-01	58	*4.7 E-02	+/-	1.5 E-01	85	8.7 E-02	+/-	3.8 E-02
101	*1.3 E-01	+/-	1.3 E-01	37	*4.2 E-02	+/-	6.0 E-02	47	8.4 E-02	+/-	5.4 E-02
21	1.2 E-01	+/-	1.2 E-01	99	4.0 E-02	+/-	3.3 E-02	20	8.2 E-02	+/-	5.0 E-02
60	*1.1 E-01	+/-	1.4 E-01	51	3.9 E-02	+/-	2.8 E-02	56	7.8 E-02	+/-	3.1 E-02
32	*1.1 E-01	+/-	1.1 E-01	105	3.8 E-02	+/-	3.0 E-02	32	7.8 E-02	+/-	4.2 E-02
29	*1.1 E-01	+/-	1.6 E-01	71	3.7 E-02	+/-	2.3 E-02	23	6.8 E-02	+/-	4.1 E-02

*Result was less than the reported overall analytical error.

Table 4-22. Top Ten 200/600 Area Soil Sample Results, 1992. (sheet 2 of 2)

Site	¹⁵⁴ Eu			Site	^{239/240} Pu			Site	⁹⁰ Sr		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
31	5.2 E-02	+/-	4.0 E-02	18	1.2 E+01	+/-	1.2 E+00	66	6.0 E+00	+/-	1.2 E+00
46	4.9 E-02	+/-	3.1 E-02	39	1.5 E+00	+/-	1.5 E-01	58	4.9 E+00	+/-	9.4 E-01
18	4.7 E-02	+/-	2.9 E-02	25	1.1 E+00	+/-	1.2 E-01	73	3.8 E+00	+/-	7.5 E-01
77	3.8 E-02	+/-	3.0 E-02	105	6.6 E-01	+/-	7.2 E-02	64	2.4 E+00	+/-	5.7 E-01
83	3.6 E-02	+/-	3.1 E-02	107	4.6 E-01	+/-	4.8 E-02	39	2.4 E+00	+/-	4.5 E-01
53	3.6 E-02	+/-	3.5 E-02	32	3.4 E-01	+/-	3.8 E-02	59	2.3 E+00	+/-	4.5 E-01
4	*3.2 E-02	+/-	3.7 E-02	26	3.2 E-01	+/-	4.1 E-02	65	1.9 E+00	+/-	3.5 E-01
42	*3.0 E-02	+/-	3.9 E-02	103	2.8 E-01	+/-	4.1 E-02	54	1.8 E+00	+/-	3.1 E-01
21	*2.8 E-02	+/-	4.9 E-02	24	2.7 E-01	+/-	3.0 E-02	33	1.7 E+00	+/-	3.4 E-01
22	*2.8 E-02	+/-	3.8 E-02	29	2.5 E-01	+/-	3.7 E-02	34	1.6 E+00	+/-	3.1 E-01

*Result was less than the reported overall analytical error.

Site	²³⁴ U			Site	²³⁵ U			Site	²³⁸ U		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
97	1.3 E+00	+/-	1.4 E-01	63	6.1 E-02	+/-	2.0 E-02	94	8.2 E+00	+/-	7.8 E-01
63	1.2 E+00	+/-	1.4 E-01	99	5.8 E-02	+/-	1.7 E-02	47	1.2 E+00	+/-	1.3 E-01
47	1.1 E+00	+/-	1.3 E-01	70	5.5 E-02	+/-	2.0 E-02	97	1.2 E+00	+/-	1.3 E-01
70	1.1 E+00	+/-	1.3 E-01	47	4.6 E-02	+/-	1.5 E-02	63	1.2 E+00	+/-	1.4 E-01
27	1.0 E+00	+/-	1.3 E-01	66	4.5 E-02	+/-	2.5 E-02	27	1.2 E+00	+/-	1.4 E-01
99	1.0 E+00	+/-	1.2 E-01	97	4.4 E-02	+/-	1.5 E-02	70	1.0 E+00	+/-	1.3 E-01
110	1.0 E+00	+/-	1.2 E-01	44	4.3 E-02	+/-	1.9 E-02	14	9.4 E-01	+/-	1.1 E-01
14	1.0 E+00	+/-	1.2 E-01	72	4.2 E-02	+/-	2.0 E-02	92	9.4 E-01	+/-	1.1 E-01
92	9.5 E-01	+/-	1.1 E-01	27	4.0 E-02	+/-	1.6 E-02	99	9.2 E-01	+/-	1.1 E-01
78	9.4 E-01	+/-	1.2 E-01	92	3.9 E-02	+/-	1.4 E-02	78	9.0 E-01	+/-	1.1 E-01

*Result was less than the reported overall analytical error.

Table 4-23. Top Ten Vegetation Sample Results, 1992. (sheet 1 of 2)

Site	⁶⁰ Co			Site	¹³⁷ Cs			Site	¹³⁴ Cs		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
25	*5.8 E-02	+/-	6.2 E-02	37	3.0 E-01	+/-	8.3 E-02	25	*4.4 E-02	+/-	4.5 E-02
95	4.7 E-02	+/-	2.7 E-02	92	2.5 E-01	+/-	4.1 E-02	95	2.7 E-02	+/-	2.2 E-02
2	4.3 E-02	+/-	4.0 E-02	59	2.4 E-01	+/-	4.4 E-02	9	*2.3 E-02	+/-	2.8 E-02
41	*4.1 E-02	+/-	6.3 E-02	101	2.2 E-01	+/-	4.4 E-02	32	*1.5 E-02	+/-	3.5 E-02
85	2.6 E-02	+/-	2.2 E-02	55	1.3 E-01	+/-	3.0 E-02	50	1.4 E-02	+/-	1.7 E-02
100	2.6 E-02	+/-	1.8 E-02	95	1.3 E-01	+/-	4.8 E-02	59	*1.4 E-02	+/-	1.7 E-02
34	*2.0 E-02	+/-	4.8 E-02	44	1.2 E-01	+/-	4.7 E-02	98	*1.4 E-02	+/-	2.0 E-02
90	*1.8 E-02	+/-	2.4 E-02	41	1.0 E-01	+/-	5.5 E-02	82	*1.2 E-02	+/-	1.6 E-02
99	*1.8 E-02	+/-	2.8 E-02	43	7.8 E-02	+/-	3.7 E-02	100	*1.1 E-02	+/-	1.8 E-02
101	*1.4 E-02	+/-	2.0 E-02	2	7.7 E-02	+/-	4.1 E-02	88	*9.8 E-03	+/-	1.7 E-02

*Result was less than the reported overall analytical error.

Site	¹⁰⁶ Ru			Site	¹²⁵ Sb			Site	¹⁵⁵ Eu		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
9	*2.0 E-01	+/-	2.3 E-01	106	*5.0 E-02	+/-	5.3 E-02	41	*9.9 E-02	+/-	1.3 E-01
88	1.8 E-01	+/-	1.7 E-01	99	*4.9 E-02	+/-	5.3 E-02	43	*8.5 E-02	+/-	9.5 E-02
37	*1.7 E-01	+/-	3.6 E-01	110	*3.7 E-02	+/-	5.2 E-02	9	7.3 E-02	+/-	7.1 E-02
90	*1.4 E-01	+/-	2.2 E-01	41	*3.7 E-02	+/-	1.2 E-01	90	5.8 E-02	+/-	5.4 E-02
25	*1.1 E-01	+/-	5.3 E-01	83	*3.3 E-02	+/-	5.6 E-02	78	5.3 E-02	+/-	4.3 E-02
43	*1.1 E-01	+/-	3.0 E-01	79	*2.7 E-02	+/-	4.3 E-02	37	*4.1 E-02	+/-	1.2 E-01
106	*9.3 E-02	+/-	2.0 E-01	96	*2.7 E-02	+/-	4.6 E-02	98	*3.7 E-02	+/-	5.3 E-02
102	*8.6 E-02	+/-	1.9 E-01	92	*2.5 E-02	+/-	5.8 E-02	67	*2.8 E-02	+/-	5.2 E-02
82	*7.3 E-02	+/-	1.5 E-01	32	*2.5 E-02	+/-	8.5 E-02	79	*2.5 E-02	+/-	4.9 E-02
84	*6.6 E-02	+/-	2.0 E-01	84	*2.1 E-02	+/-	5.8 E-02	85	*2.4 E-02	+/-	4.5 E-02

*Result was less than the reported overall analytical error.

Table 4-23. Top Ten Vegetation Sample Results, 1992. (sheet 2 of 2)

Site	¹⁵⁴ Eu			Site	^{239/240} Pu			Site	⁹⁰ Sr		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
7	*1.0 E-01	+/-	1.6 E-01	105	5.1 E-02	+/-	5.7 E-03	2	5.2 E-01	+/-	1.0 E-01
2	*8.2 E-02	+/-	1.3 E-01	34	4.2 E-02	+/-	6.2 E-03	9	3.1 E-01	+/-	6.2 E-02
25	*7.8 E-02	+/-	2.0 E-01	2	3.3 E-02	+/-	4.7 E-03	67	2.2 E-01	+/-	5.4 E-02
100	7.8 E-02	+/-	6.0 E-02	37	2.7 E-02	+/-	3.4 E-03	34	1.8 E-01	+/-	3.7 E-02
50	7.3 E-02	+/-	6.6 E-02	9	1.2 E-02	+/-	2.0 E-03	92	1.7 E-01	+/-	3.6 E-02
88	*6.6 E-02	+/-	7.0 E-02	32	1.1 E-02	+/-	2.0 E-03	97	1.4 E-01	+/-	3.0 E-02
90	*5.4 E-02	+/-	9.0 E-02	43	1.1 E-02	+/-	2.0 E-03	101	1.4 E-01	+/-	2.7 E-02
48	*5.2 E-02	+/-	1.5 E-01	44	6.8 E-03	+/-	1.6 E-03	105	1.3 E-01	+/-	2.7 E-02
105	*5.2 E-02	+/-	7.6 E-02	92	4.2 E-03	+/-	1.2 E-03	37	1.2 E-01	+/-	2.6 E-02
92	*4.7 E-02	+/-	8.7 E-02	106	4.1 E-03	+/-	7.9 E-04	90	1.2 E-01	+/-	2.4 E-02

*Result was less than the reported overall analytical error.

Site	²³⁴ U			Site	²³⁵ U			Site	²³⁸ U		
	Result	+/-	Counting error		Result	+/-	Counting error		Result	+/-	Counting error
85	4.6 E-02	+/-	2.0 E-02	85	*8.0 E-03	+/-	8.8 E-03	92	4.7 E-02	+/-	2.0 E-02
92	4.6 E-02	+/-	2.0 E-02	90	*2.3 E-03	+/-	6.7 E-03	85	2.7 E-02	+/-	1.5 E-02
90	3.4 E-02	+/-	1.7 E-02	98	*1.8 E-03	+/-	2.9 E-03	94	1.6 E-02	+/-	7.3 E-03
82	1.9 E-02	+/-	5.8 E-03	99	*6.7 E-04	+/-	2.6 E-03	100	1.6 E-02	+/-	6.2 E-03
95	1.9 E-02	+/-	6.3 E-03	55	*4.4 E-04	+/-	1.6 E-03	82	1.4 E-02	+/-	4.6 E-03
81	1.9 E-02	+/-	5.1 E-03	50	*2.6 E-04	+/-	1.5 E-03	99	1.3 E-02	+/-	7.1 E-03
59	1.7 E-02	+/-	7.7 E-03	97	*1.1 E-04	+/-	2.4 E-03	90	1.3 E-02	+/-	1.1 E-02
99	1.6 E-02	+/-	8.2 E-03	88	*3.7 E-05	+/-	1.8 E-03	81	1.2 E-02	+/-	4.0 E-03
100	1.3 E-02	+/-	6.0 E-03	82	*-5.8 E-05	+/-	1.8 E-03	97	1.2 E-02	+/-	5.9 E-03
94	1.3 E-02	+/-	7.0 E-03	81	*-5.9 E-05	+/-	1.8 E-03	59	1.2 E-02	+/-	6.2 E-03

*Result was less than the reported overall analytical error.

5.0 EXTERNAL RADIATION MONITORING

5.1 INTRODUCTION

A network of thermoluminescent dosimeters (TLD) was positioned in and around the 100, 200/600, and 300/400 Areas to monitor exposure rates from external radiation sources (primarily gamma rays). The TLD measurements were taken to determine baseline exposure rates in the operations area environment. From these baseline data, the contribution of Hanford Site activities can be discerned and the potential dose to employees caused by external exposure can be assessed.

The environmental TLDs measure exposure rates from all types of external radiation sources. These include cosmic radiation, naturally occurring radioactivity in air and soil, and fallout from nuclear weapons testing, as well as any contribution from Hanford Site activities. The results are reported in units of mrem/yr.

The TLDs consist of four LiF (TLD-700) and one CaF_2Dy (TLD-200) chips in a plastic card. Each card was placed in a translucent, waterproof, plastic holder; three cards were mounted about 1 m (3 ft) aboveground at each location. The TLDs were placed at active and inactive surface-water disposal sites, and near facilities (tank farms, active cribs, and the facility fence lines). The TLDs were exchanged and read each calendar quarter. Each quarterly measurement is an average of the three cards exposed at the same location. The PNL Radiation Calibration Laboratory has calibrated the response of the chips; results were reported in terms of external exposure (mrem).

5.2 RESULTS

5.2.1 100 Area

The 1992 TLD results indicate that the ALARA exposure guidelines for nonradiation zone workers (240 mrem/yr) were not exceeded in any nonradiologically controlled area and there continues to be an apparent, overall decreasing trend in dose rates at these locations.

Direct radiation levels were predictably higher near facilities that had contained or received liquid effluent from N Reactor. These facilities included the 1325-N LWDF, the 1301-N LWDF, and the 1304-N Emergency Dump Tank.

The average environmental dose rates measured near the 1325-N LWDF in 1992 were approximately 3 percent lower than the 1991 levels.

Dose rates measured near the 1301-N LWDF in 1992 showed an annual average decrease of approximately 6 percent compared to 1991 levels. This decline at both the 1301-N and 1325-N LWDFs represents a continuing trend of decreased dose rates at these facilities, primarily due to the decay of ^{60}Co (5.3-yr half life).

Dose rates measured near the 1304-N EDT (sites 7 and 29) in 1992 were approximately 7 percent lower than the 1991 levels. A figure showing these sites can be found in Appendix F.

Dose rates were measured at the N Springs shoreline to determine potential external radiation doses to the public as well as to a Hanford worker. Because of the "skyshine" effect from the 1301-N LWDF, dose rates at the N Springs were elevated above 100 mrem/yr, the DOE annual external dose limit to members of the public. However, neither a member of the public nor a Hanford worker would conceivably spend an entire year at the N Springs; therefore, the values shown in Figure 5-1 are for comparison purposes only. N Springs dose reduction measures are currently being studied (Table 5-1).

5.2.2 200/600 Area

The 1992 TLD results for the 200/600 Area indicated that the ALARA exposure guidelines for nonradiation zone workers (240 mrem/yr) were exceeded in 3 cases. These sites were located on the fenceline of the 241-A Tank Farm complex in areas under access control and were not accessible by nonradiation zone workers. These elevated levels were localized and few in number and therefore have minimal impact.

5.2.2.1 External Radiation Trends 200/600 Area. Table 5-2 shows a comparison of 1992 TLD results to 1991. Results indicated that operations in the 200/600 Areas did not contribute significantly to the external radiation exposure rates of the general working environment. As a result of some increases seen near waste handling facilities, such as the 241-A Tank Farm Complex, the overall annual dose rate in the 200 Areas showed a 5 percent increase from 1991 to 1992. Consequently, the exposure rate in the general 200 Areas environment was not significantly different from the exposure rate received offsite from natural radiation sources. As expected, external radiation levels were elevated at certain sites, radiological control areas, and facilities, reflecting the proximity to radioactive waste management activities.

5.2.3 300/400 Area

This was the second year of external radiation monitoring in the 300/400 Areas. The 1992 TLD results for the 300/400 Areas indicated that the ALARA exposure guidelines for nonradiation workers (240 mrem/yr) were exceeded in 1 case. This site was located near the 340 Facility gate, which was not accessible to nonradiation zone workers. This site has varying dose rates from the loading and storage of radioactive waste prior to shipment to the 200 Areas for disposal. This elevated level was localized and therefore has very little impact.

5.2.3.1 External Radiation Trends 300/400 Area. This was the second year of external radiation monitoring of operations in the 300/400 Areas, the results are compared to those from the previous year. This comparison indicates that the 300/400 Areas did not contribute significantly to the external radiation exposure rates of the general working environment. Consequently, the exposure

Figure 5-1. Annual Average Dose at N Springs.

H9305012.1

Table 5-1. 100 Area Thermoluminescent Dosimeter Exposure Result (mrem/yr).

Site	1991 Average	1992 Average	92 vs 91 % change	1301-N	92 vs 91 % change
1	1300	1360	5%	1	5%
2	1220	1180	-3%	2	-3%
3	510	460	-10%	3	-10%
4	2240	1950	-13%	4	-13%
5	750	670	-11%	5	-11%
6	260	240	-8%	6	-8%
7	1220	1080	-11%	15	-11%
8	70	60	-14%	18	-14%
9	80	80	0%	22	0%
10	60	60	0%	32	0%
11	70	70	0%	33	0%
12	80	80	0%	Average	-6%
13	120	120	0%	1325-N	92 vs 91 % change
14	390	430	10%		
15	940	900	-4%		
16	280	270	-4%		
17	40	40	0%	30	-15%
18	1120	1300	16%	34	26%
19	50	50	0%	35	-7%
20	50	60	20%	36	-14%
21	390	420	8%	Average	-3%
22	590	600	2%		
23	40	40	0%		
24	50	50	0%		
25	70	70	0%		
26	260	250	-4%		
27	80	80	0%		
28	270	260	-4%		
29	2340	2210	-6%		
30	9150	7740	-15%		
31	250	490	96%		
32	310	200	-35%		
33	240	320	33%		
34	8560	10770	26%		
35	14260	13280	-7%		
36	440	380	-14%		
37	210	360	71%		
38	220	120	-45%		
39	210	200	-5%		
40	310	310	0%		
41	420	400	-5%		
Average	1210	1200	-1%		

Sites identified in Figure F-1, Appendix F.

Table 5-2. 200/600 Area Thermoluminescent Dosimeter Exposure Results (mrem/yr).

Site	1991 Average	1992 Average	92 vs 91 % change	Site	1991 Average	1992 Average	92 vs 91 % change
202	92	98	6%	233	110	109	-1%
203	95	101	7%	234	120	106	-12%
204	132	137	3%	235	102	102	0%
205	87	94	8%	236	97	99	2%
206	81	101	24%	237	114	118	4%
207	84	97	15%	238	100	101	2%
208	187	186	-1%	239	97	99	2%
209	91	97	6%	240	99	100	1%
210	138	145	5%	241	109	114	4%
211	94	104	10%	242	91	96	6%
212	95	98	4%	243	94	96	2%
213	91	97	6%	244	100	95	-6%
214	86	101	18%	245	96	103	7%
215	90	101	12%	246	95	99	4%
216	91	100	10%	247	102	108	6%
217	95	99	4%	249	304	249	-18%
218	93	101	9%	250	143	146	2%
219	97	100	3%	251	125	130	4%
220	102	104	2%	252	115	115	0%
221	98	107	9%	253	106	105	-1%
222	90	97	8%	254	109	117	8%
223	107	112	5%	255	120	126	5%
224	100	107	7%	256	836	702	-16%
225	130	135	4%	258	195	465	139%
226	93	93	1%	259	133	145	9%
227	86	90	5%	260	145	142	-2%
228	88	92	5%	261	110	120	9%
229	105	108	3%	262	94	96	2%
230	133	154	16%	263	102	113	11%
231	101	113	12%	264	103	110	7%
232	102	104	2%				
				AVG	121	127	5%

Sites identified in Figure F-1, Appendix F.

rate in the general 300/400 Area environment was not significantly different from the exposure rate received offsite from natural radiation sources. As expected, radiation levels were elevated at certain waste sites, radiological control areas, and facilities, reflecting the proximity to radioactive waste management activities.

Table 5-3. 300/400 Area Thermoluminescent Dosimeter Results (1991 and 1992).

Site	1991 Average	1992 Average	92 vs 91 % change
1	90	90	-2%
2	90	90	-4%
3	100	90	-8%
4	160	140	-11%
5	90	80	-12%
6	110	110	0%
7	720	610	-16%
8	100	100	2%
9	80	70	-17%
10	190	90	-53%
11	130	110	-19%
12	90	80	-5%
13	80	90	6%
14	80	90	5%
15	100	90	-6%
Average	150	130	-13%

Sites identified in Figure F-1, Appendix F.

6.0 SURFACE WATER DISPOSAL UNITS AND SEEPAGES

6.1 INTRODUCTION

Water, vegetation, and sediment samples were collected from the active ponds, ditches, and N Springs in 1992. Springs, ponds, and ditches in the 100, 200/600, and 300/400 Areas receive wastewater from the chemical processing plants and other facilities. All water was sampled at the point of discharge to ensure compliance with internal company standards and applicable DOE standards. As an additional operational check, the WHC OEMP collects water samples at the ponds and ditches. Sampling locations are shown in Appendix G, Figures G-1 and G-2. Sources of liquid effluents are listed in Table G-1.

Water samples of 1 L were collected on a weekly basis from the active ponds and ditches. The pH was determined each week, then the samples were composited and analyzed monthly for gross alpha, gross beta, gamma-emitting radionuclides, and ^{90}Sr . Each site has replicate samples taken for 1 month (4 weeks), on a rotating basis. Additionally, a 1-L sample was taken quarterly from each site for nitrate analysis and ^3H analysis. Samples of aquatic vegetation were collected from ponds and ditches yearly to determine root uptake of radionuclides from potentially contaminated sediments. Along with vegetation samples, sediment samples were collected to measure the accumulation of radionuclides. These samples consist of a composite of five plugs, each 900 cm^2 by 2.5-cm-deep. The vegetation and sediments were analyzed for gamma-emitting radionuclides ^{90}Sr , ^{239}Pu , and U.

6.2 RESULTS

6.2.1 Water

6.2.1.1 100 Areas. Seepage wells and groundwater seepages along the 100-N Area shoreline (N Springs) were sampled to verify that the reported radionuclide releases to the Columbia River via the N Springs were credible. Release reporting utilizes conservatively based radionuclide concentrations, multiplied by the estimated groundwater flow into the river. By characterizing the radionuclide concentrations in the seeps along the entire shoreline from 100-N Area downstream to 100-D Area, the results can be compared to the radionuclide concentrations measured in the effluent monitoring well, N-8T. Historically, the highest concentrations of radionuclides have been shown to be in the area of the N-8T Well, and these biased concentrations were applied to the entire N Springs discharge region, thereby providing conservatively high release values.

With the shutdown of N Reactor in January 1987 and the resultant decreased effluent flow to the 1325-N LWDF, concentrations of most of the radionuclides that were typically present in the N Springs discharge during reactor operation have significantly decreased. Exceptions to this were the levels of tritium and ^{90}Sr . Figures 6-1 and 6-2 (respectively) represent the historic concentrations of these radionuclides from samples collected from the

Figure 6-1. N Springs Shoreline Tritium Concentrations 1987-1992.

Figure 6-2. N Springs Shoreline ⁹⁰Sr Concentrations 1985-1992.

N Springs shoreline wells, including Well N-8T. Since 1986, ⁹⁰Sr concentrations have exceeded the DOE DCG values only in the sample locations in the vicinity of N-8T. Due to river fluctuations and groundwater discharge rates, some wells may not have been sampled and, therefore, results are not shown in Figures 6-1 and 6-2.

Samples were collected on October 9 during a low river stage. Six of the thirteen shoreline wells were dry and could not be sampled. The remaining seven wells exhibited radionuclide concentrations markedly lower than those of previous years. The characterization profile indicates that the N-8T Well continues to monitor the N Springs discharge in the region of highest conservatism.

6.2.1.2 200/600 Area. Water, sediment, and aquatic vegetation samples were collected from 10 sample locations from active ponds and ditches located in the 200/600 Areas. Ponds and ditches in the 200/600 Area receive potentially contaminated wastewater from the chemical processing plants and other facilities. All water is sampled continuously at the point of discharge to ensure compliance with internal company standards and applicable DOE standards. As an additional check, the OEMP collects water samples at the ponds and ditches used to dispose of this wastewater. All potentially contaminated wastewaters are disposed to ditches or ponds that are controlled areas.

Radioanalytical results from water sampling of ponds and ditches are summarized in Appendix G. The sampling point for the active portion of the 216-U-14 ditch was relocated because of stabilization of the lower portion. This new sampling point resulted in the highest gross alpha and beta results for all sample points. This new sample location is in a more radioactively contaminated area and will be closely monitored.

6.2.1.3 300/400 Area. Currently, no surface water was sampled in the 300 Area. Sampling of the 400 Area process pond is sampled by PNL and reported in the Hanford Site Environmental Report. To avoid duplication of effort the data is shared with WHC upon validation by PNL.

6.2.2 Nonradiological Parameters

6.2.2.1 100 Area. There were no samples analyzed for nonradioactive parameters in the 100 Area during 1992.

6.2.2.2 200/600 Area. Results of pH determinations are summarized in Appendix G, Table G-3 and nitrate determinations are summarized in Appendix G, Table G-4. The pH annual averages ranged from neutral to slightly basic. The highest annual average pH of 8.1 was found at the 216-B-3 Pond 3rd overflow and the east Powerhouse Ditch. All of the nitrate results were less than the detection limit (approximately 1.4 mg/L) except for the 216-T-4 ditch where a maximum nitrate level of 3.9 mg/L was detected in one quarterly sample. This was well below the Drinking Water Standard 40 CFR 141 for nitrates (45 mg/L).

6.2.2.3 300/400 Area. Currently, no surface water is sampled in the 300 Area. Sampling of the 400 Area process pond is sampled by PNL and reported in the Hanford Site Environmental Report. To reduce duplication of effort the data is shared with WHC upon validation by PNL.

6.2.3 Aquatic Vegetation

6.2.3.1 100 Area. There were no aquatic vegetation samples analyzed in the 100 Area during 1992.

6.2.3.2 200/600 Area. Aquatic vegetation samples are collected from ponds and ditches that have growing aquatic vegetation. Ten vegetation samples were collected from 10 ponds and ditches in 1992. Each sample consisted of growing stems and leaves from the predominant plant species at each location. The vegetation was analyzed for gamma-emitting radionuclides, as well as ^{90}Sr , ^{239}Pu , and U with the results reported in Appendix G, Table G-5.

6.2.3.3 300/400 Area. Currently, no aquatic vegetation was sampled in the 300 Area. The 400 Area process pond is sampled by PNL and reported in the Hanford Site Environmental Report. To reduce duplication of effort the data is shared with WHC upon validation by PNL.

6.2.4 Sediment

6.2.4.1 100 Area. There were no samples analyzed for radioactive parameters in the 100 Area during 1992.

6.2.4.2 200/600 Area. The results from sampling pond and ditch sediments are provided in Appendix G, Table G-6. The highest ^{137}Cs result was found at the 216-B-3-3 ditch. The concentration measured in 1992 was 100 pCi/g, less than 1 percent of WHC's soil standard for posting. The highest Pu result was found at the 216-B-3-3 Ditch. The concentration measured in 1992 was 14 pCi/g, approximately 19 percent of WHC's soil standard for posting. All ponds and ditches that receive potentially contaminated water were within posted radiological control areas.

6.2.4.3 300/400 Area. Currently, no surface water sediment is sampled in the 300 Area. The 400 Area process pond is sampled by PNL and reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). To avoid duplication of effort the data is shared with WHC upon validation by PNL.

6.3 CONCLUSIONS

There were no significant increases in radioactivity observed in surface water samples from ponds and ditches in 1992. All surface waters associated with separations area operations were below the DCG for all radionuclides. The analytical results of vegetation samples taken at the ponds and ditches revealed that, while some physiological uptake of radionuclides occurred, the amounts were relatively low. Sediment samples taken demonstrated elevated levels (above background) of mainly ^{137}Cs and Pu. However, all ponds and ditches that receive potentially contaminated water were within posted RCAs.

7.0 RADIOLOGICAL SURVEYS

7.1 INTRODUCTION

Radiological surveys are conducted to determine changes in the radiological status of the 100, 200/600, and 300/400 Areas outdoor waste sites. These sites include surface water disposal units, cribs, trenches, burial grounds, French drains, and reverse wells. Trends in radiation levels or radiological contamination may aid in assessing the adequacy of waste containment indicating movement of radioactive material away from radiological control areas, or detect releases that might otherwise go undetected. The radiological survey locations are indicated in Appendix H, Figures H-1 through H-10.

7.2 ROADS

Road surveys are performed with the Mobile Surface Contamination Monitor (MSCM) tractor or a vehicle equipped with sodium iodide detectors mounted on the undercarriage. The detector height is adjustable. The average survey height is 1 ft above the pavement.

The vehicle is driven at approximately 11 km/h (7 mi/h). When activity is detected, the vehicle is stopped and a thorough survey is made with a portable survey instrument equipped with a P-11 probe. Appropriate management is notified if contamination is identified, and corrective actions are initiated.

All frequently traveled blacktop and improved roads and parking lots in and around the 200 Areas are surveyed bimonthly to detect the presence of radioactive material. Roads less frequently traveled or with low contamination potential are surveyed either quarterly or semiannually. Some roads on the Hanford Site are surveyed by PNL and survey results are reported in the *Hanford Site Environmental Report for Calendar Year 1992* (Woodruff and Lundgren 1993). No new contamination was detected on the roads in 1992.

7.3 SURFACE WATER DISPOSAL UNITS

Surface water disposal units (pond and ditch banks) are routinely surveyed to identify potential contamination at these sites. The thin-window, pancake-type Geiger-Muller probe with the BNW-1 count-rate meter is the principal instrument used in these surveys. Special survey plots are designated around the perimeters of these sites. They are marked with metal posts and numbered. Contaminated soil and vegetation was identified at the 216-U-14 Active Ditch in 1990, and a soil sampling and work plan for stabilizing this area was issued in 1991. In 1992, the surface soil and vegetation were removed, and the area was covered with approximately 12 to 18 in. of clean cobbles. However, contaminated tumbleweeds were found growing on the newly stabilized surface in October 1992. The tumbleweeds were removed, and the area was placed on the herbicide spray program.

7.4 SOLID WASTE DISPOSAL SITES

The retired solid waste disposal sites are surveyed semiannually or annually to detect radiological changes, primarily via biological intrusion. There are solid-waste disposal sites located in each of the operating areas 100-B, C, D, DR, F, K, 200 East and 200 West, and the 600 Areas. (See Figures H-1 through H-10)

Contaminated specks were identified at the 218-W-1, 218-W-2A, 218-W-4A, 218-W-4B, 218-W-11 and 218-E-12B burial grounds in 1992 with a maximum contamination level of 3,500 cpm. The contamination was removed or backfilled shortly after it was identified.

7.5 LOW-LEVEL LIQUID WASTE DISPOSAL SITES

Low-level liquid waste disposal sites, other than open ponds and ditches, consist of cribs, French drains, reverse or injection wells, trenches, covered ponds and ditches, and unplanned release sites. As with solid-waste disposal sites, liquid-waste sites are surveyed at least annually, and as often as quarterly, to detect changes in surface radiological conditions. The most significant survey results in 1992 are listed below. Sites remediated or backfilled to meet radiological lowered posting requirements are listed in Section 7.12.

Environmental Restorations Operations develops an annual work plan for remediating identified contamination. Sites are cleaned or stabilized as soon as possible, but, because of previously scheduled remediation and prioritization of the sites, contamination may not always be stabilized in the same year it is found.

7.5.1 216-A Sites

Contamination and standing water at the 216-A-40 basin are considered to be a source of contaminated mud for swallow nests and adjacent areas of speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) (see Figure H-7).

The 216-A-1, 216-A-6, and 216-A-7 Cribs were backfilled and stabilized in 1992.

Weed growth has been noted at the following cribs: 216-A-37-1, 216-A-37-2, and 216-A-45. (No contamination was detected.)

Contaminated vegetation was found in the 216-A-40 Basin (40,000 cpm and 4.5 mrad/h).

7.5.2 216-B Sites

Weed growth was noted on 216-B-59 and 216-B-64. (No contamination was detected.)

The 216-B-7A and 7B, 216-B-8, 216-B-9, 216-B-11A and 11B, and 216-B-51 Cribs were stabilized in 1992.

7.5.3 216-S Sites

Several contaminated specks (150 to 400 cpm) were found outside the north boundary of the recently stabilized 216-S-13 Crib, and the area was cleaned up and clean fill placed on the area. Speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) ranging from 100 to 200 cpm and one speck greater than 100,000 cpm was found in the 216-S-9 Crib. This area is scheduled for stabilization in 1993.

7.5.4 216-T Sites

Stabilization efforts were completed at the 216-T-5, 216-T-7, 216-T-36 Cribs, and the 216-T-14 through 17 trenches during 1992.

7.5.5 216-U Sites

Vegetation growth was noted on 216-U-17. No contamination was noted.

7.5.6 216-Z Sites

Vegetation was found growing on the 216-Z-1A, 216-Z-2, and 216-Z-3 Cribs in 1992. (No contamination was detected.)

7.5.7 Unplanned Release Sites

The most noteworthy contamination was found at the following unplanned release sites.

The zone at UN-216-W-33 that identifies contaminated vegetation over the underground pipeline from 216-U-8 Crib to the 224-U was extended in 1991. Contaminated vegetation was again found in this area during 1992 with readings of 200 to 800 cpm beta/gamma.

Spotty contamination and contaminated vegetation continues to be found on the east-west transfer line (UN-216-E-41). Contamination ranged from 400 to 100,000 cpm and 25 mrad/h. Some contamination has been removed, but there is no estimated completion date for the cleanup and stabilization of this site.

UN-216-E-44 was stabilized and posting was changed from SCA to URM in 1992.

Shotcrete was used to stabilize the UN-216-W-36 site in 1991 and appears to be working well.

The area of contamination at the B Plant railroad spur (UN-216-E-23) remained the same in 1992. A plan for remediation of the area is scheduled in 1993.

The area of contamination south of the 244-A Lift Station known as UN-216-E-43 continues to be a problem. The size of the posted surface contamination increased again during 1992. Efforts to cleanup some of the contamination were noted in the last survey but levels of contamination still remain with beta radiation readings up to 10 mrad/h/0.5 mR/h and 100,000 cpm.

The area of contamination outside of 241-U Tank Farm known as UN-216-W-35 expanded to the north in 1992. General contamination in this area is 200 to 600 cpm with speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) levels up to 15,000 cpm.

7.6 TANK FARM PERIMETERS

Tank farm perimeters and associated facilities are surveyed semiannually to detect any migration of contamination. Tank farms and related facilities are sources of environmental contamination migration. Recontamination along the same fence lines from year to year seems to be associated with the prevailing wind direction and the contamination located within the tank farms and associated with tank farm activities.

In 200 East Area, the south and east fence lines of 241-B Farm and 241-BX-BY Farms were decontaminated in 1992. A large area of contamination known as UN-216-E-17, north of 241-BX Farm, had been stabilized in 1991 and remained uncontaminated in 1992.

Areas on the northwest and southeast perimeter fence lines of 241-C Farm were found to be contaminated in 1992. The specks were removed shortly after they were identified. This same area has been contaminated and decontaminated several times in the past and continues to be a problem area.

In 200 West Area, the east fence line of 241-SX Farm has a zone extension to the blacktop road. Approximately 20 acres of surface contamination area (UN-216-W-24) is adjacent to this fence line. The speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) is a result of wind-blown migration from the tank farm.

The north and east fence line of 241-T Farm that had migrating contamination is known as UN-216-W-31. This area was cleaned up and stabilized in 1992. The surface area inside the tank farm perimeter was decontaminated as much as possible and a layer of gravel placed on top for stabilization of the remaining contamination.

The schedule for cleanup of these areas around the tank farms has yet to be determined. It is planned that the interior of the tank farms will be cleaned up or stabilized within the fence lines to prevent recontamination.

7.7 BC CRIBS AND CONTROLLED AREA

The BC cribs and trenches (Appendix H, Figure H-2) are a series of liquid-waste disposal sites that were active in the mid-1950's. In 1959, it was discovered that animals had burrowed into one trench and transported radioactivity over an area estimated to exceed 1,000 ha (2,500 acres). In 1979, special survey plots were established throughout the controlled area to monitor for migration of the contamination. Data accumulated during the 10-year period indicate that no significant migration of contamination away from the areas has occurred. The cribs and trenches were surface stabilized in 1982.

This area, approximately 5 km² (2 mi²), is currently posted as a RCA and bounds the south and east side of an area leased to Ecology. Sample results taken in 1991 south of the Ecology, the operator of the commercial burial ground site revealed a large amount of ⁶⁰Co. With this information, it was determined that the contamination was related to the low-level radioactive waste operations at the Ecology and not migration from the BC cribs and trenches. The road was decontaminated in 1991, shortly after the contamination was found. Again, contamination was found to the south of this area and was posted as a SCA.

7.8 100 AREA SITES

In October of 1990, contamination of the shoreline below 100-N Reactor was posted as a SCA near the N Springs seeps. In 1991, contaminated vegetation and mulberry trees resulted in a zone expansion. The contaminated trees were removed and a herbicide spray program was implemented in December 1991. There was no recurrence of the contamination in 1992.

An area of speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) on the riverbank below 107-KE and KW remains posted as a SCA. The SCA is approximately 16.2 ha (40 acres) with contamination levels ranging from 200 to 20,000 cpm.

7.9 100-N AREA RADIATION SURVEYS

Radiation levels are measured annually along the 100-N Area portion of the Columbia River shoreline. Annual environmental radiation surveys also are conducted at intersecting points of survey grids established around the 1301-N and 1325-N LWDFs to monitor radiation levels associated with the disposal facilities.

Each of the surveys used a Bicron Model 5050 portable micro-R meter. The meter was calibrated by PNL to a ¹³⁷Cs source. All readings were taken at a height of 1 m (3.28 ft) at 15.24-m (50-ft) intervals. The micro-R readings obtained for these surveys reflect relative (to each other) dose rates only and do not indicate actual whole body penetrating dose rates, as this type of instrument is overly sensitive to nonpenetrating low energy gamma-emitting radiation sources.

7.10 COLUMBIA RIVER SHORELINE SURVEY

In July 1992, relative dose rates were measured along the Columbia River shoreline starting near the N Area outfall (005) and proceeding downstream past the N Springs (refer to Figure 5-1). A graphic representation of the shoreline survey data is presented in Figure 7-1. The locations of the 100-N Area facilities that potentially contribute to dose rates measured near the river shoreline are shown. At the time of the survey, N Reactor was shut down. The 1304-N Emergency Dump Tank was empty. There was no flow to the 1325-N LWDF. The 1310-N Radioactive Chemical Waste Storage Facility was empty.

Graphs depicting the relative environmental dose rates from annual surveys along the Columbia River shoreline opposite the 1301-N LWDF were similar in shape but lower in 1992 than the 1991 measurements. The decrease is attributable to the continuing decay of ^{60}Co (5.3-yr half life), one of the major residual radionuclides in the 1301-N Facility. As of September 19, 1985, this facility no longer was used and no longer contained water that, during operation, shielded direct radiation levels (see Figure 7-1).

7.11 LIQUID WASTE DISPOSAL FACILITY RADIATION SURVEYS

7.11.1 Introduction

The 1301-N and 1325-N LWDFs are secured facilities posted as radiation zones. Because of the potential for radionuclide contamination and direct radiation exposure, a security fence surrounds the facilities. Only trained personnel are allowed access to the disposal facilities. Even then, workers do not spend large amounts of time in these areas.

7.11.2 1301-N Liquid Waste Disposal Facility Survey Results

Figure F-8 shows the relative environmental dose rates detected around the 1301-N LWDF on August 4, 1992. The N Reactor was not operating at the time of the survey. The 1325-N LWDF was not receiving liquid effluent. The 1310-N Radioactive Chemical Treatment Facility was empty.

The data indicate that the areas near the "box weir" (inlet) portion of the 1301-N LWDF and the first leg of the 1301-N trench have the highest background dose rates. The absence of water from the LWDF is the major factor contributing to the dose rates. During operation, water levels in the crib shielded much of the radiation emitted by the contaminated sediments.

An overall decrease in the relative dose rates measured at this facility was indicated in 1992. The continued decay of the radionuclide inventory contained in the 1301-N LWDF is the cause of this reduction.

Figure 7-1. 100-N Area Shoreline Survey Results.

7.11.3 1325-N Liquid Waste Disposal Facility

The relative environmental dose rates detected around the 1325-N LWDF on August 6, 1992, are presented in Figure F-7. The N Reactor was not operating at the time and the 1325-N LWDF was not receiving liquid effluent. The 1310-N Radioactive Chemical Waste Storage Facility was empty. The 1301-N LWDF did not contain liquid effluent.

In 1992, the 1325-N LWDF showed an overall decrease in relative dose rates compared to the 1991 survey. This coincides with the TLD measurements obtained during the same time periods. The continued decay of the radionuclide inventory contained in the 1301-N LWDF is the cause of this reduction.

7.12 STABILIZATION AND SITE REMEDIATION

In 1992, several large contaminated sites were surface stabilized by scraping the contaminated topsoil and consolidating the contamination into smaller areas. These smaller areas were covered with 15.24 cm (6 in.) of clean dirt. Other sites were backfilled with 15.24 to 61 cm (6 in. to 2 ft) of clean dirt. Either method resulted in SCA postings being reduced to URM areas or being released from radiological control. The sites remediated and/or radiologically reposted in 1992 are shown in Table 7-1.

Table 7-1. Sites Remediated or Radiologically Reposted in 1992
(approximate surface area in acres).

Site Designation	Status change	Acreage
116-F-1 Lewis Canal Extension	SCA to Released	1.2
116-H-2	SCA to URM	0.1
116-K-1	SCA to URM	4.1
"D" Island Vents	Unposted to SCA	0.1
216-A-6	SCA to URM	1.5
216-A-7 a & b	SCA to URM	0.3
B-Pond Overflow	SCA to URM	0.3
216-B-7 a & b	SCA to URM	0.1
216-B-8	SCA to URM	0.5
216-B-9	SCA to URM	0.3
216-B-11 a & b	SCA to URM	0.1
216-B-51	SCA to URM	0.1
216-B-56	SCA to Released	0.4
216-B-59	SCA to URM	2.1
216-T-5 & 7	SCA to URM	2.7

**Table 7-1. Sites Remediated or Radiologically Reposted in 1992
(approximate surface area in acres). (cont)**

Site Designation	Status change	Acreage
216-T-14 Thru 17	SCA to URM	3.5
216-T-36	SCA to URM	0.3
216-U-14 Ditch	SCA to URM	1.5
UN-216-E-44	SCA to Released	15.0
UN-216-W-31	SCA to URM	4.0

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8.0 SPECIAL PROJECTS, SAMPLING, AND INVESTIGATIVE MONITORING

8.1 INTRODUCTION

Investigative samples were collected in and near facility and waste site environments at the Hanford Site during 1992 to confirm or detect the absence or presence of potential radioactive contaminants. The purpose of investigative sampling and monitoring was to determine whether effluent controls and waste containment systems were adequate. Investigative sampling or monitoring was initiated at:

- A broader area of a routinely monitored site when results from a radiological survey showed elevated contamination levels
- An area where scheduled activities (e.g., demolition or stabilization) at or near a contamination source made it necessary to assess the radiological condition of the area
- A site where biotic intrusion (e.g., animal burrows or deep-rooted vegetation) had created potential for the spread of contaminants
- Sites where the integrity of waste containment systems needed to be demonstrated
- Spill or release sites to determine the concentrations of radioactive contamination.

Types of investigative samples in previous years have included air; water; snow; sediment; soil; vegetation such as grass, tumbleweed, sagebrush, trees, and fruit; and various wildlife (including nests) such as spiders, ants, termites, fish, toads, snakes, birds, rabbits, mice, and carnivores.

Because the results of the OEMP were combined in a single report in 1991 and 1992 rather than in separate reports for each of the major operations areas (i.e., 100, 200, and 300 Areas), comparisons between areas when checking for trends of contamination must be made with care. For example, if one was looking for a trend in Russian thistle (tumbleweed) contamination over the entire Hanford Site before 1991, it would be necessary to examine the annual reports for each of the 100, 200, and 300 Areas. All data are now presented in one report, but they are identified for each area.

8.2 1992 SAMPLE TYPES

Samples in 1992 included soil; tumbleweeds (*Salsola kali*); gopher snakes (*Pituophis melanoleucus*); pigeon (*Columba livia*) feces; cliff swallow (*Hirundo rustica*) nests; a bushy-tailed woodrat (*Neotoma cinerea*); house mice (*Mus musculus*); deer mice (*Peromyscus maniculatus*); a black-tailed jackrabbit (*Lepus californicus*); and a Nuttall's cottontail (*Sylvilagus nuttallii*).

8.3 METHODS

Methods for collecting or otherwise obtaining investigative samples, as well as field preparation of samples, are found in *Operational Environmental Monitoring*, WHC-CM-7-4 (WHC 1991). Investigative samples were sent to the WHC Analytical Laboratory at 222-S in the 200 West Area because radioactive contamination levels were known to be or were potentially above environmental levels.

8.3.1 Soil

Investigative soil samples were collected either from an area previously identified as being contaminated or from an area to be characterized. If contamination was known or suspected, samples were collected from the contaminated area rather than a random surface sample as would be the case for routine monitoring and characterization studies.

8.3.2 Vegetation

Investigative vegetation samples were collected either from plants previously identified as being contaminated or from an area to be characterized. Contaminated vegetation was not collected randomly as would be the case for routine monitoring or for sites to be characterized.

8.3.3 Wildlife

Animals or carcasses found near facilities or waste disposal sites were collected by Biological Field Services under authority of the pest control license and submitted to the 222-S Laboratory for analyses.

8.3.4 Laboratory Analyses

Samples were washed to remove external contamination before analyses. The wash water was then analyzed, and the results were reported with the sample analytical data. Vegetation samples occasionally included the entire plant, including roots if required. Animal samples of larger specimens, after being washed, were divided into portions to separate skin and fur or feathers, viscera organs, and muscle and bone. Small animals were dissolved in acid prior to analysis because dissection would not result in a large enough sample.

8.4 RESULTS

Field monitor results, expressed here as cpm or as milliroentgen per meter (mR/m) and millirad per hour (mrad/h), were obtained using, respectively, a Geiger-Mueller Counter equipped with a P-11 Probe or with a dose rate meter. Laboratory sample analysis results are expressed in picocuries per gram (pCi/g) or picocuries per sample.

8.4.1 Soil

There were 30 investigative soil samples taken in 1992. The maximum radionuclide concentrations were speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) of ^{60}Co ($1.1 \text{ E}+07 \text{ pCi/sample}$) from near the 100 D Area, ^{90}Sr ($1.0 \text{ E}+06 \text{ pCi/g}$) and ^{137}Cs ($1.9 \text{ E}+03 \text{ pCi/g}$), both from the 200 Areas, and, from the 300 Area, ^{234}Th ($7.3 \text{ E}+02 \text{ pCi/g}$), ^{234}Pa ($1.1 \text{ E}+03 \text{ pCi/g}$), and ^{235}U ($3.8 \text{ E}+01 \text{ pCi/g}$) (Appendix I, Table I-1). The number of contamination incidents, the radioactivity levels, and the range of radionuclide concentrations were consistent with prior special sampling results for the respective areas.

8.4.2 Biota

8.4.2.1 Vegetation. There were 13 instances of contaminated vegetation detected during routine monitoring at Hanford in 1992 (Table 8-2 and Appendix I, Table I-2). Only one sample (from 100-F Area and reading 1,500 cpm) was analyzed at a laboratory and the maximum radionuclide concentrations were ^{137}Cs ($<9.6 \text{ E}-01 \text{ pCi/g}$) and ^{235}U ($3.1 \text{ E}-01 \text{ pCi/g}$). The other 12 contaminated tumbleweeds were found during remedial operations and disposed of so that only field-instrument readings of radioactivity are available. Field-instrument readings ranged from 350 to 40,000 cpm, which are within the ranges reported for the past 3 years. The amount of vegetation found to be contaminated with radioactivity was not unusual. The greatest numbers of contaminated vegetation samples (i.e., 42) submitted for analyses occurred in 1978. However, in the 200 Areas prior to 1980 when vegetation control was limited or nonexistent, contaminated vegetation was counted in acres rather than individual specimens. Vegetation control in 1992, as in 1991, was noticeably more effective than in 1990 and 1989 and represents a return to an improving trend, which had been evident from 1981 up to 1989 (Conklin et al. 1985) when resistance to the herbicide in use was first noted. Improved vegetation control was probably the result of improved equipment and use of more effective herbicides.

8.4.2.2 Wildlife. There were 27 investigative animal or nest samples taken in 1992. The maximum radionuclide concentrations were ^{60}Co ($7.4 \text{ E}+04 \text{ pCi/g}$), ^{90}Sr ($3.1 \text{ E}+03 \text{ pCi/g}$), ^{106}Ru ($4.2 \text{ E}+03 \text{ pCi/g}$), ^{137}Cs ($7.9 \text{ E}+03 \text{ pCi/g}$), and ^{155}Eu ($1.7 \text{ E}+03 \text{ pCi/g}$) (Appendix I, Table I-3). The total number of animals found to be contaminated with radioactivity, the radioactivity levels, and the given ranges of radionuclide concentrations were consistent with prior special sampling results for the respective areas; however, the number of incidents decreased slightly compared to 32 in 1991. The greatest numbers of contaminated animals were found in 1982 (i.e., 44 - mostly pigeons). However, in the 200 Areas prior to 1981, only selected, representative samples were submitted for radionuclide analyses.

8.5 SPECIAL CHARACTERIZATION STUDIES

Special characterization projects were conducted to verify the status of contamination at 216-U-14 Ditch in 200 West Area before stabilization of the lower end, around B Stack in 200 East Area, and on D Island in the Columbia River, which was the site of the old liquid effluent outfall from

100-D Reactor. Maximum radionuclide concentrations at these sites are listed in Appendix I, Table I-1. The contaminated mulberry bushes and trees at N Springs were removed in 1991. The stumps were treated with herbicides to prevent regrowth and showed none in 1992.

8.5.1 216-U-14 Ditch/200 West Area

Surface soil and vegetation samples were initially collected in late 1991 before interim stabilization of the lower portion of the 216-U-14 active Ditch in 1992. This ditch received effluents from the UO₂ Plant, 242-S evaporator, and, before stabilization of the upper portion of 216-U-14 Ditch, effluents from the Laundry and Mask Cleaning Station. The 1991 soil samples had maximum radionuclide concentrations of ¹³⁷Cs (9.5 E+02 pCi/g), ^{239/240}Pu (1.2 E+00 pCi/g), ⁹⁰Sr (9.4 E+02 pCi/g), and ^{total}U (6.4 E+01 pCi/g).

In 1992, additional soil core samples of the ditch were taken and the highest radionuclide concentration was ¹³⁷Cs (1.6 E+03 pCi/g). The lower portion of the ditch was stabilized in 1992 and was posted URM. The contaminated portion of the ditch remained a SCA.

8.5.2 221-B Stack Environs/200 East Area

Radioactively contaminated soil was found during construction activities near B Plant. Soil samples were analyzed, and there were elevated radionuclide concentrations for ¹³⁷Cs (1.9 E+03 pCi/g) and ⁹⁰Sr (1.0 E+06 pCi/g).

8.5.3 D Island/100 Area

Speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) was found during a routine radiological survey of D Island. D Island was the outfall site of the liquid effluent line from the inactive D Reactor and is a candidate site for Expedited Response Action for Hanford Site cleanup. The highest radionuclide concentration of the most contaminated speck was ⁶⁰Co (1.1 E+07 pCi for the entire speck). A typical soil sample is approximately 500 grams, and, if the speck had been 1.0 E-03 gram (a conservative estimate), the concentration of ⁶⁰Co in the soil would have been 2.2 E+01 pCi/g. The contaminated specks were picked up and disposed of in a solid waste burial ground. Additional shoreline sampling by PNL in 1992 did not indicate further problems with speck contamination (i.e., single grains of soil, rust particles, feces, or pieces of vegetation) (Woodruff and Lundgren 1993).

