



Duane Arnold Energy Center
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Operated by Nuclear Management Company, LLC

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2000 Annual Radiological Environmental Report

Please find attached one (1) copy of the 2000 Annual Radiological Environmental Report for the Duane Arnold Energy Center. This report is transmitted in accordance with the DAEC Offsite Dose Assessment Manual (section 6.4.2) reporting requirements.

Sincerely,

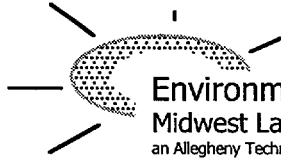
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DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
DOCKET NO. 50-331

ANNUAL REPORT
TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiation Environmental Monitoring Program

January 1 to December 31, 2000

Prepared and submitted by

ENVIRONMENTAL, Inc.
MIDWEST LABORATORY
PROJECT NO. 8001

Approved : _____

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PREFACE

Staff members of the Environmental, Inc., Midwest Laboratory were responsible for the acquisition of data presented in this report, with the exception of Appendices D and E, which were completed by DAEC personnel. All environmental samples, with the exception of aquatic, were collected by personnel of DAEC. Aquatic samples were collected by the University of Iowa Hygenic Laboratory.

The report was prepared by Environmental, Inc., Midwest Laboratory, with the exception of Appendices D and E, which were prepared by DAEC personnel.

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1.0 INTRODUCTION

This report summarizes and interprets results of the Radiological Environmental Monitoring Program conducted by Environmental, Inc., Midwest Laboratory at the Duane Arnold Energy Center, Palo, Iowa, during the period January - December, 2000. This Program monitors the levels of radioactivity in the air, terrestrial, and aquatic environments in order to assess the impact of the Plant on its surroundings.

Tabulation of the individual analyses made during the year are included in Part II of this report.

Duane Arnold Energy Center (DAEC) is located in Linn County, Iowa, on the Cedar River, owned by IES Utilities, Inc and operated by Nuclear Management Corporation. The Duane Arnold Energy Center is a 565.7 MW(e) boiling water reactor. Initial criticality was attained on March 23, 1974. The reactor reached 100% power on August 12, 1974. Commercial operation began on February 1, 1975.

2.0 SUMMARY

The Radiological Environmental Monitoring Program required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Duane Arnold Energy Center is described. Results for 2000 are summarized and discussed.

Program findings show background levels of radioactivity in the environmental samples collected in the vicinity of the Duane Arnold Energy Center. No effect on the environment due to the operation of the Duane Arnold Energy Center is indicated.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

3.1 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program at the Duane Arnold Energy Center (DAEC) is to assess the impact of the plant on its environment. For this purpose, samples are collected from the air, terrestrial, and aquatic environments and analyzed for radioactive content. In addition, ambient gamma radiation levels are monitored by thermoluminescent dosimeters (TLDs).

Sources of environmental radiation include the following:

- (1) Natural background radiation arising from cosmic rays and primordial radionuclides;
- (2) Fallout from atmospheric nuclear detonations;
- (3) Releases from nuclear power plants; and
- (4) Industrial and medical radioactive waste.

In interpreting the data, effects due to the DAEC operation must be distinguished from those due to other sources.

A major interpretive aid in assessment of these effects is the design of the monitoring program at the DAEC which is based on the indicator-control concept. Most types of samples are collected both at indicator locations (nearby, downwind, or downstream) and at control locations (distant, upwind, or upstream). A station effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuations in radiation levels arising from other sources.

An additional interpretive technique involves analyses for specific radionuclides present in the environmental samples collected from the DAEC site. The DAEC's monitoring program includes analyses for strontium-90 and iodine-131, which are fission products, and tritium, which is produced by cosmic rays, atmospheric nuclear detonations, and also by nuclear power plants. Most samples are also analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, and cerium-144. These three gamma-emitting isotopes were selected as radiological impact indicators because of the different characteristic proportions in which they appear in the fission product mix produced by a nuclear reactor and that produced by a nuclear detonation. Each of the three isotopes is produced in roughly equivalent amounts by a reactor: each constitutes about 10% of the total activity of fission products ten (10) days after reactor shutdown. On the other hand, ten (10) days after a nuclear explosion, the contributions of zirconium-95, cerium-144, and cesium-137 to the activity of the resulting debris are in the approximate ratio 4:1:0.03 (Eisenbud, 1963). The other group quantified consists of niobium-95, ruthenium-103 and -106, cesium-134, barium-lanthanum-140, and cerium-141. These isotopes are released in small quantities by nuclear power plants, but to date their major source of injection into the general environment has been atmospheric nuclear testing. Nuclides of the next group, manganese-54, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of nuclear power plant effluents, but are not produced in significant quantities by nuclear detonations.

3.1 Program Design and Data Interpretation (continued)

Nuclides of the final group, beryllium-7, which is of cosmogenic origin, and potassium-40, a naturally-occurring isotope, were chosen as calibration monitors and should not be considered radiological impact indicators.

Characteristic properties of isotopes quantified in gamma-spectroscopic analysis are presented in Table 5.1. Other means of distinguishing sources of environmental radiation can be employed in interpreting the data. Current radiation levels can be compared with previous levels, including those measured before the Plant became operational. Results of the DAEC's Monitoring Program can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.2 Program Description

The sampling and analysis schedule for the environmental radiological monitoring program at the DAEC is summarized in Table 5.2 and is briefly reviewed below. Table 5.3 defines the sampling location codes used in Table 5.2 and specifies for each location its type (indicator or control) and its distance, direction, and sector relative to the reactor site. The types of samples collected at each location and the frequency of collections are presented in Table 5.4 using codes defined in Table 5.5.

To monitor the air environment, airborne particulates are collected on membrane filters by continuous pumping at twelve locations. Also, airborne iodine is collected by continuous pumping through charcoal filters at six of these locations. Nine of the twelve locations are indicators and three are controls (D-1, D-2, and D-13). Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity. If gross beta activity exceeds ten times the yearly mean of the control samples, gamma isotopic analysis is performed. Quarterly composites of airborne particulates from each location are analyzed for gamma emitting isotopes.

Charcoal filters are analyzed weekly for iodine-131 on all samples.

Ambient gamma radiation is monitored at twelve air sampling locations. In addition, gamma radiation is monitored at thirty-three special locations: seventeen in a circle within a 0.5 mi. radius of the DAEC stack; six in 22.5° sectors within 1 mi. of the DAEC stack; and ten in 22.5° sectors between 1 and 3 miles of the DAEC stack. Two TLDs are placed at each location and are exchanged and analyzed quarterly.

Precipitation is collected monthly from one location and analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

Milk samples are collected monthly from five locations during the non-grazing season, October through April, and biweekly during the grazing season, May 1 through September 30. One location is a control (D-105) and the rest are indicators. All samples are analyzed for iodine-131 and gamma-emitting isotopes.

For additional monitoring of the terrestrial environment, grain, hay and broad leaf vegetation samples are collected annually, as available, from nine locations: one control (D-105) and eight indicators (D-16, D-57, D-58, D-63, D-72, D-93, D-94, and D-106). Grain, hay and broad leaf (green leafy) vegetation samples are analyzed for gamma-emitting isotopes and at least one broad leaf vegetation is analyzed for iodine-131. If cattle are slaughtered for home use, a meat sample is collected annually, during or immediately

Program Description (continued)

following a grazing period from animals grazing on-site. The sample is analyzed for gamma-emitting isotopes. Also, potable ground water is collected quarterly from a treated municipal water system (D-53), the inlet to the municipal water treatment system (D-54) and four additional ground water locations (D-55, D-57, D-58, and D-72). The samples are analyzed for gross beta and tritium. If gross beta activity exceeds ten times the yearly mean of the control samples, gamma isotopic, strontium-89 and strontium-90 analyses are performed.

Soil samples are collected once per year at two indicator locations (D-15 and D-16). The samples are analyzed for strontium-90 and gamma-emitting isotopes.

Surface water is collected monthly from five river, pond and sewage effluent locations, one control (D-49) and four indicator (D-50, D-51, D-99, and D-107). All monthly samples are analyzed for gamma-emitting isotopes. Tritium analyses are performed on quarterly composites from each location. In addition, all samples from Location D-107 (plant sewage discharge) are analyzed for potassium-40 by flame photometry.