8.6 TRENDS OF HANFORD RADIOACTIVE CONTAMINATION

Investigative sampling data indicate that uncontrolled radioactive contamination at Hanford Site operations areas has been trending in a generally downward direction.

Table 8-1. Investigative Soil Samples Collected from the Operations Areas in 1992.

Sample type (number)	Locations (radioactivity)	Elevated radionuclides	Maximum concentration (pCi/g) ^a
Soil (30)	216-U-14 Ditch/200 West (characterization samples)	¹³⁷ Cs	1.6 E+03
	221-B Stack/200 East (characterization samples)	¹³⁷ Cs	1.9 E+03
		⁹⁰ Sr	1.0 E+06
	7th & Baltimore Ave/200 East (500 - 40,000 cpm) ^b	¹³⁷ Cs	8.9 E+00
		⁹⁰ Sr	7.2 E+01
	D Island/600 (9 mrad/h) ^c	⁶⁰ Co	1.1 E+07 ^d
	216-S-8 Crib/200 West (4 mrad/h)	¹³⁷ Cs	1.6 E+03
		⁹⁰ Sr	7.4 E+03
	201-C/200 East (20,000 cpm)	¹³⁷ Cs	2.6 E+01
		⁹⁰ Sr	3.5 E+02
	300 Area Treated Effluent Disposal Facility Site (800 to 1,000 cpm)	²³⁴ Th	7.3 E+02
		^{234m} Pa	1.1 E+03
		²³⁵ U	3.8 E+01

^aPicocuries per gram.^bCounts per minute.^cMillirad per hour.^dPicocuries per sample.

Table 8-2. Investigative Vegetation Samples Collected from the Operations Areas in 1992.

Sample type (number)	Locations (radioactivity)	Elevated radionuclides	Maximum concentration (pCi/g) ^a
Tumbleweed (13)	118-F-5 Burial Ground/100-F (1,500 cpm) ^b	¹³⁷ Cs Total U	<9.6 E-01 3.1 E-01
	216-U-14 Ditch/200 West (5,000 cpm)	NA ^c	NA
	UN-216-E-5/200 East (40,000 cpm)	NA	NA
	UN-216-E-16/200 East (600 cpm)	NA	NA
	207 T Retention Basin/ 200 West (2,000 cpm)	NA	NA
	216-A-40 Basin/200 East (350 cpm)	NA	NA
	216-A-30 Crib/200 East (3,000 cpm)	NA	NA
	216-Z-5 Crib/200 West (25,000 cpm)	NA	NA
	216-A-6 Crib/200 East (900 cpm)	NA	NA
	216-U-11 Crib/200 West (700 cpm)	NA	NA
	216-B-1-2-3/200 East (NR) ^d	NA	NA
	Well 199-Hr4-46/100-H (300 cpm)	NA	NA
	Well 116-H-2/100-H (NR)	NA	NA

^aPicocuries per gram.^bCounts per minute.^cNot analyzed.^dNot recorded.

Table 8-3. Investigative Wildlife Samples Collected from the Operations Areas in 1992. (sheet 1 of 2)

Sample type (number)	Locations (radioactivity)	Elevated radionuclides	Maximum concentration (pCi/g) ^a
Gopher snake (2)	B Plant/200 East (500 cpm) ^b	¹³⁷ Cs	7.9 E+03
	Grout Plant/200 East (NR) ^c	⁹⁰ Sr ¹³⁷ Cs	3.0 E+02 7.2 E+01
Pigeon feces (1)	Hot-semi Works/200 East (Basin read 990 cpm alpha)	¹³⁷ Cs	2.8 E+01
Cliff swallow nests (2)	222-T/200 West (25,000 cpm)	⁶⁰ Co	1.7 E+00
		⁹⁰ Sr	6.8 E+01
		¹³⁷ Cs	5.0 E+01
	PUREX/200 East (35,000 cpm)	⁵⁴ Mn	1.6 E+02
		⁶⁰ Co	7.4 E+04
		⁹⁰ Sr	3.4 E+02
		¹³⁷ Cs	2.3 E+03
		¹⁵⁴ Eu	4.7 E+02
		¹⁵⁵ Eu	1.8 E+02
		²³⁸ Pu	7.5 E+00
		²³⁹ Pu	4.7 E+01
Bushy-tailed woodrat (1)	105 KE/100-K (150 cpm)	NA ^d	NA
House mouse (9)	202-A/200 East (2,800 cpm)	⁹⁰ Sr	2.9 E+03
		¹³⁷ Cs	<2.1 E+01
		^{239/240} Pu	<5.0 E+00
	244 AR Vault/200 East (9 mrad/h) ^e	¹³⁷ Cs	1.5 E+03
		Total U	1.3 E+00
	MO-909/200 West (10,000 cpm)	⁹⁰ Sr	3.1 E+03

Table 8-3. Investigative Wildlife Samples Collected from the Operations Areas in 1992. (sheet 2 of 2)

Sample type (number)	Locations (radioactivity)	Elevated radionuclides	Maximum concentration (pCi/g) ^a
Deer Mouse (10)	244 A Lift Station/200 East (400 cpm)	¹³⁷ Cs	<4.6 E+00
	105 KW & KE/100-K (150 cpm)	¹³⁷ Cs ^{239/240} Pu	3.8 E+01 <1.1 E+00
	MO-927/200 East (NR)	¹³⁷ Cs ^{239/240} Pu	<2.5 E+01 <5.0 E+00
	MO-012/200 East (3,000 cpm)	¹³⁷ Cs	9.3 E+00
	333 & 338/300 (300 - 400 cpm)	⁶⁰ Co ⁹⁰ Sr ¹⁰⁶ Ru/Rh ¹²⁵ Sb ¹³⁷ Cs ¹⁴⁴ Ce/Pr ¹⁵⁴ Eu ¹⁵⁵ Eu ²³⁹ Pu	9.7 E+01 6.3 E+01 4.2 E+03 1.6 E+03 5.5 E+03 3.8 E+04 6.5 E+02 1.7 E+03 1.8 E+01
	1706 KE/100-K (4,000 cpm)	¹³⁷ Cs	1.1 E+02
Black-tailed jackrabbit (1)	201-C/200 East (50,000 cpm)	⁹⁰ Sr ¹³⁷ Cs ¹⁵⁴ Eu ²³⁹ Pu	1.1 E+03 5.6 E+01 1.6 E+00 1.9 E+01
Nuttall's cottontail (1)	Z Plant/200 West (NR)	Total U ^{239/240} Pu	4.6 E+00 <5.0 E+00

^aPicocuries per gram.

^bCounts per minute.

^cNot recorded.

^dNot analyzed.

^eMillirad per hour.

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APPENDIX A
QUALITY ASSURANCE

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QUALITY ASSURANCE

Quality Assurance (QA) may be defined as the actions necessary to ensure the accuracy of a program. Westinghouse Hanford Company's (WHC) environmental surveillance QA program consists of procedures and guides to demonstrate that environmental monitoring techniques and analyses are performed within established limits of acceptance. This is documented in the Operational Environmental Monitoring Program (OEMP) QA Project Plan (Schmidt 1992).

Written operating procedures are an integral part of the WHC OEMP QA program. Procedures for field operations are provided in an internal WHC manual. This appendix briefly describes the essential components of the WHC OEMP QA program.

DOCUMENTATION

Record keeping is a vital part of any environmental monitoring program. Maintenance of environmental data is important from a QA standpoint, from a regulatory standpoint, and for trend analysis and optimization of environmental monitoring procedures. For these reasons, each phase of the WHC OEMP is documented. This documentation includes sampling logs, annual reports, and occurrence reports.

SAMPLE REPLICATION

Replicate sampling and subsequent analysis are the primary means of assessing sample variability. Duplicate samples of air, water, soil, sediment, and vegetation are collected as part of the routine OEMP.

DATA ANALYSIS

Environmental data are reviewed to determine compliance with applicable Federal and company guides. The data are analyzed both graphically and by standard statistical tests to determine trends and impacts on the environment. Newly acquired data are compared with historical data and natural background levels. Routine environmental data are stored on both magnetic media (i.e., in a computer environment) and hard-copy printouts.

TRAINING

To ensure quality and consistency in sample collection and handling, all personnel performing such work received formal training. All WHC Health Physics Technologists (HPT) are required to complete a certification program through the WHC Health Physics Department. In addition, those HPTs assigned to environmental programs receive special classroom orientation and on-the-job training by experienced personnel. Environmental Engineering Studies personnel, in addition to their formal training received while obtaining

professional degrees, received training in such courses as "Radiation in the Environment," taught through the Tri-Cities University Center, courses taught at the Harvard School of Public Health, and various short courses.

SAMPLE FREQUENCY

The frequency of sample collection is presented below.

1. Ambient air sample filters and water samples from active ponds and ditches are collected weekly.
2. Radiological surveys of roads are performed on a quarterly or bimonthly basis, as stated in Section 7.0.
3. The thermoluminescent dosimeters (TLD) at facilities, ponds, and ditches are exchanged quarterly.
4. Radiological surveys of waste sites are performed quarterly, semiannually, or annually depending on the operating status, condition, and history of the site.
5. The soil, vegetation, and fecal samples are collected annually. Mud and vegetation samples from active ponds and ditches also are collected annually.

ANALYTICAL PROCEDURES

Three laboratories provided analytical support to the WHC OEMP; these are the International Technology Analytical Services-Richland Laboratory (ITAS-RL), the Radiation Standards and Engineering Laboratory at Pacific Northwest Laboratory (PNL), and the WHC 222-S Analytical Laboratory. The environmental samples are analyzed in accordance with prescribed procedures and quality control guides. The analytical procedures necessary to implement the environmental monitoring program are described briefly below and are listed according to the respective laboratory.

International Technology Analytical Services

Much of the OEMP involves measuring radionuclide concentrations at or near background levels. These environmental measurements require a very low detection limit and typically are performed at ITAS-RL. The analytical laboratory routinely performs analyses on soil, vegetation, animal feces, and air samples. Analyses are performed according to procedures and quality control guides described by the Environmental Measurements Laboratory (EML 1972), the U.S. Atomic Energy Commission (AEC 1974), and the National Council on Radiation Protection and Measurements (NCRPM 1976).

1. Air Samples

- a. Gamma Energy Analysis - Gamma-emitting radionuclides are measured by direct counting of the air sample filter with a hyperpure germanium detector. The gamma spectra are analyzed using a Nuclear Data 7700 software system.
- b. Strontium - Airborne ^{89}Sr and ^{90}Sr are determined by leaching the composited air sample filters with nitric acid and initially precipitating them as a nitrate. The sample is purified by iron and barium scavenging. The final precipitate, strontium carbonate, then is counted for total beta (needed to set the ^{89}Sr value) with a low-background beta proportional counter. Both ^{89}Sr and ^{90}Sr are calculated from the resulting count data using a computer.
- c. Plutonium - The various plutonium isotopes are leached from the air sample filter with nitric acid and passed through an ion-exchange resin. Further decontamination from lead, bismuth, and other transuranics by washing with nitric and hydrochloric acids is done. The plutonium then is eluted from the resin and electrodeposited on a stainless-steel disk, where it is counted using a surface barrier alpha spectrometer, and data are collected on a Nuclear Data system.
- d. Uranium - The uranium is leached from the air sample filter and extracted as tetrapropyl ammonium uranyltrinitrate followed by back extraction into water. Following treatment with sodium and LiF, the aqueous sample is analyzed with a fluorometer to determine the mass of uranium.

2. Groundwater Samples

- a. Total Alpha and Beta Activity - The total activity caused by alpha- and beta-emitting radionuclides is measured by directly counting the dried residue with a gas-flow proportional counter.
- b. Strontium-90 - The strontium is removed from the water sample by precipitating it as a nitrate using nitric acid. The sample is purified by repeated scavenging with barium chromate and precipitating with barium carbonate. The strontium carbonate then is counted with a low-background gas-flow proportional counter.
- c. Gamma Energy Analysis - Gamma-emitting radionuclides are analyzed by directly counting the water sample with a Germanium-Lithium Ge(Li) detector equipped with a multichannel pulse-height analyzer.
- d. Tritium - Water samples are analyzed for tritium with a liquid scintillation spectrometer.
- e. Total Uranium - The water samples are analyzed for uranium first by treating them with sodium and lithium fluoride and then analyzing them with a fluorometer.

3. Soil Samples

- a. Gamma Energy Analysis - Gamma-emitting radionuclides in soil are measured using a Marinelli beaker and counting with a Ge(Li) detector equipped with a multichannel pulse-height analyzer.
- b. Strontium-90 - The ^{90}Sr is removed from the soil sample by leaching the dried sample with nitric acid. The strontium in solution is converted to an oxalate followed by precipitation as strontium carbonate. The carbonate is deposited on a planchet and counted in the same manner as the ^{90}Sr water samples.
- c. Technetium-99 - The ^{99}Tc is isolated from other elements using hydroxide carbonate coprecipitation, leaving it in solution as the pertechnetate ion (TcO_4^-). Further purification is achieved by an anion-exchange column path, followed by liquid scintillation spectrometry.

4. Vegetation Samples

- a. Gamma Energy Analysis - Gamma-emitting radionuclides in vegetation are measured by direct counting of the sample with a Ge(Li) detector equipped with a multichannel pulse height analyzer.
- b. Strontium-90 - The ^{90}Sr is removed from the vegetation sample by leaching the dried sample with nitric acid. The strontium in solution is converted to an oxalate followed by precipitation as strontium carbonate. The carbonate is deposited on a planchet and counted in the same manner as the ^{90}Sr water samples.
- c. Technetium-99 - The ^{99}Tc is isolated from other elements using hydroxide carbonate coprecipitation, leaving it in solution as the pertechnetate ion (TcO_4^-). Further purification is achieved by an anion-exchange column path, followed by liquid scintillation spectrometry.

Pacific Northwest Laboratory Radiation Standards and Engineering

Thermoluminescent Dosimeters - External radiation levels are measured using TLDs. Three TLDs at each sampling location monitor facilities, water sampling sites, active tank farms and various cribs, and trenches associated with the PUREX Plant operation. The TLDs consist of four lithium fluoride LiF (TLD-700) and one calcium fluoride containing dysprosium as an impurity $\text{CaF}_2:\text{Dy}$ (TLD-200) chip in a plastic card.

The TLDs are calibrated, packaged, and read by the PNL Radiation Calibration Laboratory, Radiation Standards and Engineering Department. All TLD work is performed in accordance with the procedures and specific guides from the American National Standards Institute (ANSI 1975) and PNL.

Westinghouse Hanford 222-S Analytical Laboratory

The WHC 222-S Laboratory also provides analytical support to the OEMP. This laboratory is the one normally used for samples containing higher-than-normal environmental levels of radioactivity. Analytical procedures and quality control guides are described by the EML (EML 1972), the American Society for Testing and Materials (ASTM 1976), the American Public Health Association (APHA 1980), and the U.S. Environmental Protection Agency (EPA 1979). A brief description of the routine analyses performed by the 222-S Laboratory is presented below.

1. Pond and Ditch Water

- a. Total Alpha and Beta Activity - An aliquot of the pond or ditch water is added to a stainless-steel dish and evaporated to dryness. The total alpha and beta activities are measured by direct counting with a gas flow proportional counter.
- b. Gamma Energy Analysis - The liquid sample is sealed inside a geometrically approved container. The gamma-emitting radionuclides are measured by direct counting with a Ge(Li) detector equipped with a multichannel analyzer.
- c. Strontium-90 - The ^{90}Sr is removed from the aqueous sample by precipitating the ^{90}Sr out with barium carbonate. The strontium carbonate is purified by redissolving with nitric acid, precipitating as a nitrate, and precipitating again as a carbonate. The ^{90}Sr activity is determined by beta counting with a gas flow proportional counter.
- d. Plutonium - Actinides are removed from the aqueous sample by precipitation with iron. The precipitate is redissolved in hydrochloric acid and the plutonium is separated from the other actinides by ion exchange. The plutonium is electrodeposited on a planchet and counted using alpha spectrometry.

2. Pond and Ditch Mud and Sediment

- a. Gamma Energy Analysis - The gamma-emitting radionuclides are measured by direct counting of the dried sediment sample using a Ge(Li) detector equipped with a multichannel analyzer.
- b. Soil Leach - Strontium, plutonium, americium, and other elements are leached from the soil sample using a mixture of hydrochloric and nitric acids. The leachate is then analyzed for specific radionuclides as is done with the liquid samples.

3. Pond and Ditch Vegetation

- a. Gamma Energy Analysis - The liquid sample is sealed inside a geometrically approved container. The gamma-emitting radionuclides are measured by direct counting with a Ge(Li) detector equipped with a multichannel analyzer.

- b. Vegetation Leach - The vegetation samples are dry ashed in a furnace and then leached with a mixture of hydrochloric and nitric acids. The leachate is analyzed for specific radionuclides as is done with the liquid samples.

APPENDIX B

GLOSSARY

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GLOSSARY

Definitions

Aboveground Tank - A tank situated so that its entire surface area is completely above the plane of the adjacent surrounding surface and the entire surface area of the tank (including the tank bottom) is able to be visually inspected (WAC 173-303-040).

Administrative Control Value (ACV) - Operating contractor's internally imposed release limit for an airborne or liquid effluent. The ACV is usually expressed as a fraction or multiple of the derived concentration guide (DCG)-public but may also be expressed as a total release value (curies per year for Kr-85 and tritium). In applying the ACV, the "Unity Rule" applies; the sum of the fractions of the ACV in an effluent shall not exceed 1.

Airborne Radioactive Effluents - Radioactive particles, mists, vapors, fumes, and/or gases contained or entrained in airborne effluents.

Aquifer - A subsurface formation consisting of sufficient saturated permeable material to yield significant quantities of water.

Areal Contamination - Contamination generally confined to less than the first centimeter of soil. Numerically, the radioactivity content averaged over a suitable area.

As Low As Reasonably Achievable (ALARA) - The implementation of ALARA is described in WHC-CM-4-11, ALARA Program Manual. This concept applies to maintaining releases at or below prescribed regulatory limits.

Assure - To remove any doubt, to promise.

Audit - An announced examination of a facility or operation to determine compliance with the specific requirements.

Average Soil Contamination - Contamination generally dispersed through the soil. Numerically, the radioactivity content averaged over a suitable mass of soil

Backfill Soil - The soil used as a plant growth medium between the depths of 30-120 cm as measured at the restabilization site.

Background Radiation - Refers to regional levels of radioactivity produced by sources other than those of specific interest (e.g., the nuclear activities at the Hanford Site).

Barrier or Engineered Barrier - At a disposal site, a man-made addition designed to retard or preclude radionuclide or other contaminant transport and/or preserve the integrity of the disposal site.

Becquerel (Bq) - The standard international unit of radioactivity. One Bq is one disintegration per second or:

$$\text{Bq} = 2.7 \text{ E} - 11 \text{ Ci}$$

Biological Transport - Means of biological transport may include one or more of the following processes:

- Movement of subsurface radioactivity to the surface by physiological vegetative processes
- Dispersion of such vegetation by the wind
- Contaminated urine and feces deposited by animals that have gained access to and ingested radioactive materials
- Contaminated animals themselves that have ingested radioactive materials directly or ingested other contaminated animals or plants
- Physical displacement of radioactive materials by burrowing animals
- Nests built using contaminated materials.

Biota - The plant and animal life of a specific region.

Building - A structure created to shelter any form of human activity, such as a house, barn, church, hotel, or similar structure; it also may refer to a historically related complex, such as a courthouse and jail; or at Hanford, buildings to include: old reactor buildings, office buildings, e.g., 2750 Building, 222-S Laboratory Building, etc.

Burial Ground - An area specifically designated for the subsurface disposal and/or storage of solid, dry radioactive waste.

Burial Ground - A land area specifically designated to receive contaminated solid or solidified liquid waste packages and equipment. The contaminated articles are usually placed in trenches and covered with overburden.

By-Product - A material that is not one of the primary products of a production process and is not solely or separately produced by the production process. Examples are process residues such as slags or distillation column bottoms. The term does not include a co-product that is produced for the general public's use and is ordinarily used in the form in which it is produced by the process.

Calibration - Determining the deviation of an instrument from a standard traceable to the National Bureau of Standards (NIST) or other recognized agency and reporting the deviations and/or eliminating them by adjustment.

Central Landfill - The contractor-operated, U.S. Department of Energy (DOE)-owned disposal site used for disposal of trash and other nonhazardous nonradioactive wastes.

Chemical Processing - Chemical treatment of material to separate desired components selectively. At the Hanford Site, plutonium, uranium, and fission products were chemically separated from irradiated fuels.

Chemical Substance - Any organic or inorganic substance except:

1. Any mixture.
2. Any pesticide when used as a pesticide.
3. Any tobacco product.
4. Any source material, special nuclear material, or by-product material.
5. Any firearms, shells, or cartridges.
6. Any food, food additive, drug, cosmetic, or device, when used for its intended purpose.

Manufacture for Commercial Purpose - To import, produce, or manufacture with the purpose of obtaining commercial advantage for the manufacturer, including manufacturing any amount of a chemical substance or mixture for the following reasons:

1. Distribution in commerce
2. Use by the manufacturer, including use for product research and development, or as an intermediate. The definition of manufacturer includes extracting a chemical from another chemical substance or mixture of substances.

Chemical Trench - The central landfill trench that is for the disposal of chemicals, hazardous wastes, and hazardous substances.

Committed Dose Equivalent - The predicted total dose equivalent to a tissue or organ over a 50-year period after a known intake of a radionuclide into the body. It does not include contributions from external dose. Committed dose equivalent is expressed in units of rem (or sievert).

Committed Effective Dose Equivalent - The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighing factor. Committed effective dose equivalent is expressed in units of rem (or sievert).

Composite Sample - A number of random samples initially collected from a waste and combined into a single sample; this sample is analyzed for the contaminants of concern.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) - Commonly known as "Superfund," CERCLA was enacted to respond to uncontrolled releases of hazardous substances to the environment, primarily at inactive sites that were not adequately addressed by the *Resource Conservation and Recovery Act of 1976 (RCRA)*. CERCLA also applies to actively-managed facilities and any onshore or offshore facility.

Confined Aquifer - A subsurface water-bearing region having defined and relatively impermeable upper and lower boundaries.

Conserve - Use methods and procedures necessary to protect any endangered or threatened species. Such methods and procedures include, but are not limited to, activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation. In the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, methods and procedures may include regulated taking.

Controlled Area - An area where access is controlled to protect individuals from exposure to radiation and radioactive materials.

Construction - Addition, enlargement, modification, replacement, alteration, or restart (after a period of 5 years of nonoperation) of any process or stationary source, which may increase emissions or ambient air concentrations of any contaminant for which federal or state ambient or emission standards have been established.

Contamination Limit - That concentration limit or activity limit for radioactive materials below which posting restrictions and environmental controls to protect personnel or the environment are not necessary.

Crib - A subsurface, low-level, liquid-waste disposal site that allows the liquid waste to percolate into surrounding soil.

Crib - An underground structure designed to receive liquid waste that percolates into the soil directly or percolates into the soil after having traveled through a connected tile field.

Decommissioning - Actions taken to reduce the potential health and safety impacts of DOE-controlled contaminated facilities. Actions could include stabilizing, reducing, or removing radioactivity or demolishing the contaminated facilities.

Decommissioning - The process of removing a facility or area from operation, often involving decontamination and/or disposal and incorporating appropriate controls and safeguards.

Decontamination - The removal of contamination from a surface or from within another material.

Decontamination - The removal of radioactive or hazardous contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical treating, mechanical cleaning, or other techniques.

Demolition Waste - Solid waste, made up largely of inert waste resulting from the demolition or razing of buildings, roads, and other man-made structures. Demolition waste consists of, but is not limited to, concrete, brick, bituminous concrete, wood and masonry, composition roofing and roofing paper, steel, and minor amounts of other metals like copper.

Plaster (sheet rock or plaster board), asbestos, or any material other than wood that is likely to produce gases or a leachate during the decomposition process is not considered to be demolition waste.

Derived Concentration Guide for Occupational Exposure (DCG-Occupational) - Those concentrations in air or water that an occupationally exposed individual would have to inhale/ingest in a year to result in 5000 mrem/50 year dose commitment.

Derived Concentration Guide for Public Exposure (DCG-Public) - The concentration of radioactive materials in air or water specified in Appendix A, "Derived Concentration Guides for Controlling Exposure to Members of the Public," of this manual. The DCG-Public are those concentrations of radionuclides in air or water that would result in a maximum effective committed dose equivalent to 100 mrem per year using ICRP-30 dose methodology under conditions of continuous exposure or use (i.e., continuously breathing or being immersed in contaminated air or exclusively drinking contaminated water).

Diffuse Source - A source or sources of radioactive or chemical contaminants released into the environment that do not have a defined point or origin of release (a nonpoint source). Such sources are also known as area sources.

Dispersible - Capable of being widely spread.

Disposal - Discharging, discarding, or abandoning dangerous wastes, or the treatment, decontamination, or recycling of such wastes once they have been discarded or abandoned. This includes the discharge of any dangerous wastes into or on any land, air, or water (WAC 173-303-040). This definition also includes radioactive materials.

Disposal Facility - Any facility or part of a facility where hazardous and/or radioactive waste is intentionally placed or where any land or water waste will remain after closure.

District - A geographically definable area (urban or rural) which has a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united either by past events or aesthetically by planned physical development. A district may also be individual elements that are separated geographically but linked by association or history.

Disturbance - Includes, but is not limited to, the following: leveling; firebreak, road, or utility line construction; excavation of pits, foundations and trenches; quarrying and borrowing of rock and soils; seismic testing; and stockpiling of earth.

Ditch - An open surface site for transport of liquid wastes to a pond or trench structure designed for percolation.

Ecology - The Washington State Department of Ecology.

Effective Dose Equivalent (EDE) - The summation of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighing factor. This sum is a risk-equivalent value and can be used to estimate the health-effects risk of the exposed individual. The tissue-specific weighing factor represents the fraction of the total health risk resulting from uniform whole-body irradiation that would be contributed by that particular tissue. The EDE includes the committed EDE from internal deposition of radionuclides and the EDE due to penetrating radiation from sources external to the body. EDE is expressed in units of rem (or sievert).

Effluent - An airborne or liquid discharge from a facility after all engineered waste treatment and effluent controls have been performed. The term includes onsite discharges to the atmosphere, lagoons, ponds, cribs, injection wells, French drains, or ditches. The term does not include solid waste stored or removed for disposal or wastes that are contained in retention basins or tanks prior to treatment and/or disposal.

Emissions Unit - Regarding air pollutant emissions, any part of a stationary source that emits or would have the potential to emit any pollutant subject to regulation.

Ensure - To make certain, make sure, make safe.

Environmental Monitoring Plan (EMP) - A two-part document prepared for each site, facility, or process that uses, generates, releases, or manages significant pollutants or hazardous materials.

Exhaust System - A stack, gaseous effluent system, building ventilation system, or any system that vents air or gaseous material to the atmosphere.

Expedited Response Action - An interim response action (IRA) or interim measure (IM) process. This includes any onsite response action (under CERCLA or RCRA authority) to mitigate site contamination conducted before initiation of remedial action or corrective action in accordance with final record of decision (ROD) or permit modifications.

Facility - A processing plant, tank farm, shop, laboratory, powerhouse, or laundry. Including all contiguous land and structures, other appurtenances, and improvements on land used for recycling, reusing, reclaiming, transferring, storing, treating of dangerous waste (including treatment, storage, and disposal sites as well as groundwater wells). (40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities," and WAC 173-303-040.)

Facility-Specific Environmental Monitoring - Routine environmental monitoring of all environmental media (air, biota, etc.) around facility parameters.

Field Blank - Aliquots of analyte-free water or solvents brought to the field in sealed containers and transported to the laboratory with the sample container. Field blanks include trip blanks and equipment blanks.

Field Duplicate - Field duplicates are collected at specified frequencies and are used to document precision. The field duplicate precision depends on the variance of waste composition, sampling techniques, and analytical technique.

Fish or Wildlife - Any member of the animal kingdom including (without limitation) any mammal, fish, bird, amphibian, reptile, mollusk, crustacean, arthropod, or other invertebrate--including any part, product, egg, offspring, or the dead body or parts of the offspring.

French Drain - A covered or rock-filled encasement with the bottom end open to allow liquids to seep into the ground.

Fugitive Emissions - Material that is generated incidental to an operation, process, or activity and that is released or dispersed into the open air. Fugitive emissions occur via pathways that do not allow routine measurement at the point of release.

Grab Sample - A single sample removed from a stream over a short time interval.

Groundwater - Water that exists below ground surface (i.e., within the zone of saturation).

High Efficiency Particulate Air (HEPA) Filter - To qualify as a HEPA, a filter must achieve an efficiency of 99.97 percent under laboratory conditions and 99.95 percent after installation for the removal of airborne particulates greater than 3×10^{-5} cm (0.3 microns).

High-Level Nuclear Waste - Spent nuclear fuel or radioactive waste resulting directly from the dissolution and reprocessing of spent nuclear fuel. Secondary waste streams resulting from the dissolution and reprocessing of spent nuclear fuel are not considered high-level waste.

Immobile Radionuclides - All those radionuclides that are sorbed onto Hanford soils and usually would not migrate through the vadose zone or the groundwater below the future control zone.

Inactive Crib - A crib that has been designated as permanently out of service.

Inactive Radioactive Waste Site - Any waste site that is no longer needed for current operational programs and that is not currently an active waste disposal site.

Inactive Waste Sites - Inactive waste sites include units such as burial grounds, unplanned release sites, cribs, ditches, ponds, trenches, and basins, abandoned storage areas, drains, single-shell tank piping, transfer pits, and jumper boxes.

Injection Well - A well used for mixing liquid waste with groundwater.

Inert Wastes - Noncombustible, nondangerous solid wastes that are likely to retain their physical and chemical structure under expected conditions of disposal, including resistance to biological attack and chemical attack from acidic rainwater.

Insure - To cover by insurance against loss.

Less Than Detectable - An analytical term for a concentration in a sample that is lower than the minimum detection capabilities of that analytical equipment or process.

Low-Level Waste - Any gaseous, liquid, or solid radioactive waste not classified as high-level waste, transuranic (TRU) waste, or spent nuclear fuel, as defined by DOE 5820.2. Also see Threshold Concentrations.

Maximum Contaminant Level (MCL) - The drinking water standards specified in 40 CFR 141, "National Primary Drinking Water Regulations." See Appendix C, "Maximum Contaminant Levels."

Minimum Detection Limit - See detection limit.

Mixed Waste - Dangerous waste that also contains enough radioactivity to be classified as radioactive waste in accordance with this manual, Section 7.4, "Radioactive Solid Waste Storage and Disposal."

Modification - Any physical or operational change to a stationary source which results in an increase in the rate of emission to the atmosphere of an air pollutant to which a standard applies.

Monitored Sample - A sample collected in a monitoring system and used to alert operations to nonroutine releases and to provide process control.

Monitoring System - Instrumentation that provides measurement of an airborne or liquid waste stream parameters. The system includes a detector and associated readout components. A continuous monitoring system measures the stream parameters on a near-real-time basis or as specified in applicable EPA regulations 40 CFR 52, "Approval and Promulgation of Implementation Plans," Appendix E; 40 CFR 51, "Requirements for Preparation Adoption and Submittal of Implementation Plans," Appendix P or as defined in applicable ANSI Standards. A radiation monitoring system is a system in which radiation or radioactivity is the measured parameter. An integrating monitoring system totals the instantaneously measured parameter over some time period. A sampling system does not measure or read out an instantaneous stream parameter.

Naturally Occurring Radioactive Materials - Also see Threshold Concentrations.

Nonroutine Activities - Any actions on a large-scale (>5 acres), including stabilization, soil removal, fixative or sealant application, other surface treatments, or other activities that could impact future remediation activities in an inactive waste site.

Normally Contaminated Airborne or Liquid Effluent - An airborne or liquid effluent from a facility or area that contains dispersible or unsealed radioactive materials in quantities sufficient to cause releases of radioactive materials in excess of 10 percent of the ACL averaged over 1 year (i.e., the total activity present times an appropriate suspendable or immisible fraction divided by the total annual flow exceeds 10 percent of the ACL).

Operate - As used in this section with respect to the activities of WHC, the term "operate" (and other forms of the term) will refer to the performance by WHC of its day-to-day activities in connection with the tanks and tank systems. Such activities shall be subject to the overall management, control, and oversight by DOE.

Operational Environmental Monitoring - The collection and analysis of samples of air, water, soil, foodstuffs, biota, and other media near nuclear facilities on DOE sites and their environs and the measurement of external radiation for purposes of demonstrating compliance with applicable standards, assessing radiation exposures to employees and members of the public, and the near-field environment.

Operations - In this report this term loosely refers to WHC activities including chemical processing, waste management, and decommissioning.

Operations - The contractor organization responsible for operating plants and facilities.

Overall Error - In this report, this term means the overall analytical error supplied by the laboratory performing the analysis.

Percolation - Downward movement of water through the interstices of unsaturated rock or soil because of gravity or hydrostatic pressure.

Pesticide - In this manual, as defined in 40 CFR 162, the term pesticide covers all pest control chemicals such as herbicides, rodenticides, and insecticides.

Plutonium Processing and Handling Facility - Any facility constructed primarily to process plutonium (including ²³⁸Pu) and that handles in-process plutonium.

Plutonium Storage Facility - Any facility constructed to store strategic (category I) quantities of plutonium.

Point of Release - The point at which a material is released to the environment such as the top of a stack or the end of a pipe.

Point Source - A single defined point (origin) of an airborne release, such as a vent or stack.

Pond - A surface impoundment used to contain or percolate low-level liquid radioactive wastes, mixed wastes, or hazardous wastes.

Potentially Contaminated Airborne or Liquid Effluent - An airborne or liquid effluent from a facility or area that contains radioactive materials in quantities sufficient to cause releases of radioactive materials in excess of 10 percent of the ACV averaged over 1 year (the total activity present times a reasonable suspendable or immersible fraction divided by the annual flow equals more than 10 percent of the ACV).

Potentially Corrosive Liquid Waste Stream - Any liquid waste stream that has been identified as having the potential, during upset conditions, to discharge liquid with a pH value of less than or equal to 2, or greater than or equal to 12.5.

Previously Disturbed Ground - Ground that has had its contours altered by leveling, filling, or excavation or that has been contaminated by radiation or dangerous chemicals to the extent that an individual cannot enter the area without wearing protective clothing. Disturbance is determined by observation, aerial photographs, and topographic maps.

Quality Assurance - A process designed to maintain the quality of the results of a program within established limits of acceptance.

Quality Assurance - All those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.

Radiation Survey - Evaluation of an area or object with portable instruments to identify radioactive materials and radiation fields present.

Radioactive Byproduct - Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material (*Atomic Energy Act of 1954*, as amended). The nonradioactive hazardous component of the waste material will be subject to regulation under *Resource Conservation and Recovery Act of 1976* (RCRA).

Radioactive Liquid Effluent - A liquid effluent that has a reasonable potential for containing radioactive materials in quantities such that the annual average concentration is equal to or greater than the MCL. Also see Threshold Concentrations.

Radioactive Solid Waste - See Threshold Concentrations.

Radiological Control Area - An area where access is controlled to protect individuals from exposure to radiation and/or radioactive materials. Radiological control areas include, but are not limited to, areas posted as Radiation Area, Surface Contamination, and Underground Radioactive Materials, to describe the radiological condition of the area within.

Radiological Posting - Information in the form of signs and chains to inform people of conditions that warrant avoidance or special precautions for entry.

Release From Radiological Posting - Removal of signs and chains when access to an area no longer needs to be restricted for radiological protection purposes.

Representative Sample - The average stream parameter being measured occurs in the sample in the same average proportion that it occurs in the environmental discharge.

Retired Waste Site - A waste site that is isolated and no longer available to receive waste in any form.

Reverse Well - Same as injection well.

Routine Activities - Any actions on a small-scale (<5 acres), including radioactive hot-spot removal, vegetation removal, fencing, posting, herbicide spraying, stabilization, or immediate spill response) in an inactive waste site. In general, these routine actions shall not interfere with RCRA/CERCLA response or site investigations.

Routine Emissions - Air emissions of pollutants or releases from accidents are not considered routine. However, releases of air pollutants to the atmosphere that result from normal operations, and releases, that are not routine but are more likely than not to occur, are included as routine emissions.

Sampling System - Instrumentation and equipment that remove a part of a liquid or airborne wastestream for subsequent quantitative determination of stream parameters. The system generally employs such devices as filters, other sample collection media, or effluent traps of some kind. A continuous sampling system removes a part of the stream continuously except during sample change, maintenance, repair, or other necessary outages. A grab sampling system removes an instantaneous part of the stream or removes a part of the stream over a time period.

Sealed - A container having a cover bonded with the container or a cover strong enough to prevent contact with and dispersion of the contents of the container under conditions of use and wear for which it was designed.

Sediment Column - The sediment beneath a crib. It can mean either all the sediment beneath the bottom of the crib extending to the water table or all sediment beneath a crib contaminated by radioactive materials.

Separation Areas - The fenced 200 Areas and those areas (such as B Pond and Gable Mountain Pond) that have received or continue to receive liquid waste discharged from previous or current chemical processing and waste management operations. The FCZ includes the separation area.

Separations Area - The primary area on the Hanford Site where chemical processing and most waste management activities are performed. It includes the 200 Areas and nearby 600 Area sites. WHC is landlord of the Separations Area.

Site - The location of a significant event, a prehistoric or historic occupation or activity, or a building or structure (whether standing, ruined, or vanished) where the location itself maintains historical or archeological value, regardless of the value of any existing structure.

Soil at depth - Soil below 36 in.

Solid waste - Any discarded material that is not excluded by WAC 173-303-017(2) or that is not excluded by a variance granted under WAC 173-303-017(5). Materials are solid waste if they are: (1) abandoned by being disposed of, burned, or incinerated, or (2) accumulated, stored, or treated (but not recycled) before (or in lieu of) being abandoned by being disposed of, burned, or incinerated. In addition, a solid waste includes any material considered to be inherently waste-like.6.2.1(3e).

Specific Contamination - Single grains of soil, rust particles, feces, or pieces of vegetation.

Speculative Accumulation - A material accumulated before being recycled. If the material is potentially recyclable and at least 75 percent is recycled during the calendar year (commencing on January 1), it is not a speculative accumulation.

Spent Materials - Used materials that are no longer usable without being regenerated, reclaimed, or reprocessed. Examples are spent solvents, spent activated carbon, spent catalysts, and spent acids. Does not include spent fuel from reactors.

Spot Contamination - A spot or quantity of contamination less than 1 cm³ in volume, or areal contamination less than 15 cm² in area.

Stabilization - The process of covering surface contaminated areas with clean backfill or topsoil.

Standard - A specified set of rules or conditions concerned with the classification of components; delineation of procedures; definition of terms; designation of materials, performance, design, or operations; or measurements of quality in describing materials, products, systems, services, or practices. A standard is more general than a procedure or specification and more specific than a criterion.

Standard Error of the Mean - A measure of the uncertainty in the estimated averages of data because of random variations.

Stationary Source - Any building, structure, facility, or installation that emits or may emit any air pollutant.

Structure - A work constructed by man that consists of interdependent and interrelated parts in a definite pattern of organization. It is often a large-scale engineering project.

Suitable Surface Area - Area no more than 15 cm² over which spot contamination may be averaged in determining areal contamination.

Sump - Any stationary pit or reservoir, including those troughs/trenches connected to it, that serve to collect oil products, hazardous substances, low-level radioactive material, dangerous waste, mixed waste, high-level radioactive materials, or TRU materials.

Surface Contamination - A radiological control status that refers to radioactivity on the surface of the ground that exceeds the soil contamination standard.

Surface Soil - Soil from 0- to 2-in. deep.

Surface Stabilization - A remedial action program on waste disposal sites that includes the addition of at least 46 to 50 cm (18 to 20 in.) of clean soil followed by revegetation. It is designed to cover surface contamination and inhibit biological and wind transport.

Surplus Facilities - Surplus facilities include all facilities that have been accepted into a decommissioning program.

Survey - A method to detect the release, disposal, or presence of radioactive materials or hazardous substances under a specific set of conditions to determine actual or potential hazards. Such an evaluation may include, but is not limited to, tests, physical examinations, and measurements of radiation or concentrations of materials.

Suspect Waste Site - Any site thought to contain dangerous, hazardous, and/or radioactive waste. This does not include sites that currently have been identified by the Waste Information Data System (WIDS).

Suspendable Fraction - The fraction of material that may become airborne.

Taking of Any Animal - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any animal or attempt to engage in any such activity.

Tank - A stationary device designed to contain an accumulation of oil products, hazardous substances, low-level radioactive material, dangerous waste, mixed waste, high-level radioactive materials, or TRU materials, which are constructed primarily of nonearthen materials (e.g., wood, concrete, steel, plastic) that provide structural support.

Tank Farm - An area of large underground tanks designed to store up to 1 Mgal each of high-level liquid waste.

Technologically Enhanced Naturally Occurring Radioactivity - Refined or processed ores or other materials containing naturally occurring radioactive materials, such that radiation exposure or potential radiation exposure is increased.

Thermoluminescent Dosimeter - A chip or series of chips used for measuring external gamma radiation. It consists of a material capable of absorbing energy imparted by ionizing radiation, then emitting light as a result of thermal stimulation. A measure of that light is proportional to the radioactivity absorbed.

Threshold Concentrations - Those concentrations of radionuclides in various wastes or substances that do not require the controls of radioactive waste disposal.

1. Air. No threshold value exists.
2. Liquid. Liquids containing radionuclides in a concentration of less than $0.04 \times \text{DCG}$ may be disposed of as nonradioactive liquid waste. This threshold level is equivalent to the EPA Drinking Water Standard (40 CFR 141).
3. Soil/Solid. Soils or other solids containing radionuclides below those listed in Table 6-1 (on hold) may be released for onsite disposal as nonradioactive waste. No offsite release criteria exist. (See Section 7.4).

Threshold Limit Value (TLV) - Threshold limit value time-weighted average (TLV-TWA). The time-weight average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Topsoil - The soil used as a plant growth medium at the surface to a depth of 30 cm as measured at the restabilization site. Topsoil is added soil to support the stabilization of a retired disposal facility with the objective of controlling erosion, establishing the growth of perennial grasses, and preventing the growth of deep-rooted vegetation. Topsoil shall fall within the requirements stated in Section 7.7, "Mixed Waste."

Transuranic (TRU) Radionuclide - Any radionuclide having an atomic number greater than 92 (DOE 5820.2).

Transuranic Waste - Without regard to source or form, radioactive waste that at the end of institutional control periods is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g (3700 Bq/g). The Waste Isolation Pilot Plant, high-level waste, and spent nuclear fuel as defined by DOE Order 5820.2 are specifically excluded from this definition.

Trip Blank - A type of field blank used to accompany sample containers to and from the field and to detect contamination or cross-contamination that occurs during sample handling and transportation.

Unconfined Aquifer - An aquifer that has a water table or surface at atmospheric pressure.

Uncontaminated Soil - A soil or a land area that requires no controls or restrictions in any way for radiation protection purposes and/or meets the contamination limit specifications of Section 7.3, "Dangerous Waste Control."

Underground Radioactive Material - A radiological posting status where subsurface radioactivity is present but where surface contamination does not exceed the soil standards.

Underground Storage Tank - Any one or any combination of tanks (including underground connection pipes) that are used to contain an accumulation of regulated substances. At least 10 percent of the volume of the tanks (including the volume of underground pipes) is beneath the surface of the ground (WAC 173-360-120). A tank situated in an underground area (such as a basement, cellar, etc.) is not considered to be underground if the tank is situated on or above the surface of the floor (WAC 173-360-110). Surface impoundments, pits, ponds, lagoons, storm water collection systems, or septic tanks are not considered to be underground storage tanks, and are not subject to the underground storage tank requirements (WAC 173-360-110).

Unity Rule - If more than one radionuclide is present, the sum of the fractions represented by each radionuclide concentration divided by its respective limiting concentration (ACV) shall not exceed unity. This rule could also apply to parameters other than radionuclide concentration.

Unplanned Radioactive Release Site - Any site thought to contain radioactive material that is released unintentionally (spills, windblown contamination, tumbleweeds, etc.).

Unplanned Release Site - An area that was contaminated by an unplanned release of radioactive contamination, making it a radiological control area.

Unsampled Liquid Disposal Site - A liquid waste disposal site that is currently receiving an effluent stream that does not require sampling.

U.S. Environmental Protection Agency (EPA) -

Vadose Zone - The zone of aeration in the earth's crust above the groundwater level.

Vadose Zone - The unsaturated region of soil or the zone of aeration between the ground surface and the water table.

Vector - A vertebrate or invertebrate that can transmit toxic, radioactive, or infectious material from a disposal or storage site to uncontrolled areas like flies, birds, and mice.

Waste Management - The activity involved with storing, disposing, shipping, handling, and monitoring all radioactive waste.

Waste Sites - Any facility used for the planned disposal of hazardous, radioactive, toxic, or nonradioactive/nontoxic waste.

Water Table - The upper boundary of an unconfined aquifer below which saturated groundwater occurs.

Table B-1. Radionuclide Nomenclature

Radionuclide	Symbol	Half-Life	Radionuclide	Symbol	Half-Life
tritium	^3H	12.3 yr	cesium-137	^{137}Cs	30.2 yr
beryllium-7	^7Be	53.28 d	cerium-144	^{144}Ce	284 d
carbon-14	^{14}C	5730 yr	promethium-147	^{147}Pm	2.62 yr
sodium-22	^{22}Na	2.6 yr	europium-152	^{152}Eu	12 yr
potassium-40	^{40}K	1.26×10^9 yr	europium-154	^{154}Eu	16 yr
argon-41	^{41}Ar	1.8 h	europium-155	^{155}Eu	1.8 yr
chromium-51	^{51}Cr	27.7 d	thallium-208	^{208}Tl	3.1 min
manganese-54	^{54}Mn	312 d	bismuth-212	^{212}Bi	60.6 min
cobalt-57	^{57}Co	271.8 d	lead-212	^{212}Pb	10.6 h
cobalt-60	^{60}Co	5.3 yr	polonium-212	^{212}Po	0.3×10^{-6} s
nickel-63	^{63}Ni	92 yr	polonium-216	^{216}Po	0.15 s
zinc-65	^{65}Zn	243.8 d	radon-220	^{220}Rn	55.6 s
krypton-85	^{85}Kr	10.7 yr	radium-226	^{226}Ra	1600 yr
strontium-89	^{89}Sr	52 d	radium-228	^{228}Ra	5.75 yr
strontium-90	^{90}Sr	28.8 yr	thorium-232	^{232}Th	1.4×10^{10} yr
niobium-95	^{95}Nb	36 d	uranium total	U or uranium	--
zirconium-95	^{95}Zr	64.0 d	uranium-234	^{234}U	2.4×10^5 yr
molybdenum-99	^{99}Mo	66.0 h	uranium-235	^{235}U	7×10^7 yr
technetium-99	^{99}Tc	2.12×10^5 yr	uranium-236	^{236}U	2.3×10^7 yr
ruthenium-103	^{103}Ru	39.4 d	uranium-238	^{238}U	4.5×10^9 yr
ruthenium-106	^{106}Ru	367 d	plutonium-238	^{238}Pu	87.7 yr
tin-113	^{113}Sn	115 d	neptunium-239	^{239}Np	2.4 d
antimony-125	^{125}Sb	2.7 yr	plutonium-239	^{239}Pu	2.4×10^4 yr
iodine-129	^{129}I	1.6×10^7 yr	plutonium-240	^{240}Pu	6537 yr
iodine-131	^{131}I	8.0 d	plutonium-241	^{241}Pu	14.4 yr
barium-133	^{133}Ba	10.53 yr	americium-241	^{241}Am	433 yr
cesium-134	^{134}Cs	2.1 yr			

APPENDIX C

**AMBIENT AIR MONITORING FIGURES
AND TABLES**

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Figure C-1. The 100-N Reactor Area Air Sampler Locations.

29204047.1

Figure C-2. The 200 East Area Air Sampler Locations.

Figure C-3. The 200 West Area Air Sampler Locations.

29003042.4

Figure C-4. Locations of Background Air Sampling Stations.