The aquatic environment is also monitored by upstream and downstream (D-49 and D-61) semiannual collections of fish. River bottom sediment is also collected semiannually at the plant's intake and discharge (D-50 and D-51) and downstream of the sewage plant (D-107). The samples are analyzed for gamma-emitting isotopes.

3.3 Program Execution

The program was executed as described in the preceding section with the following exceptions:

- (1) No milk was available from location D-101 for the months of February and March, 2000. Goats were dry. Milk was not available from location D-93 for the May 31, 2000 collection. Milk was not available from location D-63 in December, 2000. The cows were sold.
- (2) The precipitation sample for September, 2000 was collected as scheduled, but lost in transit.
- (3) TLD data was not available for the third quarter, 2000 from location D-18. Both emergency and regular TLDs were missing in the field.
- (4) The air particulate sample was missed for the week ending 11-22-00. The filter was lost in the field.

3.4 Laboratory Procedures

The iodine-131 analyses in milk were made using a sensitive radiochemical procedure involving separation of the iodine using an ion-exchange method, solvent extraction and subsequent beta counting.

Gamma-spectroscopic analyses were performed with HPGe detectors. Levels of iodine-131 in vegetation were determined by gamma spectroscopy. Concentrations of airborne iodine-131 in charcoal samples were also determined by gamma spectroscopy.

Tritium was determined by a liquid scintillation technique.

Analytical Procedures used by Environmental, Inc. are on file and are available for inspection. Procedures are based on those prescribed by the Health and Safety Laboratory of the U.S. Dep't of Energy, Edition 28, 1997, U.S. Environmental Protection Agency for Measurement of Radioactivity in Drinking Water, 1980, and the U.S. Environmental Protection Agency, EERF, Radiochemical Procedures Manual, 1984.

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (Environmental, Inc., Midwest Laboratory, 2000). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in the crosscheck programs are presented in Appendix A.

3.5 Program Modifications

There were no program modifications during the year, 2000.

4.0 RESULTS AND DISCUSSION

All collections and analyses were made as scheduled, except for the listing in Table 5.6.

Results are summarized in Table 5.7 as recommended by the Nuclear Regulatory Commission. For each type of analysis and sample medium, the table lists the mean and range of all indicator and control locations, as well as that location with the highest mean and range.

The tabulated results of all measurements are not included in this section, although references to these results will be made in the discussion. A complete tabulation of results for 2000 is contained in Part II of the Annual Report on the Radiological Environmental Monitoring Program for the Duane Arnold Energy Center.

4.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported atmospheric nuclear tests in 2000.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in 2000.

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were nearly identical at both indicator and control locations (0.026 and 0.027 pCi/m³, respectively) and were similar to levels observed from 1984 through 1999. The results are tabulated below. The data for 1986 does not include the results from May 19 to June 9, 1986, which were influenced by the accident at Chernobyl.

<u>Year</u>	<u>Indicators</u>	<u>Controls</u>		<u>Year</u>	<u>Indicators</u>	<u>Controls</u>
Concentration (pCi/m ³)				Concentration (pCi/m ³)		
1985	0.024	0.024		1993	0.022	0.023
1986	0.024	0.024		1994	0.023	0.024
1987	0.024	0.026		1995	0.025	0.024
1988	0.026	0.028		1996	0.024	0.023
1989	0.026	0.029		1997	0.023	0.023
1990	0.022	0.024		1998	0.024	0.024
1991	0.023	0.022		1999	0.026	0.027
1992	0.022	0.023		2000	0.027	0.028

Average annual gross beta concentrations in airborne particulates.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955), was detected in all samples. All other gamma-emitting isotopes were below their respective LLD limits. No effect from plant operation is indicated.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.07 pCi/m³ in all samples.