29003042.7

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 1 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-019	⁷ Be	8.3 E-02	±	2.3 E-02	1.0 E-01	±	2.0 E-02	9.3 E-02	±	2.2 E-02
	⁴⁰ K	3.4 E-03	±	5.6 E-03	1.0 E-02	±	3.6 E-03	6.8 E-03	±	4.6 E-03
	⁶⁰ Co	8.3 E-05	±	4.5 E-04	1.4 E-04	±	2.4 E-04	1.1 E-04	±	3.4 E-04
	⁶⁵ Zn	1.6 E-04	±	1.0 E-03	-5.4 E-04	±	7.4 E-04	-1.9 E-04	±	8.8 E-04
	⁹⁰ Sr	9.7 E-06	±	3.4 E-05	5.4 E-06	±	1.8 E-05	7.5 E-06	±	2.6 E-05
	⁹⁵ ZrNb	1.3 E-03	±	2.0 E-03	2.5 E-03	±	1.8 E-03	1.9 E-03	±	1.9 E-03
	¹⁰⁶ Ru	2.0 E-03	±	3.9 E-03	-1.5 E-03	±	2.5 E-03	2.5 E-04	±	3.2 E-03
	¹²⁵ Sb	1.1 E-05	±	1.1 E-03	5.2 E-05	±	4.7 E-04	3.1 E-05	±	8.0 E-04
	¹³⁴ Cs	-1.1 E-04	±	3.7 E-04	1.4 E-04	±	2.0 E-04	1.6 E-05	±	2.8 E-04
	¹³⁷ Cs	2.5 E-04	±	3.4 E-04	-2.1 E-05	±	2.1 E-04	1.1 E-04	±	2.8 E-04
	¹⁴⁴ CePr	8.1 E-04	±	3.0 E-03	1.1 E-03	±	1.7 E-03	9.8 E-04	±	2.3 E-03
	¹⁵⁴ Eu	6.6 E-04	±	1.3 E-03	-3.3 E-05	±	6.3 E-04	3.2 E-04	±	9.7 E-04
	¹⁵⁵ Eu	-4.9 E-05	±	9.0 E-04	3.4 E-05	±	3.4 E-04	-7.9 E-06	±	6.2 E-04
	²³⁴ U	1.9 E-05	±	1.4 E-05	1.4 E-05	±	4.1 E-06	1.7 E-05	±	9.2 E-06
	²³⁵ U	-1.6 E-06	±	2.1 E-06	9.6 E-07	±	9.6 E-07	-3.3 E-07	±	1.5 E-06
	²³⁸ U	29.6 E-06	±	1.1 E-05	1.8 E-05	±	4.5 E-06	1.4 E-05	±	7.6 E-06
	²³⁸ Pu	1.2 E-07	±	5.7 E-07	7.1 E-08	±	4.4 E-07	9.4 E-08	±	5.1 E-07
	^{239/40} Pu	2.0 E-06	±	1.6 E-06	2.5 E-06	±	1.5 E-06	2.3 E-06	±	1.5 E-06
N-101	⁷ Be	1.2 E-01	±	2.3 E-02	1.3 E-01	±	2.6 E-02	1.2 E-01	±	2.5 E-02
	⁴⁰ K	3.5 E-03	±	2.9 E-03	4.1 E-03	±	4.2 E-03	3.8 E-03	±	3.5 E-03
	⁶⁰ Co	1.3 E-03	±	4.6 E-04	1.8 E-03	±	5.9 E-04	1.5 E-03	±	5.3 E-04
	⁶⁵ Zn	-2.0 E-04	±	7.9 E-04	-8.8 E-04	±	1.1 E-03	-5.4 E-04	±	9.6 E-04
	⁹⁰ Sr	1.5 E-05	±	2.2 E-05	6.1 E-05	±	3.0 E-05	3.8 E-05	±	2.6 E-05
	⁹⁵ ZrNb	-1.9 E-03	±	2.2 E-03	1.2 E-03	±	2.1 E-03	-3.4 E-04	±	2.2 E-03
	¹⁰⁶ Ru	1.9 E-04	±	2.3 E-03	3.1 E-04	±	2.6 E-03	2.5 E-04	±	2.4 E-03
	¹²⁵ Sb	1.1 E-05	±	5.5 E-04	-2.6 E-04	±	7.4 E-04	-1.3 E-04	±	6.5 E-04
	¹³⁴ Cs	3.0 E-05	±	1.9 E-04	-1.4 E-04	±	3.0 E-04	-5.6 E-05	±	2.5 E-04
	¹³⁷ Cs	6.0 E-05	±	2.3 E-04	3.9 E-04	±	3.6 E-04	2.3 E-04	±	2.9 E-04
	¹⁴⁴ CePr	-4.3 E-04	±	2.3 E-03	-2.0 E-03	±	3.1 E-03	-1.2 E-03	±	2.7 E-03
	¹⁵⁴ Eu	-8.3 E-05	±	7.5 E-04	4.7 E-04	±	7.3 E-04	2.0 E-04	±	7.4 E-04
	¹⁵⁵ Eu	-8.9 E-05	±	5.2 E-04	-3.7 E-04	±	6.2 E-04	-2.3 E-04	±	5.7 E-04
	²³⁴ U	4.7 E-06	±	2.3 E-06	6.3 E-06	±	2.8 E-06	5.5 E-06	±	2.6 E-06
	²³⁵ U	3.3 E-07	±	6.0 E-07	8.3 E-07	±	7.8 E-07	5.8 E-07	±	6.9 E-07
	²³⁸ U	3.0 E-06	±	1.9 E-06	5.3 E-06	±	2.2 E-06	4.1 E-06	±	2.1 E-06
	²³⁸ Pu	4.3 E-07	±	5.9 E-07	1.1 E-06	±	1.6 E-06	7.9 E-07	±	1.1 E-06
	^{239/40} Pu	2.1 E-06	±	1.1 E-06	1.1 E-05	±	4.3 E-06	6.4 E-06	±	2.7 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 2 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-102	⁷ Be	1.3 E-01	±	2.4 E-02	9.7 E-02	±	2.2 E-02	1.1 E-01	±	2.3 E-02
	⁴⁰ K	6.1 E-03	±	2.7 E-03	1.2 E-04	±	3.9 E-03	3.1 E-03	±	3.3 E-03
	⁶⁰ Co	1.9 E-04	±	3.3 E-04	5.0 E-04	±	4.2 E-04	3.4 E-04	±	3.7 E-04
	⁶⁵ Zn	2.2 E-04	±	7.0 E-04	9.0 E-04	±	7.5 E-04	5.6 E-04	±	7.3 E-04
	⁹⁰ Sr	2.3 E-05	±	2.2 E-05	5.4 E-06	±	2.0 E-05	1.4 E-05	±	2.1 E-05
	⁹⁵ ZrNb	1.3 E-03	±	1.7 E-03	-4.6 E-04	±	2.0 E-03	4.1 E-04	±	1.9 E-03
	¹⁰⁶ Ru	4.4 E-04	±	2.7 E-03	-3.6 E-05	±	2.7 E-03	2.0 E-04	±	2.7 E-03
	¹²⁵ Sb	-1.4 E-04	±	5.7 E-04	-3.3 E-04	±	6.2 E-04	-2.4 E-04	±	6.0 E-04
	¹³⁴ Cs	-5.2 E-05	±	2.1 E-04	6.2 E-06	±	2.7 E-04	-2.3 E-05	±	2.4 E-04
	¹³⁷ Cs	4.9 E-05	±	1.6 E-04	2.4 E-05	±	2.8 E-04	3.6 E-05	±	2.2 E-04
	¹⁴⁴ CePr	1.5 E-04	±	2.2 E-03	-9.9 E-04	±	2.5 E-03	-4.2 E-04	±	2.4 E-03
	¹⁵⁴ Eu	-8.1 E-04	±	7.7 E-04	-6.6 E-04	±	9.1 E-04	-7.4 E-04	±	8.4 E-04
	¹⁵⁵ Eu	-9.5 E-05	±	5.3 E-04	-8.3 E-05	±	6.7 E-04	-8.9 E-05	±	6.0 E-04
	²³⁴ U	4.8 E-06	±	2.8 E-06	7.0 E-06	±	2.9 E-06	5.9 E-06	±	2.8 E-06
	²³⁵ U	4.8 E-08	±	5.2 E-07	4.7 E-07	±	6.6 E-07	2.6 E-07	±	5.9 E-07
	²³⁸ U	2.4 E-06	±	2.1 E-06	5.3 E-06	±	2.3 E-06	3.8 E-06	±	2.2 E-06
	²³⁸ Pu	2.2 E-07	±	4.4 E-07	6.7 E-07	±	1.1 E-06	4.4 E-07	±	7.6 E-07
	^{239/240} Pu	1.7 E-06	±	1.0 E-06	2.2 E-06	±	1.7 E-06	1.9 E-06	±	1.4 E-06
N-103	⁷ Be	1.2 E-01	±	2.6 E-02	8.7 E-02	±	2.9 E-02	1.0 E-01	±	2.8 E-02
	⁴⁰ K	2.2 E-03	±	2.4 E-03	1.2 E-02	±	3.7 E-03	7.0 E-03	±	3.0 E-03
	⁶⁰ Co	1.2 E-04	±	2.2 E-04	-6.4 E-05	±	2.1 E-04	2.7 E-05	±	2.1 E-04
	⁶⁵ Zn	7.7 E-04	±	5.6 E-04	-5.2 E-04	±	9.0 E-04	1.3 E-04	±	7.3 E-04
	⁹⁰ Sr	7.4 E-06	±	1.7 E-05	3.9 E-06	±	1.8 E-05	5.7 E-06	±	1.8 E-05
	⁹⁵ ZrNb	2.7 E-04	±	1.3 E-03	-2.5 E-05	±	2.0 E-03	1.2 E-04	±	1.6 E-03
	¹⁰⁶ Ru	-8.8 E-05	±	2.0 E-03	-4.2 E-04	±	2.5 E-03	-2.5 E-04	±	2.3 E-03
	¹²⁵ Sb	1.3 E-04	±	5.9 E-04	-2.4 E-04	±	5.4 E-04	-5.7 E-05	±	5.7 E-04
	¹³⁴ Cs	-1.8 E-04	±	2.1 E-04	4.6 E-04	±	2.5 E-04	1.4 E-04	±	2.3 E-04
	¹³⁷ Cs	1.1 E-04	±	2.0 E-04	-2.3 E-04	±	2.4 E-04	-6.5 E-05	±	2.2 E-04
	¹⁴⁴ CePr	1.1 E-03	±	2.1 E-03	6.0 E-04	±	2.3 E-03	8.6 E-04	±	2.2 E-03
	¹⁵⁴ Eu	-3.9 E-04	±	6.0 E-04	5.9 E-04	±	5.8 E-04	1.0 E-04	±	5.9 E-04
	¹⁵⁵ Eu	2.2 E-04	±	4.5 E-04	2.5 E-04	±	4.2 E-04	2.3 E-04	±	4.3 E-04
	²³⁴ U	6.4 E-06	±	2.2 E-06	9.5 E-06	±	3.3 E-06	7.9 E-06	±	2.8 E-06
	²³⁵ U	4.1 E-07	±	5.2 E-07	7.3 E-08	±	3.5 E-07	2.4 E-07	±	4.3 E-07
	²³⁸ U	4.2 E-06	±	1.8 E-06	4.6 E-06	±	2.1 E-06	4.4 E-06	±	2.0 E-06
	²³⁸ Pu	1.1 E-07	±	3.8 E-07	-8.1 E-08	±	1.1 E-06	1.2 E-08	±	7.6 E-07
	^{239/240} Pu	9.3 E-07	±	8.5 E-07	5.6 E-07	±	1.1 E-06	7.4 E-07	±	9.8 E-07

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 3 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-105	⁷ Be	1.4 E-01	±	2.9 E-02	9.4 E-02	±	2.9 E-02	1.2 E-01	±	2.9 E-02
	⁴⁰ K	3.5 E-03	±	2.6 E-03	5.2 E-03	±	6.5 E-03	4.3 E-03	±	4.5 E-03
	⁶⁰ Co	2.0 E-03	±	5.4 E-04	3.9 E-03	±	8.9 E-04	3.0 E-03	±	7.2 E-04
	⁶⁵ Zn	3.9 E-04	±	8.3 E-04	8.1 E-05	±	1.1 E-03	2.4 E-04	±	9.4 E-04
	⁹⁰ Sr	1.2 E-05	±	1.8 E-05	2.4 E-05	±	2.5 E-05	1.8 E-05	±	2.1 E-05
	⁹⁵ ZrNb	-4.5 E-04	±	2.3 E-03	-1.5 E-04	±	2.2 E-03	-3.0 E-04	±	2.2 E-03
	¹⁰⁶ Ru	-1.9 E-04	±	2.4 E-03	-9.9 E-04	±	2.4 E-03	-5.9 E-04	±	2.4 E-03
	¹²⁵ Sb	-1.0 E-04	±	5.8 E-04	8.4 E-05	±	6.1 E-04	-1.0 E-05	±	6.0 E-04
	¹³⁴ Cs	2.1 E-05	±	2.7 E-04	-2.9 E-06	±	2.8 E-04	8.8 E-06	±	2.7 E-04
	¹³⁷ Cs	2.7 E-04	±	2.5 E-04	2.7 E-04	±	3.5 E-04	2.7 E-04	±	3.0 E-04
	¹⁴⁴ CePr	1.5 E-03	±	2.1 E-03	1.9 E-03	±	2.6 E-03	1.7 E-03	±	2.3 E-03
	¹⁵⁴ Eu	-7.0 E-04	±	7.9 E-04	2.2 E-04	±	8.6 E-04	-2.4 E-04	±	8.2 E-04
	¹⁵⁵ Eu	-3.1 E-04	±	5.2 E-04	1.8 E-04	±	4.9 E-04	-6.9 E-05	±	5.1 E-04
	²³⁴ U	2.6 E-06	±	1.7 E-06	5.7 E-06	±	2.5 E-06	4.1 E-06	±	2.1 E-06
	²³⁵ U	4.8 E-07	±	5.9 E-07	2.8 E-07	±	6.4 E-07	3.8 E-07	±	6.1 E-07
	²³⁸ U	2.4 E-06	±	1.6 E-06	5.5 E-06	±	2.4 E-06	3.9 E-06	±	2.0 E-06
	²³⁸ Pu	1.4 E-06	±	1.5 E-06	1.9 E-06	±	1.6 E-06	1.6 E-06	±	1.5 E-06
	^{239/40} Pu	4.1 E-06	±	2.6 E-06	4.7 E-06	±	2.4 E-06	4.4 E-06	±	2.5 E-06
N-155	⁷ Be	1.9 E-01	±	3.0 E-02	8.2 E-02	±	2.1 E-02	1.4 E-01	±	2.5 E-02
	⁴⁰ K	5.8 E-03	±	3.2 E-03	5.0 E-03	±	3.2 E-03	5.4 E-03	±	3.2 E-03
	⁶⁰ Co	2.7 E-04	±	2.3 E-04	-8.2 E-05	±	3.1 E-04	9.4 E-05	±	2.7 E-04
	⁶⁵ Zn	-1.4 E-04	±	7.5 E-04	3.1 E-04	±	5.8 E-04	8.6 E-05	±	6.7 E-04
	⁹⁰ Sr	2.8 E-05	±	2.3 E-05	5.3 E-05	±	2.7 E-05	4.0 E-05	±	2.5 E-05
	⁹⁵ ZrNb	0.0	±	2.0 E-03	-2.8 E-05	±	1.9 E-03	-1.4 E-05	±	1.9 E-03
	¹⁰⁶ Ru	-2.4 E-03	±	2.6 E-03	2.1 E-03	±	2.7 E-03	-1.4 E-04	±	2.7 E-03
	¹²⁵ Sb	-4.4 E-04	±	7.0 E-04	1.8 E-04	±	7.4 E-04	-1.3 E-04	±	7.2 E-04
	¹³⁴ Cs	-1.4 E-04	±	2.7 E-04	1.3 E-04	±	2.4 E-04	-4.5 E-06	±	2.5 E-04
	¹³⁷ Cs	4.1 E-04	±	2.6 E-04	3.9 E-04	±	3.0 E-04	4.0 E-04	±	2.8 E-04
	¹⁴⁴ CePr	5.6 E-04	±	2.5 E-03	-1.2 E-03	±	2.5 E-03	-3.2 E-04	±	2.5 E-03
	¹⁵⁴ Eu	3.5 E-04	±	7.2 E-04	-7.4 E-04	±	7.1 E-04	-1.9 E-04	±	7.2 E-04
	¹⁵⁵ Eu	8.5 E-05	±	4.6 E-04	5.1 E-05	±	5.8 E-04	6.8 E-05	±	5.2 E-04
	²³⁴ U	7.8 E-06	±	3.0 E-06	1.1 E-05	±	4.1 E-06	9.4 E-06	±	3.5 E-06
	²³⁵ U	2.0 E-07	±	5.8 E-07	2.0 E-06	±	1.6 E-06	1.1 E-06	±	1.1 E-06
	²³⁸ U	9.0 E-06	±	3.1 E-06	8.6 E-06	±	3.5 E-06	8.8 E-06	±	3.3 E-06
	²³⁸ Pu	6.6 E-07	±	7.6 E-07	1.6 E-07	±	4.8 E-07	4.1 E-07	±	6.2 E-07
	^{239/40} Pu	1.2 E-05	±	3.2 E-06	8.6 E-06	±	2.5 E-06	1.0 E-05	±	2.9 E-06

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Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 4 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-158	⁷ Be	1.1 E-01	±	2.7 E-02	1.1 E-01	±	3.0 E-02	1.1 E-01	±	2.8 E-02
	⁴⁰ K	4.2 E-03	±	3.1 E-03	8.6 E-03	±	3.9 E-03	6.4 E-03	±	3.5 E-03
	⁶⁰ Co	-2.7 E-04	±	3.1 E-04	-4.3 E-05	±	2.8 E-04	-1.5 E-04	±	2.9 E-04
	⁶⁵ Zn	1.3 E-05	±	7.5 E-04	2.4 E-04	±	7.0 E-04	1.3 E-04	±	7.3 E-04
	⁹⁰ Sr	1.4 E-04	±	4.4 E-05	1.8 E-04	±	5.1 E-05	1.6 E-04	±	4.7 E-05
	⁹⁵ ZrNb	1.7 E-03	±	2.4 E-03	2.6 E-03	±	1.3 E-03	2.1 E-03	±	1.8 E-03
	¹⁰⁶ Ru	5.6 E-04	±	2.6 E-03	-2.6 E-03	±	2.8 E-03	-1.0 E-03	±	2.7 E-03
	¹²⁵ Sb	-1.9 E-04	±	7.0 E-04	1.2 E-04	±	5.0 E-04	-3.2 E-05	±	6.0 E-04
	¹³⁴ Cs	-1.1 E-04	±	2.5 E-04	2.2 E-04	±	1.9 E-04	5.4 E-05	±	2.2 E-04
	¹³⁷ Cs	8.9 E-05	±	2.5 E-04	1.2 E-04	±	2.2 E-04	1.0 E-04	±	2.3 E-04
	¹⁴⁴ CePr	4.1 E-04	±	2.6 E-03	-6.2 E-04	±	2.1 E-03	-1.1 E-04	±	2.3 E-03
	¹⁵⁴ Eu	-6.2 E-04	±	8.5 E-04	3.8 E-05	±	7.3 E-04	-2.9 E-04	±	7.9 E-04
	¹⁵⁵ Eu	5.6 E-04	±	6.1 E-04	-4.0 E-05	±	4.1 E-04	2.6 E-04	±	5.1 E-04
	²³⁴ U	4.3 E-06	±	2.3 E-06	1.1 E-05	±	3.8 E-06	7.7 E-06	±	3.0 E-06
	²³⁵ U	5.9 E-07	±	7.8 E-07	3.0 E-07	±	5.8 E-07	4.5 E-07	±	6.8 E-07
	²³⁸ Pu	8.5 E-08	±	3.7 E-07	-2.5 E-09	±	3.5 E-07	4.1 E-08	±	3.6 E-07
	²³⁸ U	5.7 E-06	±	2.4 E-06	5.2 E-06	±	2.5 E-06	5.4 E-06	±	2.4 E-06
	^{239/240} Pu	1.7 E-06	±	1.2 E-06	9.4 E-06	±	2.7 E-06	5.5 E-06	±	1.9 E-06
N-161	⁷ Be	1.2 E-01	±	2.3 E-02	9.7 E-02	±	2.1 E-02	1.1 E-01	±	2.2 E-02
	⁴⁰ K	5.6 E-03	±	3.0 E-03	3.9 E-03	±	3.0 E-03	4.7 E-03	±	3.0 E-03
	⁶⁰ Co	2.3 E-04	±	2.4 E-04	-3.4 E-04	±	2.6 E-04	-5.9 E-05	±	2.5 E-04
	⁶⁵ Zn	1.6 E-04	±	6.8 E-04	-3.7 E-04	±	7.9 E-04	-1.0 E-04	±	7.4 E-04
	⁹⁰ Sr	1.6 E-05	±	1.9 E-05	3.1 E-05	±	2.3 E-05	2.3 E-05	±	2.1 E-05
	⁹⁵ ZrNb	-1.2 E-03	±	1.9 E-03	1.6 E-04	±	1.8 E-03	-5.0 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-2.2 E-03	±	2.3 E-03	4.0 E-04	±	2.6 E-03	-8.9 E-04	±	2.5 E-03
	¹²⁵ Sb	5.6 E-04	±	5.5 E-04	3.4 E-04	±	6.1 E-04	4.5 E-04	±	5.8 E-04
	¹³⁴ Cs	-2.6 E-04	±	2.1 E-04	-1.1 E-05	±	2.1 E-04	-1.4 E-04	±	2.1 E-04
	¹³⁷ Cs	8.1 E-05	±	2.1 E-04	1.1 E-04	±	2.4 E-04	9.7 E-05	±	2.2 E-04
	¹⁴⁴ CePr	2.6 E-04	±	2.2 E-03	-1.2 E-03	±	2.5 E-03	-4.6 E-04	±	2.4 E-03
	¹⁵⁴ Eu	4.8 E-05	±	6.9 E-04	1.1 E-04	±	5.8 E-04	7.8 E-05	±	6.4 E-04
	¹⁵⁵ Eu	1.0 E-04	±	5.0 E-04	-5.4 E-05	±	5.2 E-04	2.4 E-05	±	5.1 E-04
	²³⁴ U	3.9 E-06	±	2.1 E-06	5.7 E-06	±	4.2 E-06	4.8 E-06	±	3.1 E-06
	²³⁵ U	5.5 E-07	±	6.6 E-07	9.7 E-09	±	1.2 E-06	2.8 E-07	±	9.1 E-07
	²³⁸ Pu	2.1 E-07	±	4.2 E-07	3.0 E-07	±	4.9 E-07	2.5 E-07	±	4.5 E-07
	²³⁸ U	4.3 E-06	±	2.1 E-06	7.6 E-06	±	4.6 E-06	5.9 E-06	±	3.3 E-06
	^{239/240} Pu	2.2 E-05	±	4.2 E-06	2.1 E-05	±	4.0 E-06	2.2 E-05	±	4.1 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 5 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-165	⁷ Be	1.6 E-01	±	3.1 E-02	9.1 E-02	±	2.1 E-02	1.2 E-01	±	2.6 E-02
	⁴⁰ K	2.0 E-03	±	3.4 E-03	8.3 E-03	±	4.2 E-03	5.2 E-03	±	3.8 E-03
	⁶⁰ Co	7.9 E-05	±	2.7 E-04	-1.0 E-04	±	2.8 E-04	-1.1 E-05	±	2.7 E-04
	⁶⁵ Zn	4.1 E-04	±	7.3 E-04	5.4 E-04	±	6.4 E-04	4.7 E-04	±	6.8 E-04
	⁹⁰ Sr	2.9 E-06	±	1.8 E-05	-8.8 E-06	±	1.6 E-05	-2.9 E-06	±	1.7 E-05
	⁹⁵ ZrNb	8.1 E-04	±	1.6 E-03	6.4 E-04	±	2.2 E-03	7.3 E-04	±	1.9 E-03
	¹⁰⁶ Ru	5.4 E-04	±	1.8 E-03	1.4 E-04	±	3.2 E-03	3.4 E-04	±	2.5 E-03
	¹²⁵ Sb	-2.9 E-04	±	6.6 E-04	2.8 E-04	±	6.7 E-04	-9.0 E-06	±	6.6 E-04
	¹³⁴ Cs	-1.3 E-04	±	3.1 E-04	8.3 E-05	±	2.8 E-04	-2.1 E-05	±	2.9 E-04
	¹³⁷ Cs	-1.8 E-04	±	2.7 E-04	6.5 E-06	±	2.1 E-04	-8.5 E-05	±	2.4 E-04
	¹⁴⁴ CePr	-9.9 E-04	±	2.4 E-03	1.4 E-03	±	2.9 E-03	1.9 E-04	±	2.6 E-03
	¹⁵⁴ Eu	-1.3 E-04	±	8.2 E-04	4.5 E-05	±	9.1 E-04	-4.0 E-05	±	8.6 E-04
	¹⁵⁵ Eu	3.0 E-04	±	5.3 E-04	5.8 E-05	±	5.5 E-04	1.8 E-04	±	5.4 E-04
	²³⁴ U	1.3 E-05	±	3.6 E-06	1.4 E-06	±	1.9 E-06	7.0 E-06	±	2.7 E-06
	²³⁵ U	7.8 E-07	±	8.1 E-07	-3.4 E-07	±	6.6 E-07	2.2 E-07	±	7.4 E-07
	²³⁸ U	9.6 E-06	±	3.1 E-06	-5.9 E-07	±	1.3 E-06	4.5 E-06	±	2.2 E-06
	²³⁸ Pu	3.3 E-06	±	1.6 E-06	7.3 E-07	±	6.7 E-07	2.0 E-06	±	1.1 E-06
	^{239/240} Pu	1.7 E-04	±	2.0 E-05	5.1 E-05	±	7.2 E-06	1.1 E-04	±	1.3 E-05
N-168	⁷ Be	1.7 E-01	±	2.9 E-02	1.1 E-01	±	2.1 E-02	1.4 E-01	±	2.5 E-02
	⁴⁰ K	2.7 E-03	±	2.4 E-03	5.5 E-03	±	3.0 E-03	4.1 E-03	±	2.7 E-03
	⁶⁰ Co	-1.6 E-04	±	3.1 E-04	-1.5 E-04	±	3.0 E-04	-1.5 E-04	±	3.0 E-04
	⁶⁵ Zn	5.0 E-04	±	6.8 E-04	2.3 E-04	±	7.5 E-04	3.7 E-04	±	7.1 E-04
	⁹⁰ Sr	3.1 E-05	±	2.4 E-05	5.0 E-06	±	1.8 E-05	1.8 E-05	±	2.1 E-05
	⁹⁵ ZrNb	8.7 E-04	±	1.8 E-03	5.1 E-04	±	1.8 E-03	6.9 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-6.7 E-04	±	2.1 E-03	1.3 E-03	±	2.4 E-03	2.9 E-04	±	2.3 E-03
	¹²⁵ Sb	-8.7 E-05	±	6.0 E-04	-6.5 E-04	±	7.1 E-04	-3.7 E-04	±	6.6 E-04
	¹³⁴ Cs	-4.1 E-05	±	1.9 E-04	-4.0 E-05	±	2.6 E-04	-4.0 E-05	±	2.2 E-04
	¹³⁷ Cs	2.9 E-05	±	2.0 E-04	2.0 E-04	±	2.0 E-04	1.2 E-04	±	2.0 E-04
	¹⁴⁴ CePr	-4.0 E-04	±	2.1 E-03	-1.1 E-03	±	2.4 E-03	-7.7 E-04	±	2.3 E-03
	¹⁵⁴ Eu	-1.5 E-04	±	6.3 E-04	3.9 E-04	±	5.4 E-04	1.2 E-04	±	5.9 E-04
	¹⁵⁵ Eu	2.8 E-04	±	5.2 E-04	2.2 E-04	±	5.7 E-04	2.5 E-04	±	5.4 E-04
	²³⁴ U	2.3 E-05	±	4.5 E-06	1.8 E-05	±	4.7 E-06	2.0 E-05	±	4.6 E-06
	²³⁵ U	5.4 E-07	±	7.5 E-07	4.3 E-07	±	9.4 E-07	4.8 E-07	±	8.5 E-07
	²³⁸ U	1.9 E-05	±	4.0 E-06	1.0 E-05	±	3.6 E-06	1.5 E-05	±	3.8 E-06
	²³⁸ Pu	5.3 E-07	±	6.2 E-07	1.1 E-06	±	9.0 E-07	7.9 E-07	±	7.6 E-07
	^{239/240} Pu	9.0 E-06	±	2.5 E-06	6.8 E-06	±	2.2 E-06	7.9 E-06	±	2.4 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 6 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-304	⁷ Be	9.2 E-02	±	1.9 E-02	9.9 E-02	±	2.1 E-02	9.6 E-02	±	2.0 E-02
	⁴⁰ K	4.3 E-03	±	2.7 E-03	1.4 E-04	±	6.0 E-03	2.2 E-03	±	4.3 E-03
	⁶⁰ Co	4.4 E-05	±	2.6 E-04	-1.3 E-04	±	3.0 E-04	-4.2 E-05	±	2.8 E-04
	⁶⁵ Zn	9.4 E-05	±	5.1 E-04	-1.7 E-04	±	6.6 E-04	-3.8 E-05	±	5.8 E-04
	⁹⁰ Sr	1.2 E-06	±	1.5 E-05	-1.6 E-06	±	1.6 E-05	-2.4 E-07	±	1.6 E-05
	⁹⁵ ZrNb	-1.5 E-03	±	1.9 E-03	1.6 E-03	±	2.0 E-03	6.5 E-05	±	1.9 E-03
	¹⁰⁶ Ru	-6.0 E-04	±	2.1 E-03	8.1 E-04	±	2.6 E-03	1.1 E-04	±	2.3 E-03
	¹²⁵ Sb	2.1 E-04	±	5.2 E-04	1.0 E-04	±	6.1 E-04	1.6 E-04	±	5.6 E-04
	¹³⁴ Cs	-5.7 E-05	±	2.0 E-04	2.2 E-04	±	2.3 E-04	7.9 E-05	±	2.2 E-04
	¹³⁷ Cs	1.1 E-04	±	2.1 E-04	4.4 E-05	±	2.3 E-04	7.5 E-05	±	2.2 E-04
	¹⁴⁴ CePr	-5.5 E-04	±	1.7 E-03	6.2 E-04	±	2.7 E-03	3.5 E-05	±	2.2 E-03
	¹⁵⁴ Eu	-1.2 E-05	±	7.3 E-04	2.7 E-04	±	6.3 E-04	1.3 E-04	±	6.8 E-04
	¹⁵⁵ Eu	5.4 E-05	±	4.6 E-04	-1.6 E-04	±	5.7 E-04	-5.4 E-05	±	5.2 E-04
	²³⁴ U	7.9 E-06	±	2.9 E-06	1.0 E-05	±	3.4 E-06	9.1 E-06	±	3.1 E-06
	²³⁵ U	7.2 E-07	±	8.7 E-07	7.7 E-07	±	9.2 E-07	7.4 E-07	±	8.9 E-07
	²³⁸ U	1.1 E-05	±	3.2 E-06	7.8 E-06	±	2.8 E-06	9.4 E-06	±	3.0 E-06
	²³⁸ Pu	1.6 E-07	±	4.5 E-07	2.6 E-07	±	5.5 E-07	2.1 E-07	±	5.0 E-07
	^{239/240} Pu	3.3 E-06	±	1.5 E-06	2.9 E-06	±	1.4 E-06	3.1 E-06	±	1.4 E-06
N-305	⁷ Be	1.1 E-01	±	2.3 E-02	8.2 E-02	±	1.9 E-02	9.4 E-02	±	2.1 E-02
	⁴⁰ K	4.9 E-03	±	2.9 E-03	1.1 E-02	±	3.8 E-03	7.8 E-03	±	3.3 E-03
	⁶⁰ Co	9.8 E-05	±	2.4 E-04	1.4 E-04	±	2.5 E-04	1.2 E-04	±	2.5 E-04
	⁶⁵ Zn	0.0	±	6.9 E-04	2.7 E-04	±	6.9 E-04	1.3 E-04	±	6.9 E-04
	⁹⁰ Sr	-5.9 E-07	±	1.5 E-05	1.0 E-05	±	1.9 E-05	4.9 E-06	±	1.7 E-05
	⁹⁵ ZrNb	1.6 E-03	±	1.6 E-03	8.2 E-04	±	2.2 E-03	1.2 E-03	±	1.9 E-03
	¹⁰⁶ Ru	-8.7 E-04	±	2.0 E-03	3.7 E-03	±	2.6 E-03	1.4 E-03	±	2.3 E-03
	¹²⁵ Sb	3.1 E-04	±	4.9 E-04	-1.7 E-04	±	8.2 E-04	6.8 E-05	±	6.6 E-04
	¹³⁴ Cs	8.2 E-05	±	1.9 E-04	-2.1 E-04	±	3.0 E-04	-6.4 E-05	±	2.4 E-04
	¹³⁷ Cs	0.0	±	3.1 E-04	2.4 E-05	±	2.4 E-04	1.2 E-05	±	2.3 E-04
	¹⁴⁴ CePr	5.5 E-04	±	2.1 E-03	8.4 E-04	±	2.5 E-03	6.9 E-04	±	2.3 E-03
	¹⁵⁴ Eu	6.0 E-04	±	6.4 E-04	-7.6 E-04	±	8.5 E-04	-8.4 E-05	±	7.4 E-04
	¹⁵⁵ Eu	-7.5 E-05	±	4.5 E-04	-1.1 E-04	±	5.8 E-04	-9.3 E-05	±	5.2 E-04
	²³⁴ U	4.0 E-06	±	2.0 E-06	5.3 E-06	±	2.6 E-06	4.7 E-06	±	2.3 E-06
	²³⁵ U	1.3 E-07	±	4.3 E-07	8.3 E-07	±	9.3 E-07	4.8 E-07	±	6.8 E-07
	²³⁸ Pu	1.4 E-07	±	4.2 E-07	1.4 E-07	±	4.6 E-07	1.4 E-07	±	4.4 E-07
	²³⁸ U	3.2 E-06	±	1.8 E-06	4.9 E-06	±	2.4 E-06	4.1 E-06	±	2.1 E-06
	^{239/240} Pu	8.0 E-07	±	7.8 E-07	1.9 E-06	±	1.4 E-06	1.3 E-06	±	1.1 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 7 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-956	⁷ Be	1.7 E-01	±	3.1 E-02	8.3 E-02	±	2.1 E-02	1.3 E-01	±	2.6 E-02
	⁴⁰ K	2.4 E-03	±	2.9 E-03	2.0 E-03	±	3.0 E-03	2.2 E-03	±	2.9 E-03
	⁶⁰ Co	9.8 E-05	±	2.3 E-04	-1.7 E-04	±	2.7 E-04	-3.6 E-05	±	2.5 E-04
	⁶⁵ Zn	-1.0 E-03	±	9.1 E-04	-3.5 E-04	±	9.7 E-04	-6.9 E-04	±	9.4 E-04
	⁹⁰ Sr	5.7 E-05	±	2.9 E-05	1.3 E-04	±	4.2 E-05	9.1 E-05	±	3.6 E-05
	⁹⁵ ZrNb	9.4 E-04	±	1.9 E-03	9.9 E-04	±	1.7 E-03	9.6 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-1.5 E-03	±	2.6 E-03	-1.4 E-03	±	2.7 E-03	-1.4 E-03	±	2.6 E-03
	¹²⁵ Sb	3.9 E-04	±	4.4 E-04	-2.3 E-04	±	6.5 E-04	8.1 E-05	±	5.4 E-04
	¹³⁴ Cs	5.0 E-06	±	2.0 E-04	3.3 E-05	±	2.4 E-04	1.9 E-05	±	2.2 E-04
	¹³⁷ Cs	9.0 E-04	±	3.4 E-04	3.1 E-04	±	2.5 E-04	6.1 E-04	±	3.0 E-04
	¹⁴⁴ CePr	5.1 E-04	±	2.5 E-03	0.0	±	2.9 E-03	2.5 E-04	±	2.7 E-03
	¹⁵⁴ Eu	-2.6 E-05	±	7.4 E-04	5.9 E-04	±	4.5 E-04	2.8 E-04	±	6.0 E-04
	¹⁵⁵ Eu	-2.8 E-04	±	5.3 E-04	2.8 E-04	±	5.6 E-04	-5.0 E-07	±	5.4 E-04
	²³⁴ U	5.8 E-06	±	2.8 E-06	5.6 E-06	±	2.5 E-06	5.7 E-06	±	2.7 E-06
	²³⁵ U	6.7 E-07	±	8.9 E-07	6.5 E-07	±	8.3 E-07	6.6 E-07	±	8.6 E-07
	²³⁸ U	3.8 E-06	±	2.3 E-06	3.9 E-06	±	2.1 E-06	3.9 E-06	±	2.2 E-06
	²³⁸ Pu	4.2 E-07	±	5.9 E-07	4.2 E-07	±	6.5 E-07	4.2 E-07	±	6.2 E-07
	^{239/240} Pu	3.5 E-06	±	1.6 E-06	2.7 E-06	±	1.5 E-06	3.1 E-06	±	1.6 E-06
N-957	⁷ Be	1.3 E-01	±	2.3 E-02	8.9 E-02	±	2.0 E-02	1.1 E-01	±	2.2 E-02
	⁴⁰ K	3.6 E-04	±	2.9 E-03	5.7 E-03	±	3.8 E-03	3.0 E-03	±	3.3 E-03
	⁶⁰ Co	-2.1 E-04	±	2.4 E-04	-2.3 E-04	±	2.6 E-04	-2.2 E-04	±	2.5 E-04
	⁶⁵ Zn	3.7 E-04	±	5.9 E-04	-3.1 E-04	±	7.6 E-04	3.2 E-05	±	6.7 E-04
	⁹⁰ Sr	8.1 E-06	±	1.7 E-05	-6.4 E-06	±	1.8 E-05	8.6 E-07	±	1.7 E-05
	⁹⁵ ZrNb	-6.5 E-04	±	1.7 E-03	5.6 E-04	±	2.1 E-03	-4.5 E-05	±	1.9 E-03
	¹⁰⁶ Ru	1.7 E-04	±	2.3 E-03	6.9 E-04	±	2.4 E-03	4.3 E-04	±	2.3 E-03
	¹²⁵ Sb	-1.3 E-04	±	5.6 E-04	-7.8 E-05	±	6.2 E-04	-1.1 E-04	±	5.9 E-04
	¹³⁴ Cs	2.9 E-05	±	2.0 E-04	8.9 E-05	±	2.0 E-04	5.9 E-05	±	2.0 E-04
	¹³⁷ Cs	1.2 E-04	±	2.0 E-04	4.7 E-05	±	2.2 E-04	8.2 E-05	±	2.1 E-04
	¹⁴⁴ CePr	-6.6 E-04	±	2.1 E-03	4.0 E-04	±	2.5 E-03	-1.3 E-04	±	2.3 E-03
	¹⁵⁴ Eu	-1.5 E-04	±	6.3 E-04	8.3 E-05	±	7.6 E-04	-3.3 E-05	±	7.0 E-04
	¹⁵⁵ Eu	4.0 E-04	±	4.7 E-04	-2.4 E-04	±	5.2 E-04	7.7 E-05	±	5.0 E-04
	²³⁴ U	4.5 E-06	±	2.7 E-06	9.9 E-06	±	3.0 E-06	7.2 E-06	±	2.8 E-06
	²³⁵ U	4.4 E-07	±	8.9 E-07	8.2 E-07	±	8.1 E-07	6.3 E-07	±	8.5 E-07
	²³⁸ Pu	9.6 E-07	±	1.3 E-06	2.2 E-07	±	4.9 E-07	5.9 E-07	±	8.9 E-07
	²³⁸ U	6.6 E-06	±	±2.9 E-06	9.3 E-06	±	±2.9 E-06	8.0 E-06	±	±2.9 E-06
	^{239/240} Pu	1.1 E-05	±	3.7 E-06	1.2 E-06	±	9.1 E-07	5.9 E-06	±	2.3 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 8 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-961	⁷ Be	1.0 E-01	±	2.0 E-02	6.3 E-02	±	1.8 E-02	8.2 E-02	±	1.9 E-02
	⁴⁰ K	7.1 E-04	±	2.8 E-03	5.7 E-03	±	3.9 E-03	3.2 E-03	±	3.4 E-03
	⁶⁰ Co	-1.4 E-04	±	2.5 E-04	-2.1 E-04	±	2.8 E-04	-1.7 E-04	±	2.7 E-04
	⁶⁵ Zn	-3.2 E-04	±	7.5 E-04	5.7 E-04	±	7.7 E-04	1.3 E-04	±	7.6 E-04
	⁹⁰ Sr	-8.3 E-06	±	1.5 E-05	-1.3 E-05	±	1.5 E-05	-1.1 E-05	±	1.5 E-05
	⁹⁵ ZrNb	1.6 E-03	±	1.5 E-03	1.0 E-03	±	1.9 E-03	1.3 E-03	±	1.7 E-03
	¹⁰⁶ Ru	1.6 E-03	±	2.2 E-03	-1.2 E-03	±	2.6 E-03	2.4 E-04	±	2.4 E-03
	¹²⁵ Sb	7.4 E-05	±	5.4 E-04	-4.9 E-04	±	7.1 E-04	-2.1 E-04	±	6.2 E-04
	¹³⁴ Cs	-9.3 E-05	±	2.2 E-04	-1.5 E-04	±	2.3 E-04	-1.2 E-04	±	2.3 E-04
	¹³⁷ Cs	-3.9 E-05	±	1.9 E-04	-1.8 E-04	±	2.3 E-04	-1.1 E-04	±	2.1 E-04
	¹⁴⁴ CePr	-1.3 E-03	±	2.5 E-03	-2.9 E-03	±	2.9 E-03	-2.1 E-03	±	2.7 E-03
	¹⁵⁴ Eu	6.6 E-04	±	7.1 E-04	-2.6 E-04	±	9.0 E-04	2.0 E-04	±	8.1 E-04
	¹⁵⁵ Eu	2.8 E-04	±	4.4 E-04	6.2 E-04	±	5.3 E-04	4.5 E-04	±	4.8 E-04
	²³⁴ U	4.3 E-06	±	2.0 E-06	3.5 E-06	±	2.3 E-06	3.9 E-06	±	2.1 E-06
	²³⁵ U	5.4 E-07	±	6.4 E-07	2.7 E-07	±	6.0 E-07	4.0 E-07	±	6.2 E-07
	²³⁸ Pu	-8.1 E-08	±	1.2 E-06	1.6 E-07	±	4.6 E-07	3.7 E-08	±	8.3 E-07
	²³⁸ U	3.9 E-06	±	1.9 E-06	2.5 E-06	±	1.7 E-06	3.2 E-06	±	1.8 E-06
	^{239/40} Pu	3.9 E-07	±	8.0 E-07	5.0 E-07	±	6.5 E-07	4.4 E-07	±	7.2 E-07
N-963	⁷ Be	9.9 E-02	±	2.2 E-02	8.0 E-02	±	2.0 E-02	9.0 E-02	±	2.1 E-02
	⁴⁰ K	1.9 E-03	±	2.8 E-03	5.9 E-03	±	2.7 E-03	3.9 E-03	±	2.8 E-03
	⁶⁰ Co	-5.6 E-05	±	1.6 E-04	1.1 E-04	±	2.8 E-04	2.6 E-05	±	2.2 E-04
	⁶⁵ Zn	-5.8 E-04	±	7.6 E-04	1.2 E-05	±	9.2 E-04	-2.8 E-04	±	8.4 E-04
	⁹⁰ Sr	6.9 E-06	±	1.8 E-05	2.7 E-04	±	6.7 E-05	1.4 E-04	±	4.2 E-05
	⁹⁵ ZrNb	-2.3 E-04	±	1.9 E-03	3.2 E-04	±	2.1 E-03	4.4 E-05	±	2.0 E-03
	¹⁰⁶ Ru	-1.5 E-03	±	2.1 E-03	5.9 E-04	±	2.7 E-03	-4.5 E-04	±	2.4 E-03
	¹²⁵ Sb	1.1 E-04	±	5.0 E-04	2.6 E-04	±	7.2 E-04	1.9 E-04	±	6.1 E-04
	¹³⁴ Cs	-8.2 E-05	±	2.0 E-04	5.9 E-05	±	2.6 E-04	-1.2 E-05	±	2.3 E-04
	¹³⁷ Cs	2.3 E-05	±	1.8 E-04	-1.3 E-04	±	2.6 E-04	-5.3 E-05	±	2.2 E-04
	¹⁴⁴ CePr	-6.3 E-04	±	2.1 E-03	-1.5 E-03	±	2.7 E-03	-1.1 E-03	±	2.4 E-03
	¹⁵⁴ Eu	3.7 E-05	±	5.9 E-04	1.2 E-03	±	9.2 E-04	6.1 E-04	±	7.6 E-04
	¹⁵⁵ Eu	-1.4 E-04	±	4.3 E-04	5.5 E-04	±	5.3 E-04	2.0 E-04	±	4.8 E-04
	²³⁴ U	8.8 E-06	±	2.7 E-06	1.6 E-05	±	4.1 E-06	1.2 E-05	±	3.4 E-06
	²³⁵ U	4.2 E-07	±	5.9 E-07	8.6 E-07	±	8.6 E-07	6.4 E-07	±	7.3 E-07
	²³⁸ U	8.3 E-06	±	2.6 E-06	8.6 E-06	±	2.9 E-06	8.5 E-06	±	2.7 E-06
	²³⁸ Pu	2.0 E-05	±	5.7 E-06	9.6 E-05	±	1.3 E-05	5.8 E-05	±	9.5 E-06
	^{239/40} Pu	7.1 E-06	±	3.1 E-06	1.7 E-05	±	4.1 E-06	1.2 E-05	±	3.6 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 9 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-964	⁷ Be	1.1 E-01	±	2.1 E-02	1.1 E-01	±	2.7 E-02	1.1 E-01	±	2.4 E-02
	⁴⁰ K	2.9 E-03	±	3.0 E-03	1.0 E-02	±	4.1 E-03	6.7 E-03	±	3.5 E-03
	⁶⁰ Co	-2.2 E-04	±	2.0 E-04	-1.8 E-04	±	2.8 E-04	-2.0 E-04	±	2.4 E-04
	⁶⁵ Zn	-1.1 E-03	±	7.3 E-04	-2.3 E-04	±	5.8 E-04	-6.5 E-04	±	6.6 E-04
	⁹⁰ Sr	1.5 E-05	±	2.1 E-05	6.0 E-07	±	1.8 E-05	7.7 E-06	±	2.0 E-05
	⁹⁵ ZrNb	8.5 E-04	±	1.7 E-03	1.3 E-03	±	1.9 E-03	1.1 E-03	±	1.8 E-03
	¹⁰⁶ Ru	-1.5 E-03	±	2.4 E-03	4.8 E-04	±	2.3 E-03	-5.2 E-04	±	2.4 E-03
	¹²⁵ Sb	-8.7 E-04	±	6.1 E-04	2.9 E-05	±	5.5 E-04	-4.2 E-04	±	5.8 E-04
	¹³⁴ Cs	-3.7 E-04	±	2.7 E-04	2.2 E-05	±	2.2 E-04	-1.7 E-04	±	2.4 E-04
	¹³⁷ Cs	8.7 E-05	±	1.6 E-04	-2.6 E-06	±	2.1 E-04	4.2 E-05	±	1.9 E-04
	¹⁴⁴ CePr	1.3 E-03	±	2.3 E-03	-1.3 E-03	±	2.1 E-03	-2.0 E-05	±	2.2 E-03
	¹⁵⁴ Eu	-9.2 E-05	±	6.4 E-04	3.8 E-04	±	5.2 E-04	1.4 E-04	±	5.8 E-04
	¹⁵⁵ Eu	-5.4 E-05	±	4.5 E-04	4.6 E-04	±	4.0 E-04	2.0 E-04	±	4.3 E-04
	²³⁴ U	1.3 E-05	±	3.7 E-06	1.1 E-05	±	3.0 E-06	1.2 E-05	±	3.4 E-06
	²³⁵ U	6.7 E-07	±	8.5 E-07	8.2 E-07	±	7.6 E-07	7.5 E-07	±	8.1 E-07
	²³⁸ Pu	9.4 E-07	±	1.2 E-06	-8.1 E-08	±	9.0 E-07	4.3 E-07	±	1.0 E-06
	²³⁸ U	1.6 E-05	±	3.9 E-06	9.3 E-06	±	2.8 E-06	1.2 E-05	±	3.4 E-06
	^{239/40} Pu	6.5 E-06	±	2.8 E-06	3.4 E-06	±	2.1 E-06	5.0 E-06	±	2.5 E-06
N-965	⁷ Be	1.3 E-01	±	2.4 E-02	9.3 E-02	±	2.4 E-02	1.1 E-01	±	2.4 E-02
	⁴⁰ K	6.6 E-03	±	3.5 E-03	1.2 E-02	±	5.2 E-03	9.2 E-03	±	4.4 E-03
	⁶⁰ Co	1.8 E-04	±	1.9 E-04	1.0 E-04	±	2.1 E-04	1.4 E-04	±	2.0 E-04
	⁶⁵ Zn	-4.3 E-04	±	7.3 E-04	2.7 E-04	±	7.6 E-04	-8.1 E-05	±	7.5 E-04
	⁹⁰ Sr	1.3 E-05	±	2.3 E-05	3.5 E-06	±	1.8 E-05	8.2 E-06	±	2.0 E-05
	⁹⁵ ZrNb	-8.3 E-04	±	1.8 E-03	1.7 E-04	±	2.1 E-03	-3.3 E-04	±	1.9 E-03
	¹⁰⁶ Ru	5.3 E-04	±	2.4 E-03	-1.8 E-03	±	2.7 E-03	-6.5 E-04	±	2.6 E-03
	¹²⁵ Sb	2.6 E-04	±	5.5 E-04	1.6 E-04	±	5.4 E-04	2.1 E-04	±	5.4 E-04
	¹³⁴ Cs	8.9 E-05	±	2.1 E-04	5.6 E-05	±	2.4 E-04	7.3 E-05	±	2.2 E-04
	¹³⁷ Cs	1.3 E-04	±	1.9 E-04	-1.8 E-04	±	2.4 E-04	-2.3 E-05	±	2.1 E-04
	¹⁴⁴ CePr	-8.3 E-04	±	2.2 E-03	-4.2 E-05	±	1.9 E-03	-4.3 E-04	±	2.1 E-03
	¹⁵⁴ Eu	-5.6 E-04	±	6.3 E-04	-8.5 E-05	±	8.9 E-04	-3.2 E-04	±	7.6 E-04
	¹⁵⁵ Eu	5.4 E-05	±	4.6 E-04	6.2 E-05	±	4.6 E-04	5.8 E-05	±	4.6 E-04
	²³⁴ U	6.5 E-06	±	2.4 E-06	6.0 E-06	±	2.5 E-06	6.2 E-06	±	2.4 E-06
	²³⁵ U	1.3 E-07	±	4.2 E-07	1.1 E-06	±	8.6 E-07	6.1 E-07	±	6.4 E-07
	²³⁸ U	6.3 E-06	±	2.2 E-06	3.3 E-06	±	1.8 E-06	4.8 E-06	±	2.0 E-06
	²³⁸ Pu	2.8 E-06	±	1.8 E-06	-3.0 E-08	±	4.8 E-07	1.4 E-06	±	1.1 E-06
	^{239/40} Pu	1.1 E-05	±	3.7 E-06	3.2 E-06	±	1.8 E-06	7.3 E-06	±	2.7 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 10 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-966	⁷ Be	1.1 E-01	±	2.2 E-02	9.8 E-02	±	2.3 E-02	1.0 E-01	±	2.3 E-02
	⁴⁰ K	5.8 E-03	±	3.3 E-03	1.4 E-02	±	4.3 E-03	9.9 E-03	±	3.8 E-03
	⁶⁰ Co	2.8 E-05	±	2.6 E-04	1.0 E-04	±	2.5 E-04	6.4 E-05	±	2.5 E-04
	⁶⁵ Zn	2.3 E-04	±	6.2 E-04	5.5 E-04	±	6.4 E-04	3.9 E-04	±	6.3 E-04
	⁹⁰ Sr	6.3 E-06	±	1.9 E-05	1.1 E-05	±	2.0 E-05	8.8 E-06	±	1.9 E-05
	⁹⁵ ZrNb	9.2 E-04	±	1.7 E-03	9.0 E-04	±	1.8 E-03	9.1 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-1.0 E-03	±	2.5 E-03	-2.0 E-04	±	2.2 E-03	-6.2 E-04	±	2.4 E-03
	¹²⁵ Sb	1.2 E-04	±	5.3 E-04	2.5 E-04	±	4.8 E-04	1.9 E-04	±	5.0 E-04
	¹³⁴ Cs	-1.8 E-04	±	2.3 E-04	-2.4 E-05	±	2.3 E-04	-1.0 E-04	±	2.3 E-04
	¹³⁷ Cs	2.4 E-04	±	2.0 E-04	-3.7 E-05	±	2.2 E-04	1.0 E-04	±	2.1 E-04
	¹⁴⁴ CePr	9.6 E-04	±	2.0 E-03	-7.1 E-05	±	2.1 E-03	4.4 E-04	±	2.0 E-03
	¹⁵⁴ Eu	1.5 E-04	±	5.2 E-04	-1.9 E-04	±	5.2 E-04	-2.2 E-05	±	5.2 E-04
	¹⁵⁵ Eu	1.5 E-04	±	4.8 E-04	3.7 E-04	±	4.2 E-04	2.6 E-04	±	4.5 E-04
	²³⁴ U	9.7 E-06	±	2.7 E-06	1.2 E-05	±	3.2 E-06	1.1 E-05	±	2.9 E-06
	²³⁵ U	3.0 E-07	±	6.3 E-07	1.9 E-07	±	4.2 E-07	2.5 E-07	±	5.3 E-07
	²³⁸ Pu	6.8 E-07	±	7.6 E-07	6.7 E-07	±	1.0 E-06	6.7 E-07	±	9.0 E-07
	²³⁸ U	5.1 E-06	±	2.0 E-06	5.5 E-06	±	2.2 E-06	5.3 E-06	±	2.1 E-06
	^{239/240} Pu	2.0 E-06	±	1.4 E-06	3.7 E-06	±	2.0 E-06	2.9 E-06	±	1.7 E-06
N-967	⁷ Be	1.2 E-01	±	2.4 E-02	9.6 E-02	±	2.7 E-02	1.1 E-01	±	2.5 E-02
	⁴⁰ K	2.8 E-03	±	2.7 E-03	7.8 E-03	±	3.8 E-03	5.3 E-03	±	3.3 E-03
	⁶⁰ Co	1.3 E-04	±	1.7 E-04	1.3 E-04	±	2.5 E-04	1.3 E-04	±	2.1 E-04
	⁶⁵ Zn	-4.5 E-05	±	5.6 E-04	1.2 E-04	±	6.3 E-04	3.6 E-05	±	6.0 E-04
	⁹⁰ Sr	1.4 E-05	±	2.1 E-05	-2.1 E-06	±	1.6 E-05	5.8 E-06	±	1.8 E-05
	⁹⁵ ZrNb	-3.8 E-04	±	1.8 E-03	1.5 E-03	±	1.4 E-03	5.4 E-04	±	1.6 E-03
	¹⁰⁶ Ru	8.4 E-04	±	2.4 E-03	-1.6 E-03	±	2.5 E-03	-3.6 E-04	±	2.4 E-03
	¹²⁵ Sb	5.2 E-05	±	6.2 E-04	-5.9 E-04	±	6.7 E-04	-2.7 E-04	±	6.4 E-04
	¹³⁴ Cs	-7.5 E-05	±	2.2 E-04	1.8 E-04	±	2.4 E-04	5.5 E-05	±	2.3 E-04
	¹³⁷ Cs	1.6 E-04	±	2.7 E-04	2.3 E-04	±	2.5 E-04	2.0 E-04	±	2.6 E-04
	¹⁴⁴ CePr	2.9 E-04	±	2.1 E-03	1.3 E-03	±	2.5 E-03	7.9 E-04	±	2.3 E-03
	¹⁵⁴ Eu	-2.2 E-04	±	7.8 E-04	1.3 E-04	±	4.4 E-04	-4.7 E-05	±	6.1 E-04
	¹⁵⁵ Eu	8.0 E-05	±	4.6 E-04	-3.1 E-05	±	6.0 E-04	2.5 E-05	±	5.3 E-04
	²³⁴ U	6.9 E-06	±	2.5 E-06	7.5 E-06	±	2.6 E-06	7.2 E-06	±	2.6 E-06
	²³⁵ U	4.4 E-07	±	6.2 E-07	9.4 E-08	±	4.8 E-07	2.7 E-07	±	5.5 E-07
	²³⁸ U	4.3 E-06	±	2.0 E-06	3.6 E-06	±	1.9 E-06	3.9 E-06	±	2.0 E-06
	²³⁸ Pu	-8.1 E-08	±	8.9 E-07	2.5 E-07	±	6.5 E-07	8.4 E-08	±	7.7 E-07
	^{239/240} Pu	6.6 E-07	±	1.1 E-06	7.9 E-06	±	2.8 E-06	4.3 E-06	±	1.9 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 11 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-968	⁷ Be	9.4 E-02	±	2.1 E-02	8.5 E-02	±	2.4 E-02	8.9 E-02	±	2.3 E-02
	⁴⁰ K	4.0 E-03	±	2.7 E-03	1.8 E-02	±	5.0 E-03	1.1 E-02	±	3.9 E-03
	⁶⁰ Co	-5.9 E-05	±	2.8 E-04	4.3 E-05	±	2.6 E-04	-8.0 E-06	±	2.7 E-04
	⁶⁵ Zn	3.3 E-04	±	5.1 E-04	3.9 E-05	±	7.1 E-04	1.8 E-04	±	6.1 E-04
	⁹⁰ Sr	-1.8 E-07	±	1.7 E-05	-1.5 E-06	±	1.8 E-05	-8.3 E-07	±	1.8 E-05
	⁹⁵ ZrNb	1.5 E-03	±	1.9 E-03	2.3 E-04	±	1.8 E-03	8.5 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-3.5 E-04	±	2.4 E-03	-5.9 E-04	±	2.2 E-03	-4.7 E-04	±	2.3 E-03
	¹²⁵ Sb	2.1 E-04	±	5.6 E-04	1.2 E-04	±	5.9 E-04	1.7 E-04	±	5.7 E-04
	¹³⁴ Cs	-9.2 E-06	±	2.3 E-04	-1.4 E-05	±	2.1 E-04	-1.2 E-05	±	2.2 E-04
	¹³⁷ Cs	-2.5 E-05	±	2.0 E-04	7.0 E-05	±	2.1 E-04	2.3 E-05	±	2.0 E-04
	¹⁴⁴ CePr	1.3 E-03	±	2.5 E-03	-6.3 E-05	±	2.2 E-03	6.3 E-04	±	2.3 E-03
	¹⁵⁴ Eu	5.3 E-04	±	6.2 E-04	-3.8 E-04	±	6.9 E-04	7.2 E-05	±	6.6 E-04
	¹⁵⁵ Eu	2.5 E-04	±	4.8 E-04	-8.4 E-05	±	5.4 E-04	8.2 E-05	±	5.1 E-04
	²³⁴ U	1.1 E-05	±	3.0 E-06	1.8 E-05	±	4.3 E-06	1.5 E-05	±	3.6 E-06
	²³⁵ U	7.9 E-07	±	7.4 E-07	9.4 E-07	±	8.4 E-07	8.6 E-07	±	7.9 E-07
	²³⁸ U	1.1 E-05	±	2.9 E-06	9.1 E-06	±	2.7 E-06	9.8 E-06	±	2.8 E-06
	²³⁸ Pu	-8.4 E-08	±	6.4 E-07	5.4 E-07	±	1.0 E-06	2.3 E-07	±	8.3 E-07
	^{239/240} Pu	1.7 E-06	±	1.3 E-06	1.5 E-06	±	1.6 E-06	1.6 E-06	±	1.5 E-06
N-969	⁷ Be	1.2 E-01	±	2.4 E-02	1.2 E-01	±	2.5 E-02	1.2 E-01	±	2.4 E-02
	⁴⁰ K	4.7 E-03	±	3.1 E-03	4.5 E-03	±	3.1 E-03	4.6 E-03	±	3.1 E-03
	⁶⁰ Co	9.8 E-05	±	3.0 E-04	-1.5 E-05	±	2.5 E-04	4.2 E-05	±	2.8 E-04
	⁶⁵ Zn	-2.8 E-04	±	7.0 E-04	4.1 E-04	±	7.8 E-04	6.5 E-05	±	7.4 E-04
	⁹⁰ Sr	3.9 E-05	±	2.5 E-05	2.0 E-05	±	2.2 E-05	2.9 E-05	±	2.3 E-05
	⁹⁵ ZrNb	-8.6 E-04	±	1.9 E-03	-1.9 E-03	±	2.2 E-03	-1.4 E-03	±	2.1 E-03
	¹⁰⁶ Ru	-1.1 E-03	±	1.9 E-03	-9.0 E-04	±	2.5 E-03	-9.9 E-04	±	2.2 E-03
	¹²⁵ Sb	-2.5 E-04	±	5.2 E-04	4.2 E-04	±	7.0 E-04	8.8 E-05	±	6.1 E-04
	¹³⁴ Cs	2.2 E-05	±	2.2 E-04	-2.8 E-04	±	2.7 E-04	-1.3 E-04	±	2.4 E-04
	¹³⁷ Cs	-1.6 E-05	±	2.1 E-04	1.1 E-04	±	2.5 E-04	4.8 E-05	±	2.3 E-04
	¹⁴⁴ CePr	2.2 E-04	±	1.9 E-03	-3.2 E-03	±	2.8 E-03	-1.5 E-03	±	2.3 E-03
	¹⁵⁴ Eu	-1.5 E-04	±	7.9 E-04	4.1 E-05	±	6.8 E-04	-5.4 E-05	±	7.4 E-04
	¹⁵⁵ Eu	-8.4 E-06	±	5.1 E-04	3.8 E-04	±	5.3 E-04	1.8 E-04	±	5.2 E-04
	²³⁴ U	2.8 E-06	±	3.1 E-06	4.7 E-06	±	2.1 E-06	3.7 E-06	±	2.6 E-06
	²³⁵ U	-5.2 E-09	±	9.9 E-07	5.4 E-07	±	7.5 E-07	2.7 E-07	±	8.7 E-07
	²³⁸ U	7.5 E-06	±	4.2 E-06	6.0 E-06	±	2.2 E-06	6.8 E-06	±	3.2 E-06
	²³⁸ Pu	-8.1 E-08	±	8.0 E-07	7.0 E-07	±	1.0 E-06	3.1 E-07	±	9.0 E-07
	^{239/240} Pu	1.3 E-06	±	1.2 E-06	4.7 E-06	±	2.4 E-06	3.0 E-06	±	1.8 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 12 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-970	⁷ Be	1.7 E-01	±	2.9 E-02	1.2 E-01	±	2.7 E-02	1.4 E-01	±	2.8 E-02
	⁴⁰ K	4.6 E-03	±	3.7 E-03	7.3 E-03	±	3.5 E-03	6.0 E-03	±	3.6 E-03
	⁶⁰ Co	-8.4 E-05	±	2.3 E-04	6.8 E-05	±	2.4 E-04	-8.1 E-06	±	2.3 E-04
	⁶⁵ Zn	3.4 E-05	±	5.0 E-04	-8.1 E-04	±	7.3 E-04	-3.9 E-04	±	6.2 E-04
	⁹⁰ Sr	2.1 E-05	±	2.2 E-05	1.6 E-05	±	2.1 E-05	1.9 E-05	±	2.2 E-05
	⁹⁵ ZrNb	-6.8 E-04	±	1.8 E-03	-1.4 E-03	±	2.2 E-03	-1.0 E-03	±	2.0 E-03
	¹⁰⁶ Ru	-4.8 E-04	±	1.6 E-03	3.1 E-04	±	2.4 E-03	-8.4 E-05	±	2.0 E-03
	¹²⁵ Sb	5.0 E-04	±	5.7 E-04	-2.9 E-04	±	6.7 E-04	1.0 E-04	±	6.2 E-04
	¹³⁴ Cs	1.8 E-04	±	2.0 E-04	-1.6 E-04	±	2.2 E-04	1.3 E-05	±	2.1 E-04
	¹³⁷ Cs	-2.6 E-04	±	2.0 E-04	2.1 E-04	±	2.1 E-04	-2.4 E-05	±	2.0 E-04
	¹⁴⁴ CePr	7.3 E-05	±	2.4 E-03	2.4 E-03	±	2.8 E-03	1.2 E-03	±	2.6 E-03
	¹⁵⁴ Eu	-3.7 E-04	±	7.5 E-04	-2.3 E-04	±	6.4 E-04	-3.0 E-04	±	6.9 E-04
	¹⁵⁵ Eu	1.7 E-05	±	5.1 E-04	2.1 E-04	±	5.3 E-04	1.1 E-04	±	5.2 E-04
	²³⁴ U	6.3 E-06	±	2.3 E-06	7.4 E-06	±	2.6 E-06	6.9 E-06	±	2.4 E-06
	²³⁵ U	-1.5 E-07	±	1.7 E-07	2.3 E-07	±	5.5 E-07	4.1 E-08	±	3.6 E-07
	²³⁸ Pu	-8.1 E-08	±	6.7 E-07	6.0 E-07	±	8.7 E-07	2.6 E-07	±	7.7 E-07
	²³⁸ U	6.8 E-06	±	2.4 E-06	7.4 E-06	±	2.5 E-06	7.1 E-06	±	2.4 E-06
	^{239/240} Pu	1.6 E-06	±	1.3 E-06	5.1 E-06	±	2.3 E-06	3.4 E-06	±	1.8 E-06
N-972	⁷ Be	6.1 E-02	±	1.7 E-02	9.0 E-02	±	2.6 E-02	7.5 E-02	±	2.1 E-02
	⁴⁰ K	4.8 E-03	±	2.9 E-03	4.5 E-03	±	5.4 E-03	4.6 E-03	±	4.1 E-03
	⁶⁰ Co	-1.7 E-04	±	2.2 E-04	1.7 E-04	±	2.4 E-04	5.0 E-07	±	2.3 E-04
	⁶⁵ Zn	-2.9 E-04	±	5.9 E-04	1.3 E-03	±	7.9 E-04	5.2 E-04	±	6.9 E-04
	⁹⁰ Sr	6.1 E-05	±	3.2 E-05	1.7 E-06	±	1.7 E-05	3.1 E-05	±	2.5 E-05
	⁹⁵ ZrNb	2.0 E-03	±	1.6 E-03	7.7 E-04	±	1.9 E-03	1.4 E-03	±	1.8 E-03
	¹⁰⁶ Ru	6.2 E-04	±	1.9 E-03	0.0	±	2.6 E-03	3.1 E-04	±	2.3 E-03
	¹²⁵ Sb	2.6 E-04	±	5.3 E-04	8.4 E-05	±	5.5 E-04	1.7 E-04	±	5.4 E-04
	¹³⁴ Cs	-2.8 E-04	±	2.1 E-04	1.4 E-04	±	2.1 E-04	-6.9 E-05	±	2.1 E-04
	¹³⁷ Cs	5.0 E-06	±	2.5 E-04	1.2 E-04	±	2.4 E-04	6.0 E-05	±	2.5 E-04
	¹⁴⁴ CePr	4.2 E-04	±	1.9 E-03	2.7 E-03	±	2.1 E-03	1.6 E-03	±	2.0 E-03
	¹⁵⁴ Eu	-5.0 E-04	±	7.5 E-04	-3.6 E-04	±	8.7 E-04	-4.3 E-04	±	8.1 E-04
	¹⁵⁵ Eu	6.7 E-05	±	5.1 E-04	-3.4 E-04	±	4.6 E-04	-1.4 E-04	±	4.8 E-04
	²³⁴ U	6.3 E-06	±	2.4 E-06	3.7 E-06	±	2.1 E-06	5.0 E-06	±	2.2 E-06
	²³⁵ U	6.9 E-07	±	7.7 E-07	3.0 E-07	±	5.6 E-07	5.0 E-07	±	6.7 E-07
	²³⁸ U	4.8 E-06	±	2.1 E-06	4.8 E-06	±	2.1 E-06	4.8 E-06	±	2.1 E-06
	²³⁸ Pu	-3.7 E-07	±	5.7 E-07	1.2 E-06	±	1.0 E-06	4.1 E-07	±	7.9 E-07
	^{239/240} Pu	3.2 E-06	±	3.2 E-06	3.2 E-05	±	5.9 E-06	1.8 E-05	±	4.6 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 13 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-973	⁷ Be	1.8 E-01	±	2.9 E-02	1.3 E-01	±	2.4 E-02	1.5 E-01	±	2.7 E-02
	⁴⁰ K	5.5 E-03	±	3.2 E-03	2.8 E-03	±	3.1 E-03	4.1 E-03	±	3.1 E-03
	⁶⁰ Co	-6.9 E-05	±	2.7 E-04	1.6 E-04	±	2.0 E-04	4.5 E-05	±	2.3 E-04
	⁶⁵ Zn	-7.1 E-04	±	9.0 E-04	4.9 E-05	±	7.1 E-04	-3.3 E-04	±	8.0 E-04
	⁹⁰ Sr	5.6 E-05	±	3.2 E-05	1.2 E-04	±	4.0 E-05	8.7 E-05	±	3.6 E-05
	⁹⁵ ZrNb	4.0 E-04	±	1.7 E-03	7.2 E-04	±	2.0 E-03	5.6 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-7.9 E-04	±	2.1 E-03	-1.6 E-04	±	2.6 E-03	-4.7 E-04	±	2.3 E-03
	¹²⁵ Sb	4.8 E-04	±	5.4 E-04	2.5 E-04	±	6.4 E-04	3.6 E-04	±	5.9 E-04
	¹³⁴ Cs	5.0 E-06	±	2.5 E-04	1.5 E-04	±	2.2 E-04	7.9 E-05	±	2.4 E-04
	¹³⁷ Cs	5.0 E-04	±	3.0 E-04	8.7 E-04	±	3.1 E-04	6.9 E-04	±	3.0 E-04
	¹⁴⁴ CePr	1.5 E-03	±	2.2 E-03	-1.4 E-03	±	2.3 E-03	5.5 E-05	±	2.3 E-03
	¹⁵⁴ Eu	-5.2 E-05	±	5.1 E-04	-3.4 E-04	±	8.0 E-04	-2.0 E-04	±	6.6 E-04
	¹⁵⁵ Eu	-1.8 E-04	±	5.1 E-04	-5.8 E-04	±	6.0 E-04	-3.8 E-04	±	5.6 E-04
	²³⁴ U	9.3 E-06	±	2.8 E-06	1.9 E-05	±	4.5 E-06	1.4 E-05	±	3.6 E-06
	²³⁵ U	5.8 E-07	±	6.3 E-07	6.6 E-07	±	7.7 E-07	6.2 E-07	±	7.0 E-07
	²³⁸ Pu	3.8 E-06	±	2.2 E-06	4.2 E-07	±	9.7 E-07	2.1 E-06	±	1.6 E-06
	²³⁸ U	8.7 E-06	±	2.6 E-06	1.6 E-05	±	4.0 E-06	1.2 E-05	±	3.3 E-06
	^{239/40} Pu	5.4 E-05	±	1.0 E-05	2.7 E-06	±	2.0 E-06	2.8 E-05	±	6.0 E-06
N-974	⁷ Be	2.0 E-01	±	3.2 E-02	1.1 E-01	±	2.4 E-02	1.6 E-01	±	2.8 E-02
	⁴⁰ K	5.1 E-03	±	2.9 E-03	3.5 E-03	±	3.5 E-03	4.3 E-03	±	3.2 E-03
	⁶⁰ Co	-1.7 E-05	±	1.7 E-04	-3.6 E-05	±	3.2 E-04	-2.7 E-05	±	2.5 E-04
	⁶⁵ Zn	0.0	±	5.6 E-04	-7.8 E-04	±	8.6 E-04	-3.9 E-04	±	7.1 E-04
	⁹⁰ Sr	4.2 E-06	±	1.7 E-05	2.3 E-06	±	1.7 E-05	3.3 E-06	±	1.7 E-05
	⁹⁵ ZrNb	1.6 E-03	±	1.7 E-03	2.6 E-03	±	1.8 E-03	2.1 E-03	±	1.8 E-03
	¹⁰⁶ Ru	7.3 E-04	±	2.0 E-03	-1.4 E-03	±	2.9 E-03	-3.5 E-04	±	2.5 E-03
	¹²⁵ Sb	6.3 E-05	±	5.7 E-04	7.6 E-05	±	5.6 E-04	7.0 E-05	±	5.6 E-04
	¹³⁴ Cs	-9.3 E-05	±	2.2 E-04	-1.1 E-04	±	2.7 E-04	-1.0 E-04	±	2.5 E-04
	¹³⁷ Cs	8.7 E-05	±	1.6 E-04	-8.2 E-05	±	2.2 E-04	2.5 E-06	±	1.9 E-04
	¹⁴⁴ CePr	-4.5 E-04	±	2.2 E-03	-1.1 E-03	±	2.7 E-03	-7.9 E-04	±	2.4 E-03
	¹⁵⁴ Eu	5.0 E-04	±	5.0 E-04	6.5 E-04	±	4.7 E-04	5.7 E-04	±	4.8 E-04
	¹⁵⁵ Eu	9.7 E-05	±	5.1 E-04	2.4 E-04	±	5.8 E-04	1.7 E-04	±	5.5 E-04
	²³⁴ U	2.6 E-05	±	7.8 E-06	3.0 E-06	±	1.8 E-06	1.5 E-05	±	4.8 E-06
	²³⁵ U	3.3 E-06	±	2.4 E-06	2.2 E-07	±	4.5 E-07	1.7 E-06	±	1.4 E-06
	²³⁸ U	2.7 E-05	±	7.7 E-06	2.2 E-06	±	1.5 E-06	1.5 E-05	±	4.6 E-06
	²³⁸ Pu	2.1 E-08	±	1.6 E-07	4.8 E-07	±	1.0 E-06	2.5 E-07	±	5.9 E-07
	^{239/40} Pu	1.1 E-06	±	6.0 E-07	1.5 E-06	±	1.4 E-06	1.3 E-06	±	1.0 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 14 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-975	⁷ Be	1.0 E-01	±	2.0 E-02	9.4 E-02	±	2.3 E-02	9.7 E-02	±	2.2 E-02
	⁴⁰ K	4.1 E-03	±	2.7 E-03	8.9 E-03	±	5.5 E-03	6.5 E-03	±	4.1 E-03
	⁶⁰ Co	2.4 E-04	±	2.1 E-04	-1.7 E-04	±	3.1 E-04	3.7 E-05	±	2.6 E-04
	⁶⁵ Zn	-3.4 E-05	±	4.8 E-04	1.9 E-04	±	7.2 E-04	7.6 E-05	±	6.0 E-04
	⁹⁰ Sr	-4.0 E-06	±	1.7 E-05	3.1 E-05	±	2.4 E-05	1.4 E-05	±	2.0 E-05
	⁹⁵ ZrNb	-6.3 E-04	±	1.6 E-03	7.1 E-04	±	1.8 E-03	4.0 E-05	±	1.7 E-03
	¹⁰⁶ Ru	9.6 E-04	±	2.2 E-03	-1.6 E-03	±	2.5 E-03	-3.3 E-04	±	2.3 E-03
	¹²⁵ Sb	9.3 E-05	±	5.4 E-04	2.1 E-04	±	5.5 E-04	1.5 E-04	±	5.5 E-04
	¹³⁴ Cs	1.5 E-04	±	1.8 E-04	6.2 E-05	±	2.6 E-04	1.1 E-04	±	2.2 E-04
	¹³⁷ Cs	2.6 E-05	±	1.9 E-04	9.1 E-05	±	2.4 E-04	5.9 E-05	±	2.2 E-04
	¹⁴⁴ CePr	1.3 E-03	±	2.1 E-03	-3.0 E-04	±	2.4 E-03	4.7 E-04	±	2.2 E-03
	¹⁵⁴ Eu	4.9 E-04	±	5.1 E-04	-4.1 E-05	±	7.4 E-04	2.2 E-04	±	6.3 E-04
	¹⁵⁵ Eu	-1.6 E-04	±	4.9 E-04	1.9 E-04	±	4.6 E-04	1.4 E-05	±	4.8 E-04
	²³⁴ U	6.3 E-06	±	2.3 E-06	1.1 E-05	±	3.0 E-06	8.5 E-06	±	2.6 E-06
	²³⁵ U	9.2 E-07	±	8.1 E-07	1.9 E-07	±	4.2 E-07	5.5 E-07	±	6.1 E-07
	²³⁸ U	5.5 E-06	±	2.1 E-06	7.0 E-06	±	2.4 E-06	6.2 E-06	±	2.2 E-06
	²³⁸ Pu	6.3 E-07	±	1.0 E-06	1.1 E-07	±	5.2 E-07	3.7 E-07	±	7.6 E-07
	^{239/40} Pu	2.1 E-06	±	1.8 E-06	1.4 E-05	±	4.0 E-06	8.0 E-06	±	2.9 E-06
N-977	⁷ Be	1.3 E-01	±	2.4 E-02	7.5 E-02	±	2.4 E-02	1.0 E-01	±	2.4 E-02
	⁴⁰ K	4.8 E-03	±	2.5 E-03	1.3 E-02	±	4.4 E-03	8.8 E-03	±	3.5 E-03
	⁶⁰ Co	1.7 E-04	±	2.2 E-04	1.3 E-04	±	2.0 E-04	1.5 E-04	±	2.1 E-04
	⁶⁵ Zn	-4.6 E-04	±	8.9 E-04	8.5 E-04	±	4.8 E-04	1.9 E-04	±	6.8 E-04
	⁹⁰ Sr	2.6 E-06	±	1.5 E-05	1.7 E-04	±	4.8 E-05	8.7 E-05	±	3.2 E-05
	⁹⁵ ZrNb	2.2 E-04	±	1.7 E-03	3.4 E-04	±	1.5 E-03	2.8 E-04	±	1.6 E-03
	¹⁰⁶ Ru	7.6 E-04	±	2.5 E-03	-1.9 E-03	±	2.7 E-03	-5.5 E-04	±	2.6 E-03
	¹²⁵ Sb	-9.5 E-05	±	5.5 E-04	-5.8 E-04	±	5.5 E-04	-3.4 E-04	±	5.5 E-04
	¹³⁴ Cs	4.7 E-05	±	2.2 E-04	2.4 E-05	±	2.1 E-04	3.5 E-05	±	2.1 E-04
	¹³⁷ Cs	2.1 E-04	±	2.3 E-04	6.0 E-05	±	2.2 E-04	1.3 E-04	±	2.2 E-04
	¹⁴⁴ CePr	4.5 E-04	±	2.0 E-03	-6.0 E-04	±	2.3 E-03	-7.2 E-05	±	2.1 E-03
	¹⁵⁴ Eu	2.4 E-04	±	6.3 E-04	-1.9 E-04	±	5.1 E-04	2.5 E-05	±	5.7 E-04
	¹⁵⁵ Eu	2.6 E-04	±	4.4 E-04	-3.9 E-04	±	4.1 E-04	-6.4 E-05	±	4.3 E-04
	²³⁴ U	4.1 E-06	±	3.2 E-06	6.8 E-06	±	2.5 E-06	5.5 E-06	±	2.9 E-06
	²³⁵ U	3.7 E-07	±	1.2 E-06	5.6 E-08	±	5.8 E-07	2.1 E-07	±	8.8 E-07
	²³⁸ Pu	1.5 E-09	±	3.0 E-07	9.4 E-08	±	4.8 E-07	4.8 E-08	±	3.9 E-07
	²³⁸ U	2.8 E-06	±	2.9 E-06	5.2 E-06	±	2.1 E-06	4.0 E-06	±	2.5 E-06
	^{239/40} Pu	1.1 E-06	±	7.9 E-07	1.3 E-06	±	1.2 E-06	1.2 E-06	±	9.7 E-07