Ambient Radiation (TLDs)

At twelve air sampling locations, the TLD readings averaged 15.3 and 14.4 mR/quarter for indicator and control locations, respectively. At locations within a half mile, one mile and three mile radius of the stack, measurements averaged 17.4 mR/quarter, 18.6 mR/quarter and 15.7 mR/quarter, respectively. The average for all locations was 16.6 mR/quarter. This is lower than the estimated average natural background radiation for Middle America, 19.5 mR/quarter, which is based on data on Pages 71 and 108 of the report, "Natural Background Radiation in the United States" (National Council on Radiation Protection and Measurements, 1975). The terrestrial absorbed dose (uncorrected for structural and body shielding) ranges from 8.8 to 18.8 mrad/quarter and averages 11.5 mrad/quarter for Middle America. Cosmic radiation and cosmogenic radionuclides contribute 8.0 mrad/quarter for a total average of 19.5 mrad/quarter. No plant effect is indicated.

Precipitation

In precipitation, the tritium concentration was below the LLD of 330 pCi/L in all samples. No gamma-emitting isotopes were detected. No plant effect is indicated.

Milk

Iodine-131 results were below the detection limit of 1.0 pCi/L in all samples.

No gamma-emitting isotopes, except naturally occurring potassium-40, were detected in any milk samples. This is consistent with the finding of the National Center for Radiological Health that most radiocontaminants in feed do not find their way into milk due to the selective metabolism of the cow. The common exceptions are radioisotopes of potassium, cesium, strontium, barium, and iodine (National Center for Radiological Health, 1968).

In summary, milk data for 2000 show no radiological effects of plant operation.

Ground Water

The annual mean for gross beta activity measured 3.4 pCi/L and was similar to the levels observed from 1980 through 1999. The location with the highest mean (5.9 pCi/L) was D-58, a farm 1.0 mile distant from the plant. Tritium was below the LLD of 330 pCi/L in all samples. No effect from plant operation is indicated.

Vegetation

Iodine-131 concentrations in broadleaf vegetation were below the LLD level of 0.021 pCi/g wet weight in all samples.

Except for potassium-40, which was observed in all vegetation samples (broadleaf, grain, and forage), all other gamma-emitting isotopes were below detection limits in all samples. No effect from plant operation is indicated.

Soil

Strontium-90 was detected in one sample from location D-15 and measured 0.031 pCi/g dry weight, less than half the activity detected in 1990. Cesium-137 activity averaged 0.20 pCi/g dry weight. Both strontium-90 and cesium-137 activities are similar to or less than levels observed from 1988 through 1999, these levels are generally attributable to deposition of fallout from previous decades.

Naturally-occurring potassium-40 averaged 13.84 pCi/g dry weight. No effect from plant operation is indicated.

Surface Water

Concentrations of tritium measured below the LLD level of 330 pCi/L in all samples. All gamma-emitting isotopes were below their respective LLDs.

Potassium-40 was measured at one location, D-107 (sewage effluent). The concentration ranged from 4.1-33.7 pCi/L and averaged 19.3 pCi/L.

No plant effect on surface water is indicated.

Fish

All gamma-emitting isotopes, except naturally-occurring potassium-40, in edible portions were below detection limits. The potassium-40 level was similar at both indicator and control locations (2.93 and 3.04 pCi/g wet, respectively). No plant effect on fish is indicated.

River Sediments

River sediments were collected in May and September, 2000, and analyzed for gamma-emitting isotopes. Traces of Cesium-137 were detected at both indicator and control locations, at concentrations of 0.075 and 0.033 pCi/g dry, respectively, similar to concentrations observed from 1988 through 1999. Potassium-40 activity ranged from 7.38 - 8.80 pCi/g dry weight and averaged 8.07 pCi/g dry weight.

All other gamma-emitting isotopes were below detection limits.

5.0 TABLES AND FIGURES

Table 5.1 Characteristic properties of isotopes quantified in gamma-spectroscopic analyses.

Designation	Comment	Isotope	Half-life ^a
I. Naturally Occurring			
A. Cosmogenic	Produced by interaction of cosmic rays with atmosphere	Be-7	53.2 d
B. Terrestrial	Primordial	K-40	1.26 x 10 ⁹ y
II. Fission Products ^b			
Nuclear detonations constitute the major environmental source			
A. Short-lived		I-131	8.04 d
		Ba-140	12.8 d
B. Other than Short-lived		Nb-95	35.15 d
		Zr-95	65 d
		Ru-103	39.35 d
		Ru-106	368.2 d
		Cs-134	2.061 y
		Cs-137	30.174 y
		Ce-141	32.5 d
		Ce-144	284.31 d
III. Activation Products			
Typically found in nuclear power plant effluents		Mn-54	312.5 d
		Fe-59	45.0 d
		Co-58	70.78 d
		Co-60	5.26 y
		Zn-65	245 d

^a Half-lives are taken from Appendix E of Environmental Quarterly, 1 January 1978, EML-334 (U. S. Department of Energy, 1978).