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 15 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-978	⁷ Be	1.1 E-01	±	2.3 E-02	9.6 E-02	±	2.2 E-02	1.0 E-01	±	2.2 E-02
	⁴⁰ K	9.3 E-04	±	3.7 E-03	4.9 E-03	±	3.5 E-03	2.9 E-03	±	3.6 E-03
	⁶⁰ Co	0.0	±	2.5 E-04	3.4 E-04	±	3.3 E-04	1.7 E-04	±	2.9 E-04
	⁶⁵ Zn	1.6 E-04	±	6.1 E-04	6.2 E-04	±	8.3 E-04	3.9 E-04	±	7.2 E-04
	⁹⁰ Sr	1.6 E-05	±	1.8 E-05	-3.4 E-06	±	1.7 E-05	6.4 E-06	±	1.7 E-05
	⁹⁵ ZrNb	-9.3 E-04	±	1.9 E-03	-2.8 E-05	±	1.9 E-03	-4.8 E-04	±	1.9 E-03
	¹⁰⁶ Ru	-1.0 E-03	±	2.1 E-03	-3.6 E-04	±	2.7 E-03	-6.9 E-04	±	2.4 E-03
	¹²⁵ Sb	-2.3 E-04	±	5.0 E-04	-1.5 E-04	±	6.8 E-04	-1.9 E-04	±	5.9 E-04
	¹³⁴ Cs	2.1 E-04	±	2.0 E-04	-2.6 E-05	±	2.5 E-04	9.2 E-05	±	2.2 E-04
	¹³⁷ Cs	2.7 E-04	±	1.7 E-04	4.0 E-05	±	2.0 E-04	1.5 E-04	±	1.8 E-04
	¹⁴⁴ CePr	-1.7 E-03	±	2.0 E-03	-6.2 E-04	±	2.5 E-03	-1.2 E-03	±	2.2 E-03
	¹⁵⁴ Eu	-1.1 E-04	±	5.5 E-04	-4.3 E-05	±	6.6 E-04	-7.8 E-05	±	6.0 E-04
	¹⁵⁵ Eu	-3.1 E-04	±	4.7 E-04	1.5 E-04	±	6.2 E-04	-7.7 E-05	±	5.5 E-04
	²³⁴ U	2.7 E-06	±	2.1 E-06	4.7 E-06	±	2.0 E-06	3.7 E-06	±	2.0 E-06
	²³⁵ U	1.4 E-07	±	4.8 E-07	3.0 E-07	±	5.2 E-07	2.2 E-07	±	5.0 E-07
	²³⁸ U	3.5 E-06	±	2.2 E-06	5.3 E-06	±	2.0 E-06	4.4 E-06	±	2.1 E-06
	²³⁸ Pu	4.2 E-09	±	3.1 E-07	-1.7 E-08	±	5.6 E-07	-6.6 E-09	±	4.3 E-07
	^{239/40} Pu	9.8 E-07	±	7.6 E-07	8.3 E-06	±	3.1 E-06	4.6 E-06	±	1.9 E-06
N-980	⁷ Be	1.2 E-01	±	2.3 E-02	1.2 E-01	±	2.5 E-02	1.2 E-01	±	2.4 E-02
	⁴⁰ K	4.3 E-03	±	2.7 E-03	4.6 E-03	±	3.8 E-03	4.5 E-03	±	3.3 E-03
	⁶⁰ Co	-1.1 E-04	±	2.6 E-04	8.5 E-05	±	2.9 E-04	-1.2 E-05	±	2.7 E-04
	⁶⁵ Zn	-1.3 E-04	±	7.1 E-04	3.5 E-04	±	7.6 E-04	1.1 E-04	±	7.4 E-04
	⁹⁰ Sr	1.5 E-04	±	4.2 E-05	1.7 E-05	±	2.3 E-05	8.3 E-05	±	3.3 E-05
	⁹⁵ ZrNb	-4.3 E-04	±	1.5 E-03	3.5 E-04	±	1.7 E-03	-3.8 E-05	±	1.6 E-03
	¹⁰⁶ Ru	1.6 E-04	±	2.3 E-03	9.7 E-04	±	2.7 E-03	5.6 E-04	±	2.5 E-03
	¹²⁵ Sb	-5.8 E-05	±	5.4 E-04	-3.8 E-04	±	6.1 E-04	-2.2 E-04	±	5.7 E-04
	¹³⁴ Cs	9.5 E-05	±	2.0 E-04	-4.7 E-04	±	3.1 E-04	-1.9 E-04	±	2.5 E-04
	¹³⁷ Cs	2.4 E-06	±	2.0 E-04	1.7 E-04	±	2.5 E-04	8.4 E-05	±	2.3 E-04
	¹⁴⁴ CePr	5.0 E-05	±	2.1 E-03	-7.6 E-04	±	2.8 E-03	-3.6 E-04	±	2.4 E-03
	¹⁵⁴ Eu	-3.5 E-04	±	7.5 E-04	9.0 E-05	±	6.0 E-04	-1.3 E-04	±	6.7 E-04
	¹⁵⁵ Eu	2.2 E-04	±	4.8 E-04	2.7 E-04	±	5.5 E-04	2.4 E-04	±	5.1 E-04
	²³⁴ U	3.0 E-06	±	2.2 E-06	8.0 E-06	±	3.3 E-06	5.5 E-06	±	2.7 E-06
	²³⁵ U	5.5 E-07	±	7.5 E-07	1.4 E-07	±	4.9 E-07	3.5 E-07	±	6.2 E-07
	²³⁸ U	1.4 E-06	±	1.6 E-06	6.2 E-06	±	2.9 E-06	3.8 E-06	±	2.3 E-06
	²³⁸ Pu	4.5 E-09	±	3.1 E-07	1.7 E-06	±	1.6 E-06	8.4 E-07	±	9.5 E-07
	^{239/40} Pu	5.6 E-07	±	5.8 E-07	1.7 E-06	±	1.6 E-06	1.1 E-06	±	1.1 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 16 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-981	⁷ Be	1.2 E-01	±	2.4 E-02	1.7 E-01	±	3.1 E-02	1.4 E-01	±	2.7 E-02
	⁴⁰ K	1.5 E-03	±	2.9 E-03	2.0 E-03	±	3.0 E-03	1.7 E-03	±	3.0 E-03
	⁶⁰ Co	-1.1 E-04	±	2.6 E-04	-1.4 E-04	±	2.3 E-04	-1.3 E-04	±	2.4 E-04
	⁶⁵ Zn	9.4 E-05	±	7.6 E-04	3.4 E-04	±	8.3 E-04	2.2 E-04	±	7.9 E-04
	⁹⁰ Sr	6.7 E-05	±	2.9 E-05	-2.4 E-07	±	1.9 E-05	3.4 E-05	±	2.4 E-05
	⁹⁵ ZrNb	-8.5 E-04	±	1.9 E-03	2.5 E-04	±	2.3 E-03	-3.0 E-04	±	2.1 E-03
	¹⁰⁶ Ru	2.2 E-03	±	1.8 E-03	-1.6 E-03	±	2.6 E-03	3.4 E-04	±	2.2 E-03
	¹²⁵ Sb	1.6 E-05	±	5.1 E-04	-9.2 E-05	±	7.3 E-04	-3.8 E-05	±	6.2 E-04
	¹³⁴ Cs	-4.7 E-05	±	2.1 E-04	-4.7 E-05	±	2.8 E-04	-4.7 E-05	±	2.4 E-04
	¹³⁷ Cs	3.1 E-05	±	2.1 E-04	1.3 E-04	±	2.2 E-04	7.8 E-05	±	2.1 E-04
	¹⁴⁴ CePr	-1.7 E-03	±	2.3 E-03	1.6 E-03	±	2.7 E-03	-1.5 E-05	±	2.5 E-03
	¹⁵⁴ Eu	2.5 E-04	±	7.1 E-04	-3.3 E-04	±	1.0 E-03	-3.6 E-05	±	8.6 E-04
	¹⁵⁵ Eu	-1.4 E-04	±	4.5 E-04	4.2 E-05	±	6.2 E-04	-4.9 E-05	±	5.4 E-04
	²³⁴ U	4.6 E-06	±	2.3 E-06	9.4 E-06	±	6.5 E-06	7.0 E-06	±	4.4 E-06
	²³⁵ U	2.4 E-07	±	6.9 E-07	8.3 E-07	±	2.4 E-06	5.3 E-07	±	1.5 E-06
	²³⁸ U	4.1 E-06	±	2.2 E-06	6.5 E-06	±	5.3 E-06	5.3 E-06	±	3.8 E-06
	²³⁸ Pu	3.3 E-07	±	4.7 E-07	9.6 E-07	±	1.1 E-06	6.4 E-07	±	7.6 E-07
	^{239/40} Pu	1.1 E-06	±	7.3 E-07	4.0 E-07	±	7.7 E-07	7.7 E-07	±	7.5 E-07
N-982	⁷ Be	1.8 E-01	±	3.0 E-02	1.4 E-01	±	2.7 E-02	1.6 E-01	±	2.8 E-02
	⁴⁰ K	4.5 E-03	±	3.1 E-03	2.6 E-03	±	3.3 E-03	3.5 E-03	±	3.2 E-03
	⁶⁰ Co	-1.8 E-04	±	2.4 E-04	-4.1 E-05	±	2.9 E-04	-1.1 E-04	±	2.6 E-04
	⁶⁵ Zn	-3.7 E-04	±	7.9 E-04	6.0 E-04	±	5.5 E-04	1.1 E-04	±	6.7 E-04
	⁹⁰ Sr	9.5 E-06	±	2.0 E-05	5.6 E-06	±	1.8 E-05	7.6 E-06	±	1.9 E-05
	⁹⁵ ZrNb	-1.5 E-04	±	1.5 E-03	1.1 E-03	±	1.7 E-03	4.9 E-04	±	1.6 E-03
	¹⁰⁶ Ru	8.1 E-04	±	1.6 E-03	-5.3 E-04	±	2.5 E-03	1.4 E-04	±	2.1 E-03
	¹²⁵ Sb	-5.3 E-04	±	5.8 E-04	4.1 E-04	±	6.4 E-04	-6.1 E-05	±	6.1 E-04
	¹³⁴ Cs	-1.5 E-04	±	2.1 E-04	-7.2 E-05	±	2.5 E-04	-1.1 E-04	±	2.3 E-04
	¹³⁷ Cs	1.2 E-04	±	2.1 E-04	8.2 E-05	±	2.2 E-04	1.0 E-04	±	2.1 E-04
	¹⁴⁴ CePr	-1.7 E-04	±	2.2 E-03	4.3 E-04	±	2.4 E-03	1.3 E-04	±	2.3 E-03
	¹⁵⁴ Eu	-3.7 E-05	±	7.4 E-04	-1.1 E-04	±	7.5 E-04	-7.3 E-05	±	7.5 E-04
	¹⁵⁵ Eu	-1.6 E-04	±	5.6 E-04	3.2 E-04	±	5.3 E-04	8.4 E-05	±	5.4 E-04
	²³⁴ U	2.0 E-06	±	2.0 E-06	5.7 E-06	±	2.6 E-06	3.8 E-06	±	2.3 E-06
	²³⁵ U	-1.3 E-07	±	4.5 E-07	9.1 E-07	±	9.0 E-07	3.9 E-07	±	6.8 E-07
	²³⁸ U	4.2 E-06	±	2.2 E-06	6.0 E-06	±	2.5 E-06	5.1 E-06	±	2.3 E-06
	²³⁸ Pu	1.6 E-07	±	4.6 E-07	5.0 E-07	±	7.5 E-07	3.3 E-07	±	6.0 E-07
	^{239/40} Pu	8.2 E-07	±	7.5 E-07	1.1 E-06	±	1.1 E-06	9.6 E-07	±	9.0 E-07

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 17 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-984	⁷ Be	8.3 E-02	±	2.1 E-02	1.1 E-01	±	2.8 E-02	9.4 E-02	±	2.5 E-02
	⁴⁰ K	-3.3 E-04	±	3.0 E-03	1.3 E-03	±	4.9 E-03	4.7 E-04	±	3.9 E-03
	⁶⁰ Co	6.4 E-05	±	1.7 E-04	2.1 E-04	±	2.2 E-04	1.4 E-04	±	1.9 E-04
	⁶⁵ Zn	4.3 E-04	±	5.7 E-04	6.3 E-04	±	7.5 E-04	5.3 E-04	±	6.6 E-04
	⁹⁰ Sr	2.8 E-04	±	7.1 E-05	2.3 E-04	±	6.1 E-05	2.6 E-04	±	6.6 E-05
	⁹⁵ ZrNb	2.5 E-04	±	2.0 E-03	3.7 E-04	±	2.3 E-03	3.1 E-04	±	2.1 E-03
	¹⁰⁶ Ru	-2.6 E-03	±	2.7 E-03	-1.6 E-03	±	2.2 E-03	-2.1 E-03	±	2.5 E-03
	¹²⁵ Sb	-2.8 E-04	±	6.7 E-04	-9.9 E-05	±	5.9 E-04	-1.9 E-04	±	6.3 E-04
	¹³⁴ Cs	6.0 E-05	±	2.3 E-04	-9.6 E-05	±	2.2 E-04	-1.8 E-05	±	2.2 E-04
	¹³⁷ Cs	5.9 E-04	±	2.1 E-04	2.2 E-04	±	2.4 E-04	4.0 E-04	±	2.2 E-04
	¹⁴⁴ CePr	6.3 E-04	±	2.7 E-03	-1.8 E-04	±	2.3 E-03	2.3 E-04	±	2.5 E-03
	¹⁵⁴ Eu	-2.1 E-04	±	4.6 E-04	3.0 E-04	±	5.0 E-04	4.7 E-05	±	4.8 E-04
	¹⁵⁵ Eu	1.5 E-04	±	5.1 E-04	-9.0 E-05	±	4.1 E-04	2.8 E-05	±	4.6 E-04
	²³⁴ U	5.2 E-06	±	2.7 E-06	5.3 E-06	±	2.8 E-06	5.2 E-06	±	2.7 E-06
	²³⁵ U	2.8 E-08	±	4.9 E-07	7.0 E-07	±	9.0 E-07	3.6 E-07	±	7.0 E-07
	²³⁸ U	5.2 E-06	±	2.6 E-06	3.9 E-06	±	2.3 E-06	4.5 E-06	±	2.4 E-06
	²³⁸ Pu	4.6 E-07	±	6.4 E-07	2.9 E-07	±	5.4 E-07	3.8 E-07	±	5.9 E-07
	^{239/40} Pu	3.5 E-06	±	1.6 E-06	2.7 E-07	±	5.5 E-07	1.9 E-06	±	1.1 E-06
N-985	⁷ Be	1.5 E-01	±	2.6 E-02	1.1 E-01	±	2.5 E-02	1.3 E-01	±	2.6 E-02
	⁴⁰ K	3.5 E-03	±	3.3 E-03	1.4 E-02	±	4.8 E-03	8.5 E-03	±	4.0 E-03
	⁶⁰ Co	-3.5 E-05	±	2.4 E-04	-2.6 E-05	±	1.6 E-04	-3.0 E-05	±	2.0 E-04
	⁶⁵ Zn	-1.4 E-04	±	6.5 E-04	-1.0 E-03	±	8.9 E-04	-5.7 E-04	±	7.7 E-04
	⁹⁰ Sr	4.6 E-05	±	2.5 E-05	4.9 E-04	±	1.0 E-04	2.7 E-04	±	6.3 E-05
	⁹⁵ ZrNb	-1.2 E-03	±	2.0 E-03	1.3 E-03	±	2.1 E-03	6.0 E-05	±	2.0 E-03
	¹⁰⁶ Ru	2.6 E-05	±	2.2 E-03	-2.5 E-03	±	2.7 E-03	-1.2 E-03	±	2.4 E-03
	¹²⁵ Sb	-9.5 E-05	±	5.5 E-04	3.9 E-05	±	6.1 E-04	-2.8 E-05	±	5.8 E-04
	¹³⁴ Cs	0.0	±	2.4 E-04	9.7 E-05	±	2.1 E-04	4.9 E-05	±	2.2 E-04
	¹³⁷ Cs	2.7 E-04	±	2.3 E-04	1.4 E-04	±	2.3 E-04	2.0 E-04	±	2.3 E-04
	¹⁴⁴ CePr	5.0 E-05	±	2.0 E-03	2.0 E-05	±	2.6 E-03	3.5 E-05	±	2.3 E-03
	¹⁵⁴ Eu	-1.5 E-04	±	7.1 E-04	-6.2 E-04	±	8.6 E-04	-3.8 E-04	±	7.8 E-04
	¹⁵⁵ Eu	-3.1 E-04	±	4.4 E-04	-2.0 E-04	±	4.6 E-04	-2.6 E-04	±	4.5 E-04
	²³⁴ U	5.8 E-06	±	3.2 E-06	1.1 E-05	±	3.4 E-06	8.5 E-06	±	3.3 E-06
	²³⁵ U	-5.8 E-07	±	5.1 E-07	4.6 E-07	±	6.4 E-07	-6.4 E-08	±	5.8 E-07
	²³⁸ U	8.1 E-06	±	3.8 E-06	1.2 E-05	±	3.4 E-06	9.9 E-06	±	3.6 E-06
	²³⁸ Pu	4.3 E-07	±	5.6 E-07	7.7 E-07	±	8.1 E-07	6.0 E-07	±	6.8 E-07
	^{239/40} Pu	1.3 E-06	±	8.8 E-07	7.3 E-06	±	2.4 E-06	4.3 E-06	±	1.6 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 18 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-987	⁷ Be	1.6 E-01	±	2.9 E-02	8.8 E-02	±	2.4 E-02	1.2 E-01	±	2.6 E-02
	⁴⁰ K	1.3 E-03	±	3.0 E-03	2.8 E-04	±	6.7 E-03	7.9 E-04	±	4.9 E-03
	⁶⁰ Co	-2.2 E-04	±	3.1 E-04	-3.8 E-05	±	2.2 E-04	-1.3 E-04	±	2.6 E-04
	⁶⁵ Zn	1.2 E-04	±	5.9 E-04	-4.1 E-04	±	8.7 E-04	-1.5 E-04	±	7.3 E-04
	⁹⁰ Sr	7.9 E-06	±	2.0 E-05	-1.3 E-05	±	1.5 E-05	-2.5 E-06	±	1.8 E-05
	⁹⁵ ZrNb	1.2 E-03	±	2.2 E-03	-1.1 E-03	±	2.0 E-03	1.5 E-05	±	2.1 E-03
	¹⁰⁶ Ru	2.2 E-03	±	2.0 E-03	2.2 E-03	±	2.2 E-03	2.2 E-03	±	2.1 E-03
	¹²⁵ Sb	-2.6 E-04	±	6.4 E-04	-1.1 E-04	±	5.8 E-04	-1.9 E-04	±	6.1 E-04
	¹³⁴ Cs	-9.0 E-05	±	2.3 E-04	-8.3 E-05	±	2.2 E-04	-8.6 E-05	±	2.2 E-04
	¹³⁷ Cs	2.2 E-04	±	2.5 E-04	-9.0 E-05	±	2.4 E-04	6.7 E-05	±	2.4 E-04
	¹⁴⁴ CePr	2.7 E-04	±	2.1 E-03	1.1 E-03	±	2.1 E-03	6.9 E-04	±	2.1 E-03
	¹⁵⁴ Eu	-1.3 E-04	±	6.2 E-04	9.8 E-04	±	5.5 E-04	4.3 E-04	±	5.9 E-04
	¹⁵⁵ Eu	4.0 E-04	±	5.2 E-04	-6.5 E-05	±	4.0 E-04	1.7 E-04	±	4.6 E-04
	²³⁴ U	8.8 E-06	±	3.4 E-06	4.7 E-06	±	2.5 E-06	6.7 E-06	±	2.9 E-06
	²³⁵ U	5.8 E-07	±	8.1 E-07	1.3 E-07	±	5.9 E-07	3.6 E-07	±	7.0 E-07
	²³⁸ U	6.0 E-06	±	2.8 E-06	3.3 E-06	±	2.0 E-06	4.6 E-06	±	2.4 E-06
	²³⁸ Pu	7.0 E-07	±	7.2 E-07	6.4 E-07	±	9.3 E-07	6.7 E-07	±	8.2 E-07
	^{239/40} Pu	4.3 E-06	±	1.7 E-06	2.9 E-06	±	1.8 E-06	3.6 E-06	±	1.8 E-06
N-991	⁷ Be	9.6 E-02	±	2.0 E-02	1.2 E-01	±	2.4 E-02	1.1 E-01	±	2.2 E-02
	⁴⁰ K	2.6 E-03	±	2.6 E-03	3.4 E-03	±	3.5 E-03	3.0 E-03	±	3.1 E-03
	⁶⁰ Co	-1.9 E-04	±	2.4 E-04	1.6 E-04	±	2.5 E-04	-1.2 E-05	±	2.5 E-04
	⁶⁵ Zn	6.0 E-04	±	6.3 E-04	-2.3 E-04	±	9.5 E-04	1.8 E-04	±	7.9 E-04
	⁹⁰ Sr	1.0 E-05	±	1.8 E-05	2.8 E-06	±	1.8 E-05	6.6 E-06	±	1.8 E-05
	⁹⁵ ZrNb	-7.8 E-04	±	1.6 E-03	2.8 E-04	±	2.0 E-03	-2.5 E-04	±	1.8 E-03
	¹⁰⁶ Ru	-1.6 E-03	±	2.3 E-03	-1.7 E-03	±	2.6 E-03	-1.7 E-03	±	2.5 E-03
	¹²⁵ Sb	8.0 E-04	±	5.5 E-04	4.2 E-04	±	6.4 E-04	6.1 E-04	±	5.9 E-04
	¹³⁴ Cs	1.8 E-04	±	1.9 E-04	2.1 E-04	±	2.2 E-04	1.9 E-04	±	2.1 E-04
	¹³⁷ Cs	4.6 E-05	±	2.1 E-04	1.4 E-04	±	2.4 E-04	9.3 E-05	±	2.2 E-04
	¹⁴⁴ CePr	3.7 E-04	±	2.3 E-03	1.3 E-04	±	2.5 E-03	2.5 E-04	±	2.4 E-03
	¹⁵⁴ Eu	-4.8 E-04	±	7.2 E-04	-4.8 E-04	±	7.7 E-04	-4.8 E-04	±	7.4 E-04
	¹⁵⁵ Eu	2.7 E-04	±	4.4 E-04	-1.2 E-04	±	5.9 E-04	7.4 E-05	±	5.2 E-04
	²³⁴ U	1.1 E-05	±	4.4 E-06	1.1 E-05	±	3.9 E-06	1.1 E-05	±	4.1 E-06
	²³⁵ U	9.8 E-08	±	6.9 E-07	3.8 E-07	±	8.5 E-07	2.4 E-07	±	7.7 E-07
	²³⁸ U	6.5 E-06	±	3.3 E-06	7.8 E-06	±	2.9 E-06	7.1 E-06	±	3.1 E-06
	²³⁸ Pu	-8.1 E-08	±	5.6 E-07	-2.8 E-07	±	2.9 E-07	-1.8 E-07	±	4.3 E-07
	^{239/40} Pu	1.0 E-06	±	9.3 E-07	2.0 E-06	±	2.0 E-06	1.5 E-06	±	1.4 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 19 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-992	⁷ Be	1.0 E-01	±	2.2 E-02	1.0 E-01	±	2.5 E-02	1.0 E-01	±	2.3 E-02
	⁴⁰ K	3.8 E-03	±	3.2 E-03	9.9 E-03	±	3.7 E-03	6.8 E-03	±	3.4 E-03
	⁶⁰ Co	-2.1 E-04	±	3.0 E-04	-2.3 E-04	±	2.4 E-04	-2.2 E-04	±	2.7 E-04
	⁶⁵ Zn	5.2 E-04	±	5.5 E-04	-2.4 E-04	±	6.8 E-04	1.4 E-04	±	6.2 E-04
	⁹⁰ Sr	9.3 E-06	±	1.8 E-05	2.5 E-06	±	1.8 E-05	5.9 E-06	±	1.8 E-05
	⁹⁵ ZrNb	-4.3 E-04	±	2.1 E-03	1.5 E-03	±	1.4 E-03	5.2 E-04	±	1.7 E-03
	¹⁰⁶ Ru	-5.6 E-05	±	2.0 E-03	5.3 E-04	±	2.1 E-03	2.4 E-04	±	2.1 E-03
	¹²⁵ Sb	4.4 E-04	±	4.9 E-04	-1.0 E-05	±	4.5 E-04	2.2 E-04	±	4.7 E-04
	¹³⁴ Cs	-3.8 E-05	±	2.0 E-04	2.1 E-05	±	1.8 E-04	-8.9 E-06	±	1.9 E-04
	¹³⁷ Cs	1.3 E-04	±	2.0 E-04	-2.4 E-04	±	2.5 E-04	-5.4 E-05	±	2.3 E-04
	¹⁴⁴ CePr	1.1 E-03	±	2.3 E-03	-4.2 E-04	±	1.9 E-03	3.6 E-04	±	2.1 E-03
	¹⁵⁴ Eu	3.7 E-05	±	5.9 E-04	3.4 E-04	±	5.8 E-04	1.9 E-04	±	5.8 E-04
	¹⁵⁵ Eu	-1.7 E-04	±	4.7 E-04	-1.3 E-04	±	3.1 E-04	-1.5 E-04	±	3.9 E-04
	²³⁴ U	7.4 E-06	±	2.7 E-06	9.6 E-06	±	3.6 E-06	8.5 E-06	±	3.2 E-06
	²³⁵ U	6.8 E-07	±	7.7 E-07	6.6 E-07	±	9.9 E-07	6.7 E-07	±	8.8 E-07
	²³⁸ U	8.5 E-06	±	2.8 E-06	8.4 E-06	±	3.3 E-06	8.4 E-06	±	3.0 E-06
	²³⁸ Pu	2.3 E-07	±	4.3 E-07	3.1 E-07	±	1.2 E-06	2.7 E-07	±	8.1 E-07
	^{239/40} Pu	1.1 E-06	±	7.8 E-07	9.7 E-07	±	1.4 E-06	1.1 E-06	±	1.1 E-06
N-994	⁷ Be	9.9 E-02	±	2.0 E-02	1.2 E-01	±	2.5 E-02	1.1 E-01	±	2.2 E-02
	⁴⁰ K	8.6 E-03	±	3.2 E-03	8.5 E-03	±	3.4 E-03	8.6 E-03	±	3.3 E-03
	⁶⁰ Co	-1.7 E-04	±	2.1 E-04	0.0	±	2.1 E-04	-8.5 E-05	±	2.1 E-04
	⁶⁵ Zn	-1.6 E-04	±	7.8 E-04	2.6 E-05	±	6.6 E-04	-6.7 E-05	±	7.2 E-04
	⁹⁰ Sr	-3.9 E-06	±	1.6 E-05	-2.6 E-05	±	1.8 E-05	-1.5 E-05	±	1.7 E-05
	⁹⁵ ZrNb	-8.8 E-04	±	2.1 E-03	-1.1 E-04	±	1.8 E-03	-4.9 E-04	±	2.0 E-03
	¹⁰⁶ Ru	-4.0 E-04	±	2.0 E-03	1.6 E-03	±	2.3 E-03	6.2 E-04	±	2.2 E-03
	¹²⁵ Sb	-1.7 E-05	±	4.0 E-04	1.6 E-04	±	5.9 E-04	7.3 E-05	±	4.9 E-04
	¹³⁴ Cs	0.0	±	2.3 E-04	-3.1 E-04	±	2.4 E-04	-1.5 E-04	±	2.4 E-04
	¹³⁷ Cs	3.7 E-05	±	1.8 E-04	-9.3 E-06	±	2.8 E-04	1.4 E-05	±	2.3 E-04
	¹⁴⁴ CePr	2.2 E-04	±	1.9 E-03	-7.8 E-04	±	2.5 E-03	-2.8 E-04	±	2.2 E-03
	¹⁵⁴ Eu	7.5 E-05	±	6.8 E-04	-3.0 E-04	±	9.8 E-04	-1.1 E-04	±	8.3 E-04
	¹⁵⁵ Eu	0.0	±	4.6 E-04	-3.1 E-04	±	5.8 E-04	-1.6 E-04	±	5.2 E-04
	²³⁴ U	6.0 E-06	±	2.7 E-06	9.6 E-06	±	3.5 E-06	7.8 E-06	±	3.1 E-06
	²³⁵ U	4.6 E-07	±	8.4 E-07	2.6 E-07	±	7.8 E-07	3.6 E-07	±	8.1 E-07
	²³⁸ U	6.0 E-06	±	2.6 E-06	3.3 E-06	±	2.0 E-06	4.7 E-06	±	2.3 E-06
	²³⁸ Pu	2.2 E-07	±	4.3 E-07	5.5 E-07	±	1.0 E-06	3.8 E-07	±	7.4 E-07
	^{239/40} Pu	1.6 E-06	±	1.0 E-06	1.8 E-06	±	1.6 E-06	1.7 E-06	±	1.3 E-06

Table C-1. Air Sample Results for 100/200 Areas (pCi/m³).
(sheet 20 of 20)

Site	Isotope	1st Half 1992 result	±	Overall error	2nd Half 1992 result	±	Overall error	Average result	±	Average overall error
N-998	⁷ Be	NS	±		9.0 E-02	±	2.0 E-02	9.0 E-02	±	2.0 E-02
	⁴⁰ K	NS	±		8.4 E-03	±	5.9 E-03	8.4 E-03	±	5.9 E-03
	⁶⁰ Co	NS	±		-2.4 E-04	±	4.5 E-04	-2.4 E-04	±	4.5 E-04
	⁶⁵ Zn	NS	±		-1.0 E-04	±	1.1 E-03	-5.1 E-05	±	5.5 E-04
	⁹⁰ Sr	NS	±		-1.4 E-05	±	2.5 E-05	-7.1 E-06	±	1.3 E-05
	⁹⁵ ZrNb	NS	±		-7.0 E-04	±	2.4 E-03	-7.0 E-04	±	2.4 E-03
	¹⁰⁶ Ru	NS	±		-2.2 E-03	±	3.7 E-03	-2.2 E-03	±	3.7 E-03
	¹²⁵ Sb	NS	±		-4.9 E-04	±	8.9 E-04	-4.9 E-04	±	8.9 E-04
	¹³⁴ Cs	NS	±		-4.2 E-04	±	4.3 E-04	-4.2 E-04	±	4.3 E-04
	¹³⁷ Cs	NS	±		-2.2 E-05	±	3.6 E-03	-2.2 E-05	±	3.6 E-03
	¹⁴⁴ CePr	NS	±		2.6 E-04	±	3.3 E-03	2.6 E-04	±	3.3 E-03
	¹⁵⁴ Eu	NS	±		-2.9 E-04	±	1.1 E-03	-1.4 E-04	±	5.6 E-04
	¹⁵⁵ Eu	NS	±		-2.0 E-05	±	8.0 E-04	-2.0 E-05	±	8.0 E-04
	²³⁴ U	NS	±		1.5 E-05	±	5.0 E-06	1.5 E-05	±	5.0 E-06
	²³⁵ U	NS	±		1.1 E-06	±	1.4 E-06	1.1 E-06	±	1.4 E-06
	²³⁸ U	NS	±		1.1 E-05	±	4.2 E-06	1.1 E-05	±	4.2 E-06
	²³⁸ Pu	NS	±		7.2 E-07	±	1.2 E-06	7.2 E-07	±	1.2 E-06
	^{239/240} Pu	NS	±		1.5 E-06	±	1.7 E-06	1.5 E-06	±	1.7 E-06
N-999	⁷ Be	NS	±		8.7 E-02	±	2.5 E-02	8.7 E-02	±	2.5 E-02
	⁴⁰ K	NS	±		1.7 E-02	±	7.2 E-03	1.7 E-02	±	7.2 E-03
	⁶⁰ Co	NS	±		-7.0 E-05	±	4.1 E-04	-7.0 E-05	±	4.1 E-04
	⁶⁵ Zn	NS	±		4.7 E-04	±	1.1 E-03	2.3 E-04	±	5.3 E-04
	⁹⁰ Sr	NS	±		-1.0 E-05	±	2.5 E-05	-5.2 E-06	±	1.3 E-05
	⁹⁵ ZrNb	NS	±		1.8 E-03	±	1.7 E-03	1.8 E-03	±	1.7 E-03
	¹⁰⁶ Ru	NS	±		1.9 E-03	±	3.2 E-03	1.9 E-03	±	3.2 E-03
	¹²⁵ Sb	NS	±		-2.9 E-04	±	7.8 E-04	-2.9 E-04	±	7.8 E-04
	¹³⁴ Cs	NS	±		1.6 E-04	±	2.6 E-04	1.6 E-04	±	2.6 E-04
	¹³⁷ Cs	NS	±		-1.6 E-04	±	2.9 E-04	-1.6 E-04	±	2.9 E-04
	¹⁴⁴ CePr	NS	±		1.1 E-03	±	3.0 E-03	1.1 E-03	±	3.0 E-03
	¹⁵⁴ Eu	NS	±		1.9 E-04	±	7.3 E-04	9.4 E-05	±	3.6 E-04
	¹⁵⁵ Eu	NS	±		2.8 E-04	±	6.8 E-04	2.8 E-04	±	6.8 E-04
	²³⁴ U	NS	±		4.6 E-06	±	3.1 E-06	4.6 E-06	±	3.1 E-06
	²³⁵ U	NS	±		8.4 E-07	±	1.1 E-06	8.4 E-07	±	1.1 E-06
	²³⁸ U	NS	±		3.0 E-06	±	2.6 E-06	3.0 E-06	±	2.6 E-06
	²³⁸ Pu	NS	±		6.6 E-07	±	1.9 E-06	6.6 E-07	±	1.9 E-06
	^{239/240} Pu	NS	±		2.5 E-06	±	2.9 E-06	2.5 E-06	±	2.9 E-06

NOTE: Negative values indicate results at or near background levels of radioactivity.
NS = Not sampled.