^b Includes fission-product daughters.

Table 5.2 Sample collection and analysis program.

Exposure Pathway and/or Sample Type	Sampling Location		Sampling and Collection Frequency	Type and Frequency of Analysis	
	Sample Point	Description			
Airborne Particulates	1	Cedar Rapids (C)	Continuous operation of sampler with sample collection at least once per week or as required by dust loading	Analyze for gross beta activity more than 24 hours after filter change. Perform gamma isotopic analysis on each sample having gross beta activity greater than ten times the yearly mean of the control samples.	
	2	Marion (C)			
	3	Hiawatha			
	5	Palo			
	6	Center Point			
	7	Shellsburg			
	8	Urbana			
	10	Atkins			
	11	Toddsville			Composite weekly samples to form a quarterly composite (by location). Analyze quarterly composite for gamma isotopic.
	13	Alburnett (C)			
15	On-site North				
16	On-site South				
Airborne Iodine	2	Marion (C)	Continuous operation of sampler with sample collection at least once per week.	Analyze each cartridge for iodine- 131.	
	5	Palo			
	7	Shellsburg			
	8	Urbana			
	11	Toddsville			
15	On-site North				
Ambient Radiation	1-2 (C)	Air Particulate	Two dosimeters continuously at each location. Both dosimeters are changed at least quarterly.	Read gamma radiation dose quarterly.	
	3, 5-8	Locations			
	10, 11				
	13 (C)				
	15, 16				
	18-23,	Within 0.5 mile of			
	28-32,	Stack			
	33-42	Within 3.0 miles of			
		Stack			
	43-48	Within 1.0 mile of			
82-86,	Stack				
91					
Surface Water	49	Lewis Access (C)	Once per month.	Gamma isotopic analyses of each sample (by location).	
	50	Plant Intake (C)			
	51	Plant Discharge			
	99	Pleasant Creek			
	107	Plant Sewage Discharge			Composite monthly samples to form quarterly composite (by location). Analyze quarterly composite for tritium.

(C) denotes control location. All other locations are indicators.

Table 5.2 Sample collection and analysis program, (continued).

Exposure Pathway and/or Sample Type	Sampling Location		Sampling and Collection Frequency	Type and Frequency of Analysis
	Sample Point	Description		
Ground Water (potable)	53	Treated Municipal Water	Grab sample at least once per quarter	Gross beta and tritium activity analysis on quarterly sample. If gross beta is greater than ten times the yearly mean of gamma isotopic and Sr-89 and Sr-90 analyses.
	54	Inlet to Municipal Water Treatment System		
	55	On-site well		
	57, 58 72	Wells off-site and within 4 km of DAEC		
River Sediment	50	Plant Intake (C)	At least once every six months.	Gamma isotopic analysis of each sample.
	51	Plant Discharge		
	107	Sewage Effluent Canal		
Vegetation	16, 57, 58, 63, 72, 93, 94, 106, 105 (C)	Farms that raise food crops	Annually at harvest time. One sample of each: grain, green leafy, and forage. At least one sample should be broadleaf vegetation.	Gamma isotopic analysis of edible portions. I-131 analysis on broadleaf vegetation.
Fish	49	Cedar River upstream of DAEC not influenced by effluent (C)	One sample per 6 months (once during January through July and once during August through December).	Gamma isotopic analysis on edible portions.
	61	Downstream of DAEC in influence of effluent		
Milk ^b	105	Control Farm near Norway, Iowa	At least once per two weeks during the grazing season.	<u>During the grazing season:</u> Gamma isotopic and iodine-131 analyses of each sample.
	63, 93, 96, 101	Dairy Farms within 10 miles of Site	At least once per month during the non-grazing season.	<u>During the non-grazing season:</u> Gamma isotopic and iodine-131 analyses of each sample.