APPENDIX D

**GROUNDWATER MONITORING FIGURES
AND TABLES**

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Figure D-1. Location of Groundwater Wells at 100-N Area.

Figure D-2. Location Groundwater Wells at the 100-K Area.

Figure D-3. Groundwater Monitoring Well Locations in the 200 East Area.

29003042.9

Figure D-4. Groundwater Monitoring Well Locations in the 200 West Area.

Figure D-5. Groundwater Monitoring Well Locations in the Separations Area.

29003042.11

Figure D-6. Monitoring Well Locations for the 300 Area Process Trenches.

29207026.5

Figure D-7. Average Concentration of ^{60}Co , ^{90}Sr , and ^{131}I Detected in Well N-33 from 1985 through 1992.

29204022.1

Figure D-8. Total Uranium in Groundwater Upgradient of the 216-U-1 and 216-U-2 Cribs.

Figure D-9. Total Uranium in Groundwater Downgradient of the 216-U-1 and 216-U-2 Cribs.

Figure D-10. Total Uranium in Groundwater at the 216-U-17 Crib.

Figure D-11. Total Uranium in Groundwater at the 216-U-08 Crib.

Figure D-12. Total Uranium in Groundwater at the 216-B-62 Crib.

Figure D-13. Total Uranium in Groundwater at the 216-S-25 Crib.

Figure D-14. Average Concentrations of ^3H in the 400 Area Water Supply Wells (pCi/L).

29207026.10

Figure D-15. Average Concentrations of ^{60}Co in the 400 Area Water Supply Wells (pCi/L).

29207026.11

Table D-1. Concentrations of ^3H Detected in 100 Area Groundwater in 1992 (pCi/l).

Well	# Samples	Maximum	Minimum	Average	Std Dev
N-8T	50	4.5 E+05	2.0 E+03	4.3 E+04	6.7 E+04
N-14	5	8.5 E+04	8.0 E+04	8.3 E+04	2.0 E+03
N-17	1	7.5 E+03	7.5 E+03	7.5 E+03	
N-21	1	1.6 E+03	1.6 E+03	1.6 E+03	
N-26	1	8.0 E+02	8.0 E+02	8.0 E+02	
N-27	1	3.9 E+04	3.9 E+04	3.9 E+04	
N-29	1	2.7 E+04	2.7 E+04	2.7 E+04	
N-32	3	9.7 E+04	8.0 E+04	8.9 E+04	6.8 E+03
N-33	1	4.5 E+04	4.5 E+04	4.5 E+04	
N-41	1	4.7 E+04	4.7 E+04	4.7 E+04	
N-47	1	1.9 E+03	1.9 E+03	1.9 E+03	
N-54	2	1.0 E+04	1.0 E+04	1.0 E+04	5.0 E+01
N-55	1	6.9 E+03	6.9 E+03	6.9 E+03	
N-56	4	1.7 E+04	1.6 E+04	1.7 E+04	2.2 E+02
N-57	2	9.9 E+03	7.9 E+03	8.9 E+03	1.0 E+03
N-70	3	4.8 E+04	4.4 E+04	4.6 E+04	1.7 E+03
N-71	1	2.2 E+00	2.2 E+00	2.2 E+00	
N-74	4	3.4 E+04	3.2 E+04	3.3 E+04	7.3 E+02
N-75	1	6.5 E+04	6.5 E+04	6.5 E+04	
N-76	1	4.6 E+04	4.6 E+04	4.6 E+04	
K-11	1	1.4 E+03	1.4 E+03	1.4 E+03	
K-19	2	4.6 E+03	1.1 E+03	2.9 E+03	1.8 E+03
K-20	2	6.8 E+02	5.3 E+02	6.0 E+02	7.2 E+01
K-22	2	5.3 E+02	4.4 E+02	4.8 E+02	4.2 E+01
K-27	5	8.9 E+04	3.4 E+04	5.1 E+04	2.0 E+04
K-28	4	1.9 E+03	1.1 E+03	1.6 E+03	3.0 E+02
K-29	4	2.0 E+04	1.2 E+04	1.6 E+04	3.3 E+03
K-30	5	1.5 E+06	1.6 E+05	7.0 E+05	6.6 E+05

Table D-2. Concentrations of ^{60}Co Detected in 100 Area Groundwater in 1992 (pCi/l).

Well	# Samples	Maximum	Minimum	Average	Std Dev
N-8T	49	3.2 E+01	< 2.0 E-01	7.8 E+00	5.8 E+00
N-14	4	1.2 E+01	4.1 E+00	7.1 E+00	2.8 E+00
N-17	1	7.0 E+00	7.0 E+00	7.0 E+00	
N-27	1	1.4 E+01	1.4 E+01	1.4 E+01	
N-29	1	6.5 E+00	6.5 E+00	6.5 E+00	
N-32	3	2.1 E+01	1.3 E+01	1.6 E+01	3.7 E+00
N-33	2	1.1 E+01	5.5 E+00	8.3 E+00	2.8 E+00
N-41	1	9.1 E+00	9.1 E+00	9.1 E+00	
N-47	13	1.0 E+01	8.5 E-02	2.3 E+00	2.9 E+00
N-48	13	5.5 E+00	2.7 E-01	1.7 E+00	1.6 E+00
N-54	1	8.8 E+00	8.8 E+00	8.8 E+00	
N-56	3	7.9 E+00	6.3 E+00	7.2 E+00	6.5 E-01
N-57	2	9.5 E+00	6.3 E+00	7.9 E+00	1.6 E+00
N-70	3	1.5 E+01	3.5 E+00	1.0 E+01	4.9 E+00
N-74	4	6.1 E+00	3.1 E+00	4.1 E+00	1.2 E+00
K-19	1	1.3 E+00	1.3 E+00	1.3 E+00	
K-20	1	< 3.1 E+00	< 3.1 E+00	< 3.1 E+00	
K-22	1	< 2.3 E+00	< 2.3 E+00	< 2.3 E+00	
K-27	2	1.3 E+01	1.0 E+00	7.1 E+00	6.1 E+00
K-28	2	< 4.0 E+00	2.8 E+00	3.4 E+00	6.0 E-01
K-29	2	7.1 E+00	< 3.5 E+00	5.3 E+00	1.8 E+00
K-30	3	5.4 E+00	< 2.7 E+00	3.9 E+00	1.1 E+00

Table D-3. Concentrations of ^{90}Sr Detected in 100 Area Groundwater in 1992 (pCi/l).

Well	# Samples	Maximum	Minimum	Average	Std Dev
N-8T	50	8.0 E+03	4.0 E+03	6.5 E+03	8.5 E+02
N-14	5	1.3 E+03	9.8 E+02	1.1 E+03	1.3 E+02
N-17	1	1.8 E+02	1.8 E+02	1.8 E+02	
N-21	1	1.9 E+00	1.9 E+00	1.9 E+00	
N-27	1	2.4 E+02	2.4 E+02	2.4 E+02	
N-29	1	3.7 E+02	3.7 E+02	3.7 E+02	
N-32	3	4.0 E+00	2.3 E+00	3.1 E+00	6.8 E-01
N-33	2	4.3 E+01	4.2 E+01	4.2 E+01	8.5 E-01
N-41	1	4.0 E-01	4.0 E-01	4.0 E-01	
N-54	2	3.2 E+02	2.6 E+02	2.9 E+02	3.0 E+01
N-55	1	2.6 E+01	2.6 E+01	2.6 E+01	
N-56	5	2.6 E+02	2.0 E+02	2.3 E+02	2.0 E+01
N-57	2	5.9 E+01	4.8 E+01	5.3 E+01	5.6 E+00
N-70	3	3.0 E-01	5.0 E-02	2.1 E-01	1.1 E-01
N-74	3	4.3 E-01	2.7 E-01	3.7 E-01	6.9 E-02
N-75	1	1.5 E+03	1.5 E+03	1.5 E+03	
N-76	1	9.8 E+01	9.8 E+01	9.8 E+01	

Table D-4. Concentrations of ^{106}Ru Detected in 100 Area Groundwater in 1992 (pCi/l).

Well	# Samples	Maximum	Minimum	Average	Std Dev
N-8T	49	< 2.2 E+02	< 5.3 E-01	< 2.3 E+01	3.2 E+01
N-21	1	7.1 E+01	7.1 E+01	7.1 E+01	
N-47	13	< 4.9 E+01	< 1.5 E+00	< 1.7 E+01	2.0 E+01
N-48	13	< 3.4 E+01	< 1.3 E+00	< 1.3 E+01	1.3 E+01
N-74	1	4.9 E+01	4.9 E+01	4.9 E+01	
K-19	1	< 1.2 E+01	< 1.2 E+01	< 1.2 E+01	
K-20	1	< 2.4 E+01	< 2.4 E+01	< 2.4 E+01	
K-22	1	< 3.4 E+01	< 3.4 E+01	< 3.4 E+01	
K-27	2	5.1 E+01	< 7.3 E+00	2.9 E+01	2.2 E+01
K-28	2	< 3.3 E+01	4.4 E+00	1.8 E+01	1.4 E+01
K-29	2	2.2 E+01	5.8 E+00	1.4 E+01	8.1 E+00
K-30	3	6.1 E+01	< 1.3 E+01	3.5 E+01	2.0 E+01

Table D-5. Concentrations of ^{125}Sb Detected in 100 Area Groundwater in 1992 (pCi/l).

Well	# Samples	Maximum	Minimum	Average	Std Dev
N-8T	49	2.4 E+01	9.6 E-01	1.0 E+01	6.5 E+00
N-14	4	2.8 E+01	1.2 E+01	1.7 E+01	6.4 E+00
N-27	1	1.7 E+01	1.7 E+01	1.7 E+01	
N-29	1	3.2 E+01	3.2 E+01	3.2 E+01	
N-32	2	3.3 E+01	2.3 E+01	2.8 E+01	5.1 E+00
N-33	2	3.4 E+01	2.4 E+01	2.9 E+01	5.0 E+00
N-41	1	< 1.7 E+00	< 1.7 E+00	< 1.7 E+00	
N-47	13	1.2 E+01	8.2 E-02	4.1 E+00	3.9 E+00
N-48	13	1.5 E+01	3.9 E-01	3.4 E+00	4.0 E+00
N-57	2	1.4 E+01	8.3 E+00	1.1 E+01	2.9 E+00
N-70	3	7.1 E+00	3.7 E+00	5.7 E+00	1.5 E+00
N-73	1	1.8 E+01	1.8 E+01	1.8 E+01	
N-74	3	4.4 E+00	2.8 E+00	3.9 E+00	7.8 E-01
N-75	1	2.2 E+01	2.2 E+01	2.2 E+01	
K-19	1	< 3.6 E-01	< 3.6 E-01	< 3.6 E-01	
K-20	1	< 6.2 E+00	< 6.2 E+00	< 6.2 E+00	
K-22	1	6.6 E+00	6.6 E+00	6.6 E+00	
K-27	2	5.6 E+01	4.7 E+01	5.1 E+01	4.5 E+00
K-28	2	1.2 E+01	8.4 E+00	1.0 E+01	1.9 E+00
K-29	2	< 1.5 E+01	< 1.6 E+00	< 8.4 E+00	6.8 E+00
K-30	3	< 5.4 E+00	< 6.0 E-01	< 2.9 E+00	2.0 E+00

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APPENDIX E

**SOIL AND VEGETATION MONITORING
FIGURES AND TABLES**

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Figure E-1. Soil and Vegetation Sampling Locations in the 100-B/C Area.

Figure E-2. Soil and Vegetation Sampling Locations in the 100-D/DR Area.

Figure E-3. Soil and Vegetation Sampling Locations in the 100-F Area.

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Figure E-4. Soil and Vegetation Sampling Locations in the 100-H Area.

29204022.4

Figure E-5. Soil and Vegetation Sampling Locations in the 100-K Area.

Figure E-6. Soil and Vegetation Sampling Locations in the 100-N Area.

29204022.14

Figure E-7. Soil and Vegetation Sampling Locations in the 200 East Area.

Figure E-8. Soil and Vegetation Sampling Locations in the 200 West Area.

Figure E-9. Soil and Vegetation Sampling Locations in the 600 Area.

Figure E-10. 300 Area Soil Sampling Locations.

29207026.2

Figure E-11. 400 Area Soil Sampling Locations.

29207026.4

Figure E-12. 300 Area Vegetation Sampling Locations.

29207026.1

Figure E-13. 400 Area Vegetation Sampling Locations.

Table E-1. Soil Results for 100 Areas, 1992 (pCi/g dry weight).
(sheet 1 of 4)

Site ID	Co-60			Cs-137			Cs-134			Ru-106		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
B-1	2.88 E-02	±	1.60 E-02	5.56 E-01	±	6.64 E-02	3.20 E-03	±	1.10 E-02	1.11 E-01	±	1.13 E-02
B-2	7.59 E-02	±	3.00 E-02	1.99 E+00	±	2.08 E-02	1.67 E-03	±	1.34 E-02	1.41 E-01	±	1.28 E-01
C-1	6.74 E-03	±	1.65 E-02	1.64 E-01	±	2.81 E-02	1.05 E-01	±	2.01 E-02	2.93 E-02	±	1.26 E-01
C-2	1.77 E-01	±	3.15 E-02	1.39 E+00	±	1.45 E-01	1.89 E-02	±	1.48 E-02	2.01 E-02	±	1.39 E-01
D-1	4.95 E-02	±	1.39 E-02	3.19 E-01	±	4.03 E-02	9.90 E-03	±	8.54 E-02	3.76 E-02	±	9.00 E-02
D-2	7.59 E-02	±	2.17 E-02	5.48 E-01	±	6.62 E-02	2.38 E-03	±	9.59 E-03	5.43 E-02	±	1.07 E-01
D-3	6.06 E-02	±	1.65 E-02	2.11 E-01	±	2.99 E-02	3.11 E-05	±	8.67 E-03	8.03 E-02	±	8.08 E-02
D-4	1.28 E-03	±	1.02 E-02	2.09 E-01	±	2.85 E-02	6.43 E-03	±	7.90 E-03	2.03 E-02	±	7.47 E-02
F-1	2.20 E-02	±	1.35 E-02	1.28 E-01	±	2.67 E-02	6.33 E-03	±	9.71 E-03	7.26 E-02	±	8.78 E-02
F-2	6.04 E-02	±	1.85 E-02	1.41 E-01	±	2.51 E-02	7.25 E-03	±	8.67 E-03	6.99 E-02	±	8.24 E-02
F-3	7.97 E-02	±	1.82 E-02	9.98 E-01	±	1.06 E-01	1.41 E-01	±	2.15 E-02	3.63 E-03	±	1.12 E-01
F-4	1.35 E-02	±	1.35 E-02	7.00 E-02	±	1.48 E-02	3.73 E-02	±	1.15 E-02	2.10 E-03	±	9.26 E-02
F-5	4.90 E-03	±	1.20 E-02	6.78 E-01	±	7.66 E-02	3.20 E-03	±	9.72 E-03	4.86 E-02	±	1.40 E+01
H-1	2.96 E-02	±	1.64 E-02	3.47 E-01	±	4.42 E-02	1.50 E-02	±	1.19 E-02	4.16 E-02	±	1.06 E-01
H-2	1.21 E-02	±	1.34 E-02	3.62 E-01	±	4.59 E-02	6.02 E-03	±	1.03 E-02	5.52 E-02	±	9.43 E-02
K-1	4.85 E-01	±	5.95 E-02	8.25 E-01	±	9.04 E-02	5.77 E-03	±	1.11 E-02	2.80 E-02	±	1.17 E-01
K-2	9.43 E-02	±	2.38 E-02	4.73 E-01	±	5.53 E-02	2.02 E-03	±	1.22 E-02	7.40 E-02	±	1.20 E-01
K-3	2.63 E-02	±	1.44 E-02	4.95 E-01	±	5.88 E-02	3.64 E-03	±	9.67 E-03	9.08 E-02	±	9.84 E-02
K-4	1.67 E-02	±	3.36 E-02	7.00 E-01	±	9.44 E-02	3.83 E-01	±	6.33 E-02	2.55 E-02	±	2.98 E-01
K-5	3.71 E-03	±	1.20 E-02	1.78 E-01	±	2.90 E-02	6.17 E-03	±	9.46 E-03	4.71 E-02	±	9.71 E-02
N-1	7.05 E-01	±	8.48 E-02	1.76 E-01	±	3.25 E-02	2.34 E-03	±	1.14 E-02	5.39 E-02	±	1.07 E-01
N-2	1.38 E+01	±	1.39 E+00	2.15 E+00	±	2.28 E-01	1.05 E-02	±	2.81 E-02	4.45 E-01	±	2.85 E-01
N-3	1.79 E+01	±	1.80 E+00	1.61 E+00	±	1.78 E-01	3.57 E-03	±	2.79 E-02	4.56 E-02	±	2.91 E-01
N-4	8.79 E-01	±	1.02 E-01	8.83 E-01	±	9.86 E-02	1.86 E-01	±	3.01 E-02	7.75 E-02	±	1.74 E-01
N-5	4.20 E-01	±	5.33 E-02	4.25 E-01	±	5.10 E-02	7.69 E-02	±	1.76 E-02	1.68 E-02	±	1.24 E-01
N-6	2.93 E-03	±	1.18 E-02	2.45 E-02	±	1.12 E-02	5.47 E-03	±	9.23 E-03	5.96 E-02	±	9.04 E-02
N-7	8.10 E-02	±	2.67 E-02	6.46 E-01	±	7.45 E-02	9.67 E-04	±	1.09 E-02	3.59 E-03	±	1.12 E-01
N-8	9.03 E-03	±	1.59 E-02	8.74 E-02	±	1.94 E-02	2.68 E-02	±	1.29 E-02	1.01 E-02	±	1.11 E-01
N-9	1.17 E-01	±	2.67 E-02	4.19 E-01	±	5.16 E-02	2.82 E-03	±	1.02 E-02	9.43 E-03	±	9.84 E-02
N-10	2.44 E-01	±	3.65 E-02	1.66 E-01	±	2.86 E-02	6.10 E-03	±	1.12 E-02	7.66 E-02	±	1.04 E-01
N-11	7.28 E-02	±	2.88 E-02	2.75 E-01	±	4.40 E-02	4.82 E-03	±	1.17 E-02	8.97 E-03	±	1.21 E-01
N-12	7.15 E-02	±	1.95 E-02	8.66 E-01	±	9.59 E-02	1.76 E-02	±	1.25 E-02	6.94 E-02	±	1.12 E-01

Table E-1. Soil Results for 100 Areas, 1992 (pCi/g dry weight).
(sheet 2 of 4)

Site ID	Sb-125			Eu-155			Eu-154			Sr-90		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
B-1	2.30 E-02	±	3.35 E-02	5.60 E-02	±	3.93 E-02	5.89 E-02	±	4.83 E-02	6.50 E-02	±	1.44 E-02
B-2	1.29 E-02	±	4.27 E-02	1.37 E-02	±	3.99 E-02	1.25 E-01	±	5.27 E-02	2.14 E-01	±	4.18 E-02
C-1	1.49 E-02	±	3.64 E-02	1.51 E-02	±	4.96 E-02	3.42 E-02	±	5.69 E-02	4.17 E-02	±	1.00 E-02
C-2	1.05 E-02	±	4.32 E-02	6.40 E-02	±	5.78 E-02	1.80 E-01	±	6.13 E-02	5.69 E-01	±	1.06 E-01
D-1	2.17 E-03	±	2.49 E-02	6.37 E-02	±	3.37 E-02	2.95 E-02	±	3.60 E-02	4.44 E-02	±	1.06 E-02
D-2	1.27 E-02	±	3.05 E-02	2.65 E-02	±	3.55 E-02	7.85 E-02	±	4.24 E-02	1.39 E-01	±	2.69 E-02
D-3	2.31 E-04	±	2.32 E-02	3.29 E-02	±	3.02 E-02	2.40 E-02	±	3.53 E-02	4.15 E-02	±	1.15 E-02
D-4	9.51 E-03	±	2.15 E-02	6.70 E-02	±	2.93 E-02	1.86 E-02	±	3.23 E-02	3.74 E-02	±	1.45 E-02
F-1	2.92 E-03	±	2.52 E-02	2.92 E-03	±	3.51 E-02	3.88 E-02	±	3.88 E-02	1.36 E-01	±	3.23 E-02
F-2	9.24 E-03	±	2.53 E-02	2.02 E-02	±	3.09 E-02	6.69 E-02	±	3.64 E-02	1.71 E-01	±	3.24 E-02
F-3	1.54 E-02	±	3.87 E-02	2.28 E-02	±	4.82 E-02	5.66 E-02	±	5.10 E-02	1.23 E-01	±	2.38 E-02
F-4	3.74 E-03	±	2.58 E-02	5.75 E-02	±	4.13 E-02	3.57 E-02	±	3.79 E-02	1.74 E-02	±	5.37 E-02
F-5	2.11 E-02	±	2.81 E-02	6.49 E-02	±	3.53 E-02	1.37 E-02	±	3.65 E-02	1.45 E-01	±	3.36 E-02
H-1	1.38 E-02	±	3.09 E-02	2.87 E-02	±	4.04 E-02	2.33 E-02	±	4.62 E-02	7.91 E-02	±	1.75 E-02
H-2	2.01 E-03	±	2.76 E-02	1.82 E-02	±	3.58 E-02	1.41 E-02	±	3.98 E-02	7.96 E-02	±	1.57 E-02
K-1	9.20 E-03	±	3.28 E-02	6.25 E-02	±	4.15 E-02	3.65 E-01	±	6.65 E-02	2.53 E-01	±	4.88 E-02
K-2	1.87 E-02	±	3.49 E-02	8.85 E-02	±	4.53 E-02	8.12 E-02	±	5.24 E-02	6.95 E-01	±	1.44 E-01
K-3	3.29 E-03	±	2.98 E-02	2.94 E-02	±	3.83 E-02	8.82 E-03	±	4.22 E-02	1.24 E-01	±	2.55 E-02
K-4	6.18 E-02	±	8.55 E-02	1.03 E-01	±	9.92 E-02	3.38 E-02	±	1.12 E-01	1.12 E-01	±	2.29 E-02
K-5	2.49 E-02	±	2.65 E-02	6.65 E-02	±	3.68 E-02	3.61 E-02	±	4.05 E-02	6.48 E-02	±	1.42 E-02
N-1	6.88 E-02	±	3.36 E-02	2.55 E-02	±	3.56 E-02	2.76 E-02	±	4.16 E-02	3.68 E-02	±	8.80 E-03
N-2	4.51 E-02	±	7.49 E-02	5.75 E-02	±	6.68 E-02	4.43 E-02	±	7.99 E-02	3.14 E-01	±	5.91 E-02
N-3	2.66 E-02	±	7.23 E-02	7.54 E-01	±	1.09 E-01	2.79 E+00	±	3.25 E-01	5.00 E-01	±	9.47 E-02
N-4	1.11 E-02	±	5.21 E-02	3.23 E-02	±	5.82 E-02	6.71 E-02	±	5.83 E-02	1.66 E-01	±	3.11 E-02
N-5	4.07 E-03	±	4.02 E-02	6.70 E-02	±	4.88 E-02	2.85 E-02	±	4.78 E-02	7.43 E-02	±	1.53 E-02
N-6	1.22 E-02	±	2.45 E-02	4.78 E-02	±	3.37 E-02	6.08 E-02	±	3.67 E-02	5.94 E-03	±	3.35 E-03
N-7	2.14 E-03	±	3.32 E-02	3.48 E-02	±	3.77 E-02	3.19 E-02	±	4.04 E-02	1.42 E-01	±	2.96 E-02
N-8	1.25 E-02	±	3.39 E-02	8.14 E-02	±	4.58 E-02	4.09 E-02	±	5.05 E-02	2.08 E-02	±	6.76 E-03
N-9	8.23 E-03	±	3.04 E-02	4.92 E-02	±	3.51 E-02	9.51 E-03	±	4.24 E-02	1.19 E-01	±	2.37 E-02
N-10	1.69 E-02	±	2.96 E-02	7.19 E-02	±	3.84 E-02	2.84 E-02	±	3.94 E-02	5.16 E-02	±	1.20 E-02
N-11	6.55 E-03	±	3.66 E-02	1.87 E-02	±	3.70 E-02	2.20 E-03	±	4.31 E-02	1.42 E-01	±	2.90 E-02
N-12	1.71 E-02	±	3.45 E-02	4.71 E-02	±	4.07 E-02	2.33 E-02	±	4.72 E-02	1.80 E-01	±	3.46 E-02

Table E-1. Soil Results for 100 Areas, 1992 (pCi/g dry weight).
(sheet 3 of 4)

Site ID	Pu-239/40			Pu-238			U-234			U-235		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
B-1	1.50 E-02	±	1.94 E-03	2.02 E-04	±	2.20 E-04	8.25 E-01	±	9.52 E-02	2.60 E-02	±	1.09 E-02
B-2	4.98 E-02	±	6.90 E-03	1.14 E-03	±	5.47 E-04	7.22 E-01	±	8.84 E-02	4.00 E-02	±	1.41 E-02
C-1	3.47 E-03	±	1.23 E-03	3.52 E-04	±	3.72 E-04	6.22 E-01	±	7.88 E-02	2.09 E-02	±	1.04 E-02
C-2	4.65 E-02	±	5.26 E-03	1.45 E-03	±	4.44 E-04	6.67 E-01	±	8.77 E-02	3.24 E-02	±	1.40 E-02
D-1	6.06 E-03	±	1.08 E-03	2.64 E-04	±	1.89 E-04	6.42 E-01	±	7.94 E-02	1.99 E-02	±	9.79 E-03
D-2	1.31 E-02	±	2.31 E-03	4.82 E-04	±	3.38 E-04	6.78 E-01	±	8.21 E-02	3.84 E-02	±	1.32 E-02
D-3	3.75 E-03	±	1.24 E-03	2.42 E-04	±	3.00 E-04	5.99 E-01	±	7.34 E-02	2.09 E-02	±	9.79 E-03
D-4	4.09 E-03	±	1.09 E-03	2.16 E-04	±	2.86 E-04	7.69 E-01	±	9.46 E-02	1.97 E-02	±	1.08 E-02
F-1	4.43 E-03	±	1.08 E-03	8.86 E-04	±	4.38 E-04	7.70 E-01	±	9.38 E-02	3.56 E-02	±	1.35 E-02
F-2	2.99 E-03	±	1.18 E-03	8.45 E-05	±	2.02 E-04	6.04 E-01	±	8.16 E-02	2.73 E-02	±	1.34 E-02
F-3	1.75 E-02	±	3.02 E-03	1.66 E-03	±	6.86 E-04	6.13 E-01	±	8.53 E-02	3.53 E-02	±	1.52 E-02
F-4	1.16 E-03	±	5.10 E-04	1.53 E-04	±	2.68 E-04	6.50 E-01	±	8.14 E-02	1.74 E-02	±	9.57 E-03
F-5	9.65 E-03	±	1.71 E-03	3.20 E-04	±	2.50 E-04	6.28 E-01	±	7.82 E-02	2.55 E-02	±	1.28 E-02
H-1	7.70 E-03	±	1.37 E-03	3.77 E-04	±	2.51 E-04	6.77 E-01	±	8.94 E-02	2.45 E-02	±	1.26 E-02
H-2	6.02 E-03	±	1.16 E-03	3.16 E-04	±	2.48 E-04	6.48 E-01	±	8.30 E-02	3.66 E-02	±	1.41 E-02
K-1	3.73 E-02	±	4.32 E-03	1.48 E-03	±	4.43 E-04	6.75 E-01	±	8.95 E-02	3.15 E-02	±	1.46 E-02
K-2	4.02 E-03	±	9.87 E-04	4.86 E-04	±	2.44 E-04	8.04 E-01	±	9.65 E-02	3.39 E-02	±	1.25 E-02
K-3	8.94 E-03	±	1.50 E-03	4.27 E-04	±	2.61 E-04	9.28 E-01	±	1.13 E-01	2.42 E-02	±	1.19 E-02
K-4	1.09 E-02	±	2.07 E-03	2.77 E-04	±	2.65 E-04	6.70 E-01	±	8.77 E-02	3.28 E-02	±	1.40 E-02
K-5	5.61 E-03	±	1.09 E-03	1.66 E-04	±	1.65 E-04	1.10 E+00	±	1.25 E-01	3.95 E-02	±	1.41 E-02
N-1	4.33 E-03	±	9.95 E-04	4.55 E-04	±	2.89 E-04	6.99 E-01	±	8.65 E-02	1.80 E-02	±	1.02 E-02
N-2	3.69 E-02	±	4.95 E-03	4.87 E-03	±	1.12 E-03	7.24 E-01	±	8.92 E-02	2.06 E-02	±	1.09 E-02
N-3	6.20 E-02	±	7.76 E-03	1.06 E-02	±	1.85 E-03	5.98 E-01	±	7.86 E-02	2.48 E-02	±	1.19 E-02
N-4	9.36 E-03	±	1.68 E-03	9.46 E-04	±	4.34 E-04	7.53 E-01	±	9.45 E-02	2.80 E-02	±	1.27 E-02
N-5	4.18 E-03	±	1.01 E-03	5.71 E-04	±	3.46 E-04	6.60 E-01	±	8.17 E-02	3.00 E-02	±	1.21 E-02
N-6	2.92 E-04	±	3.01 E-04	3.66 E-05	±	1.07 E-04	6.65 E-01	±	8.34 E-02	2.81 E-02	±	1.19 E-02
N-7	1.21 E-02	±	2.30 E-03	3.02 E-04	±	2.87 E-04	5.86 E-01	±	7.85 E-02	2.97 E-02	±	1.32 E-02
N-8	1.05 E-03	±	7.57 E-04	1.18 E-04	±	2.68 E-04	6.80 E-01	±	5.32 E-02	2.58 E-02	±	1.12 E-02
N-9	1.11 E-02	±	2.34 E-03	1.30 E-03	±	6.61 E-04	7.30 E-01	±	1.04 E-01	2.46 E-02	±	1.54 E-02
N-10	4.54 E-03	±	9.95 E-04	4.19 E-04	±	3.12 E-04	6.33 E-01	±	8.26 E-02	1.73 E-02	±	1.07 E-02
N-11	6.49 E-03	±	1.41 E-03	4.69 E-04	±	3.29 E-04	6.70 E-01	±	8.64 E-02	2.19 E-02	±	1.29 E-02
N-12	1.78 E-02	±	3.18 E-03	9.17 E-04	±	5.31 E-04	6.65 E-01	±	8.27 E-02	2.78 E-02	±	1.18 E-02

Table E-1. Soil Results for 100 Areas, 1992 (pCi/g dry weight).
(sheet 4 of 4)

Site ID	U-238DA	
	Result	± Overall error
B-1	7.89 E-01	± 9.12 E-02
B-2	7.27 E-01	± 8.84 E-02
C-1	6.51 E-01	± 8.11 E-02
C-2	6.92 E-01	± 8.96 E-02
D-1	6.87 E-01	± 8.31 E-02
D-2	6.68 E-01	± 8.06 E-02
D-3	5.79 E-01	± 7.09 E-02
D-4	7.35 E-01	± 9.07 E-02
F-1	7.71 E-01	± 9.33 E-02
F-2	6.13 E-01	± 8.21 E-02
F-3	5.71 E-01	± 8.05 E-02
F-4	6.96 E-01	± 8.51 E-02
F-5	6.44 E-01	± 7.92 E-02
H-1	6.44 E-01	± 8.56 E-02
H-2	6.67 E-01	± 8.42 E-02
K-1	7.38 E-01	± 9.50 E-02
K-2	8.11 E-01	± 9.67 E-02
K-3	9.14 E-01	± 1.11 E-01
K-4	7.08 E-01	± 9.08 E-02
K-5	1.06 E+00	± 1.20 E-01
N-1	7.23 E-01	± 8.81 E-02
N-2	7.40 E-01	± 8.81 E-02
N-3	6.19 E-01	± 8.00 E-02
N-4	7.12 E-01	± 8.98 E-02
N-5	7.22 E-01	± 8.71 E-02
N-6	6.61 E-01	± 8.25 E-02
N-7	6.14 E-01	± 8.06 E-02
N-8	6.72 E-01	± 5.25 E-02
N-9	6.65 E-01	± 9.64 E-02
N-10	6.55 E-01	± 8.43 E-02
N-11	6.70 E-01	± 8.56 E-02
N-12	6.70 E-01	± 8.26 E-02

NOTE: Negative values indicate results at or near background levels of radioactivity.

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 1 of 12)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs			¹⁰⁶ Ru		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
1	-1.7 E-02	±	1.4 E-02	1.1 E+00	±	1.2 E-01	-1.4 E-02	±	1.1 E-02	-5.1 E-02	±	1.1 E-01
2	9.6 E-03	±	1.3 E-02	1.1 E+00	±	1.1 E-01	-1.5 E-01	±	2.2 E-02	-2.8 E-02	±	1.1 E-01
3	-2.0 E-03	±	1.0 E-02	4.4 E+00	±	4.4 E-01	-2.7 E-04	±	9.1 E-03	-6.0 E-02	±	9.1 E-02
4	1.0 E-02	±	1.2 E-02	6.9 E+00	±	7.0 E-01	-6.2 E-03	±	1.2 E-02	1.3 E-01	±	1.2 E-01
5	1.2 E-04	±	1.0 E-02	1.2 E+00	±	1.3 E-01	1.1 E-02	±	8.7 E-03	-2.0 E-02	±	8.7 E-02
6	1.3 E-02	±	1.2 E-02	4.3 E-01	±	5.0 E-02	-1.5 E-01	±	2.1 E-02	-1.4 E-02	±	1.0 E-01
7	3.5 E-03	±	1.1 E-02	1.8 E-01	±	2.6 E-02	4.4 E-03	±	8.3 E-03	1.6 E-02	±	8.5 E-02
8	-5.0 E-03	±	1.1 E-02	1.4 E-01	±	2.6 E-02	8.4 E-03	±	9.1 E-03	-1.4 E-02	±	8.9 E-02
9	-1.4 E-03	±	9.4 E-03	5.4 E-01	±	6.3 E-02	-7.5 E-03	±	9.1 E-03	2.5 E-02	±	8.5 E-02
10	1.1 E-02	±	1.4 E-02	6.9 E-03	±	1.3 E-02	-1.8 E-01	±	2.5 E-02	4.2 E-02	±	1.1 E-01
11	-3.8 E-03	±	1.1 E-02	3.6 E+00	±	3.7 E-01	-5.8 E-02	±	1.4 E-02	-9.2 E-02	±	1.1 E-01
12	5.5 E-04	±	8.5 E-03	2.3 E+00	±	2.4 E-01	-2.1 E-03	±	8.5 E-03	1.6 E-02	±	8.5 E-02
13	1.1 E-03	±	1.1 E-02	6.9 E+00	±	6.9 E-01	-8.8 E-02	±	1.7 E-02	3.8 E-03	±	1.3 E-01
14	-1.6 E-02	±	1.4 E-02	1.5 E-01	±	2.3 E-02	-1.8 E-01	±	2.4 E-02	-1.1 E-02	±	1.0 E-01
15	2.4 E-03	±	1.1 E-02	7.7 E-01	±	8.2 E-02	-8.4 E-03	±	9.2 E-03	-9.5 E-03	±	8.5 E-02
16	-2.9 E-03	±	9.0 E-03	8.6 E-01	±	9.1 E-02	8.7 E-04	±	7.2 E-03	-1.0 E-02	±	7.1 E-02
17	-9.2 E-03	±	1.3 E-02	4.2 E+00	±	4.3 E-01	5.0 E-03	±	1.2 E-02	-4.5 E-03	±	1.2 E-01
18	6.8 E-03	±	9.0 E-03	3.4 E+00	±	3.4 E-01	-7.2 E-03	±	9.2 E-03	-3.1 E-02	±	9.3 E-02
19	-7.9 E-03	±	1.5 E-02	9.8 E-01	±	1.0 E-01	-1.8 E-01	±	2.5 E-02	9.1 E-02	±	1.1 E-01
20	3.3 E-03	±	1.4 E-02	2.3 E+00	±	2.3 E-01	-1.2 E-02	±	1.3 E-02	-4.1 E-03	±	1.3 E-01
21	-7.9 E-03	±	1.6 E-02	3.9 E-01	±	4.7 E-02	-1.8 E-01	±	2.6 E-02	1.2 E-01	±	1.2 E-01
22	1.5 E-02	±	1.2 E-02	1.3 E+00	±	1.3 E-01	-8.9 E-03	±	9.9 E-03	9.3 E-04	±	9.7 E-02
23	1.3 E-02	±	1.1 E-02	5.1 E+00	±	5.1 E-01	6.8 E-03	±	1.1 E-02	3.9 E-02	±	1.1 E-01
24	4.5 E-03	±	1.1 E-02	4.2 E+00	±	4.2 E-01	2.6 E-03	±	1.0 E-02	-2.7 E-02	±	9.8 E-02
25	5.1 E-03	±	1.1 E-02	3.7 E+00	±	3.8 E-01	-5.6 E-03	±	9.8 E-03	-7.3 E-03	±	9.6 E-02
26	1.3 E-02	±	1.2 E-02	1.3 E+00	±	1.4 E-01	-1.6 E-01	±	2.3 E-02	-1.5 E-01	±	1.1 E-01
27	2.0 E-02	±	1.2 E-02	4.4 E-01	±	5.0 E-02	-2.7 E-02	±	1.1 E-02	4.8 E-02	±	9.7 E-02
28	-1.1 E-02	±	9.6 E-03	1.7 E+00	±	1.7 E-01	3.7 E-03	±	8.0 E-03	-1.7 E-02	±	8.2 E-02
29	2.5 E-02	±	1.6 E-02	2.2 E+01	±	2.2 E+00	-1.6 E-02	±	1.7 E-02	1.1 E-01	±	1.6 E-01
30	6.9 E-03	±	1.2 E-02	1.1 E+01	±	1.1 E+00	5.2 E-04	±	1.3 E-02	2.0 E-02	±	1.4 E-01
31	9.8 E-03	±	1.2 E-02	5.8 E+00	±	5.9 E-01	-2.8 E-02	±	1.5 E-02	-7.8 E-03	±	1.4 E-01

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 2 of 12)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs			¹⁰⁶ Ru		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
32	1.2 E-03	±	1.1 E-02	4.9 E+00	±	5.0 E-01	5.0 E-03	±	1.1 E-02	1.1 E-01	±	1.1 E-01
33	-1.3 E-02	±	1.1 E-02	2.7 E+01	±	2.7 E+00	7.7 E-03	±	1.8 E-02	-2.2 E-01	±	1.8 E-01
34	4.5 E-03	±	1.1 E-02	8.9 E+00	±	8.9 E-01	-9.8 E-03	±	1.1 E-02	3.9 E-02	±	1.1 E-01
35	-2.4 E-03	±	1.3 E-02	2.7 E+00	±	2.8 E-01	-1.6 E-01	±	2.4 E-02	-5.1 E-02	±	1.3 E-01
36	1.4 E-03	±	1.4 E-02	4.8 E+00	±	4.9 E-01	-2.1 E-02	±	1.4 E-02	7.6 E-02	±	1.4 E-01
37	1.7 E-03	±	1.0 E-02	1.2 E+01	±	1.2 E+00	-9.9 E-03	±	1.3 E-02	1.0 E-01	±	1.3 E-01
38	2.0 E-02	±	9.5 E-03	7.2 E-01	±	7.9 E-02	-5.2 E-03	±	8.6 E-03	-6.5 E-04	±	8.5 E-02
39	1.5 E-02	±	1.3 E-02	1.1 E+01	±	1.1 E+00	-1.2 E-01	±	2.2 E-02	-1.1 E-01	±	1.6 E-01
40	-9.5 E-04	±	1.0 E-02	2.7 E-01	±	3.5 E-02	1.6 E-03	±	7.7 E-03	7.6 E-03	±	7.9 E-02
41	4.4 E-03	±	1.3 E-02	2.2 E+00	±	2.3 E-01	-3.8 E-02	±	1.4 E-02	-3.3 E-02	±	1.2 E-01
42	1.6 E-02	±	1.2 E-02	1.2 E+00	±	1.3 E-01	-2.8 E-02	±	1.2 E-02	9.9 E-04	±	1.0 E-01
43	1.2 E-02	±	1.0 E-02	4.9 E-01	±	5.8 E-02	-5.2 E-03	±	8.7 E-03	1.3 E-02	±	8.7 E-02
44	1.4 E-02	±	1.3 E-02	5.1 E+00	±	5.1 E-01	-1.4 E-01	±	2.2 E-02	-7.6 E-02	±	1.4 E-01
45	-9.5 E-03	±	1.5 E-02	5.8 E-01	±	6.5 E-02	-1.9 E-01	±	2.6 E-02	5.6 E-02	±	1.2 E-01
46	-5.1 E-03	±	1.0 E-02	1.9 E-01	±	2.9 E-02	3.6 E-03	±	7.7 E-03	-2.6 E-02	±	8.5 E-02
47	-4.5 E-04	±	1.3 E-02	4.3 E+00	±	4.4 E-01	-9.0 E-02	±	1.9 E-02	-1.9 E-02	±	1.3 E-01
48	-5.2 E-03	±	9.5 E-03	2.0 E+00	±	2.1 E-01	-2.2 E-03	±	8.3 E-03	3.9 E-02	±	8.4 E-02
49	-4.2 E-03	±	1.4 E-02	5.8 E-01	±	6.4 E-02	-1.8 E-01	±	2.5 E-02	-4.7 E-02	±	1.0 E-01
50	6.1 E-03	±	1.4 E-02	2.6 E-01	±	3.4 E-02	-1.1 E-01	±	1.8 E-02	-3.8 E-02	±	1.1 E-01
51	-9.5 E-03	±	1.0 E-02	1.2 E+00	±	1.2 E-01	5.0 E-03	±	9.4 E-03	-2.3 E-03	±	9.2 E-02
52	-2.8 E-03	±	1.5 E-02	3.7 E-01	±	4.4 E-02	-1.8 E-01	±	2.6 E-02	6.5 E-02	±	1.1 E-01
53	1.8 E-03	±	1.0 E-02	4.8 E+00	±	4.8 E-01	2.6 E-03	±	1.1 E-02	-8.2 E-04	±	1.1 E-01
54	1.9 E-02	±	1.9 E-02	1.6 E+02	±	1.6 E+01	-2.1 E-01	±	8.4 E-02	1.3 E-01	±	8.6 E-01
55	-7.2 E-03	±	1.1 E-02	5.1 E+00	±	5.2 E-01	-8.1 E-04	±	1.0 E-02	6.4 E-02	±	9.6 E-02
56	-5.2 E-03	±	1.1 E-02	2.1 E+00	±	2.2 E-01	-4.4 E-03	±	9.6 E-03	1.8 E-01	±	9.5 E-02
57	8.1 E-03	±	1.4 E-02	4.2 E+00	±	4.2 E-01	-3.3 E-02	±	1.4 E-02	4.5 E-02	±	1.3 E-01
58	-4.1 E-03	±	1.2 E-02	5.0 E+01	±	5.0 E+00	-1.8 E-01	±	3.6 E-02	8.1 E-02	±	3.1 E-01
59	-3.0 E-03	±	1.1 E-02	4.9 E+00	±	4.9 E-01	6.3 E-03	±	1.0 E-02	8.7 E-02	±	1.0 E-01
60	8.0 E-03	±	1.6 E-02	1.4 E+00	±	1.5 E-01	-1.8 E-01	±	2.7 E-02	1.1 E-01	±	1.4 E-01
61	1.3 E-03	±	1.3 E-02	1.1 E+00	±	1.2 E-01	-7.6 E-02	±	1.5 E-02	2.1 E-02	±	1.1 E-01
62	6.4 E-03	±	1.0 E-02	1.8 E-01	±	2.7 E-02	-4.3 E-03	±	8.1 E-03	-5.1 E-03	±	8.2 E-02

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 3 of 12)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs			¹⁰⁶ Ru		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
63	-2.2 E-03	±	1.2 E-02	5.4 E-01	±	6.4 E-02	-1.2 E-02	±	9.4 E-03	-9.0 E-02	±	8.7 E-02
64	8.8 E-03	±	9.4 E-03	2.7 E+00	±	2.7 E-01	5.3 E-03	±	9.5 E-03	-3.7 E-02	±	9.5 E-02
65	-6.3 E-04	±	1.1 E-02	2.6 E+00	±	2.7 E-01	-6.6 E-05	±	9.7 E-03	-1.6 E-02	±	1.0 E-01
66	5.4 E-03	±	1.2 E-02	2.8 E+01	±	2.8 E+00	-1.4 E-01	±	2.7 E-02	2.4 E-01	±	2.3 E-01
67	8.7 E-04	±	1.4 E-02	5.8 E-01	±	6.4 E-02	-4.4 E-02	±	1.3 E-02	-1.9 E-02	±	1.1 E-01
68	1.5 E-03	±	1.0 E-02	5.0 E-01	±	5.6 E-02	-1.1 E-02	±	8.4 E-03	-4.4 E-02	±	8.2 E-02
69	-6.6 E-03	±	1.1 E-02	3.1 E-01	±	4.0 E-02	-1.1 E-03	±	8.8 E-03	1.5 E-02	±	8.9 E-02
70	8.1 E-03	±	9.4 E-03	5.1 E-01	±	5.9 E-02	-4.1 E-03	±	8.1 E-03	1.0 E-02	±	8.5 E-02
71	5.3 E-04	±	9.5 E-03	5.7 E-01	±	6.3 E-02	6.1 E-03	±	7.7 E-03	3.2 E-02	±	7.8 E-02
72	8.9 E-03	±	1.1 E-02	1.8 E+00	±	1.8 E-01	-3.1 E-02	±	1.1 E-02	-1.8 E-02	±	9.7 E-02
73	8.2 E-03	±	9.0 E-03	4.0 E+01	±	4.0 E+00	3.4 E-03	±	2.0 E-02	-1.5 E-01	±	2.0 E-01
74	-1.1 E-02	±	1.4 E-02	2.4 E+00	±	2.4 E-01	-1.6 E-01	±	2.4 E-02	1.8 E-02	±	1.2 E-01
75	2.6 E-03	±	1.3 E-02	5.0 E-01	±	5.6 E-02	-5.3 E-02	±	1.3 E-02	1.4 E-03	±	1.0 E-01
76	-1.2 E-02	±	1.5 E-02	7.7 E-02	±	2.1 E-02	-2.3 E-02	±	1.3 E-02	1.0 E-01	±	1.1 E-01
77	-3.7 E-03	±	9.9 E-03	5.9 E-01	±	6.5 E-02	5.5 E-03	±	7.9 E-03	-1.9 E-02	±	8.2 E-02
78	4.5 E-03	±	1.1 E-02	1.7 E+00	±	1.7 E-01	4.0 E-03	±	8.6 E-03	2.6 E-02	±	9.0 E-02
79	2.0 E-03	±	9.4 E-03	1.1 E+00	±	1.1 E-01	-8.1 E-03	±	8.5 E-03	-7.6 E-02	±	8.9 E-02
80	1.9 E-03	±	1.2 E-02	2.7 E+00	±	2.8 E-01	-3.3 E-03	±	1.2 E-02	1.4 E-01	±	1.2 E-01
81	1.1 E-02	±	8.9 E-03	3.9 E-02	±	1.3 E-02	-7.4 E-03	±	7.9 E-03	-7.4 E-02	±	8.4 E-02
82	1.3 E-02	±	1.1 E-02	6.6 E-02	±	1.8 E-02	-9.3 E-04	±	9.8 E-03	-7.1 E-02	±	9.9 E-02
83	-9.1 E-03	±	1.0 E-02	8.2 E-01	±	8.9 E-02	6.4 E-03	±	8.3 E-03	2.6 E-02	±	8.8 E-02
84	5.2 E-03	±	1.4 E-02	1.4 E+00	±	1.5 E-01	-9.2 E-03	±	1.1 E-02	1.3 E-02	±	1.1 E-01
85	-7.9 E-03	±	1.3 E-02	1.2 E+00	±	1.3 E-01	1.3 E-02	±	1.1 E-02	2.1 E-02	±	1.0 E-01
86	7.8 E-03	±	1.2 E-02	5.0 E-01	±	6.0 E-02	3.7 E-03	±	1.1 E-02	-8.9 E-03	±	1.0 E-01
87	9.9 E-03	±	1.3 E-02	4.5 E-03	±	1.2 E-02	-1.6 E-01	±	2.3 E-02	8.5 E-02	±	1.1 E-01
88	5.9 E-03	±	9.4 E-03	6.5 E-02	±	1.9 E-02	-1.2 E-04	±	7.2 E-03	4.2 E-02	±	7.3 E-02
89	2.6 E-03	±	1.1 E-02	9.9 E-01	±	1.1 E-01	7.9 E-03	±	9.2 E-03	6.5 E-02	±	9.0 E-02
90	-1.0 E-02	±	1.2 E-02	1.1 E-01	±	1.9 E-02	-1.2 E-01	±	1.8 E-02	-3.0 E-02	±	9.7 E-02
91	6.8 E-03	±	1.2 E-02	6.4 E-01	±	7.0 E-02	-6.2 E-02	±	1.4 E-02	2.3 E-02	±	1.1 E-01
92	-8.4 E-03	±	1.2 E-02	7.4 E-02	±	1.9 E-02	7.4 E-03	±	8.9 E-03	-3.8 E-02	±	9.5 E-02
93	-2.0 E-03	±	1.3 E-02	3.6 E-01	±	4.3 E-02	-1.7 E-01	±	2.4 E-02	-6.7 E-02	±	1.1 E-01

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 4 of 12)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs			¹⁰⁶ Ru		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
94	-1.0 E-02	±	1.3 E-02	1.4 E-01	±	2.2 E-02	-6.3 E-02	±	1.3 E-02	2.0 E-02	±	1.0 E-01
95	1.4 E-02	±	9.9 E-03	6.5 E-01	±	7.1 E-02	-9.3 E-03	±	9.3 E-03	-1.1 E-02	±	9.3 E-02
96	7.9 E-03	±	1.3 E-02	3.0 E-01	±	3.7 E-02	-1.5 E-01	±	2.2 E-02	-7.5 E-02	±	1.1 E-01
97	-5.0 E-03	±	1.3 E-02	6.1 E-02	±	1.5 E-02	-5.7 E-02	±	1.4 E-02	-7.6 E-02	±	1.0 E-01
98	-1.8 E-02	±	1.2 E-02	5.2 E-02	±	1.7 E-02	2.2 E-03	±	9.0 E-03	-6.5 E-02	±	9.4 E-02
99	3.3 E-02	±	1.5 E-02	2.7 E-01	±	3.4 E-02	-1.7 E-01	±	2.3 E-02	5.1 E-02	±	1.1 E-01
100	-4.0 E-03	±	1.4 E-02	1.0 E+00	±	1.1 E-01	-6.9 E-02	±	1.5 E-02	-5.2 E-03	±	1.2 E-01
101	8.3 E-03	±	1.5 E-02	2.5 E+00	±	2.6 E-01	-1.6 E-01	±	2.4 E-02	1.3 E-01	±	1.3 E-01
102	-1.5 E-02	±	1.7 E-02	2.0 E+00	±	2.1 E-01	-6.1 E-02	±	1.6 E-02	8.8 E-02	±	1.3 E-01
103	-1.6 E-02	±	1.1 E-02	1.1 E+00	±	1.1 E-01	-1.0 E-02	±	8.2 E-03	4.8 E-02	±	7.9 E-02
104	2.4 E-03	±	1.0 E-02	3.7 E-01	±	4.7 E-02	4.1 E-03	±	8.5 E-03	-5.6 E-02	±	8.9 E-02
105	7.1 E-03	±	1.4 E-02	3.6 E-01	±	4.3 E-02	-1.7 E-01	±	2.4 E-02	-7.4 E-02	±	1.1 E-01
106	4.7 E-03	±	1.0 E-02	5.0 E-01	±	5.7 E-02	-1.7 E-02	±	9.3 E-03	5.4 E-03	±	8.8 E-02
107	-1.4 E-02	±	1.1 E-02	9.2 E-01	±	9.9 E-02	4.9 E-04	±	8.6 E-03	-2.2 E-02	±	9.1 E-02
108	1.1 E-02	±	1.3 E-02	2.1 E-02	±	1.1 E-02	-1.4 E-01	±	2.1 E-02	1.0 E-02	±	1.0 E-01
109	-7.6 E-03	±	1.3 E-02	1.5 E-01	±	2.3 E-02	-4.5 E-02	±	1.4 E-02	9.9 E-02	±	1.1 E-01
110	-1.8 E-03	±	9.5 E-03	9.3 E-02	±	1.9 E-02	-4.3 E-03	±	8.0 E-03	-3.1 E-02	±	7.5 E-02

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 5 of 12)

Site ID	¹²⁵ Sb			¹⁵⁵ Eu			¹⁵⁴ Eu			^{239/40} Pu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
1	2.1 E-02	±	3.6 E-02	1.6 E-02	±	4.5 E-02	-1.1 E-02	±	4.4 E-02	2.2 E-02	±	2.9 E-03
2	-1.5 E-02	±	3.8 E-02	2.5 E-02	±	4.4 E-02	-3.9 E-03	±	4.1 E-02	7.6 E-03	±	1.3 E-03
3	-2.3 E-02	±	4.0 E-02	6.0 E-02	±	3.1 E-02	1.1 E-02	±	3.0 E-02	5.6 E-02	±	6.3 E-03
4	6.6 E-02	±	4.9 E-02	3.1 E-02	±	4.3 E-02	3.2 E-02	±	3.7 E-02	1.9 E-01	±	2.8 E-02
5	2.2 E-02	±	2.7 E-02	5.3 E-02	±	3.1 E-02	-1.4 E-02	±	3.2 E-02	2.8 E-02	±	3.8 E-03
6	9.3 E-03	±	3.1 E-02	5.7 E-02	±	4.2 E-02	-1.6 E-02	±	4.2 E-02	1.1 E-01	±	1.3 E-02
7	1.4 E-02	±	2.3 E-02	4.4 E-02	±	3.1 E-02	-3.2 E-02	±	3.5 E-02	7.6 E-02	±	8.2 E-03
8	-1.0 E-02	±	2.7 E-02	3.8 E-02	±	3.4 E-02	9.9 E-03	±	3.5 E-02	7.7 E-02	±	1.1 E-02
9	2.2 E-02	±	2.5 E-02	6.3 E-02	±	3.0 E-02	1.1 E-02	±	3.5 E-02	2.7 E-02	±	3.8 E-03
10	-3.3 E-03	±	3.2 E-02	3.1 E-02	±	4.4 E-02	-2.6 E-02	±	5.0 E-02	1.4 E-03	±	6.3 E-04
11	1.3 E-03	±	4.3 E-02	2.7 E-02	±	4.6 E-02	-2.0 E-03	±	3.6 E-02	1.6 E-01	±	1.7 E-02
12	6.3 E-03	±	3.2 E-02	2.8 E-02	±	3.4 E-02	-2.0 E-02	±	3.1 E-02	1.6 E-02	±	2.7 E-03
13	-8.8 E-03	±	4.9 E-02	3.2 E-04	±	5.1 E-02	1.6 E-02	±	3.5 E-02	7.5 E-03	±	1.7 E-03
14	-2.3 E-03	±	3.1 E-02	2.9 E-02	±	4.0 E-02	-1.9 E-02	±	4.2 E-02	5.6 E-03	±	1.8 E-03
15	1.7 E-02	±	2.6 E-02	4.5 E-02	±	3.7 E-02	9.7 E-03	±	3.4 E-02	1.3 E-02	±	2.8 E-03
16	3.4 E-03	±	2.3 E-02	6.6 E-02	±	2.8 E-02	-9.2 E-03	±	2.8 E-02	2.5 E-02	±	3.4 E-03
17	1.4 E-02	±	4.5 E-02	3.3 E-02	±	4.3 E-02	-3.7 E-02	±	3.9 E-02	7.9 E-02	±	1.1 E-02
18	-5.2 E-03	±	3.6 E-02	1.5 E-02	±	3.0 E-02	4.7 E-02	±	2.9 E-02	1.2 E+01	±	1.2 E+0
19	-2.6 E-02	±	3.9 E-02	3.3 E-02	±	4.6 E-02	-2.0 E-02	±	4.6 E-02	3.3 E-02	±	4.4 E-03
20	-6.1 E-03	±	3.9 E-02	8.2 E-02	±	5.0 E-02	-1.8 E-02	±	4.6 E-02	3.8 E-02	±	5.0 E-03
21	-4.3 E-03	±	3.8 E-02	9.1 E-02	±	4.8 E-02	2.8 E-02	±	4.9 E-02	1.2 E-02	±	2.1 E-03
22	9.6 E-03	±	3.2 E-02	5.2 E-02	±	4.0 E-02	2.8 E-02	±	3.8 E-02	7.4 E-02	±	9.2 E-03
23	2.4 E-02	±	4.4 E-02	6.8 E-02	±	4.1 E-02	2.4 E-03	±	3.4 E-02	7.0 E-02	±	8.5 E-03
24	-1.7 E-02	±	3.8 E-02	4.5 E-02	±	3.0 E-02	6.9 E-03	±	3.0 E-02	2.7 E-01	±	3.0 E-02
25	5.0 E-02	±	3.7 E-02	6.4 E-02	±	3.6 E-02	-4.2 E-02	±	3.4 E-02	1.1 E+00	±	1.2 E-01
26	-3.4 E-03	±	3.5 E-02	-1.1 E-03	±	4.3 E-02	-2.3 E-02	±	4.3 E-02	3.2 E-01	±	4.1 E-02
27	-1.7 E-02	±	3.1 E-02	7.3 E-03	±	4.1 E-02	2.0 E-02	±	4.0 E-02	6.8 E-03	±	1.3 E-03
28	-2.1 E-02	±	2.9 E-02	4.1 E-02	±	3.2 E-02	2.0 E-02	±	3.0 E-02	1.2 E-02	±	2.7 E-03
29	-4.1 E-02	±	7.9 E-02	5.9 E-02	±	4.8 E-02	2.2 E-02	±	3.0 E-02	2.5 E-01	±	3.7 E-02
30	6.2 E-02	±	5.8 E-02	5.5 E-02	±	4.9 E-02	-9.2 E-03	±	3.4 E-02	1.2 E-01	±	1.4 E-02

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 6 of 12)

Site ID	¹²⁵ Sb			¹⁵⁵ Eu			¹⁵⁴ Eu			^{239/240} Pu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
31	-1.5 E-02	±	5.5 E-02	2.3 E-02	±	5.3 E-02	5.2 E-02	±	4.0 E-02	1.9 E-01	±	2.3 E-02
32	1.2 E-02	±	4.4 E-02	7.8 E-02	±	4.2 E-02	1.3 E-02	±	4.0 E-02	3.4 E-01	±	3.8 E-02
33	1.7 E-02	±	8.4 E-02	3.7 E-02	±	5.3 E-02	1.5 E-03	±	3.3 E-02	1.3 E-01	±	1.7 E-02
34	7.3 E-03	±	5.0 E-02	5.0 E-02	±	4.1 E-02	1.0 E-02	±	2.9 E-02	2.4 E-01	±	3.0 E-02
35	-2.6 E-03	±	4.7 E-02	5.7 E-02	±	5.0 E-02	-2.2 E-02	±	4.7 E-02	3.4 E-03	±	1.1 E-03
36	-2.0 E-02	±	5.5 E-02	2.7 E-02	±	5.4 E-02	2.2 E-02	±	4.4 E-02	6.5 E-03	±	1.6 E-03
37	4.2 E-02	±	6.0 E-02	3.8 E-02	±	5.1 E-02	-3.6 E-02	±	3.6 E-02	3.6 E-02	±	4.7 E-03
38	-1.7 E-02	±	2.5 E-02	3.9 E-02	±	2.6 E-02	2.5 E-02	±	3.0 E-02	1.7 E-02	±	2.8 E-03
39	1.7 E-02	±	7.2 E-02	5.6 E-02	±	6.2 E-02	-4.1 E-03	±	4.1 E-02	1.5 E+00	±	1.5 E-01
40	-7.2 E-04	±	2.3 E-02	4.7 E-02	±	3.1 E-02	-8.2 E-03	±	3.4 E-02	3.1 E-02	±	4.4 E-03
41	7.9 E-03	±	4.2 E-02	3.8 E-02	±	4.7 E-02	5.9 E-03	±	4.4 E-02	6.1 E-02	±	7.1 E-03
42	7.9 E-03	±	3.4 E-02	4.6 E-02	±	4.2 E-02	3.0 E-02	±	3.9 E-02	6.3 E-02	±	7.0 E-03
43	6.6 E-03	±	2.5 E-02	4.8 E-02	±	3.2 E-02	-4.5 E-03	±	3.2 E-02	1.5 E-02	±	2.1 E-03
44	-1.9 E-02	±	5.4 E-02	5.7 E-02	±	5.2 E-02	-2.2 E-03	±	4.5 E-02	2.1 E-01	±	2.2 E-02
45	-6.7 E-03	±	3.8 E-02	5.9 E-02	±	4.9 E-02	-1.6 E-02	±	4.9 E-02	9.1 E-03	±	1.7 E-03
46	2.1 E-03	±	2.2 E-02	3.4 E-02	±	2.6 E-02	4.9 E-02	±	3.1 E-02	1.9 E-02	±	2.4 E-03
47	1.3 E-02	±	5.2 E-02	8.4 E-02	±	5.4 E-02	2.6 E-02	±	4.3 E-02	8.5 E-02	±	9.4 E-03
48	-1.5 E-02	±	2.9 E-02	6.6 E-02	±	2.7 E-02	2.5 E-02	±	2.8 E-02	9.6 E-02	±	1.1 E-02
49	4.0 E-03	±	3.4 E-02	2.4 E-02	±	4.5 E-02	-3.6 E-04	±	4.4 E-02	1.9 E-02	±	2.5 E-03
50	-9.2 E-03	±	3.3 E-02	3.3 E-02	±	4.7 E-02	2.2 E-02	±	4.6 E-02	2.1 E-02	±	2.7 E-03
51	3.9 E-02	±	2.8 E-02	2.3 E-02	±	3.0 E-02	6.6 E-03	±	3.7 E-02	7.7 E-02	±	8.4 E-03
52	-2.4 E-02	±	3.5 E-02	3.5 E-02	±	4.5 E-02	-5.0 E-02	±	5.0 E-02	3.6 E-02	±	4.2 E-03
53	-3.0 E-02	±	4.5 E-02	5.3 E-02	±	4.2 E-02	3.6 E-02	±	3.5 E-02	6.3 E-03	±	1.2 E-03
54	-1.3 E-01	±	4.1 E-01	2.2 E-01	±	2.9 E-01	-7.1 E-03	±	7.2 E-02	1.4 E-02	±	1.9 E-03
55	1.9 E-02	±	4.0 E-02	4.4 E-02	±	3.3 E-02	-8.6 E-03	±	3.5 E-02	4.7 E-03	±	1.0 E-03
56	2.9 E-02	±	3.2 E-02	7.8 E-02	±	3.1 E-02	-2.1 E-02	±	3.5 E-02	1.1 E-03	±	4.8 E-04
57	4.4 E-03	±	4.5 E-02	3.0 E-02	±	5.0 E-02	1.6 E-02	±	3.9 E-02	2.9 E-02	±	4.0 E-03
58	4.7 E-02	±	1.5 E-01	-1.0 E-02	±	1.1 E-01	2.5 E-02	±	4.3 E-02	1.6 E-02	±	2.2 E-03
59	-1.5 E-02	±	4.3 E-02	5.6 E-02	±	3.5 E-02	1.3 E-02	±	3.7 E-02	5.1 E-03	±	9.3 E-04
60	-1.0 E-02	±	4.7 E-02	3.7 E-02	±	5.3 E-02	-4.7 E-02	±	.5 E-02	1.7 E-03	±	5.1 E-04

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 7 of 12)

Site ID	¹²⁵ Sb			¹⁵⁵ Eu			¹⁵⁴ Eu			^{239/240} Pu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
61	2.1 E-02	±	3.5 E-02	4.1 E-02	±	4.3 E-02	-6.1 E-02	±	4.3 E-02	2.3 E-03	±	6.7 E-04
62	1.2 E-03	±	2.2 E-02	5.8 E-02	±	3.0 E-02	8.0 E-03	±	3.0 E-02	3.0 E-03	±	6.7 E-04
63	4.4 E-03	±	2.8 E-02	2.0 E-02	±	3.7 E-02	1.3 E-02	±	3.9 E-02	1.4 E-02	±	1.9 E-03
64	-4.3 E-03	±	3.5 E-02	4.0 E-02	±	3.3 E-02	1.3 E-02	±	3.0 E-02	1.9 E-02	±	2.5 E-03
65	1.6 E-02	±	3.5 E-02	1.7 E-02	±	3.2 E-02	2.1 E-02	±	3.3 E-02	3.2 E-03	±	9.4 E-04
66	-1.1 E-01	±	1.1 E-01	6.2 E-02	±	8.3 E-02	1.7 E-02	±	3.8 E-02	1.6 E-02	±	2.2 E-03
67	-2.7 E-02	±	3.3 E-02	9.6 E-02	±	4.8 E-02	-1.3 E-02	±	4.3 E-02	9.2 E-03	±	1.6 E-03
68	-6.3 E-03	±	2.4 E-02	2.2 E-02	±	3.0 E-02	9.1 E-03	±	3.1 E-02	2.7 E-03	±	6.4 E-04
69	1.8 E-02	±	2.5 E-02	4.6 E-02	±	3.4 E-02	2.2 E-02	±	3.3 E-02	1.1 E-03	±	5.2 E-04
70	1.3 E-02	±	2.5 E-02	1.9 E-02	±	2.7 E-02	1.4 E-02	±	2.7 E-02	4.0 E-03	±	9.8 E-04
71	3.7 E-02	±	2.3 E-02	6.0 E-02	±	2.9 E-02	-5.5 E-03	±	3.0 E-02	1.6 E-03	±	6.3 E-04
72	2.3 E-02	±	3.1 E-02	2.6 E-02	±	4.0 E-02	-1.5 E-02	±	3.7 E-02	4.4 E-03	±	8.9 E-04
73	6.9 E-03	±	1.0 E-01	7.4 E-03	±	6.1 E-02	8.9 E-03	±	3.3 E-02	3.3 E-03	±	7.3 E-04
74	4.7 E-02	±	4.3 E-02	2.6 E-02	±	4.6 E-02	-5.2 E-02	±	4.5 E-02	4.5 E-03	±	8.7 E-04
75	6.2 E-03	±	2.7 E-02	3.4 E-02	±	4.2 E-02	1.8 E-02	±	4.2 E-02	3.0 E-02	±	4.0 E-03
76	1.7 E-02	±	3.2 E-02	5.1 E-02	±	4.7 E-02	-1.1 E-02	±	4.9 E-02	1.9 E-03	±	8.3 E-04
77	1.0 E-02	±	2.4 E-02	2.8 E-02	±	2.5 E-02	3.8 E-02	±	3.0 E-02	2.1 E-02	±	3.1 E-03
78	1.5 E-02	±	2.9 E-02	3.2 E-02	±	3.2 E-02	-4.3 E-02	±	3.4 E-02	2.5 E-02	±	3.4 E-03
79	-6.5 E-03	±	2.8 E-02	6.5 E-02	±	3.1 E-02	1.6 E-02	±	3.3 E-02	4.9 E-02	±	6.1 E-03
80	3.1 E-03	±	4.1 E-02	4.2 E-02	±	4.0 E-02	-3.7 E-03	±	4.3 E-02	3.8 E-02	±	4.5 E-03
81	1.1 E-02	±	2.1 E-02	4.7 E-02	±	3.0 E-02	-5.7 E-03	±	3.1 E-02	7.7 E-04	±	4.5 E-04
82	2.8 E-02	±	2.5 E-02	5.7 E-02	±	3.2 E-02	2.2 E-02	±	3.4 E-02	1.7 E-03	±	5.7 E-04
83	5.1 E-03	±	2.7 E-02	3.9 E-02	±	3.0 E-02	3.6 E-02	±	3.1 E-02	2.9 E-02	±	3.4 E-03
84	3.2 E-02	±	3.4 E-02	3.2 E-02	±	3.9 E-02	-5.4 E-02	±	4.2 E-02	2.6 E-02	±	3.2 E-03
85	3.3 E-02	±	3.3 E-02	8.7 E-02	±	3.8 E-02	-5.8 E-03	±	3.9 E-02	2.4 E-02	±	3.1 E-03
86	-1.3 E-03	±	3.0 E-02	3.0 E-02	±	3.6 E-02	1.5 E-02	±	3.9 E-02	5.6 E-03	±	1.2 E-03
87	1.0 E-02	±	3.1 E-02	4.7 E-02	±	4.4 E-02	7.6 E-03	±	4.3 E-02	7.1 E-04	±	4.5 E-04
88	-1.8 E-02	±	2.2 E-02	5.0 E-02	±	2.5 E-02	-3.1 E-03	±	3.0 E-02	1.6 E-03	±	5.9 E-04
89	-2.5 E-02	±	2.9 E-02	4.8 E-02	±	3.5 E-02	1.6 E-02	±	3.4 E-02	1.3 E-02	±	1.9 E-03
90	-1.4 E-02	±	2.9 E-02	2.9 E-02	±	3.8 E-02	-1.7 E-02	±	4.1 E-02	1.5 E-03	±	6.8 E-04

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 8 of 12)

Site ID	¹²⁵ Sb			¹⁵⁵ Eu			¹⁵⁴ Eu			^{239/40} Pu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
91	-9.3 E-03	±	2.9 E-02	2.9 E-02	±	4.2 E-02	1.3 E-02	±	4.4 E-02	6.8 E-03	±	1.3 E-03
92	-1.4 E-02	±	2.5 E-02	6.1 E-02	±	3.5 E-02	1.9 E-02	±	3.7 E-02	2.2 E-03	±	6.8 E-04
93	-1.9 E-02	±	3.4 E-02	2.8 E-02	±	4.4 E-02	-1.1 E-02	±	4.7 E-02	3.0 E-02	±	3.7 E-03
94	1.7 E-02	±	2.5 E-02	3.2 E-02	±	4.0 E-02	2.2 E-02	±	3.8 E-02	4.4 E-03	±	1.1 E-03
95	-1.5 E-02	±	2.6 E-02	4.7 E-02	±	3.2 E-02	-1.8 E-02	±	3.8 E-02	1.5 E-02	±	2.3 E-03
96	2.3 E-02	±	3.1 E-02	6.5 E-02	±	4.2 E-02	1.3 E-02	±	4.0 E-02	5.0 E-03	±	1.0 E-03
97	2.2 E-03	±	2.7 E-02	3.7 E-02	±	4.2 E-02	-2.2 E-02	±	4.3 E-02	2.0 E-03	±	6.4 E-04
98	2.9 E-02	±	2.6 E-02	3.8 E-02	±	3.5 E-02	2.4 E-02	±	3.6 E-02	2.2 E-03	±	6.1 E-04
99	4.0 E-02	±	3.3 E-02	4.9 E-02	±	4.4 E-02	-1.9 E-02	±	4.6 E-02	9.0 E-03	±	1.6 E-03
100	1.2 E-02	±	3.4 E-02	6.0 E-02	±	4.7 E-02	-9.4 E-03	±	4.5 E-02	2.4 E-02	±	3.6 E-03
101	1.5 E-03	±	4.4 E-02	5.2 E-02	±	5.2 E-02	-3.7 E-02	±	5.1 E-02			
102	1.0 E-02	±	4.6 E-02	4.3 E-02	±	5.2 E-02	-3.2 E-02	±	4.9 E-02			
103	-6.6 E-03	±	2.6 E-02	3.7 E-02	±	3.0 E-02	4.4 E-04	±	3.2 E-02	2.8 E-01	±	4.1 E-02
104	-1.6 E-02	±	2.6 E-02	5.5 E-02	±	3.2 E-02	2.8 E-02	±	3.3 E-02	2.9 E-03	±	7.2 E-04
105	3.8 E-02	±	3.0 E-02	1.8 E-02	±	4.3 E-02	-3.1 E-02	±	4.6 E-02	6.6 E-01	±	7.2 E-02
106	5.7 E-03	±	2.6 E-02	3.9 E-02	±	3.1 E-02	1.9 E-02	±	3.4 E-02	1.1 E-01	±	1.5 E-02
107	2.7 E-02	±	2.7 E-02	9.0 E-02	±	3.2 E-02	2.5 E-02	±	3.2 E-02	4.6 E-01	±	4.8 E-02
108	9.1 E-03	±	2.6 E-02	3.1 E-02	±	3.8 E-02	4.6 E-03	±	4.1 E-02	9.3 E-04	±	3.9 E-04
109	1.1 E-02	±	3.1 E-02	4.6 E-02	±	4.5 E-02	-3.6 E-03	±	4.4 E-02	1.2 E-02	±	1.7 E-03
110	-2.9 E-03	±	2.1 E-02	6.5 E-02	±	2.8 E-02	1.4 E-02	±	3.1 E-02	2.3 E-03	±	6.6 E-04

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 9 of 12)

Site ID	^{90}Sr			^{234}U			^{235}U			^{238}U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
1	1.8 E-01	±	3.6 E-02	6.6 E-01	±	8.5 E-02	3.1 E-02	±	1.4 E-02	6.5 E-01	±	8.4 E-02
2	5.6 E-02	±	1.3 E-02	6.9 E-01	±	8.8 E-02	1.9 E-02	±	1.1 E-02	7.3 E-01	±	9.1 E-02
3	4.1 E-01	±	7.6 E-02	6.0 E-01	±	1.1 E-01	2.8 E-02	±	1.9 E-02	6.0 E-01	±	1.1 E-01
4	6.1 E-01	±	1.1 E-01	6.5 E-01	±	8.3 E-02	2.1 E-02	±	1.1 E-02	6.6 E-01	±	8.3 E-02
5	5.2 E-01	±	9.9 E-02	7.2 E-01	±	9.7 E-02	2.5 E-02	±	1.4 E-02	6.9 E-01	±	9.3 E-02
6	6.9 E-02	±	1.5 E-02	6.5 E-01	±	8.0 E-02	3.4 E-02	±	1.3 E-02	6.0 E-01	±	7.5 E-02
7	4.1 E-02	±	1.0 E-02	6.1 E-01	±	7.9 E-02	3.8 E-02	±	1.4 E-02	6.3 E-01	±	8.1 E-02
8	3.0 E-02	±	7.8 E-03	5.0 E-01	±	6.7 E-02	2.2 E-02	±	1.1 E-02	5.5 E-01	±	7.1 E-02
9	3.0 E-01	±	5.7 E-02	5.6 E-01	±	7.3 E-02	1.6 E-02	±	9.3 E-03	5.4 E-01	±	7.0 E-02
10	2.4 E-03	±	2.5 E-03	5.6 E-01	±	7.6 E-02	2.7 E-02	±	1.3 E-02	5.5 E-01	±	7.5 E-02
11	2.0 E-01	±	3.7 E-02	7.5 E-01	±	1.2 E-01	1.4 E-02	±	1.7 E-02	6.6 E-01	±	1.1 E-01
12	2.5 E-01	±	4.8 E-02	4.9 E-01	±	7.0 E-02	2.3 E-02	±	1.3 E-02	5.1 E-01	±	7.1 E-02
13	2.2 E-01	±	4.3 E-02	5.5 E-01	±	7.8 E-02	2.3 E-02	±	1.2 E-02	5.6 E-01	±	7.9 E-02
14	7.3 E-03	±	4.5 E-03	1.0 E+00	±	1.2 E-01	3.2 E-02	±	1.3 E-02	9.4 E-01	±	1.1 E-01
15	1.5 E-01	±	2.8 E-02	6.0 E-01	±	8.3 E-02	1.3 E-02	±	9.5 E-03	6.7 E-01	±	9.0 E-02
16	9.9 E-02	±	2.1 E-02	8.4 E-01	±	1.2 E-01	2.8 E-02	±	1.6 E-02	7.0 E-01	±	1.0 E-01
17	3.5 E-01	±	6.4 E-02	6.8 E-01	±	9.0 E-02	2.2 E-02	±	1.2 E-02	6.8 E-01	±	9.0 E-02
18	1.1 E+00	±	2.3 E-01	7.5 E-01	±	9.5 E-02	3.4 E-02	±	1.4 E-02	7.1 E-01	±	9.0 E-02
19	9.5 E-02	±	2.5 E-02	6.8 E-01	±	8.6 E-02	3.0 E-02	±	1.3 E-02	6.9 E-01	±	8.7 E-02
20	1.8 E-01	±	3.5 E-02	8.7 E-01	±	1.1 E-01	2.8 E-02	±	1.3 E-02	8.5 E-01	±	1.0 E-01
21	4.4 E-02	±	1.3 E-02	6.6 E-01	±	8.7 E-02	2.1 E-02	±	1.2 E-02	6.4 E-01	±	8.4 E-02
22	3.8 E-01	±	6.9 E-02	6.2 E-01	±	8.0 E-02	2.6 E-02	±	1.2 E-02	5.8 E-01	±	7.6 E-02
23	2.9 E-01	±	5.6 E-02	7.0 E-01	±	8.7 E-02	3.5 E-02	±	1.4 E-02	7.1 E-01	±	8.7 E-02
24	5.9 E-01	±	1.1 E-01	6.6 E-01	±	8.4 E-02	2.1 E-02	±	1.1 E-02	6.5 E-01	±	8.2 E-02
25	8.7 E-01	±	2.1 E-01	8.3 E-01	±	1.0 E-01	3.0 E-02	±	1.3 E-02	8.3 E-01	±	1.0 E-01
26	6.6 E-01	±	1.3 E-01	7.1 E-01	±	9.2 E-02	3.5 E-02	±	1.5 E-02	7.2 E-01	±	9.3 E-02
27	1.6 E-01	±	3.3 E-02	1.0 E+00	±	1.3 E-01	4.0 E-02	±	1.6 E-02	1.2 E+00	±	1.4 E-01
28	1.4 E-01	±	2.8 E-02	5.7 E-01	±	7.9 E-02	3.6 E-02	±	1.5 E-02	6.1 E-01	±	8.2 E-02
29	4.0 E-01	±	7.6 E-02	5.8 E-01	±	7.4 E-02	1.7 E-02	±	9.5 E-03	5.3 E-01	±	6.9 E-02
30	1.3 E+00	±	2.4 E-01	6.5 E-01	±	8.3 E-02	3.2 E-02	±	1.4 E-02	6.2 E-01	±	7.9 E-02

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Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 10 of 12)

Site ID	⁹⁰ Sr			²³⁴ U			²³⁵ U			²³⁸ U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
31	5.3 E-01	±	9.8 E-02	5.7 E-01	±	7.9 E-02	2.1 E-02	±	1.2 E-02	6.1 E-01	±	8.2 E-02
32	4.2 E-01	±	1.0 E-01	5.5 E-01	±	7.5 E-02	2.2 E-02	±	1.1 E-02	5.2 E-01	±	7.1 E-02
33	1.7 E+00	±	3.4 E-01	7.3 E-01	±	8.9 E-02	2.3 E-02	±	1.1 E-02	7.5 E-01	±	9.1 E-02
34	1.6 E+00	±	3.1 E-01	5.6 E-01	±	8.0 E-02	1.7 E-02	±	1.1 E-02	6.0 E-01	±	8.3 E-02
35	2.5 E-01	±	6.2 E-02	6.7 E-01	±	8.9 E-02	1.2 E-02	±	9.0 E-03	6.2 E-01	±	8.3 E-02
36	6.3 E-01	±	1.1 E-01	6.3 E-01	±	8.5 E-02	1.8 E-02	±	1.1 E-02	6.0 E-01	±	8.2 E-02
37	1.5 E+00	±	2.8 E-01	7.6 E-01	±	9.8 E-02	3.6 E-02	±	1.6 E-02	7.7 E-01	±	9.8 E-02
38	2.6 E-01	±	6.2 E-02	6.9 E-01	±	9.0 E-02	3.2 E-02	±	1.5 E-02	6.9 E-01	±	9.0 E-02
39	2.4 E+00	±	4.5 E-01	7.3 E-01	±	8.9 E-02	3.6 E-02	±	1.4 E-02	7.2 E-01	±	8.7 E-02
40	2.5 E-01	±	4.6 E-02	7.2 E-01	±	1.1 E-01	2.4 E-02	±	1.5 E-02	7.0 E-01	±	1.0 E-01
41	4.6 E-01	±	8.2 E-02	7.8 E-01	±	9.5 E-02	2.8 E-02	±	1.2 E-02	7.7 E-01	±	9.4 E-02
42	2.2 E-01	±	4.3 E-02	6.8 E-01	±	8.5 E-02	2.2 E-02	±	1.1 E-02	7.2 E-01	±	8.8 E-02
43	3.0 E-01	±	5.6 E-02	8.3 E-01	±	9.7 E-02	2.9 E-02	±	1.2 E-02	7.8 E-01	±	9.1 E-02
44	2.0 E-01	±	4.1 E-02	8.9 E-01	±	1.2 E-01	4.3 E-02	±	1.9 E-02	8.6 E-01	±	1.2 E-01
45	5.2 E-01	±	9.7 E-02	7.0 E-01	±	8.9 E-02	2.7 E-02	±	1.3 E-02	7.3 E-01	±	9.1 E-02
46	3.8 E-02	±	1.1 E-02	8.2 E-01	±	9.7 E-02	3.3 E-02	±	1.3 E-02	8.4 E-01	±	9.8 E-02
47	4.1 E-01	±	7.6 E-02	1.1 E+00	±	1.3 E-01	4.6 E-02	±	1.5 E-02	1.2 E+00	±	1.3 E-01
48	2.6 E-01	±	5.0 E-02	8.8 E-01	±	1.1 E-01	3.2 E-02	±	1.4 E-02	8.3 E-01	±	1.0 E-01
49	1.1 E-01	±	2.2 E-02	6.1 E-01	±	7.9 E-02	1.8 E-02	±	1.0 E-02	5.9 E-01	±	7.7 E-02
50	6.3 E-02	±	1.3 E-02	6.9 E-01	±	8.7 E-02	1.8 E-02	±	1.0 E-02	6.7 E-01	±	8.5 E-02
51	5.3 E-01	±	9.3 E-02	6.4 E-01	±	8.5 E-02	1.6 E-02	±	1.1 E-02	6.5 E-01	±	8.6 E-02
52	7.2 E-02	±	1.4 E-02	5.9 E-01	±	7.5 E-02	1.0 E-02	±	7.7 E-03	5.5 E-01	±	7.1 E-02
53	8.0 E-01	±	1.4 E-01	6.3 E-01	±	7.9 E-02	2.0 E-02	±	1.1 E-02	6.4 E-01	±	7.9 E-02
54	1.8 E+00	±	3.1 E-01	5.6 E-01	±	7.6 E-02	2.5 E-02	±	1.2 E-02	6.0 E-01	±	7.8 E-02
55	2.7 E-01	±	5.2 E-02	6.1 E-01	±	7.6 E-02	2.6 E-02	±	1.1 E-02	6.2 E-01	±	7.6 E-02
56	1.6 E-01	±	3.1 E-02	5.8 E-01	±	7.3 E-02	2.2 E-02	±	1.0 E-02	5.9 E-01	±	7.3 E-02
57	5.6 E-01	±	1.1 E-01	5.8 E-01	±	7.4 E-02	2.9 E-02	±	1.2 E-02	6.4 E-01	±	7.9 E-02
58	4.9 E+00	±	9.4 E-01	5.7 E-01	±	7.3 E-02	2.3 E-02	±	1.1 E-02	5.6 E-01	±	7.2 E-02
59	2.3 E+00	±	4.5 E-01	6.6 E-01	±	8.2 E-02	2.6 E-02	±	1.2 E-02	6.6 E-01	±	8.2 E-02
60	3.0 E-01	±	5.8 E-02	6.3 E-01	±	7.9 E-02	2.6 E-02	±	1.2 E-02	5.9 E-01	±	7.4 E-02

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 11 of 12)

Site ID	⁹⁰ Sr			²³⁴ U			²³⁵ U			²³⁸ U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
61	1.1 E+00	±	2.1 E-01	6.6 E-01	±	8.1 E-02	2.6 E-02	±	1.2 E-02	6.6 E-01	±	8.1 E-02
62	6.2 E-02	±	1.3 E-02	6.3 E-01	±	7.8 E-02	2.3 E-02	±	1.0 E-02	6.7 E-01	±	8.0 E-02
63	1.1 E+00	±	2.1 E-01	1.2 E+00	±	1.4 E-01	6.1 E-02	±	2.0 E-02	1.2 E+00	±	1.4 E-01
64	2.4 E+00	±	5.7 E-01	7.0 E-01	±	1.0 E-01	2.9 E-02	±	1.7 E-02	7.5 E-01	±	1.1 E-01
65	1.9 E+00	±	3.5 E-01	7.1 E-01	±	1.0 E-01	2.3 E-02	±	1.5 E-02	6.9 E-01	±	9.9 E-02
66	6.0 E+00	±	1.2 E+00	5.7 E-01	±	1.0 E-01	4.5 E-02	±	2.5 E-02	6.0 E-01	±	1.0 E-01
67	5.9 E-01	±	1.5 E-01	8.2 E-01	±	1.2 E-01	1.2 E-02	±	1.3 E-02	7.4 E-01	±	1.1 E-01
68	6.8 E-01	±	1.2 E-01	7.4 E-01	±	1.0 E-01	1.6 E-02	±	1.2 E-02	7.3 E-01	±	1.0 E-01
69	2.4 E-01	±	4.4 E-02	8.4 E-01	±	1.2 E-01	3.3 E-02	±	1.8 E-02	8.4 E-01	±	1.2 E-01
70	5.0 E-01	±	8.9 E-02	1.1 E+00	±	1.3 E-01	5.5 E-02	±	2.0 E-02	1.0 E+00	±	1.3 E-01
71	5.1 E-01	±	1.2 E-01	8.0 E-01	±	1.1 E-01	2.7 E-02	±	1.5 E-02	7.6 E-01	±	1.1 E-01
72	5.1 E-01	±	9.3 E-02	5.5 E-01	±	8.7 E-02	4.2 E-02	±	2.0 E-02	5.6 E-01	±	8.8 E-02
73	3.8 E+00	±	7.5 E-01	6.3 E-01	±	7.7 E-02	1.8 E-02	±	9.1 E-03	5.7 E-01	±	7.1 E-02
74	4.1 E-01	±	7.3 E-02	6.4 E-01	±	8.0 E-02	2.8 E-02	±	1.2 E-02	6.5 E-01	±	8.0 E-02
75	8.4 E-01	±	1.6 E-01	7.4 E-01	±	1.0 E-01	3.2 E-02	±	1.7 E-02	8.8 E-01	±	1.2 E-01
76	6.3 E-01	±	1.1 E-01	7.0 E-01	±	1.0 E-01	3.1 E-02	±	1.7 E-02	7.3 E-01	±	1.0 E-01
77	1.5 E-01	±	2.7 E-02	8.3 E-01	±	1.0 E-01	2.4 E-02	±	1.2 E-02	8.2 E-01	±	1.0 E-01
78	2.6 E-01	±	4.7 E-02	9.4 E-01	±	1.2 E-01	3.3 E-02	±	1.4 E-02	9.0 E-01	±	1.1 E-01
79	3.1 E-01	±	6.0 E-02	7.9 E-01	±	1.2 E-01	2.4 E-02	±	1.6 E-02	7.2 E-01	±	1.1 E-01
80	1.7 E-01	±	3.2 E-02	6.4 E-01	±	8.5 E-02	2.9 E-02	±	1.3 E-02	6.7 E-01	±	8.7 E-02
81	1.1 E-02	±	3.9 E-03	6.2 E-01	±	9.3 E-02	2.4 E-02	±	1.4 E-02	6.9 E-01	±	1.0 E-01
82	2.1 E-02	±	5.8 E-03	7.1 E-01	±	9.1 E-02	3.4 E-02	±	1.4 E-02	7.4 E-01	±	9.2 E-02
83	2.6 E-01	±	5.0 E-02	7.1 E-01	±	1.0 E-01	1.5 E-02	±	1.3 E-02	6.9 E-01	±	9.8 E-02
84	2.9 E-01	±	5.4 E-02	6.2 E-01	±	8.7 E-02	1.6 E-02	±	1.2 E-02	5.8 E-01	±	8.3 E-02
85	2.2 E-01	±	4.2 E-02	6.0 E-01	±	8.3 E-02	1.5 E-02	±	9.9 E-03	6.1 E-01	±	8.4 E-02
86	1.5 E-01	±	2.9 E-02	6.8 E-01	±	9.3 E-02	2.3 E-02	±	1.3 E-02	6.2 E-01	±	8.6 E-02
87	1.0 E-02	±	4.1 E-03	7.7 E-01	±	1.0 E-01	2.5 E-02	±	1.3 E-02	8.5 E-01	±	1.1 E-01
88	2.3 E-02	±	6.5 E-03	8.3 E-01	±	9.9 E-02	3.0 E-02	±	1.2 E-02	8.6 E-01	±	1.0 E-01
89	1.9 E-01	±	4.9 E-02	6.7 E-01	±	8.1 E-02	1.7 E-02	±	9.1 E-03	6.6 E-01	±	8.0 E-02
90	2.5 E-01		4.8 E-02	8.4 E-01	±	1.0 E-01	3.3 E-02	±	1.3 E-02	8.1 E-01	±	9.7 E-02

Table E-2. Soil Results for 200 Areas, 1992 (pCi/g dry weight).
(sheet 12 of 12)

Site ID	^{90}Sr			^{234}U			^{235}U			^{238}U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
91	1.3 E-01	±	2.6 E-02	8.0 E-01	±	9.5 E-02	1.9 E-02	±	1.0 E-02	7.5 E-01	±	8.9 E-02
92	2.8 E-02	±	7.3 E-03	9.5 E-01	±	1.1 E-01	3.9 E-02	±	1.4 E-02	9.4 E-01	±	1.1 E-01
93	1.7 E-01	±	3.4 E-02	6.9 E-01	±	8.4 E-02	2.3 E-02	±	1.1 E-02	6.6 E-01	±	8.1 E-02
94	5.4 E-02	±	1.2 E-02	8.8 E-01	±	1.1 E-01	3.3 E-02	±	1.3 E-02	8.2 E+00	±	7.8 E-01
95	1.6 E-01	±	3.1 E-02	6.9 E-01	±	8.3 E-02	2.2 E-02	±	1.0 E-02	6.9 E-01	±	8.2 E-02
96	7.3 E-02	±	1.5 E-02	7.7 E-01	±	9.3 E-02	2.9 E-02	±	1.2 E-02	7.5 E-01	±	9.0 E-02
97	4.0 E-02	±	9.4 E-03	1.3 E+00	±	1.4 E-01	4.4 E-02	±	1.5 E-02	1.2 E+00	±	1.3 E-01
98	5.2 E-02	±	1.1 E-02	7.2 E-01	±	9.1 E-02	3.5 E-02	±	1.4 E-02	7.7 E-01	±	9.4 E-02
99	1.4 E-01	±	3.4 E-02	1.0 E+00	±	1.2 E-01	5.8 E-02	±	1.7 E-02	9.2 E-01	±	1.1 E-01
100	1.4 E-01	±	2.7 E-02	6.2 E-01	±	7.8 E-02	2.8 E-02	±	1.2 E-02	6.3 E-01	±	7.8 E-02
101	1.5 E+00	±	2.7 E-01									
102	2.6 E-01	±	4.9 E-02									
103	5.2 E-01	±	9.9 E-02	8.1 E-01	±	1.0 E-01	2.9 E-02	±	1.4 E-02	7.7 E-01	±	9.9 E-02
104	1.2 E-01	±	2.5 E-02	7.8 E-01	±	1.1 E-01	3.9 E-02	±	1.8 E-02	7.8 E-01	±	1.1 E-01
105	1.5 E-01	±	3.2 E-02	1.1 E-01	±	2.7 E-02	1.5 E-02	±	9.3 E-03	7.7 E-01	±	9.3 E-02
106	1.4 E-01	±	3.1 E-02	6.6 E-01	±	9.1 E-02	2.3 E-02	±	1.3 E-02	6.5 E-01	±	9.0 E-02
107	4.8 E-01	±	9.1 E-02	6.6 E-01	±	9.1 E-02	2.3 E-02	±	1.3 E-02	6.5 E-01	±	8.9 E-02
108	8.9 E-02	±	2.0 E-02	7.2 E-01	±	9.5 E-02	2.2 E-02	±	1.2 E-02	6.6 E-01	±	8.8 E-02
109	6.7 E-02	±	1.8 E-02	7.2 E-01	±	9.4 E-02	1.7 E-02	±	1.1 E-02	7.2 E-01	±	9.3 E-02
110	1.8 E-01	±	3.8 E-02	1.0 E+00	±	1.2 E-01	2.9 E-02	±	1.3 E-02	8.9 E-01	±	1.1 E-01

Table E-3. Soil Sample Results for the 300/400 Area, 1992
(pCi/g dry weight). (sheet 1 of 2)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
S-1	-1.9 E-02	±	8.5 E-02	1.0 E+00	±	1.9 E-01	-1.9 E-01	±	9.1 E-02
S-2	-4.5 E-03	±	3.9 E-02	6.5 E-02	±	3.6 E-02	-7.2 E-02	±	3.7 E-02
S-3	1.1 E-02	±	2.2 E-02	3.5 E-02	±	2.4 E-02	-2.3 E-02	±	2.0 E-02
S-4	-3.3 E-03	±	3.8 E-02	2.0 E-01	±	5.8 E-02	-1.2 E-01	±	4.3 E-02
S-5	3.6 E-02	±	2.4 E-02	3.2 E-02	±	2.4 E-02	-1.8 E-02	±	2.2 E-02
S-6	1.3 E-01	±	6.0 E-02	3.9 E-01	±	7.2 E-02	-3.8 E-01	±	6.7 E-02
S-7	-3.3 E-02	±	2.4 E-02	2.4 E-02	±	2.3 E-02	7.4 E-03	±	2.0 E-02
S-8	-4.4 E-02	±	3.9 E-02	4.2 E-01	±	7.2 E-02	-2.1 E-01	±	4.8 E-02
S-9	2.1 E-02	±	3.3 E-02	1.9 E-01	±	4.8 E-02	-3.0 E-02	±	2.9 E-02
S-10	-8.8 E-03	±	2.3 E-02	4.1 E-02	±	2.4 E-02	1.7 E-02	±	2.2 E-02
S-11	2.9 E-02	±	3.5 E-02	8.8 E-02	±	3.8 E-02	-2.9 E-02	±	3.5 E-02
S-12	8.6 E-03	±	3.0 E-02	3.7 E-01	±	5.7 E-02	-2.1 E-01	±	4.2 E-02
S-13	1.4 E-02	±	2.1 E-02	6.7 E-02	±	3.2 E-02	8.3 E-03	±	1.9 E-02
S-14	2.8 E-03	±	2.4 E-02	1.4 E-01	±	3.9 E-02	3.3 E-03	±	2.0 E-02
S-15	-9.2 E-03	±	3.3 E-02	4.7 E-01	±	6.8 E-02	-2.0 E-01	±	4.1 E-02

Site ID	¹⁰⁶ Ru			¹²⁵ Sb			¹⁵⁵ Eu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
S-1	4.5 E-01	±	7.6 E-01	-1.1 E-01	±	2.4 E-01	-1.1 E-01	±	2.9 E-01
S-2	-3.0 E-01	±	3.0 E-01	-8.3 E-02	±	7.8 E-02	8.3 E-02	±	1.1 E-01
S-3	-1.1 E-01	±	2.2 E-01	3.3 E-02	±	5.5 E-02	8.2 E-02	±	5.8 E-02
S-4	-9.9 E-03	±	3.2 E-01	-6.9 E-02	±	1.0 E-01	7.3 E-02	±	1.3 E-01
S-5	-1.0 E-01	±	2.0 E-01	-1.4 E-02	±	6.0 E-02	3.2 E-02	±	6.7 E-02
S-6	-1.2 E-02	±	3.0 E-01	-1.1 E-01	±	9.3 E-02	6.4 E-02	±	1.2 E-01
S-7	7.5 E-02	±	1.8 E-01	-3.3 E-02	±	5.4 E-02	3.8 E-02	±	6.1 E-02
S-8	2.9 E-01	±	2.6 E-01	-5.8 E-02	±	8.4 E-02	-1.1 E-01	±	1.0 E-01
S-9	-1.5 E-02	±	2.5 E-01	6.2 E-02	±	7.9 E-02	2.6 E-02	±	1.0 E-01
S-10	3.7 E-02	±	1.8 E-01	-3.1 E-02	±	5.8 E-02	7.2 E-02	±	6.7 E-02
S-11	-2.1 E-01	±	2.7 E-01	-3.5 E-02	±	9.2 E-02	1.5 E-01	±	1.2 E-01
S-12	4.5 E-02	±	2.6 E-01	3.4 E-02	±	6.9 E-02	7.6 E-02	±	8.9 E-02
S-13	8.5 E-02	±	1.9 E-01	-6.3 E-02	±	5.6 E-02	2.2 E-02	±	5.8 E-02
S-14	-1.5 E-02	±	2.0 E-01	1.8 E-02	±	5.3 E-02	4.4 E-03	±	6.6 E-02
S-15	9.2 E-02	±	2.3 E-01	-1.5 E-02	±	6.7 E-02	7.3 E-02	±	8.9 E-02

Table E-3. Soil Sample Results for the 300/400 Area, 1992
(pCi/g dry weight). (sheet 2 of 2)

Site ID	^{154}Eu			$^{239/40}\text{Pu}$			^{90}Sr		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
S-1	-1.2 E-01	±	3.0 E-01	5.9 E-03	±	9.8 E-04	8.4 E-02	±	1.8 E-02
S-2	-3.7 E-02	±	1.1 E-01	3.8 E-03	±	8.2 E-04	5.3 E-02	±	1.2 E-02
S-3	-7.0 E-02	±	8.4 E-02	5.9 E-04	±	2.8 E-04	1.0 E-02	±	4.1 E-03
S-4	4.2 E-02	±	1.2 E-01	6.6 E-02	±	7.5 E-03	5.2 E-02	±	1.2 E-02
S-5	7.0 E-03	±	7.1 E-02	5.1 E-03	±	9.2 E-04	9.4 E-03	±	4.7 E-03
S-6	-9.9 E-02	±	1.3 E-01	2.6 E-02	±	3.2 E-03	5.1 E-02	±	1.5 E-02
S-7	6.7 E-02	±	6.3 E-02	2.2 E-03	±	6.4 E-04	8.3 E-03	±	4.3 E-03
S-8	-1.0 E-01	±	1.3 E-01	6.3 E-03	±	1.1 E-03	5.2 E-02	±	1.3 E-02
S-9	-2.9 E-02	±	1.1 E-01	1.4 E-03	±	4.5 E-04	2.5 E-02	±	7.1 E-03
S-10	-4.0 E-02	±	9.0 E-02	1.2 E-03	±	4.6 E-04	1.1 E-02	±	4.7 E-03
S-11	-2.2 E-02	±	1.3 E-01	1.0 E-03	±	3.3 E-04	1.5 E-02	±	5.5 E-03
S-12	-4.7 E-02	±	1.0 E-01	7.1 E-03	±	1.3 E-03	9.5 E-02	±	1.9 E-02
S-13	-5.4 E-03	±	7.4 E-02	2.1 E-03	±	5.6 E-04	3.5 E-02	±	8.8 E-03
S-14	3.8 E-02	±	7.8 E-02	1.3 E-03	±	4.3 E-04	2.6 E-02	±	6.5 E-03
S-15	-7.7 E-02	±	9.7 E-02	9.3 E-03	±	1.5 E-03	1.0 E-01	±	2.6 E-02

Site ID	^{234}U			^{235}U			^{238}U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
S-1	1.1 E+00	±	1.2 E-01	2.3 E-02	±	1.0 E-02	9.7 E-01	±	1.1 E-01
S-2	1.9 E+00	±	2.0 E-01	9.1 E-02	±	2.2 E-02	1.9 E+00	±	1.9 E-01
S-3	1.9 E+00	±	2.0 E-01	9.0 E-02	±	2.1 E-02	1.7 E+00	±	1.8 E-01
S-4	9.4 E+00	±	9.4 E-01	4.1 E-01	±	6.3 E-02	8.9 E+00	±	8.9 E-01
S-5	1.9 E+00	±	1.9 E-01	1.1 E-01	±	2.3 E-02	1.7 E+00	±	1.8 E-01
S-6	3.9 E+00	±	3.9 E-01	2.3 E-01	±	3.9 E-02	3.4 E+00	±	3.4 E-01
S-7	8.7 E-01	±	1.0 E-01	3.5 E-02	±	1.3 E-02	9.1 E-01	±	1.0 E-01
S-8	7.4 E-01	±	8.8 E-02	2.0 E-02	±	9.5 E-03	6.9 E-01	±	8.3 E-02
S-9	1.0 E+00	±	1.3 E-01	3.0 E-02	±	1.5 E-02	9.3 E-01	±	1.2 E-01
S-10	6.9 E-01	±	8.3 E-02	2.8 E-02	±	1.2 E-02	6.4 E-01	±	7.7 E-02
S-11	1.1 E+00	±	1.3 E-01	5.2 E-02	±	1.9 E-02	1.0 E+00	±	1.3 E-01
S-12	9.7 E-01	±	1.1 E-01	3.9 E-02	±	1.3 E-02	9.9 E-01	±	1.1 E-01
S-13	7.0 E-01	±	8.4 E-02	3.1 E-02	±	1.2 E-02	7.1 E-01	±	8.5 E-02
S-14	7.0 E-01	±	8.6 E-02	2.0 E-02	±	1.1 E-02	8.1 E-01	±	9.6 E-02
S-15	6.5 E-01	±	7.8 E-02	2.1 E-02	±	9.9 E-03	6.5 E-01	±	7.7 E-02

NOTE: Negative values indicate results at or near background levels of radioactivity.