(C) denotes control location. All other locations are indicators.

Table 5.2 Sample collection and analysis program, (continued).

Exposure Pathway and/or Sample Type	Sampling Location		Sampling and Collection Frequency	Type and Frequency of Analysis
	Sample Point	Description		
Precipitation		On-site	Monthly	Gamma isotopic on all samples. Tritium on quarterly composites.
Meat ^c		On-site	Annually	Gamma Isotopic
Soil	15, 16	On-site	Annually	Gamma Isotopic and Sr-90.

^a Gamma isotopic analysis and analysis for gamma-emitting nuclides refer to high resolution gamma ray spectrum analysis. Any radionuclide detected at a concentration greater than the lower limit of detection (LLD) should be reported quantitatively; conversely, any radionuclide concentration less than the LLD should not be reported.

^b The grazing season is considered to be May 1 through September 30.

^c Meat was not collected in 2000; no animals slaughtered for home use.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

Code	Type	Sampling Location		Distance and Direction from Site Stack
		Sampling Point	Location Description	
D-1	C	1	Cedar Rapids	11 mi @ 135° SE
D-2	C	2	Marion	11 mi @ 125° ESE
D-3		3	Hiawatha	7 mi @ 130° SE
D-5		5	Palo	3 mi @ 200° SSW
D-6		6	Center Point	7 mi @ 0° N
D-7		7	Shellsburg	6 mi @ 255° W
D-8		8	Urbana	10 mi @ 345° NW
D-10		10	Atkins	9 mi @ 210° SSW
D-11		11	Toddville	4 mi @ 90° E
D-13	C	13	Alburnett	9 mi @ 70° ENE
D-15		15	On-site, Northwest	0.5 mi @ 305° NW
D-16		16	On-site, South	0.5 mi @ 190° SSE
D-18		18		0.5 mi NNE
D-19		19		0.5 mi NE
D-20		20		0.5 mi ENE
D-21		21		0.5 mi ENE
D-22		22		0.5 mi E
D-23		23		0.5 mi ESE
D-28		28		0.5 mi WSW
D-29		29		0.5 mi W
D-30		30		0.5 mi WNW
D-31		31		0.5 mi NW
D-32		32		0.5 mi NNW
D-33		33		3.0 mi N
D-34		34		3.0 mi NNE
D-35		35		3.0 mi NE
D-36		36		3.0 mi ENE
D-37		37		3.0 mi E
D-38		38		3.0 mi ESE
D-39		39		3.0 mi SE
D-40		40		3.0 mi SSE
D-41		41		3.0 mi S
D-42		42		3.0 mi SSE
D-43		43		1.0 mi SSW
D-44		44		1.0 mi WSW
D-45		45		1.0 mi W
D-46		46		1.0 mi WNW
D-47		47		1.0 mi WNW
D-48		48		1.0 mi NW
D-49	C	49	Lewis Access, upstream of DAEC	4.0 mi NNW
D-50	C	50	Plant Intake	
D-51		51	Plant Discharge	
D-53		53	Treated Municipal Water	
D-54		54	Inlet to Municipal Water Treatment System	
D-55		55	On-site Well	

Table 5.3 Sampling locations, Duane Arnold Energy Center (continued).

Code	Type	Sampling Location		Distance and Direction from Site Stack
		Sampling Point	Location Description	
D-57		57	Farm (Off-site Well)	1.0 mi WSW
D-58		58	Farm (Off-site Well)	0.5 mi WSW-SW
D-61		61	0.5 mi downstream of plant discharge	
D-63		63	Farm	1.5 mi WNW
D-72		72	Farm	2.0 mi SSW
D-82		82		0.5 mi SE
D-83		83		0.5 mi SSE
D-84		84		0.5 mi S
D-85		85		0.5 mi SSW
D-86		86		0.5 mi SW
D-91		91		0.5 mi N
D-93		93	Farm	2.8 mi NNE
D-94		94	Farm	2.7 mi N
D-96		96	Farm	8.0 mi SSW
D-99		99	Pleasant Creek Lake	2.5 mi WNW
D-101		101	Farm	4.0 mi E
D-105	C	105	Farm	21.3 mi SSW
D-106		106	Farm	4.5 mi SE
D-107		107	Sewage Effluent Canal	On-site

"C" denotes control location. All other locations are indicators.