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 1 of 8)

Sample ID	Co-60			Cs-137			Cs-134			Ru-106		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
B-1	3.03 E-02	±	7.88 E-02	1.58 E-02	±	7.13 E-02	-5.05 E-02	±	7.16 E-02	-4.15 E-01	±	5.69 E-01
B-2	4.57 E-02	±	7.89 E-02	5.65 E-04	±	7.23 E-02	2.18 E-02	±	7.05 E-02	-6.92 E-02	±	6.56 E-01
C-1	1.26 E-01	±	9.57 E-0	2.30 E-01	±	1.20 E-01	-6.13 E-0	±	9.86 E-02	-1.42 E-01	±	8.09 E-01
C-2	4.44 E-02	±	6.48 E-02	1.22 E-01	±	7.32 E-02	-2.46 E-02	±	7.98 E-02	5.15 E-01	±	6.64 E-01
D-1	4.76 E-02	±	4.96 E-02	-1.19 E-03	±	5.48 E-02	-9.36 E-03	±	4.79 E-02	-2.40 E-1	±	4.34 E-01
D-2	-2.66 E-02	±	5.49 E-02	-1.73 E-02	±	5.07 E-02	-3.96 E-02	±	4.84 E-02	-2.53 E-2	±	3.87 E-01
D-3	3.48 E-02	±	5.23 E-02	3.23 E-02	±	5.61 E-02	-2.13 E-02	±	5.79 E-02	6.87 E-02	±	5.60 E-01
D-4	1.37 E-01	±	7.09 E-02	-4.11 E-02	±	9.29 E-02	1.18 E-01	±	7.24 E-02	-3.95 E-01	±	7.23 E-01
F-1	1.98 E-02	±	6.65 E-02	2.08 E-01	±	7.26 E-02	-4.91 E-02	±	6.92 E-02	2.36 E-01	±	5.24 E-01
F-2	9.72 E-02	±	8.14 E-02	2.59 E-02	±	8.01 E-02	-4.44 E-02	±	8.16 E-02	-6.41 E-1	±	7.09 E-01
F-3	1.11 E-02	±	1.00 E-01	-5.43 E-04	±	8.55 E-02	-2.84 E-02	±	7.19 E-02	4.40 E-01	±	6.64 E-01
F-4	4.61 E-02	±	4.61 E-02	-1.85 E-02	±	5.01 E-02	5.72 E-02	±	4.03 E-02	-2.82 E-01	±	4.25 E-01
F-5	-2.59 E-02	±	5.11 E-02	-3.99 E-02	±	4.89 E-02	-2.60 E-03	±	4.27 E-02	1.03 E-01	±	4.13 E-01
H-1	-4.16 E-02	±	5.91 E-02	2.14 E-02	±	4.27 E-02	2.96 E-02	±	4.33 E-02	-2.84 E-03	±	4.18 E-01
H-2	2.55 E-03	±	5.79 E-02	-6.02 E-03	±	6.14 E-02	-4.08 E-02	±	6.34 E-02	-3.27 E-01	±	5.23 E-01
K-1	6.54 E-03	±	6.49 E-02	-2.51 E-02	±	6.59 E-02	5.66 E-02	±	5.77 E-02	4.42 E-01	±	5.13 E-01
K-2	7.42 E-02	±	7.86 E-02	1.64 E-02	±	8.33 E-02	-1.71 E-02	±	8.36 E-02	-6.64 E-01	±	8.38 E-01
K-3	1.35 E-02	±	9.37 E-02	-2.51 E-02	±	8.70 E-02	-2.23 E-02	±	8.68 E-02	5.52 E-02	±	8.53 E-01
K-4	3.63 E-02	±	8.16 E-02	7.31 E-02	±	8.87 E-02	5.11 E-02	±	8.27 E-02	-5.19 E-01	±	7.68 E-01
K-5	7.82 E-02	±	1.55 E-01	1.48 E-01	±	1.44 E-01	-6.23 E-03	±	1.30 E-01	-4.59 E-01	±	1.10 E+00
N-1	6.30 E-02	±	6.73 E-02	6.97 E-02	±	6.92 E-02	-1.57 E-02	±	5.64 E-02	-2.72 E-01	±	5.60 E-01
N-2	3.83 E-01	±	1.01 E-01	2.60 E-01	±	1.13 E-01	-2.33 E-02	±	5.70 E-02	-2.16 E-01	±	5.14 E-01
N-3	2.87 E-01	±	1.08 E-01	1.86 E-01	±	7.04 E-02	-2.69 E-02	±	6.19 E-02	-3.35 E-01	±	6.20 E-01
N-4	1.49 E-01	±	1.08 E-01	3.66 E-01	±	1.25 E-01	-2.38 E-02	±	8.92 E-02	3.07 E-01	±	7.38 E-01
N-5	1.03 E-01	±	8.24 E-02	9.30 E-02	±	8.27 E-02	-1.35 E-02	±	7.29 E-02	3.13 E-02	±	7.33 E-01
N-6	6.94 E-02	±	6.47 E-02	4.63 E-02	±	7.75 E-02	1.34 E-02	±	6.62 E-02	3.99 E-01	±	6.51 E-01
N-7	-2.84 E-02	±	9.01 E-02	9.99 E-02	±	9.02 E-02	-5.27 E-02	±	8.07 E-02	2.10 E-01	±	7.59 E-01
N-8	9.25 E-02	±	7.59 E-02	1.94 E-01	±	8.39 E-02	-4.34 E-03	±	6.90 E-02	3.69 E-01	±	6.63 E-01
N-9	2.90 E-02	±	9.91 E-02	9.29 E-02	±	9.56 E-02	-9.26 E-02	±	9.47 E-02	5.80 E-01	±	8.61 E-01
N-10	1.22 E-01	±	8.53 E-02	-1.98 E-02	±	7.38 E-02	4.71 E-02	±	5.77 E-02	-3.87 E-01	±	5.84 E-01
N-11	5.76 E-02	±	8.85 E-02	2.69 E-02	±	6.58 E-02	1.85 E-03	±	7.22 E-02	1.46 E-02	±	6.44 E-01
N-12	4.91 E-02	±	1.30 E-01	1.05 E-01	±	8.57 E-02	1.04 E-02	±	9.96 E-02	2.87 E-01	±	9.61 E-01
NS-1	-1.51 E-02	±	1.84 E-01	1.12 E+00	±	2.46 E-01	-1.50 E-01	±	1.67 E-01	6.01 E-01	±	1.51 E+00
NS-2	6.50 E-02	±	9.19 E-02	4.05 E-01	±	1.31 E-01	6.34 E-02	±	7.68 E-02	1.57 E-01	±	5.24 E-01

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 2 of 8)

Sample ID	Co-60			Cs-137			Cs-134			Ru-106		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
NS-3	1.73 E-02	±	1.34 E-01	1.25 E-01	±	1.19 E-01	-6.12 E-02	±	1.13 E-01	3.89 E-01	±	1.06 E+00
NS-4	-4.07 E-02	±	1.20 E-01	7.83 E-02	±	1.17 E-01	2.29 E-02	±	1.12 E-01	3.41 E-01	±	1.03 E+00
NS-5	-2.92 E-03	±	8.15 E-02	2.77 E-01	±	1.03 E-01	-5.86 E-02	±	8.03 E-02	-3.91 E-01	±	7.54 E-01
NS-6	2.26 E-01	±	1.89 E-01	1.15 E-02	±	1.35 E-01	7.36 E-02	±	1.35 E-01	1.24 E+00	±	1.19 E+00
NS-7	4.11 E-02	±	1.22 E-01	2.19 E-01	±	1.13 E-01	-1.05 E-01	±	1.28 E-01	-6.93 E-01	±	1.24 E+00
NS-8	4.45 E-02	±	1.02 E-01	1.25 E-01	±	9.58 E-02	2.75 E-02	±	9.31 E-02	1.29 E-01	±	9.47 E-01

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 3 of 8)

Sample ID	Sb-125			Eu-155			Eu-154			Sr-90		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
B-1	-7.71 E-02	±	1.63 E-01	7.11 E-03	±	1.41 E-01	1.19 E-01	±	2.05 E-01	3.67 E-01	±	6.88 E-02
B-2	4.74 E-02	±	2.00 E-01	-4.16 E-02	±	2.00 E-01	-2.04 E-01	±	2.70 E-01	5.21 E-02	±	1.41 E-02
C-1	4.92 E-02	±	2.20 E-01	6.43 E-02	±	1.94 E-01	2.36 E-01	±	3.29 E-01	5.55 E-01	±	1.10 E-01
C-2	-6.22 E-02	±	1.90 E-01	1.52 E-02	±	1.80 E-01	-2.67 E-02	±	2.17 E-01	1.94 E-02	±	8.56 E-03
D-1	-7.51 E-03	±	1.36 E-01	-8.57 E-03	±	1.01 E-01	-2.61 E-01	±	1.86 E-01	1.63 E-02	±	6.17 E-03
D-2	7.43 E-03	±	1.15 E-01	5.15 E-03	±	1.04 E-01	-2.72 E-03	±	1.33 E-01	1.48 E-01	±	2.86 E-02
D-3	1.16 E-02	±	1.43 E-01	3.03 E-02	±	1.26 E-01	4.70 E-02	±	1.82 E-01	1.52 E-02	±	6.89 E-03
D-4	8.64 E-02	±	1.75 E-01	1.44 E-01	±	1.64 E-01	1.35 E-01	±	1.90 E-01	5.21 E-02	±	1.79 E-02
F-1	-3.19 E-02	±	1.61 E-01	3.73 E-02	±	1.47 E-01	-6.30 E-02	±	2.04 E-01	4.00 E+00	±	1.01 E+00
F-2	1.60 E-01	±	2.04 E-01	1.86 E-01	±	2.00 E-01	3.03 E-01	±	2.76 E-01	1.45 E-02	±	6.62 E-03
F-3	7.77 E-02	±	2.00 E-01	5.50 E-02	±	1.85 E-01	4.85 E-01	±	2.99 E-01	1.54 E-01	±	3.91 E-02
F-4	2.32 E-02	±	1.15 E-01	8.88 E-02	±	1.04 E-01	2.61 E-02	±	1.60 E-01	8.22 E-03	±	5.30 E-03
F-5	-1.51 E-02	±	1.13 E-01	2.69 E-03	±	1.09 E-01	1.67 E-01	±	1.38 E-01	3.77 E-03	±	3.58 E-03
H-1	-6.25 E-02	±	1.27 E-01	6.34 E-02	±	1.26 E-01	0.00	±	1.49 E-01	1.12 E-01	±	2.29 E-02
H-2	-5.07 E-02	±	1.60 E-01	-5.69 E-02	±	1.47 E-01	2.74 E-01	±	1.84 E-01	2.11 E-02	±	7.24 E-03
K-1	3.53 E-02	±	1.36 E-01	-2.44 E-03	±	1.33 E-01	-1.52 E-01	±	2.15 E-01	8.25 E-02	±	1.81 E-02
K-2	-7.83 E-02	±	2.12 E-01	-9.85 E-02	±	2.11 E-01	-2.51 E-02	±	2.62 E-01	2.28 E+00	±	5.36 E-01
K-3	-5.23 E-02	±	2.23 E-01	9.30 E-02	±	1.86 E-01	-8.53 E-02	±	2.75 E-01	1.02 E-01	±	2.66 E-02
K-4	6.34 E-03	±	1.96 E-01	-3.03 E-02	±	1.77 E-01	-3.08 E-01	±	3.15 E-01	3.64 E-02	±	1.61 E-02
K-5	3.21 E-02	±	3.10 E-01	7.40 E-02	±	2.94 E-01	-7.64 E-03	±	5.11 E-01	1.40 E-01	±	4.40 E-02
N-1	-8.52 E-02	±	1.66 E-01	-3.44 E-02	±	1.62 E-01	4.69 E-02	±	2.02 E-01	1.72 E-03	±	4.51 E-03
N-2	-8.60 E-03	±	1.51 E-01	-7.97 E-02	±	1.29 E-01	5.70 E-02	±	1.86 E-01	7.86 E-03	±	6.34 E-03
N-3	3.45 E-02	±	1.60 E-01	-5.13 E-02	±	1.51 E-01	1.69 E-01	±	1.84 E-01	1.71 E-02	±	7.37 E-03
N-4	1.90 E-02	±	1.86 E-01	3.57 E-02	±	2.06 E-01	1.24 E-01	±	2.37 E-01	4.03 E-03	±	8.41 E-03
N-5	-1.38 E-01	±	1.98 E-01	-1.20 E-01	±	1.70 E-01	8.31 E-02	±	1.92 E-01	1.88 E-03	±	5.72 E-03
N-6	-2.97 E-02	±	2.10 E-01	-5.22 E-03	±	1.72 E-01	-6.01 E-02	±	2.17 E-01	7.63 E-03	±	7.87 E-03
N-7	-3.14 E-02	±	2.18 E-01	9.32 E-02	±	2.05 E-01	-3.19 E-01	±	2.87 E-01	5.10 E-02	±	1.79 E-02
N-8	1.96 E-02	±	1.81 E-01	2.48 E-02	±	1.64 E-01	1.09 E-02	±	2.01 E-01	1.22 E-01	±	3.03 E-02
N-9	-9.25 E-02	±	2.43 E-01	4.96 E-03	±	2.22 E-01	1.57 E-01	±	2.77 E-01	3.40 E-02	±	1.39 E-02
N-10	1.84 E-01	±	1.53 E-01	1.64 E-01	±	1.49 E-01	1.25 E-01	±	1.63 E-01	2.47 E-02	±	1.11 E-02
N-11	7.86 E-02	±	1.94 E-01	8.69 E-02	±	2.00 E-01	-5.66 E-02	±	2.47 E-01	1.30 E-01	±	2.92 E-02
N-12	1.09 E-01	±	2.21 E-01	6.53 E-02	±	2.14 E-01	3.44 E-01	±	3.73 E-01	2.24 E-02	±	1.59 E-02

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 4 of 8)

Sample ID	Sb-125			Eu-155			Eu-154			Sr-90		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
NS-1	-1.29 E-01	±	4.23 E-01	-4.42 E-01	±	6.91 E-01	-6.24 E-01	±	5.80 E-01	3.34 E+02	±	5.93 E+01
NS-2	1.53 E-01	±	4.97 E-01	-1.99 E-02	±	2.26 E-01	1.10 E-01	±	2.69 E-01	1.07 E+02	±	1.95 E+01
NS-3	2.28 E-01	±	2.60 E-01	1.16 E-01	±	3.41 E-01	-2.33 E-01	±	4.03 E-01	9.02 E+01	±	1.58 E+01
NS-4	3.92 E-02	±	2.64 E-01	5.00 E-04	±	3.15 E-01	1.13 E-01	±	3.07 E-01	2.33 E+00	±	4.39 E-01
NS-5	5.47 E-02	±	2.08 E-01	-1.33 E-01	±	1.83 E-01	7.11 E-02	±	2.60 E-01	1.85 E+00	±	4.36 E-01
NS-6	1.71 E-01	±	3.16 E-01	1.79 E-01	±	3.58 E-01	-4.70 E-02	±	4.53 E-01	4.85 E+01	±	9.83 E+00
NS-7	-7.80 E-02	±	2.90 E-01	-6.94 E-02	±	2.83 E-01	1.52 E-01	±	3.58 E-01	3.66 E+01	±	6.61 E+00
NS-8	5.93 E-02	±	2.39 E-01	2.00 E-01	±	2.28 E-01	2.13 E-01	±	3.30 E-01	5.26 E+00	±	1.00 E+00

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 5 of 8)

Sample ID	Pu-239/240			Pu-238			U-234			U-235		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
B-1	-2.99 E-05	±	3.03 E-04	-1.48 E-04	±	2.39 E-04	-1.64 E-03	±	4.15 E-03	-4.83 E-04	±	2.89 E-03
B-2	1.89 E-04	±	2.36 E-04	-2.33 E-05	±	1.30 E-04	1.43 E-03	±	4.59 E-03	-1.18 E-03	±	2.79 E-03
C-1	-1.23 E-04	±	2.07 E-04	-4.55 E-05	±	2.40 E-04	1.00 E-04	±	4.69 E-03	-2.23 E-03	±	2.52 E-03
C-2	1.38 E-04	±	1.72 E-04	-2.15 E-05	±	1.22 E-04	1.68 E-03	±	4.83 E-03	-1.21 E-03	±	2.73 E-03
D-1	5.20 E-05	±	1.07 E-04	-4.99 E-05	±	7.01 E-05	-1.27 E-03	±	4.08 E-03	-1.66 E-03	±	2.70 E-03
D-2	1.35 E-04	±	1.85 E-04	-1.48 E-05	±	9.13 E-05	1.03 E-03	±	4.50 E-03	-4.21 E-04	±	2.86 E-03
D-3	1.65 E-04	±	1.82 E-04	1.21 E-05	±	6.43 E-05	2.17 E-03	±	4.76 E-03	-1.59 E-03	±	2.58 E-03
D-4	-2.76 E-05	±	2.12 E-04	3.70 E-05	±	1.34 E-04	2.32 E-03	±	4.77 E-03	-1.60 E-03	±	2.59 E-03
F-1	3.16 E-05	±	3.26 E-04	-2.83 E-05	±	1.81 E-04	1.29 E-03	±	4.55 E-03	-8.59 E-04	±	2.86 E-03
F-2	1.85 E-04	±	3.15 E-04	-2.19 E-05	±	2.08 E-04	8.39 E-03	±	5.68 E-03	-5.41 E-04	±	2.86 E-03
F-3	1.21 E-03	±	6.93 E-04	-4.56 E-05	±	2.73 E-04	4.55 E-03	±	5.19 E-03	-2.03 E-03	±	3.65 E-03
F-4	1.38 E-04	±	2.33 E-04	-1.49 E-05	±	1.54 E-04	-2.62 E-03	±	3.83 E-03	-8.44 E-04	±	2.73 E-03
F-5	-1.32 E-05	±	1.30 E-04	-1.34 E-05	±	1.25 E-04	-1.95 E-03	±	4.10 E-03	-1.95 E-03	±	2.50 E-03
H-1	1.80 E-04	±	2.36 E-04	-1.35 E-05	±	1.17 E-04	-2.85 E-03	±	3.85 E-03	-9.08 E-04	±	2.73 E-03
H-2	8.20 E-05	±	1.54 E-04	1.64 E-05	±	6.79 E-05	-1.84 E-03	±	3.98 E-03	-1.14 E-03	±	2.66 E-03
K-1	1.50 E-04	±	2.17 E-04	2.27 E-05	±	8.78 E-05	-1.08 E-03	±	4.24 E-03	-8.96 E-04	±	2.79 E-03
K-2	-2.68 E-05	±	2.40 E-04	-2.72 E-05	±	1.73 E-04	-3.90 E-04	±	4.36 E-03	-1.61 E-03	±	2.60 E-03
K-3	2.91 E-04	±	2.65 E-04	-2.14 E-05	±	1.58 E-04	-8.43 E-04	±	4.16 E-03	1.03 E-04	±	3.05 E-03
K-4	1.61 E-04	±	4.33 E-04	-4.51 E-05	±	3.13 E-04	2.42 E-03	±	4.96 E-03	-1.03 E-03	±	2.87 E-03
K-5	-8.61 E-05	±	8.59 E-04	-2.55 E-04	±	3.48 E-04	6.09 E-04	±	4.45 E-03	-1.93 E-03	±	2.47 E-03
N-1	2.72 E-04	±	3.61 E-04	5.42 E-05	±	1.47 E-04	2.85 E-03	±	4.92 E-03	-2.42 E-03	±	2.57 E-03
N-2	4.08 E-04	±	3.73 E-04	-1.93 E-05	±	1.84 E-04	-7.38 E-04	±	4.14 E-03	-1.18 E-03	±	2.65 E-03
N-3	1.99 E-04	±	2.01 E-04	-1.71 E-05	±	1.31 E-04	-1.38 E-03	±	4.20 E-03	-1.62 E-03	±	2.63 E-03
N-4	-1.38 E-04	±	1.77 E-04	1.44 E-04	±	1.98 E-04	4.87 E-03	±	5.20 E-03	-1.61 E-03	±	2.60 E-03
N-5	7.47 E-05	±	2.10 E-04	-2.43 E-05	±	1.50 E-04	5.04 E-04	±	4.64 E-03	-1.42 E-03	±	2.61 E-03
N-6	2.24 E-04	±	2.73 E-04	-2.42 E-05	±	1.51 E-04	1.18 E-03	±	4.80 E-03	-8.82 E-04	±	2.86 E-03
N-7	1.09 E-04	±	3.19 E-04	3.50 E-05	±	1.55 E-04	-4.52 E-04	±	2.19 E-03	-5.76 E-04	±	1.37 E-03
N-8	3.82 E-04	±	3.12 E-04	6.54 E-05	±	1.31 E-04	1.55 E-03	±	2.57 E-03	-7.41 E-04	±	1.41 E-03
N-9	3.50 E-05	±	1.55 E-04	-2.94 E-05	±	1.95 E-04	6.24 E-04	±	2.46 E-03	-4.81 E-04	±	1.47 E-03
N-10	1.00 E-05	±	1.64 E-04	1.98 E-05	±	8.95 E-04	1.08 E-04	±	2.30 E-03	-3.85 E-04	±	1.43 E-03
N-11	4.49 E-04	±	3.65 E-04	2.21 E-05	±	9.88 E-05	1.07 E-03	±	2.43 E-03	-6.25 E-04	±	1.46 E-03
N-12	-3.01 E-04	±	5.23 E-04	-5.24 E-05	±	3.79 E-04	1.53 E-03	±	2.42 E-03	-3.62 E-04	±	1.39 E-03
NS-1	-3.36 E-04	±	5.61 E-04	1.02 E-04	±	4.58 E-04	1.04 E-04	±	3.65 E-03	8.47 E-05	±	2.20 E-03
NS-2	3.88 E-04	±	5.90 E-04	9.85 E-05	±	2.91 E-04	1.38 E-03	±	2.58 E-03	-1.02 E-03	±	1.31 E-03

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Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 6 of 8)

Sample ID	Pu-239/240			Pu-238			U-234			U-235		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
NS-3	9.97 E-04	±	1.60 E-03	6.43 E-04	±	1.01 E-03	4.41 E-02	±	8.89 E-03	2.30 E-03	±	2.45 E-03
NS-4	1.65 E-04	±	4.95 E-04	1.17 E-04	±	3.64 E-04	3.84 E-02	±	8.01 E-03	4.13 E-04	±	1.81 E-03
NS-5	3.92 E-04	±	5.25 E-04	-2.94 E-05	±	3.18 E-04	5.75 E-03	±	3.21 E-03	-5.83 E-04	±	1.37 E-03
NS-6	2.64 E-04	±	1.03 E-03	1.77 E-04	±	6.42 E-04	2.49 E-02	±	5.76 E-03	-3.58 E-04	±	1.52 E-03
NS-7	3.48 E-04	±	1.29 E-03	-9.84 E-05	±	6.77 E-04	1.21 E-02	±	4.22 E-03	-6.85 E-04	±	1.32 E-03
NS-8	6.29 E-05	±	4.41 E-04	1.80 E-04	±	3.40 E-04	1.56 E-03	±	3.05 E-03	-1.63 E-04	±	1.68 E-03

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 7 of 8)

Sample ID	U-238		
	Result	±	Overall error
B-1	3.61 E-04	±	2.90 E-03
B-2	-8.88 E-04	±	2.77 E-03
C-1	2.57 E-03	±	3.50 E-03
C-2	3.84 E-04	±	3.11 E-03
D-1	2.83 E-04	±	3.06 E-03
D-2	3.93 E-03	±	3.79 E-03
D-3	5.58 E-03	±	4.02 E-03
D-4	4.90 E-04	±	2.89 E-03
F-1	7.50 E-04	±	3.14 E-03
F-2	2.59 E-03	±	3.51 E-03
F-3	-1.21 E-03	±	2.82 E-03
F-4	-2.10 E-03	±	2.30 E-03
F-5	-1.22 E-03	±	2.43 E-03
H-1	-6.35 E-04	±	2.70 E-03
H-2	1.35 E-03	±	3.20 E-03
K-1	2.07 E-04	±	2.84 E-03
K-2	8.98 E-04	±	3.01 E-03
K-3	2.28 E-03	±	3.42 E-03
K-4	-1.04 E-04	±	2.83 E-03
K-5	7.78 E-04	±	3.07 E-03
N-1	6.60 E-04	±	3.32 E-03
N-2	-2.76 E-03	±	2.10 E-03
N-3	1.40 E-03	±	3.10 E-03
N-4	4.05 E-03	±	3.71 E-03
N-5	1.23 E-03	±	3.26 E-03
N-6	1.28 E-03	±	3.17 E-03
N-7	1.19 E-03	±	1.76 E-03
N-8	2.30 E-03	±	2.16 E-03
N-9	3.13 E-03	±	2.14 E-03
N-10	7.00 E-04	±	1.71 E-03

Table E-4. Vegetation Results for 100 Areas, 1992
(pCi/g dry weight). (sheet 8 of 8)

Sample ID	U-238		
	Result	±	Overall error
N-11	6.64 E-04	±	1.78 E-03
N-12	1.92 E-03	±	1.91 E-03
NS-1	1.43 E-03	±	2.91 E-03
NS-2	1.65 E-03	±	2.03 E-03
NS-3	3.15 E-02	±	7.18 E-03
NS-4	2.95 E-02	±	6.40 E-03
NS-5	5.54 E-03	±	2.69 E-03
NS-6	1.79 E-02	±	4.63 E-03
NS-7	1.35 E-02	±	4.09 E-03
NS-8	4.13 E-03	±	2.77 E-03

NOTE: Negative values indicate results at or near background levels of radioactivity.

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Table E-5. Vegetation Results for 200/600 Areas, 1992
(pCi/g dry weight). (sheet 1 of 6)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs			¹⁰⁶ Ru		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
2	4.3 E-02	±	4.0 E-02	7.7 E-02	±	4.1 E-02	-3.1 E-02	±	3.8 E-02	-4.4 E-02	±	2.9 E-01
7	-3.2 E-02	±	6.1 E-02	-1.5 E-03	±	3.7 E-02	-8.9 E-03	±	3.6 E-02	-2.3 E-01	±	3.5 E-01
9	9.8 E-03	±	3.3 E-02	7.0 E-02	±	4.5 E-02	2.3 E-02	±	2.8 E-02	2.0 E-01	±	2.3 E-01
25	5.8 E-02	±	6.2 E-02	6.1 E-02	±	5.6 E-02	4.4 E-02	±	4.5 E-02	1.1 E-01	±	5.3 E-01
32	-5.3 E-04	±	3.9 E-02	1.1 E-02	±	4.2 E-02	1.5 E-02	±	3.5 E-02	-5.7 E-03	±	3.2 E-01
34	2.0 E-02	±	4.8 E-02	4.2 E-02	±	4.1 E-02	-4.4 E-02	±	4.1 E-02	-1.8 E-02	±	3.6 E-01
37	-1.9 E-02	±	5.1 E-02	3.0 E-01	±	8.3 E-02	5.6 E-03	±	4.0 E-02	1.7 E-01	±	3.6 E-01
41	4.1 E-02	±	6.3 E-02	1.0 E-01	±	5.5 E-02	-4.3 E-02	±	4.6 E-02	-1.2 E-01	±	4.3 E-01
43	-2.2 E-02	±	4.2 E-02	7.8 E-02	±	3.7 E-02	-3.3 E-02	±	3.7 E-02	1.1 E-01	±	3.0 E-01
44	-2.8 E-02	±	4.5 E-02	1.2 E-01	±	4.7 E-02	-5.5 E-02	±	3.7 E-02	-2.2 E-01	±	3.5 E-01
48	1.1 E-02	±	4.6 E-02	5.8 E-02	±	4.3 E-02	-2.6 E-04	±	4.0 E-02	-2.9 E-01	±	3.8 E-01
50	8.5 E-03	±	2.0 E-02	6.4 E-02	±	2.9 E-02	1.4 E-02	±	1.7 E-02	-6.9 E-02	±	1.6 E-01
55	-1.7 E-02	±	2.7 E-02	1.3 E-01	±	3.0 E-02	-3.9 E-02	±	2.1 E-02	-5.3 E-02	±	1.8 E-01
59	-5.4 E-03	±	2.2 E-02	2.4 E-01	±	4.4 E-02	1.4 E-02	±	1.7 E-02	-5.0 E-02	±	1.6 E-01
67	-1.6 E-02	±	3.1 E-02	2.9 E-02	±	2.9 E-02	-5.1 E-03	±	2.1 E-02	5.8 E-02	±	1.9 E-01
78	-1.9 E-02	±	2.2 E-02	2.7 E-02	±	1.9 E-02	-1.5 E-02	±	1.7 E-02	-1.6 E-03	±	1.6 E-01
79	-5.0 E-03	±	2.0 E-02	2.7 E-02	±	1.9 E-02	9.0 E-03	±	1.6 E-02	5.8 E-02	±	1.5 E-01
80	1.0 E-02	±	2.7 E-02	5.7 E-02	±	2.5 E-02	-1.9 E-02	±	2.3 E-02	-1.7 E-01	±	2.1 E-01
81	3.6 E-04	±	2.5 E-02	4.0 E-03	±	2.0 E-02	-4.2 E-03	±	2.0 E-02	-4.5 E-02	±	1.8 E-01
82	7.6 E-03	±	2.0 E-02	9.4 E-03	±	1.7 E-02	1.2 E-02	±	1.6 E-02	7.3 E-02	±	1.5 E-01
83	8.5 E-03	±	2.6 E-02	1.3 E-02	±	2.3 E-02	-2.4 E-02	±	2.1 E-02	-1.1 E-01	±	1.9 E-01
84	1.1 E-02	±	2.6 E-02	-9.9 E-03	±	2.4 E-02	-5.2 E-03	±	2.1 E-02	6.6 E-02	±	2.0 E-01
85	2.6 E-02	±	2.2 E-02	-6.3 E-03	±	2.2 E-02	8.2 E-03	±	1.9 E-02	-8.1 E-02	±	1.6 E-01
88	1.1 E-03	±	2.4 E-02	6.4 E-03	±	2.2 E-02	9.8 E-03	±	1.7 E-02	1.8 E-01	±	1.7 E-01
90	1.8 E-02	±	2.4 E-02	5.0 E-02	±	4.3 E-02	6.9 E-03	±	2.3 E-02	1.4 E-01	±	2.2 E-01
92	-9.4 E-04	±	2.7 E-02	2.5 E-01	±	4.1 E-02	-2.7 E-02	±	2.4 E-02	-1.0 E-01	±	2.2 E-01
94	-1.9 E-02	±	2.7 E-02	4.6 E-02	±	2.3 E-02	2.5 E-03	±	1.9 E-02	-8.8 E-02	±	1.9 E-01
95	4.7 E-02	±	2.7 E-02	1.3 E-01	±	4.8 E-02	2.7 E-02	±	2.2 E-02	-1.2 E-01	±	2.2 E-01
96	-1.8 E-02	±	2.4 E-02	6.9 E-02	±	3.3 E-02	5.2 E-03	±	1.9 E-02	5.2 E-02	±	1.8 E-01
97	-1.1 E-02	±	2.5 E-02	1.9 E-02	±	2.1 E-02	-1.5 E-02	±	1.9 E-02	-7.2 E-02	±	1.9 E-01
98	-3.2 E-02	±	2.5 E-02	2.2 E-02	±	2.0 E-02	1.4 E-02	±	2.0 E-02	-1.1 E-01	±	1.8 E-01
99	1.8 E-02	±	2.8 E-02	3.6 E-02	±	2.2 E-02	-5.3 E-03	±	2.2 E-02	4.2 E-02	±	2.0 E-01

Table E-5. Vegetation Results for 200/600 Areas, 1992
(pCi/g dry weight). (sheet 2 of 6)

Site ID	⁶⁰ Co			¹³⁷ Cs			¹³⁴ Cs			¹⁰⁶ Ru		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
100	2.6 E-02	±	1.8 E-02	6.8 E-02	±	5.2 E-02	1.1 E-02	±	1.8 E-02	-8.2 E-02	±	1.8 E-01
101	1.4 E-02	±	2.0 E-02	2.2 E-01	±	4.4 E-02	-3.4 E-03	±	1.7 E-02	-1.5 E-02	±	1.5 E-01
102	-2.8 E-03	±	2.7 E-02	8.4 E-03	±	2.3 E-02	-2.2 E-02	±	2.3 E-02	8.6 E-02	±	1.9 E-01
104	-2.1 E-02	±	3.4 E-02	3.0 E-02	±	2.6 E-02	-1.3 E-02	±	2.6 E-02	2.0 E-02	±	2.3 E-01
105	-7.3 E-04	±	2.7 E-02	6.8 E-02	±	2.6 E-02	-1.8 E-02	±	2.2 E-02	-1.3 E-01	±	2.0 E-01
106	7.1 E-03	±	2.3 E-02	1.5 E-02	±	2.6 E-02	-3.3 E-04	±	2.2 E-02	9.3 E-02	±	2.0 E-01
110	1.3 E-02	±	2.5 E-02	1.9 E-02	±	2.3 E-02	-2.2 E-02	±	2.3 E-02	-1.7 E-01	±	2.2 E-01

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Table E-5. Vegetation Results for 200/600 Areas, 1992
(pCi/g dry weight). (sheet 3 of 6)

Site ID	¹²⁵ Sb			¹⁵⁵ Eu			¹⁵⁴ Eu			^{239/40} Pu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
2	-4.4 E-02	±	9.4 E-02	2.8 E-03	±	1.0 E-01	8.2 E-02	±	1.3 E-01	3.3 E-02	±	4.7 E-03
7	-1.3 E-01	±	1.1 E-01	1.3 E-02	±	1.1 E-01	1.0 E-01	±	1.6 E-01	2.1 E-03	±	6.5 E-04
9	-3.4 E-02	±	6.7 E-02	7.3 E-02	±	7.1 E-02	-1.5 E-01	±	1.2 E-01	1.2 E-02	±	2.0 E-03
25	-2.5 E-02	±	1.2 E-01	-1.7 E-02	±	1.3 E-01	7.8 E-02	±	2.0 E-01	1.9 E-03	±	5.7 E-04
32	2.5 E-02	±	8.5 E-02	1.2 E-02	±	7.8 E-02	-2.4 E-02	±	1.2 E-01	1.1 E-02	±	2.0 E-03
34	-7.5 E-03	±	9.3 E-02	-3.6 E-02	±	9.6 E-02	-1.1 E-01	±	1.6 E-01	4.2 E-02	±	6.2 E-03
37	-1.4 E-01	±	1.2 E-01	4.1 E-02	±	1.2 E-01	-8.7 E-02	±	1.5 E-01	2.7 E-02	±	3.4 E-03
41	3.7 E-02	±	1.2 E-01	9.9 E-02	±	1.3 E-01	-1.1 E-01	±	1.9 E-01	3.8 E-03	±	1.0 E-03
43	-1.8 E-02	±	1.1 E-01	8.5 E-02	±	9.5 E-02	4.7 E-02	±	1.5 E-01	1.1 E-02	±	2.0 E-03
44	4.5 E-03	±	9.0 E-02	-2.4 E-02	±	1.0 E-01	-1.7 E-02	±	1.6 E-01	6.8 E-03	±	1.6 E-03
48	-3.2 E-03	±	1.0 E-01	1.1 E-02	±	1.0 E-01	5.2 E-02	±	1.5 E-01	2.3 E-03	±	5.5 E-04
50	-8.7 E-03	±	4.5 E-02	-9.2 E-03	±	4.7 E-02	7.3 E-02	±	6.6 E-02	1.8 E-03	±	4.4 E-04
55	-4.6 E-02	±	5.5 E-02	2.3 E-02	±	5.7 E-02	-8.0 E-02	±	8.5 E-02	1.3 E-03	±	5.9 E-04
59	-8.7 E-03	±	4.7 E-02	2.4 E-02	±	5.0 E-02	4.8 E-03	±	7.5 E-02	7.3 E-04	±	2.9 E-04
67	-3.6 E-02	±	6.1 E-02	2.8 E-02	±	5.2 E-02	-6.4 E-02	±	1.0 E-01	2.9 E-04	±	2.1 E-04
78	-4.1 E-03	±	4.0 E-02	5.3 E-02	±	4.3 E-02	2.9 E-02	±	6.3 E-02	8.5 E-04	±	2.8 E-04
79	2.7 E-02	±	4.3 E-02	2.5 E-02	±	4.9 E-02	1.7 E-02	±	7.2 E-02	1.3 E-03	±	4.4 E-04
80	-3.7 E-02	±	6.3 E-02	-1.2 E-02	±	6.2 E-02	-2.1 E-02	±	8.6 E-02	1.5 E-03	±	6.4 E-04
81	-2.9 E-02	±	5.2 E-02	-2.3 E-02	±	5.1 E-02	6.8 E-03	±	7.9 E-02	4.1 E-04	±	2.3 E-04
82	-6.0 E-03	±	4.2 E-02	-1.0 E-02	±	4.0 E-02	5.1 E-03	±	6.4 E-02	2.5 E-04	±	2.4 E-04
83	3.3 E-02	±	5.6 E-02	3.2 E-03	±	5.7 E-02	2.3 E-02	±	9.0 E-02	6.2 E-04	±	2.7 E-04
84	2.1 E-02	±	5.8 E-02	1.3 E-02	±	6.4 E-02	2.2 E-02	±	9.0 E-02	4.6 E-04	±	2.2 E-04
85	1.2 E-02	±	4.6 E-02	2.4 E-02	±	4.5 E-02	-7.0 E-02	±	7.4 E-02	1.2 E-03	±	5.0 E-04
88	1.2 E-02	±	4.7 E-02	1.3 E-02	±	4.4 E-02	6.6 E-02	±	7.0 E-02	4.6 E-04	±	2.4 E-04
90	-3.5 E-02	±	6.0 E-02	5.8 E-02	±	5.4 E-02	5.4 E-02	±	9.0 E-02	1.1 E-03	±	4.3 E-04
92	2.5 E-02	±	5.8 E-02	2.8 E-03	±	6.1 E-02	4.7 E-02	±	8.7 E-02	4.2 E-03	±	1.2 E-03
94	-1.7 E-02	±	5.8 E-02	-2.4 E-02	±	5.8 E-02	-7.5 E-02	±	9.3 E-02	6.7 E-04	±	2.8 E-04
95	-1.0 E-02	±	6.3 E-02	1.1 E-02	±	5.5 E-02	-2.8 E-02	±	9.1 E-02	1.1 E-03	±	5.0 E-04
96	2.7 E-02	±	4.6 E-02	6.3 E-03	±	4.8 E-02	-8.6 E-03	±	8.0 E-02	4.9 E-04	±	2.8 E-04
97	-8.1 E-02	±	5.1 E-02	-2.3 E-02	±	4.7 E-02	-9.8 E-02	±	8.1 E-02	5.3 E-04	±	2.7 E-04

Table E-5. Vegetation Results for 200/600 Areas, 1992
(pCi/g dry weight). (sheet 4 of 6)

Site ID	^{125}Sb			^{155}Eu			^{154}Eu			$^{239/40}\text{Pu}$		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
98	1.5 E-02	±	5.1 E-02	3.7 E-02	±	5.3 E-02	4.3 E-03	±	8.4 E-02	5.4 E-04	±	2.1 E-04
99	4.9 E-02	±	5.3 E-02	-2.8 E-02	±	6.1 E-02	3.5 E-02	±	7.5 E-02	2.5 E-03	±	6.2 E-04
100	-2.7 E-02	±	4.7 E-02	-2.8 E-02	±	4.1 E-02	7.8 E-02	±	6.0 E-02	8.1 E-04	±	3.5 E-04
101	4.2 E-03	±	4.0 E-02	4.2 E-03	±	4.0 E-02	3.9 E-02	±	5.1 E-02	4.7 E-04	±	2.5 E-04
102	-2.1 E-02	±	5.3 E-02	1.6 E-03	±	6.1 E-02	-1.5 E-02	±	8.4 E-02	6.1 E-04	±	3.3 E-04
104	-4.3 E-02	±	7.0 E-02	2.2 E-02	±	7.4 E-02	-7.3 E-02	±	1.1 E-01	2.2 E-03	±	5.8 E-04
105	-3.9 E-02	±	5.8 E-02	-3.3 E-02	±	5.8 E-02	5.2 E-02	±	7.6 E-02	5.1 E-02	±	5.7 E-03
106	5.0 E-02	±	5.3 E-02	1.0 E-03	±	5.6 E-02	1.4 E-02	±	8.0 E-02	4.1 E-03	±	7.9 E-04
110	3.7 E-02	±	5.2 E-02	1.2 E-02	±	6.5 E-02	-3.0 E-02	±	8.6 E-02	5.8 E-04	±	2.7 E-04

Table E-5. Vegetation Results for 200/600 Areas, 1992
(pCi/g dry weight). (sheet 5 of 6)

Site ID	⁹⁰ Sr			²³⁴ U			²³⁵ U			²³⁸ U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
2	5.2 E-01	±	1.0 E-01	4.6 E-03	±	3.0 E-03	-5.1 E-04	±	1.4 E-03	3.1 E-03	±	2.3 E-03
7	2.4 E-02	±	2.0 E-02	3.1 E-03	±	2.9 E-03	-1.3 E-03	±	1.5 E-03	3.0 E-03	±	2.3 E-03
9	3.1 E-01	±	6.2 E-02	5.8 E-03	±	3.1 E-03	-4.1 E-04	±	1.5 E-03	5.4 E-03	±	2.5 E-03
25	3.7 E-02	±	1.3 E-02	1.5 E-03	±	2.6 E-03	-1.0 E-03	±	1.4 E-03	1.2 E-03	±	1.9 E-03
32	3.0 E-02	±	1.0 E-02	1.3 E-03	±	2.5 E-03	-7.0 E-04	±	1.3 E-03	1.8 E-03	±	2.0 E-03
34	1.8 E-01	±	3.7 E-02	1.8 E-03	±	2.6 E-03	-8.7 E-04	±	1.3 E-03	1.8 E-03	±	2.0 E-03
37	1.2 E-01	±	2.6 E-02	2.5 E-03	±	2.7 E-03	-8.7 E-04	±	1.3 E-03	2.7 E-03	±	2.2 E-03
41	2.9 E-02	±	9.1 E-03	9.2 E-04	±	2.4 E-03	-4.9 E-04	±	1.4 E-03	1.1 E-03	±	2.0 E-03
43	6.3 E-02	±	1.4 E-02	7.0 E-03	±	3.5 E-03	-3.3 E-04	±	1.5 E-03	6.3 E-03	±	3.0 E-03
44	1.0 E-01	±	2.2 E-02	4.4 E-03	±	3.0 E-03	-9.1 E-04	±	1.4 E-03	4.9 E-03	±	2.5 E-03
48	2.1 E-02	±	6.2 E-03	5.7 E-03	±	3.1 E-03	-5.3 E-04	±	1.4 E-03	5.9 E-03	±	2.6 E-03
50	2.8 E-03	±	2.5 E-03	1.2 E-02	±	3.9 E-03	2.6 E-04	±	1.5 E-03	6.3 E-03	±	2.7 E-03
55	2.7 E-02	±	6.6 E-03	5.7 E-03	±	3.1 E-03	4.4 E-04	±	1.6 E-03	3.5 E-03	±	2.2 E-03
59	3.0 E-02	±	9.5 E-03	1.7 E-02	±	7.7 E-03	-3.6 E-04	±	2.4 E-03	1.2 E-02	±	6.2 E-03
67	2.2 E-01	±	5.4 E-02	4.2 E-03	±	2.8 E-03	-6.9 E-04	±	1.2 E-03	2.1 E-03	±	1.9 E-03
78	2.9 E-02	±	8.8 E-03	8.7 E-03	±	3.9 E-03	-6.0 E-04	±	1.5 E-03	7.2 E-03	±	3.3 E-03
79	6.3 E-02	±	1.4 E-02	3.5 E-03	±	2.8 E-03	-6.0 E-04	±	1.4 E-03	1.8 E-03	±	2.0 E-03
80	3.4 E-02	±	8.5 E-03	1.1 E-02	±	3.8 E-03	-3.4 E-04	±	1.4 E-03	1.0 E-02	±	3.3 E-03
81	2.0 E-02	±	6.1 E-03	1.9 E-02	±	5.1 E-03	-5.9 E-05	±	1.8 E-03	1.2 E-02	±	4.0 E-03
82	9.3 E-02	±	2.0 E-02	1.9 E-02	±	5.8 E-03	-5.8 E-05	±	1.8 E-03	1.4 E-02	±	4.6 E-03
83	3.1 E-02	±	7.5 E-03	5.7 E-03	±	3.5 E-03	-1.3 E-04	±	1.8 E-03	4.7 E-03	±	2.7 E-03
84	5.3 E-02	±	1.3 E-02	1.1 E-02	±	3.7 E-03	-4.9 E-04	±	1.4 E-03	3.9 E-03	±	2.2 E-03
85	5.0 E-02	±	1.3 E-02	4.6 E-02	±	2.0 E-02	8.0 E-03	±	8.8 E-03	2.7 E-02	±	1.5 E-02
88	4.3 E-02	±	1.1 E-02	1.2 E-02	±	5.1 E-03	3.7 E-05	±	1.8 E-03	8.2 E-03	±	4.1 E-03
90	1.2 E-01	±	2.4 E-02	3.4 E-02	±	1.7 E-02	2.3 E-03	±	6.7 E-03	1.3 E-02	±	1.1 E-02
92	1.7 E-01	±	3.6 E-02	4.6 E-02	±	2.0 E-02	-2.5 E-04	±	5.5 E-03	4.7 E-02	±	2.0 E-02
94	3.3 E-02	±	1.1 E-02	1.3 E-02	±	7.0 E-03	-2.3 E-04	±	1.9 E-03	1.6 E-02	±	7.3 E-03
95	5.3 E-02	±	1.5 E-02	1.9 E-02	±	6.3 E-03	-4.5 E-04	±	1.7 E-03	1.1 E-02	±	4.8 E-03
96	1.9 E-02	±	6.4 E-03	6.0 E-03	±	5.1 E-03	-7.7 E-04	±	1.9 E-03	5.7 E-03	±	4.6 E-03
97	1.4 E-01	±	3.0 E-02	1.3 E-02	±	6.3 E-03	1.1 E-04	±	2.4 E-03	1.2 E-02	±	5.9 E-03

Table E-5. Vegetation Results for 200/600 Areas, 1992
(pCi/g dry weight). (sheet 6 of 6)

Site ID	^{90}Sr			^{234}U			^{235}U			^{238}U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
98	1.7 E-02	±	5.6 E-03	7.7 E-03	±	4.9 E-03	1.8 E-03	±	2.9 E-03	7.1 E-03	±	4.3 E-03
99	5.9 E-02	±	1.4 E-02	1.6 E-02	±	8.2 E-03	6.7 E-04	±	2.6 E-03	1.3 E-02	±	7.1 E-03
100	4.6 E-02	±	1.1 E-02	1.3 E-02	±	6.0 E-03	-3.6 E-04	±	1.9 E-03	1.6 E-02	±	6.2 E-03
101	1.4 E-01	±	2.7 E-02	1.7 E-03	±	2.5 E-03	-7.1 E-04	±	1.3 E-03	1.4 E-03	±	1.9 E-03
102	1.0 E-01	±	2.1 E-02	2.1 E-03	±	2.6 E-03	-7.2 E-04	±	1.4 E-03	2.4 E-03	±	2.1 E-03
104	6.4 E-02	±	1.5 E-02	2.1 E-03	±	2.5 E-03	-9.0 E-04	±	1.4 E-03	2.8 E-03	±	2.1 E-03
105	1.3 E-01	±	2.7 E-02	1.8 E-03	±	2.7 E-03	-3.3 E-04	±	1.6 E-03	2.7 E-03	±	2.1 E-03
106	2.5 E-02	±	7.2 E-03	5.5 E-03	±	3.0 E-03	-4.1 E-04	±	1.5 E-03	5.8 E-03	±	2.6 E-03
110	5.1 E-02	±	1.2 E-02	5.3 E-03	±	3.0 E-03	-1.0 E-03	±	1.3 E-03	6.4 E-03	±	2.7 E-03

NOTE: Negative values indicate results at or near background levels of radioactivity.

Table E-6. 300/400 Areas Vegetation Results, 1992
(pCi/g dry weight). (sheet 1 of 2)

Site ID	^{60}Co			^{137}Cs			^{134}Cs		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
V01	-3.4 E-02	±	5.4 E-02	-3.6 E-02	±	5.1 E-02	-1.8 E-02	±	4.7 E-02
V02	-2.2 E-02	±	1.3 E-01	-1.0 E-02	±	1.2 E-01	-1.6 E-01	±	1.2 E-01
V03	9.5 E-02	±	1.0 E-01	2.8 E-02	±	9.3 E-02	-1.4 E-01	±	9.3 E-02
V04	-4.7 E-02	±	1.2 E-01	2.3 E-02	±	9.3 E-02	-3.2 E-02	±	1.1 E-01
V05	-9.1 E-03	±	9.8 E-02	3.6 E-02	±	8.5 E-02	-3.7 E-02	±	1.0 E-01
V06	1.5 E-02	±	5.9 E-02	4.6 E-02	±	5.4 E-02	1.5 E-02	±	4.7 E-02
V07	1.2 E-01	±	1.2 E-01	9.7 E-02	±	1.1 E-01	1.4 E-01	±	1.2 E-01
V08	4.1 E-02	±	1.2 E-01	-7.4 E-02	±	1.1 E-01	-1.9 E-01	±	1.2 E-01
V09	-4.7 E-02	±	1.2 E-01	-5.9 E-03	±	1.1 E-01	-4.4 E-02	±	1.1 E-01
V10	6.4 E-02	±	1.6 E-01	-5.9 E-02	±	1.4 E-01	1.3 E-02	±	1.2 E-01
V11	2.4 E-02	±	1.3 E-01	1.0 E-01	±	1.3 E-01	-1.2 E-01	±	1.4 E-01
V12	1.5 E-02	±	1.1 E-01	-4.7 E-02	±	1.2 E-01	8.8 E-02	±	9.8 E-02
V13	3.6 E-02	±	8.4 E-02	8.4 E-01	±	1.7 E-01	-3.5 E-02	±	6.7 E-02
V14	5.4 E-02	±	8.6 E-02	1.2 E-01	±	9.3 E-02	-3.2 E-01	±	1.0 E-01

Site ID	^{106}Ru			^{125}Sb			^{155}Eu		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
V01	1.8 E-01	±	4.2 E-01	-4.1 E-02	±	1.2 E-01	-7.1 E-02	±	1.3 E-01
V02	-3.3 E-01	±	1.1 E+00	1.3 E-01	±	3.0 E-01	-8.0 E-02	±	3.1 E-01
V03	5.4 E-01	±	7.9 E-01	-1.1 E-02	±	2.3 E-01	1.3 E-01	±	2.5 E-01
V04	1.2 E-01	±	9.7 E-01	-1.3 E-02	±	2.6 E-01	2.3 E-02	±	2.6 E-01
V05	2.8 E-01	±	9.3 E-01	1.7 E-01	±	2.5 E-01	-8.0 E-02	±	2.3 E-01
V06	1.8 E-01	±	4.3 E-01	7.5 E-02	±	1.3 E-01	-1.2 E-01	±	1.2 E-01
V07	-4.1 E-02	±	9.8 E-01	-6.9 E-02	±	2.9 E-01	-2.9 E-01	±	2.8 E-01
V08	-5.8 E-01	±	1.1 E+00	1.5 E-02	±	3.2 E-01	1.9 E-01	±	3.0 E-01
V09	-5.2 E-01	±	9.4 E-01	-7.0 E-02	±	3.0 E-01	-4.5 E-02	±	2.9 E-01
V10	-7.6 E-01	±	1.3 E+00	-2.8 E-01	±	3.5 E-01	1.8 E-01	±	3.1 E-01
V11	1.1 E+00	±	1.0 E+00	4.9 E-01	±	3.5 E-01	-3.7 E-01	±	3.1 E-01
V12	1.7 E-01	±	1.1 E+00	-1.8 E-01	±	2.7 E-01	5.1 E-03	±	2.5 E-01
V13	-6.4 E-01	±	6.5 E-01	1.6 E-01	±	1.8 E-01	1.2 E-01	±	1.4 E-01
V14	2.2 E-01	±	7.6 E-01	9.7 E-02	±	2.2 E-01	-6.1 E-02	±	2.2 E-01

NOTE: Negative values indicate results at or near background levels of radioactivity.

Table E-6. 300/400 Areas Vegetation Results, 1992
(pCi/g dry weight). (sheet 2 of 2)

Site ID	^{154}Eu			$^{239/40}\text{Pu}$			^{90}Sr		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
V01	9.8 E-02	±	1.4 E-01	8.8 E-04	±	3.9 E-04	4.3 E-02	±	9.9 E-03
V02	-1.1 E-01	±	4.0 E-01	7.3 E-04	±	3.8 E-04	3.9 E-03	±	1.4 E-02
V03	3.1 E-01	±	2.8 E-01	3.8 E-04	±	2.0 E-04	1.7 E-02	±	1.2 E-02
V04	3.7 E-01	±	3.1 E-01	1.7 E-04	±	1.4 E-04	-4.3 E-03	±	7.4 E-03
V05	1.7 E-01	±	2.9 E-01	4.4 E-04	±	3.3 E-04	-5.8 E-03	±	8.5 E-03
V06	3.4 E-02	±	2.0 E-01	8.4 E-04	±	4.7 E-04	3.9 E-03	±	5.7 E-03
V07	-3.1 E-02	±	3.4 E-01	3.4 E-04	±	3.0 E-04	-4.2 E-03	±	1.3 E-02
V08	-1.4 E-02	±	4.0 E-01	9.0 E-05	±	1.1 E-04	5.3 E-03	±	3.5 E-03
V09	-1.3 E-01	±	3.5 E-01	1.8 E-04	±	1.5 E-04	1.8 E-03	±	9.5 E-03
V10	-2.9 E-01	±	4.8 E-01	6.2 E-04	±	2.5 E-04	6.3 E-03	±	1.3 E-02
V11	1.7 E-01	±	4.2 E-01	4.2 E-04	±	2.0 E-04	1.9 E-02	±	1.8 E-02
V12	1.7 E-02	±	3.0 E-01	7.6 E-04	±	3.6 E-04	1.8 E-02	±	6.4 E-03
V13	-3.5 E-02	±	2.3 E-01	9.8 E-03	±	1.8 E-03	1.0 E-01	±	2.0 E-02
V14	-4.2 E-02	±	2.7 E-01	3.0 E-03	±	7.0 E-04	2.7 E-01	±	6.5 E-02

Site ID	^{234}U			^{235}U			^{238}U		
	Result	±	Overall error	Result	±	Overall error	Result	±	Overall error
V01	1.4 E-01	±	1.9 E-02	7.0 E-03	±	3.5 E-03	1.1 E-01	±	1.6 E-02
V02	9.0 E-03	±	3.5 E-03	2.7 E-04	±	1.6 E-03	8.2 E-03	±	2.9 E-03
V03	6.6 E-02	±	1.1 E-02	2.6 E-03	±	2.3 E-03	4.4 E-02	±	8.2 E-03
V04	1.5 E-02	±	4.3 E-03	-3.2 E-04	±	1.3 E-03	1.1 E-02	±	3.4 E-03
V05	5.3 E-02	±	8.4 E-03	1.6 E-03	±	2.0 E-03	5.4 E-02	±	8.3 E-03
V06	3.9 E-02	±	7.1 E-03	1.5 E-03	±	1.8 E-03	3.5 E-02	±	6.5 E-03
V07	1.6 E-02	±	4.5 E-03	6.9 E-04	±	1.6 E-03	1.5 E-02	±	3.9 E-03
V08	1.9 E-02	±	5.2 E-03	-2.1 E-04	±	1.5 E-03	1.9 E-02	±	4.8 E-03
V09	1.3 E-02	±	4.5 E-03	-1.6 E-04	±	1.4 E-03	6.8 E-03	±	3.2 E-03
V10	3.4 E-02	±	6.5 E-03	-1.2 E-04	±	1.6 E-03	3.4 E-02	±	6.2 E-03
V11	6.0 E-03	±	3.3 E-03	-8.5 E-05	±	1.5 E-03	5.5 E-03	±	2.7 E-03
V12	8.4 E-02	±	1.2 E-02	4.3 E-03	±	2.6 E-03	7.7 E-02	±	1.1 E-02
V13	1.4 E-01	±	4.2 E-02	1.1 E-02	±	9.5 E-03	1.6 E-01	±	4.4 E-02
V14	5.7 E-02	±	9.7 E-03	3.2 E-04	±	1.9 E-03	4.9 E-02	±	8.6 E-03

NOTE: Negative values indicate results at or near background levels of radioactivity.

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APPENDIX F

**EXTERNAL RADIATION MONITORING
FIGURES AND TABLES**

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Table F-1. 100 Area Thermoluminescent Dosimeter Results, 1992. (sheet 1 of 2)

Site ID	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Annual stats (mrem/yr)		
	mrem/h	mrem/yr	mrem/h	mrem/yr	mrem/h	mrem/yr	mrem/h	mrem/yr	Max	Min	Avg
1	0.161	1,411	0.163	1,429	0.140	1,234	0.156	1,369	1,429	1,234	1,361
2	0.137	1,205	0.135	1,188	0.120	1,051	0.148	1,299	1,299	1,051	1,186
3	0.056	491	0.054	473	0.046	400	0.055	479	491	400	461
4	0.231	2,032	0.226	1,982	0.191	1,675	0.242	2,128	2,128	1,675	1,954
5	0.082	721	0.082	717	0.067	586	0.078	682	721	586	677
6	0.027	239	0.027	236	0.027	241	0.028	242	242	236	239
7	0.133	1,172	0.133	1,168	0.113	990	0.116	1,021	1,172	990	1,088
8	0.008	66	0.007	59	0.007	61	0.006	52	66	52	60
9	0.009	78	0.010	87	0.008	72	0.008	69	87	69	76
10	0.007	65	0.006	55	0.006	52	0.006	52	65	52	56
11	0.008	73	0.009	80	0.007	62	0.007	62	80	62	69
12	0.010	85	0.010	83	0.008	73	0.009	83	85	73	81
13	0.014	123	0.014	120	0.012	104	0.014	125	125	104	118
14	0.050	435	0.049	433	0.043	380	0.056	491	491	380	435
15	0.122	1,072	0.105	920	0.082	722	0.101	891	1,072	722	901
16	0.031	270	0.031	273	0.033	286	0.031	273	286	270	275
17	0.005	40	0.005	40	0.005	47	0.005	41	47	40	42
18	0.140	1,226	0.137	1,203	0.140	1,227	0.177	1,556	1,556	1,203	1,303
19	0.005	47	0.005	44	0.006	52	0.005	43	52	43	47
20	0.006	56	0.009	77	0.006	49	0.007	61	77	49	61
21	0.043	373	0.049	427	0.044	390	0.057	499	499	373	422
22	0.064	565	0.074	646	0.063	552	0.075	656	656	552	605
23	0.004	32	0.005	42	0.004	32	0.004	35	42	32	36

Table F-1. 100 Area Thermoluminescent Dosimeter Results, 1992. (sheet 2 of 2)

Site ID	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Annual stats (mrem/yr)		
	mremi/h	mrem/yr	mrem/h	mrem/yr	mrem/h	mrem/yr	mrem/h	mrem/yr	Max	Min	Avg
24	0.007	58	0.006	57	0.006	49	0.006	53	58	49	54
25	0.007	65	0.008	69	0.007	59	0.008	68	69	59	65
26	0.029	258	0.029	253	0.026	229	0.029	259	259	229	250
27	0.010	85	0.009	80	0.009	77	0.009	82	85	77	81
28	0.029	252	0.032	279	0.028	243	0.032	280	280	243	264
29	0.256	2,245	0.252	2,212	0.234	2,053	0.267	2,345	2,345	2,053	2,214
30	1.018	8,938	0.869	7,633	0.721	6,334	0.928	8,150	8,938	6,334	7,764
31	0.057	499	0.063	549	0.048	424	0.055	481	549	424	488
32	0.024	207	0.026	230	0.022	195	0.020	176	230	176	202
33	0.037	324	0.041	363	0.033	290	0.033	289	363	289	316
34	1.159	10,183	1.020	8,958	1.187	10,423	1.554	13,646	13,646	8,958	10,803
35	1.713	15,046	1.426	12,527	1.359	11,937	1.566	13,760	15,046	11,937	13,317
36	0.048	418	0.047	414	0.042	367	0.039	339	418	339	384
37	0.044	386	0.043	378	0.043	381	0.033	286	386	286	358
38	0.013	116	0.015	132	0.014	121	0.012	104	132	104	118
39	0.024	211	0.024	206	0.020	177	0.022	191	211	177	196
40	0.034	296	0.036	318	0.034	295	0.037	322	322	295	308
41	0.043	381	0.044	384	0.045	395	0.052	457	457	381	404

Table F-2. 100-N Area Shoreline Radiation Survey (uR/hr). (sheet 1 of 3)

Location*	1987	1988	1989	1990	1991	1992
1	16	33	11	14	11	12
2	18	34	13	14	15	13
3	20	35	17	16	14	14
4	21	38	18	18	17	18
5	26	39	19	22	18	18
6	30	43	25	27	17	20
7	38	67	31	36	20	28
8	46	91	36	46	33	37
9	55	115	43	55	46	46
10	60	138	49	64	59	55
11	70	162	55	74	72	65
12	75	186	60	83	85	70
13	80	210	65	90	100	75
14	90	270	75	120	110	100
15	110	320	85	150	120	105
16	110	380	100	160	140	110
17	105	350	105	140	130	120
18	100	370	85	90	100	100
19	90	380	70	80	80	70
20	85	460	55	70	70	50
21	80	460	50	60	50	45
22	95	490	55	50	50	50
23	100	490	55	50	50	40
24	115	480	50	50	40	40
25	120	440	60	50	50	50
26	140	420	60	50	50	50
27	150	410	65	60	50	50
28	170	380	70	60	50	60
29	200	390	80	60	50	60
30	230	390	90	60	50	70
31	260	400	110	70	50	80
32	300	400	115	80	50	80

Table F-2. 100-N Area Shoreline Radiation Survey (uR/hr). (sheet 2 of 3)

Location*	1987	1988	1989	1990	1991	1992
33	320	420	120	90	70	80
34	325	390	130	100	80	100
35	310	370	135	120	90	100
36	300	340	145	110	90	100
37	290	310	145	130	90	110
38	290	290	150	130	100	110
39	280	300	150	150	110	120
40	270	270	170	150	110	120
41	270	260	160	150	110	120
42	270	270	170	170	120	130
43	280	250	195	170	130	140
44	290	250	210	180	130	145
45	290	250	225	210	140	150
46	300	280	240	230	140	150
47	310	290	240	240	150	160
48	340	290	225	230	180	170
49	330	300	240	270	170	160
50	350	320	240	250	180	160
51	350	330	230	270	180	160
52	370	320	240	250	170	160
53	400	310	245	250	170	170
54	380	320	235	240	190	160
55	370	320	230	240	180	160
56	360	290	230	220	170	150
57	350	300	225	210	170	140
58	340	290	210	210	170	130
59	320	290	205	200	150	120
60	300	260	190	200	160	120
61	280	260	175	170	140	110
62	250	240	165	150	140	100
63	240	230	160	150	130	90
64	220	200	145	140	120	80

Table F-2. 100-N Area Shoreline Radiation Survey (uR/hr). (sheet 3 of 3)

Location*	1987	1988	1989	1990	1991	1992
65	210	180	140	120	120	80
66	180	180	115	90	110	70
67	170	170	110	110	90	60
68	160	150	100	100	90	60
69	140	140	90	90	80	60
70	130	120	85	80	70	50
71	120	100	80	70	70	40
72	110	100	75	70	60	40
73	110	80	65	60	50	40
74	90	80	65	60	50	30
75	80	80	55	50	50	30
76	70	70	55	40	50	27
77	70	60	40	40	40	26
78	60	60	40	30	40	22
79	50	50	35	30	30	21
80	40	50	33	30	30	20
81	40	45	30	25	30	19
82	40	35	30	24	30	17
83	35	35	25	24	30	17
84	30	33	23	20	30	16
85	30	32	20	18	30	14
86	20	29	18	18	20	13
87	20	27	18	19	20	14
88	20	22	17	17	15	14
89	20	22	16	15	15	12
90	18	22	15	15	15	12
91	18	20	15	13	14	11
92	15	19	13	13	13	10
93	12	15	13	13	12	9

*For survey point location refer to Figure 7-1.

Table F-3. 200/600 Area Thermoluminescent Dosimeter Results (1992). (sheet 1 of 3)

Site ID	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Annual stats (mrem/yr)		
	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	Max	Min	Avg
202	0.309	113	0.223	81	0.234	85	0.306	112	113	81	98
203	0.307	112	0.258	94	0.232	85	0.312	114	114	85	101
204	0.404	147	0.331	121	0.322	118	0.439	160	160	118	137
205	0.293	107	0.24	88	0.223	81	0.274	100	107	81	94
206	0.267	97	0.281	103	0.233	85	0.322	118	118	85	101
207	0.279	102	0.246	90	0.257	94	0.28	102	102	90	97
208	0.589	215	0.424	155	0.466	170	0.554	202	215	155	186
209	0.312	114	0.225	82	0.24	88	0.282	103	114	82	97
210	0.442	161	0.348	127	0.346	126	0.448	164	164	126	145
211	0.321	117	0.232	85	0.266	97	0.318	116	117	85	104
212	0.281	103	0.259	95	0.256	93	0.282	103	103	93	98
213	0.277	101	0.252	92	0.253	92	0.277	101	101	92	97
214	0.297	108	0.251	92	0.263	96	0.3	110	110	92	101
215	0.288	105	0.266	97	0.262	96	0.29	106	106	96	101
216	0.323	118	0.224	82	0.268	98	0.282	103	118	82	100
217	0.308	112	0.23	84	0.269	98	0.278	101	112	84	99
218	0.306	112	0.28	102	0.236	86	0.287	105	112	86	101
219	0.289	105	0.262	96	0.232	85	0.311	114	114	85	100
220	0.282	103	0.281	103	0.262	96	0.312	114	114	96	104
221	0.301	110	0.286	104	0.288	105	0.295	108	110	104	107
222	0.268	98	0.251	92	0.259	95	0.284	104	104	92	97
223	0.323	118	0.29	106	0.284	104	0.334	122	122	104	112

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Table F-3. 200/600 Area Thermoluminescent Dosimeter Results (1992). (sheet 2 of 3)

Site ID	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Annual stats (mrem/yr)		
	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	Max	Min	Avg
224	0.318	116	0.294	107	0.258	94	0.303	111	116	94	107
225	0.391	143	0.368	134	0.333	122	0.391	143	143	122	135
226	0.284	104	0.249	91	0.224	82	0.267	97	104	82	93
227	0.261	95	0.235	86	0.218	80	0.276	101	101	80	90
228	0.248	91	0.242	88	0.262	96	0.258	94	96	88	92
229	0.295	108	0.282	103	0.293	107	0.317	116	116	103	108
230	0.424	155	0.433	158	0.4	146	0.432	158	158	146	154
231	0.355	130	0.276	101	0.251	92	0.359	131	131	92	113
232	0.314	115	0.241	88	0.261	95	0.321	117	117	88	104
233	0.342	125	0.259	95	0.277	101	0.314	115	125	95	109
234	0.301	110	0.277	101	0.283	103	0.301	110	110	101	106
235	0.299	109	0.231	84	0.272	99	0.317	116	116	84	102
236	0.287	105	0.222	81	0.269	98	0.303	111	111	81	99
237	0.344	126	0.287	105	0.317	116	0.345	126	126	105	118
238	0.304	111	0.234	85	0.274	100	0.3	110	111	85	101
239	0.295	108	0.265	97	0.244	89	0.285	104	108	89	99
240	0.292	107	0.238	87	0.265	97	0.298	109	109	87	100
241	0.345	126	0.267	97	0.329	120	0.306	112	126	97	114
242	0.3	110	0.243	89	0.251	92	0.261	95	110	89	96
243	0.291	106	0.223	81	0.265	97	0.268	98	106	81	96
244	0.265	97	0.225	82	0.255	93	0.291	106	106	82	95
245	0.27	99	0.283	103	0.266	97	0.309	113	113	97	103

Table F-3. 200/600 Area Thermoluminescent Dosimeter Results (1992). (sheet 3 of 3)

Site ID	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Annual stats (mrem/yr)		
	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	Max	Min	Avg
246	0.289	105	0.267	97	0.231	84	0.294	107	107	84	99
247	0.311	114	0.278	101	0.256	93	0.335	122	122	93	108
249	0.934	341	0.638	233	0.502	183	0.656	239	341	183	249
250	0.399	146	0.397	145	0.382	139	0.417	152	152	139	146
251	0.371	135	0.342	125	0.341	124	0.366	134	135	124	130
252	0.335	122	0.295	108	0.292	107	0.338	123	123	107	115
253	0.276	101	0.291	106	0.276	101	0.308	112	112	101	105
254	0.31	113	0.33	120	0.301	110	0.346	126	126	110	117
255	0.355	130	0.336	123	0.317	116	0.376	137	137	116	126
256	2.046	747	1.523	556	1.596	583	1.89	690	747	556	644
258	1.32	482	2.354	859	1.114	407	1.245	454	859	407	551
259	0.407	149	0.382	139	0.387	141	0.414	151	151	139	145
260	0.425	155	0.357	130	0.37	135	0.399	146	155	130	142
261	0.37	135	0.302	110	0.293	107	0.352	128	135	107	120

Table F-4. 300/400 Areas Thermoluminescent Dosimeter Results, 1992.

Site ID	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		Annual stats (mrem/yr)		
	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	mrem/hr	mrem/yr	Max	Min	Avg
1	0.258	94	0.29	106	0.195	71	0.221	81	106	71	88
2	0.251	92	0.271	99	0.202	74	0.216	79	99	74	86
3	0.26	95	0.281	103	0.213	78	0.228	83	103	78	90
4	0.369	135	0.499	182	0.319	116	0.396	145	182	116	144
5	0.238	87	0.223	81	0.181	66	0.225	82	87	66	79
6	0.285	104	0.309	113	0.245	89	0.323	118	118	89	106
7	1.073	392	1.717	627	1.56	569	2.316	845	845	392	608
8	0.222	81	0.337	123	0.252	92	0.276	101	123	81	99
9	0.236	86	0.312	114	LOST		0.217	79	114	79	93
10	0.246	90	0.275	100	0.194	71	0.229	84	100	71	86
11	0.31	113	0.315	115	0.248	91	0.292	107	115	91	106
12	0.227	83	0.234	85	0.185	68	0.249	91	91	68	82
13	0.237	87	0.242	88	0.199	73	0.26	95	95	73	86
14	0.243	89	0.269	98	0.194	71	0.251	92	98	71	87
15	0.241	88	0.297	108	0.207	76	0.253	92	108	76	91

Figure F-1. Thermoluminescent Dosimeter Locations in the 100-N Area.

29202060.1

Figure F-2. Thermoluminescent Dosimeter Locations in the 200 East Area.

29105030.2

Figure F-3. Thermoluminescent Dosimeter Locations in the 200 West Area.

Figure F-4. Thermoluminescent Dosimeter Locations in the 241-A Tank Farm Complex.

Figure F-5. Thermoluminescent Dosimeter Locations at the 300 Area.

29207026.12

Figure F-6. Thermoluminescent Dosimeter Locations at the 400 Area.

39003105.2

Figure F-7. 100-N Environmental Dose Rates Survey Points Around the 1325-N LWDF (1991).

Figure F-8. 100-N Environmental Dose Rates Survey Points Around the 1301-N LWDF (1991).

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APPENDIX G

SURFACE WATER DISPOSAL UNIT (POND AND DITCH)
MONITORING FIGURES AND TABLES

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Table G-1. Radiological Results for Liquid Samples from Surface Water Disposal Units 200/600 Areas (pCi/L), 1992. (sheet 1 of 2)

Sample locations	# of samples	Total beta	Total alpha	¹³⁷ Cs	⁹⁰ Sr	³ H
216-T-4 Ditch	12	Mean Max Min	5.8 E-1 2.6 E+0 3.1 E-2	4.6 E+1 7.5 E+1 3.5 E+1	1.1 E+1 2.8 E+1 4.7 E+0	<DL ^a <DL <DL
216-B-3-3 Ditch	12	Mean Max Min	3.1 E-1 8.3 E-1 5.3 E-2	4.2 E+1 4.9 E+1 3.5 E+1	7.1 E+0 1.0 E+1 2.9 E+0	1.2 E+3 2.1 E+3 <DL
216-B-3 Pond (East)	12	Mean Max Min	2.6 E-1 6.3 E-1 6.1 E-3	4.1 E+1 4.8 E+1 3.5 E+1	8.0 E+0 1.3 E+1 5.8 E+0	7.0 E+2 1.5 E+3 <DL
216-B-3 Pond (South)	12	Mean Max Min	5.0 E-1 1.2 E+1 2.5 E-1	4.0 E+1 4.7 E+0 3.6 E-2	1.4 E+1 6.4 E+1 5.3 E+0	8.6 E+2 2.1 E+3 <DL
216-B-3 Pond (Overflow)	12	Mean Max Min	1.0 E+0 4.5 E+0 2.5 E-2	4.6 E-1 9.2 E+1 3.6 E+1	1.2 E+1 3.1 E+1 1.1 E+1	7.1 E+2 1.6 E+3 <DL
200 West Area Powerhouse Pond	12	Mean Max Min	2.5 E-1 3.5 E-1 1.7 E-1	4.1 E+1 4.8 E+1 3.5 E+1	1.6 E+1 7.8 E+1 2.9 E+0	4.6 E+2 5.5 E+2 <DL
216-B-3 Pond 3rd Overflow	12	Mean Max Min	4.8 E-1 1.2 E+0 8.6 E-2	4.1 E+1 4.8 E+1 3.5 E+1	8.5 E+0 1.4 E+1 3.3 E+0	9.5 E+2 1.9 E+3 <DL
216-Z-21 Basin	12	Mean Max Min	3.2 E-1 8.8 E-1 1.2 E-2	4.0 E+1 4.7 E+1 3.4 E+1	5.9 E+0 1.0 E+1 3.4 E+0	7.3 E+2 1.6 E+3 <DL

Table G-1. Radiological Results for Liquid Samples from Surface Water Disposal Units 200/600 Areas
(pCi/L), 1992. (sheet 2 of 2)

Sample locations	# of samples		Total beta	Total alpha	^{137}Cs	^{90}Sr	^3H
200 East Area Powerhouse Pond	12	Mean Max Min	1.7 E+0 1.6 E+1 2.6 E-2	1.3 E+0 7.9 E+0 3.1 E-2	4.1 E+1 4.8 E+1 3.4 E+1	8.1 E+0 1.5 E+1 3.6 E+0	6.3 E+2 8.3 E+2 <DL ^a
216-U-14 Ditch	09	Mean Max Min	3.0 E+1 9.2 E+2 9.4 E-2	1.2 E+1 2.9 E+1 7.9 E-2	4.0 E+1 4.8 E+1 3.3 E+1	7.8 E+0 1.2 E+1 3.5 E+0	<DL <DL <DL
DCG			1.0 E+3 ^b	3.0 E+1 ^c	3.0 E+3	1.0 E+3	2.0 E+4

^aDL = Detection Limit of ^3H = 4.5 E+2 pCi/L.

^bUsing ^{90}Sr DCG for comparison.

^cUsing ^{239}Pu DCG for comparison.

Table G-2. Nonradiological Results for Liquid Samples from Surface Water Disposal Units.

Location/ sample	pH				Nitrate (NO ₃ ⁻)			
	# of samples	Mean	Max	Min	# of samples	mg/L		
						Mean	Max	Min
216-T-4 Ditch	47	7.4	8.3	6.7	4	2.0	3.9	<DL
216-B-3-3 Ditch	50	8.1	8.7	7.4	4	<DL	<DL	<DL
216-B-3 Pond (East)	51	8.7	9.7	7.8	4	<DL	<DL	<DL
216-B-3 Pond (South)	51	8.6	9.3	7.9	4	<DL	<DL	<DL
216-B-3 Pond (Overflow)	51	8.8	9.7	7.9	4	<DL	<DL	<DL
200 West Area Powerhouse Pond	49	9.5	10.3	7.1	4	<DL	<DL	<DL
216-B-3 Pond 3rd Overflow	51	8.8	9.7	8.1	4	<DL	<DL	<DL
216-Z-21 Basin	51	8.3	8.8	7.6	4	<DL	<DL	<DL
200 East Area Powerhouse Pond	51	9.1	9.6	8.1	4	<DL	<DL	<DL
216-U-14 Ditch	39	7.2	9.5	6.5	4	<DL	<DL	<DL

Table G-3. Radiological Results for Aquatic Vegetation from Surface Water Disposal Units 200/600 Areas
(pCi/g dry weight), 1992.

Sample location	¹³⁷ Cs	⁹⁰ Sr	^{239,240} Pu	U total (g/g)
216-T-4 Ditch	<4.9	1.2	13.0	5.2 E-8
216-B-3-3 Ditch	7.8	1.4	<0.38	3.6 E-8
216-B-3 Pond (East)	<0.41	1.5	<0.41	5.5 E-8
216-B-3 Pond (South)	<0.30	<0.69	<0.44	7.7 E-8
216-B-3 Pond Overflow	<5.3	<0.61	<0.40	3.1 E-8
200 West Area Powerhouse Pond	<0.79	<0.69	<0.48	8.6 E-8
216-B-3 3rd Overflow	<4.3	<0.72	<0.46	2.3 E-8
216-Z-21 Basin	<0.86	<0.47	<0.47	2.1 E-8
200 East Area Powerhouse Pond	<3.6	5.6	<0.38	3.7 E-8
216-U-14 Ditch	0.97	<0.73	<0.48	2.4 E-7

Table G-4. Radiological Results for Sediment Samples from Surface Water Disposal Units 200/600 Areas
(pCi/g dry weight), 1992.

Sample location	¹³⁷ Cs	⁹⁰ Sr	^{239,240} Pu	U total (g/g)
216-T-4 Ditch	34	0.55	1.2	2.9 E-7
216-B-3-3 Ditch	110	1.1	14	7.9 E-7
216-B-3 Pond (East)	7.7	2.3	0.7	3.8 E-7
216-B-3 Pond (South)	15	0.45	1.4	4.4 E-7
216-B-3 Overflow	16	0.38	1.3	1.7 E-6
200 West Area Powerhouse Pond	<0.15	<0.11	<0.50	6.3 E-7
216-B-3 Pond 3rd Overflow	1.6	NR	7.5	7.7 E-7
216-Z-21 Basin	<0.12	<0.58	<0.35	3.0 E-7
200 East Area Powerhouse Pond	<0.24	0.41	<0.47	7.0 E-7
216-U-14 Ditch	4.6	<0.31	<0.37	1.2 E-5

NR = Not reported.

Figure G-1. N Springs Sample Sites.

Figure G-2. 200 East Area Pond and Ditch Sample Sites.

H9305012.2

Figure G-3. 200 West Area Pond and Ditch Sample Sites.

APPENDIX H

**RADIOLOGICAL SURVEYS FIGURES
AND TABLES**

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Figure H-2. Radiological Survey Locations in the 100-D and -DR Area.

Figure H-3. Radiological Survey Locations in the 100-F Area.

29103008.5

Figure H-4. Radiological Survey Locations in the 100-H Area.

29103008.1

Figure H-5. Radiological Survey Locations in the 100-K Area.

Figure H-6. Radiological Survey Locations in the 100-N Reactor Area.

29105057.1

Figure H-7. Radiological Survey Locations in the 200 East Area.

29103008.7

Figure H-8. Radiological Survey Locations in the 200 West Area.

29103008.6

Figure H-9. Radiological Survey Locations in the 600 Area.

Figure H-10. Radiological Survey Locations in the 300 Area.

29103008.8

APPENDIX I
SPECIAL SAMPLING FIGURES
AND TABLES

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Table I-1. Investigative Soil Samples Collected from the Operations Areas in 1992. (sheet 1 of 5)

Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides detected	Concentration (pCi/g) ^d
216-U-14 Ditch/ 200 West Area	Background	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U ^e	4.8 E+02 4.2 E-01 1.7 E 00 6.4 E+01
216-U-14 Ditch/ 200 West Area	Background	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	9.5 E+02 1.2 E 00 9.4 E 00 2.5 E+01
216-U-14 Ditch/ 200 West Area	Background	¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	8.9 E+02 2.6 E+01 1.2 E 00 2.2 E 00 4.0 E+01
216-U-14 Ditch/ 200 West Area	Background	¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	7.0 E+01 2.3 E+01 <3.1 E-01 ^f 5.0 E-01 1.0 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ⁶⁰ Co ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	1.6 E 00 2.3 E 00 4.2 E+02 1.0 E+01 1.8 E 00 1.1 E 00 1.0 E+02
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	<9.0 E-01 1.5 E+03 1.2 E+01 2.1 E 00 8.6 E-01 5.1 E+02
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ²¹⁴ Pb ^{239/240} Pu ⁹⁰ Sr Total U	<7.5 E-01 1.5 E 00 1.2 E+01 6.1 E-01 <3.8 E-01 1.6 E 00 6.9 E+01

Table I-1. Investigative Soil Samples Collected from the Operations Areas in 1992. (sheet 2 of 5)

Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides detected	Concentration (pCi/g) ^d
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<8.5 E-01 <4.5 E-01 <4.2 E-01 2.5 E 00 1.9 E+01
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ²³⁸ Pu ^{239/240} Pu ⁹⁰ Sr Total U	<7.3 E-01 <5.3 E-01 4.8 E-01 <3.6 E-01 2.0 E 00 1.7 E+01
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	<7.5 E-01 1.2 E 00 8.5 E 00 <3.8 E-01 1.8 E 00 1.2 E+01
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<7.2 E-01 1.6 E+03 1.5 E 00 6.2 E-01 2.0 E+01
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<7.5 E-01 3.7 E+01 <3.8 E-01 3.2 E 00 5.9 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.0 E-01 <5.1 E-01 <2.5 E-01 7.5 E 00 3.6 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.3 E-01 8.9 E-01 <2.6 E-01 6.6 E 00 2.9 E 00

Table I-1. Investigative Soil Samples Collected from the Operations Areas in 1992. (sheet 3 of 5)

Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides detected	Concentration (pCi/g) ^d
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.3 E-01 <4.9 E-01 <2.6 E-01 1.2 E 00 3.9 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	<5.8 E-01 1.0 E+02 1.1 E+01 <2.9 E-01 2.9 E 00 7.4 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	<7.0 E-01 1.1 E+02 6.3 E 00 <3.5 E-01 <8.5 E-01 1.7 E+01
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U ₃	<5.3 E-01 5.2 E+01 <2.6 E-01 6.8 E-01 1.6 E+01
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.2 E-01 <5.7 E-01 3.3 E-01 2.5 E 00 5.6 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	<5.7 E-01 1.4 E 00 8.8 E 00 <2.8 E-01 <7.3 E-01 6.2 E 00
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.4 E-01 <4.6 E-01 <2.6 E-01 6.0 E-01 4.9 E 00

Table I-1. Investigative Soil Samples Collected from the Operations Areas in 1992. (sheet 4 of 5)

Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides detected	Concentration (pCi/g) ^d
216-U-14 Ditch/ 200 West Area	Background	²⁴¹ Am ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	1.7 E 00 2.1 E 00 1.1 E+01 <3.9 E-01 <3.9 E-01 6.4 E 00
202 B Plant/200 East Area	30,000 cpm	¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	1.9 E+02 9.6 E 00 1.3 E 00 2.0 E+05 3.8 E 00
202 B Plant/200 East Area	30,000 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	1.9 E+03 3.8 E 00 1.0 E+06 5.0 E 00
202 B Plant/200 East Area	30,000 cpm	¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	2.3 E+02 1.0 E+01 <5.0 E-01 7.7 E+01 5.0 E 00
202 B Plant/200 East Area	30,000 cpm	¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	3.4 E+02 1.1 E+01 6.5 E-01 2.6 E+02 4.1 E 00
D Island/600 Area	9 mrad/6 mR	⁶⁰ Co ¹³⁷ Cs	1.1 E+07 ^g <4.1 E+03 ^g
D Island/600 Area	11 mrad/2.5 mR	⁶⁰ Co ¹³⁷ Cs	3.9 E+06 ^g <4.6 E+03 ^g
201 C/200 East Area	20,000 cpm	²⁴¹ Am ²¹⁴ Bi ¹³⁷ Cs ¹⁵⁴ Eu ⁴⁰ K ²¹² Pb ²¹⁴ Pb ²⁰⁸ Tl ^{239/240} Pu ⁹⁰ Sr Total U	1.9 E 00 6.5 E-01 2.6 E+01 6.9 E-01 1.6 E+01 1.1 E 00 8.2 E-01 3.3 E-01 5.2 E 00 3.5 E+02 5.4 E-01

Table I-1. Investigative Soil Samples Collected from the Operations Areas in 1992. (sheet 5 of 5)

Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides detected	Concentration (pCi/g) ^d
Near Treated Effluent Disposal Facility Site/300 Area	800 cpm	²³⁴ Th ^{234m} Pa ²³⁵ U ²¹⁴ Bi ¹³⁷ Cs ²¹² Pb ²¹⁴ Pb ²⁰⁸ Tl ^{239/240} Pu ⁹⁰ Sr Total U	7.3 E+02 1.1 E+03 3.8 E+01 4.8 E-01 2.6 E-01 6.6 E-01 7.1 E-01 1.8 E-01 <3.5 E-01 3.0 E-01 2.2 E+03
Near Treated Effluent Disposal Facility Site/300 Area	1,000 cpm	²³⁴ Th ^{234m} Pa ²³⁵ U ²¹⁴ Bi ²¹² Pb ²¹⁴ Pb ²⁰⁸ Tl ^{239/240} Pu ⁹⁰ Sr Total U	2.5 E+02 3.5 E+02 1.3 E+01 6.7 E-01 6.7 E-01 5.9 E-01 2.3 E-01 <3.5 E-01 2.3 E-01 7.4 E+02
7th & Baltimore/ 200 West Area	40,000 cpm 3 mR	²²⁸ Ac ²¹⁴ Bi ¹³⁷ Cs ⁴⁰ K ²¹² Pb ²¹⁴ Pb ²⁰⁸ Tl ^{239/240} Pu ⁹⁰ Sr Total U	6.9 E-01 4.2 E-01 1.9 E 00 1.1 E+01 6.1 E-01 5.5 E-01 1.7 E-01 <4.6 E-01 4.8 E 00 3.3 E-02

^aCounts per minute.^bMillirad per hour (absorbed dose from all types of radiation).^cMilliroentgen per hour (exposure from x-rays or gamma radiation).^dPicocuries per gram.^eUranium originally reported in grams of uranium per gram of soil was converted to picocuries per gram of soil (specific activity of 9.4 E+05 picocuries per gram multiplied times g/g of uranium).^fThe less than symbol (<) means that the reported value was less than the detection capability of the counting instrument.^gPicocuries per sample.

Table I-2. Investigative Tumbleweed Samples Collected from the Operations Areas in 1992.

Sample location	External radioactivity (cpm) ^a	Radionuclides detected	Concentration (pCi/g) ^b
118-F-5 Burial Ground/100 F Area	1,500 cpm	¹³⁷ Cs Total U ^d	<9.6 E-01 ^c 3.1 E-01
216-U-14 Ditch/200 West Area	5,000 cpm	Not Analyzed	Not Analyzed
UN-216-E-5/200 East Area	40,000 cpm	Not Analyzed	Not Analyzed
UN-216-E-16/200 East Area	600 cpm	Not Analyzed	Not Analyzed
207-T Retention Basin/200 West Area	2,000 cpm	Not Analyzed	Not Analyzed
216-A-40 Basin/200 East Area	350 cpm	Not Analyzed	Not Analyzed
216-A-30 Crib/200 East Area	3,000 cpm	Not Analyzed	Not Analyzed
216-Z-5 Crib/200 West Area	25,000 cpm	Not Analyzed	Not Analyzed
216-A-6 Crib/200 East Area	900 cpm	Not Analyzed	Not Analyzed
216-U-11 Crib/200 West Area	700 cpm	Not Analyzed	Not Analyzed
216-B-1-2-3 Ditch/200 East Area	Not Reported	Not Analyzed	Not Analyzed
199-H-4-46 Well/100 H Area	300	Not Analyzed	Not Analyzed
116-H-2 Crib/100 H Area	Not Reported	Not Analyzed	Not Analyzed

^aCounts per minute.^bPicocuries per gram.^cThe less than symbol (<) means that the reported value was less than the detection capability of the counting instrument.^dUranium originally reported in grams of uranium per gram of soil was converted to picocuries per gram of soil (specific activity of 9.4 E+05 picocuries per gram multiplied times g/g of uranium).

Table I-3. Investigative Wildlife Samples Collected from the Operations Areas in 1992. (sheet 1 of 4)

Sample type	Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides	Concentration (pCi/g ^d)
House mouse	202-A/200 East Area	Not Reported	²¹⁴ Bi ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	7.5 E+00 6.7 E+01 1.2 E+02 <5.6 E+05 ^{e,f} 5.4 E+02 ^f 7.5 E-03
House mouse	202-A/ 200 East Area	2,800 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<7.5 E 00 <5.0 E 00 2.9 E+03 1.2 E-02
House mouse wash			¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<1.9 E+01 <5.0 E+06 ^f 2.0 E+01 ^f 1.7 E-02
House mouse	202-A/ 200 East Area	2,800 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.5 E 00 <4.0 E-01 2.4 E 00 7.5 E 00
House mouse wash			¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	1.9 E+01 <5.0 E+06 ^f 6.2 E 00 ^f 1.5 E-02
Deer mouse (fur & bone)	284-W/ 200 West Area (roof)	400 cpm	Not Analyzed	Not Analyzed
House mouse	202-A/ 200 East Area	2,800 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<2.1 E+01 <1.6 E 00 2.8 E+03 7.7 E-02
House mouse wash			¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<1.8 E+01 <5.0 E+06 ^f 1.0 E+01 ^f 3.3 E-02

Table I-3. Investigative Wildlife Samples Collected from the Operations Areas in 1992. (sheet 2 of 4)

Sample type	Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides	Concentration (pCi/g ^d)
House mouse	202-A/ 200 West Area	2,800 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	1.8 E+01 <2.0 E 00 6.3 E+01 3.7 E-02
House mouse wash			¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<2.0 E+01 <5.0 E 06 ^f 1.4 E+01 ^f 2.2 E+01 ^f
Pigeon feces	Tank at 221-C/ 200 East Area	Tank contaminated to 99,990 cpm alpha	²⁴¹ Am ¹³⁷ Cs ²³⁸ Pu ^{239/240} Pu	5.9 E 00 2.8 E+01 9.1 E-01 6.8 E+01
House mouse	244-AR Vault/ 200 East Area	9 mR/h	¹³⁷ Cs Total U	1.5 E+03 1.3 E 00
House mouse wash			¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	3.8 E+02 ^f <1.0 E+07 ^f 1.1 E+03 ^f 2.2 E-01 ^f
House mouse	244-A Lift Station/ 200 East Area	400 cpm	¹³⁷ Cs Total U	<4.6 E 00 1.9 E-02
House mouse wash			¹³⁷ Cs ²³⁸ Pu ^{239/240} Pu ⁹⁰ Sr Total U	<7.6 E+01 ^f <1.4 E+01 ^f <1.0 E+01 ^f 2.7 E+01 ^f 4.2 E-01 ^f
Gopher snake	Grout Facility/ 200 East Area	500 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	7.2 E+01 <7.6 E-01 3.0 E+02 7.4 E-02
Cliff swallow nest	222-T/200 West Area	20,000 cpm	⁶⁰ Co ¹³⁷ Cs ⁴⁰ K ^{239/240} Pu ⁹⁰ Sr Total U	1.7 E 00 5.0 E+01 1.2 E+01 7.1 E-01 6.8 E+01 5.3 E-01

Table I-3. Investigative Wildlife Samples Collected from the Operations Areas in 1992. (sheet 3 of 4)

Sample type	Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides	Concentration (pCi/g ^d)
Cliff swallow nest	202-A/200 East Area	35,000 cpm	⁶⁰ Co ¹³⁷ Cs ¹⁵⁴ Eu ¹⁵⁵ Eu ⁵⁴ Mn ²³⁸ Pu ^{239/240} Pu ⁹⁰ Sr Total U	7.4 E+04 2.3 E+03 4.8 E+02 1.8 E+02 1.6 E+02 7.5 E 00 4.7 E+01 3.4 E+02 9.3 E-01
House mouse (3)	333 Bldg/300 Area	400 cpm	¹⁴⁴ Ce/Pr ⁶⁰ Co ¹³⁷ Cs ¹⁵⁴ Eu ¹⁵⁵ Eu ¹⁰⁶ Ru/Rh ¹²⁵ Sb ²³⁸ Pu ^{239/240} Pu Total U	3.8 E+04 9.7 E+01 5.5 E+02 6.5 E+02 1.7 E+03 4.2 E+03 1.6 E+03 8.8 E-01 1.8 E+01 2.0 E-02
Duck eggs	100 F Area	Background	¹³⁷ Cs ⁹⁰ Sr	<1.4 E 00 <3.6 E-08
Deer mouse	1706 KE/100 K Area	4,000 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	1.1 E+02 <4.6 E-01 1.4 E+03 ^f 4.8 E-02
Nuttall's cottontail rabbit	PFP/200 West Area	Background	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<2.0 E+01 ^f <5.0 E 00 2.7 E+06 ^f 4.6 E 00
Deer mouse	338 Bldg/300 Area	300 cpm	¹³⁷ Cs ⁹⁰ Sr Total U	2.6 E+03 6.3 E+01 6.4 E-01
Deer mouse	105 KE/100 K Area	150 cpm	¹³⁷ Cs Total U	2.6 E+01 5.1 E-01
House mice (2)	M0-909/200 West Area (by 222-T)	10,000 cpm	¹³⁷ Cs ⁹⁰ Sr Total U	<2.1 E+03 ^f 3.1 E+09 ^f 9.0 E-02

Table I-3. Investigative Wildlife Samples Collected from the Operations Areas in 1992. (sheet 4 of 4)

Sample type	Sample location	External radioactivity (cpm ^a , mrad/h ^b , or mR/h ^c)	Radionuclides	Concentration (pCi/g ^d)
Gopher snake	202-B/ 200 East Area (Electrical Gallery)	500 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	7.9 E+03 <1.3 E 00 9.0 E+02 ^f 1.1 E-01
Deer mouse	105 KE/ 100 K Area	700 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	3.8 E+01 <1.1 E 00 2.0 E+01 ^f 9.3 E-02
Deer mouse	MO-012/ 200 East Area	3,000 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<9.3 E 00 <6.7 E-01 9.4 E+02 ^f 7.1 E-02
Deer mouse	MO-927/ 200 East Area	1,200 cpm	¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<2.5 E+01 <5.5 E-01 6.3 E+02 ^f 3.8 E-03
Deer mouse wash			¹³⁷ Cs ^{239/240} Pu ⁹⁰ Sr Total U	<5.9 E-01 <5.0 E 00 3.4 E+01 ^f 5.3 E+01
Black-tailed jackrabbit rabbit	201-C/ 200 East Area	50,000 cpm 10 mrad/h 0.5 mR/h	¹³⁷ Cs ¹⁵⁴ Eu ²³⁸ Pu ^{239/240} Pu ⁹⁰ Sr Total U	5.6 E+01 1.6 E 00 3.3 E-01 1.9 E+01 1.1 E+09 ^f 5.4 E-02
Black-tailed jackrabbit wash			¹³⁷ Cs ⁹⁰ Sr Total U	4.9 E+02 ^f 6.3 E+02 ^f 7.1 E-01 ^f

^aCounts per minute.

^bMillirad per hour (absorbed dose from all types of radiation).

^cMilliroentgen per hour (exposure from x-rays or gamma radiation).

^dPicocuries per gram.

^eThe less than symbol (<) means that the reported value was less than the detection capability of the counting instrument.

^fPicocuries per sample.

^gUranium originally reported in grams of uranium per gram of soil was converted to picocuries per gram of soil (specific activity of 9.4 E+05 picocuries per gram multiplied times g/g of uranium).

APPENDIX J
CONCENTRATION GUIDES

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Table J-1. Airborne Derived Concentration Guides.

Radionuclide	DCG ¹ (pCi/m ³)
⁹⁰ Sr	9
¹³⁷ Cs	400
¹⁰⁶ Ru	30
²³⁹ Pu	0.02

¹Derived Concentration Guides.

Table J-2. Groundwater Administrative Control Value Versus Derived Concentration Guides for Water (pCi/L).

Administrative control values				
Radionuclide	200 East	200 West	600 Area	DCG ¹
³ H	None	None	None	200,000
⁶⁰ Co	5,000	5,000	5,000	5,000
⁹⁰ Sr	74	480	40	1,000
⁹⁹ Tc	4,000	4,000	4,000	100,000
¹⁰⁶ Ru	6,000	6,000	240	6,000
¹²⁹ I	20	20	20	500
¹³⁷ Cs	210	1,200	120	3,000
²³⁴ U	20	20	20	500
²³⁵ U, ²³⁸ U	24	24	24	600
²³⁸ Pu	2.0	3.6	1.6	40
²³⁹ Pu, ²⁴⁰ Pu	1.2	1.2	1.2	30

¹Derived Concentration Guides.

Table J-3. Surface Soil Concentration Guides for Posting.

Radionuclide	Guide (pCi/g)
⁵⁸ Co	10,000
⁶⁰ Co	5,000
⁹⁰ Sr	600
¹²⁹ I	4,000
¹³⁴ Cs	10,000
¹³⁷ Cs	20,000
¹⁴⁴ Ce	1,900
¹⁵² Eu	3,000
¹⁵⁴ Eu	3,000
¹⁵⁵ Eu	20,000
²³⁸ Pu	75
²³⁹ Pu	75
²⁴⁰ Pu	75
²³⁴ U	100
²³⁵ U	15
²³⁸ U	50

Reference WHC-CM-7-5, Part K.

Table J-4. Surface Soil Concentration Guides for Release.

Radionuclide	Guide (pCi/g)
⁵⁸ Co	10
⁶⁰ Co	1
⁹⁰ Sr	13
¹²⁹ I	50
¹³⁴ Cs	2
¹³⁷ Cs	3
¹⁴⁴ Ce	75
¹⁵² Eu	3
¹⁵⁴ Eu	3
¹⁵⁵ Eu	100
²³⁸ Pu	75
²³⁹ Pu	75
²⁴⁰ Pu	75
²³⁴ U	100
²³⁵ U	15
²³⁸ U	50

Reference WHC-CM-7-5, Part K.

APPENDIX K
DATA SUMMARY METHODS

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Measuring any physical quantity has some degree of inherent uncertainty. This uncertainty results from the combination of all possible inaccuracies in the measurements process, including such factors as the reading of the result, the calibration of the measuring device, and numerical rounding errors. In this report, individual radioactive measurements are accompanied by a plus or minus ($\pm$) value, which is the uncertainty term known as a two-sigma counting error.

The two-sigma counting error gives information on what the measurement might be if the same sample were counted again under identical conditions. The two-sigma counting error implies that approximately 95 percent of the time, a recount of the same sample would give a value within plus or minus the two-sigma counting error at the value reported.

Values in the tables that are less than the minimum detectable activity indicate that the reported result might have come from a sample with no radioactivity. Such values are considered below the detection limits of the measuring instrument. Also note that each radioactive measurement must have the random background radioactivity of the measuring instrument subtracted; therefore, negative results are possible, especially when the sample has very little radioactivity.

Reported averages also are accompanied by two standard errors of the mean. If the data fluctuates randomly, then the standard error is a measure of the uncertainty in the estimated average of the data because of this randomness. If trends of periodic fluctuations are present, the standard error is primarily a measure of the variability in the trends and fluctuations about the average of the data, rather than a measure of the uncertainty of the estimated average because of random fluctuations in the data.

The average, $\bar{X}$, is computed as:

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$$

where X_i is the i th measurement and n is the number of measurements.

The standard error of $\bar{X}$ was computed as:

$$SE = \sqrt{(S^2/n)}$$

where $S^2_M^n$, the variance of the n measurements, was computed as:

$$S^2_M^n = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$$

This estimator, $S^2_M^n$, includes the variance among the samples and the counting variance. The estimated $S^2_M^n$ occasionally may be less than the average counting variance.

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