Table 5.4 Type and Frequency of collection.

Location	Location Type	Weekly	Monthly	Quarterly	Semiannually	Annually
D-1	C	AP		TLD		
D-2	C	AP, AI		TLD		
D-3		AP		TLD		
D-5		AP, AI		TLD		
D-6		AP		TLD		
D-7		AP, AI		TLD		
D-8		AP, AI		TLD		
D-10		AP		TLD		
D-11		AP, AI		TLD		
D-13	C	AP		TLD		
D-15		AP, AI		TLD		SO
D-16		AP		TLD		SO, G
D-18 through D-23				TLD		
D-28 through D-42				TLD		
D-43 through D-48				TLD		
D-49	C		SW		F	
D-50	C		SW		RS	
D-51			SW		RS	
D-53			WW			
D-54			WW			
D-55			WW			
D-57			WW			G
D-58			WW			G
D-61					F	
D-63			M			G
D-72			WW			G
D-82 through D-86				TLD		
D-91				TLD		
D-93			M			G
D-94						G
D-96			M			
D-99			SW			
D-101			M			
D-105	C		M			G
D-106			M			G
D-107			SW		RS	
On-site			P			ME

"C" denotes control location. All other locations are indicators.

Table 5.5. Sample codes used in 5.4.

Code	Description
AP	Airborne Particulates
AI	Airborne Iodine
TLD	Thermoluminescent Dosimeter
P	Precipitation
M	Milk
WW	Well Water
G	Vegetation
ME	Meat
SO	Soil
SW	Surface Water
F	Fish
RS	River Sediment

Table 5.6. Missed collections and analyses, Duane Arnold Energy Center.

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
MI	I-131, Gamma	D-101	02-01-00	Sample not received; goat dry.
MI	I-131, Gamma	D-101	03-07-00	Sample not received; goat dry.
MI	I-131, Gamma	D-93	05-31-00	Sample not available.
P	I-131, Gamma	DAEC	09-26-00	Sample accidentally discarded by the utility.
TLD	Ambient Gamma	D-18	3rd Qtr., 2000	TLDs missing in the field.
AP	Gross Beta	D-1	11-22-00	Sample lost in the field.
MI	Gross Beta	D-63	12-05-00	Sample no longer available, cows sold.

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2000
 (County, State)

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e
				Location ^d	Mean (F) ^c Range ^c		
Airborne Particulates (pCi/m ³)	GB ^f 622	0.002	0.027 (468/468) (0.004-0.069)	D-5, Palo 3 mi. SSW	0.029 (52/52) (0.012-0.059)	0.028 (154/155) (0.012-0.067)	0
	GS 48						
	Be-7	0.020	0.069 (12/12) (0.044-0.082)	D-10, Atkins 9 mi. SSW	0.073 (4/4) (0.065-0.077)	0.069 (12/12) (0.044-0.082)	0
	Nb-95	0.0015	< LLD			< LLD	0
	Zr-95	0.0031	< LLD			< LLD	0
	Ru-103	0.0015	< LLD			< LLD	0
	Ru-106	0.0087	< LLD			< LLD	0
	Cs-134	0.0010	< LLD			< LLD	0
	Cs-137	0.0012	< LLD			< LLD	0
	Ce-141	0.0030	< LLD			< LLD	0
Ce-144	0.0069	< LLD			< LLD	0	
Airborne Iodine (pCi/m ³)	I-131 622	0.070	< LLD	-	-	< LLD	0
TLD, AP Locations (mR/quarter)	Gamma 48	1.0	15.3 (36/36) (10.8-21.1)	D-8, Urbana 10 mi. NW	19.3 (4/4) (17.8-21.1)	14.4 (12/12) (12.0-17.3)	0
TLD, within 0.5 mi. of Stack (mR/quarter)	Gamma 67	1.0	17.4 (67/67) (11.5-23.0)	D-30, 0.5 mi. WNW	21.3 (4/4) (18.8-23.0)	None	0
TLD, within 1.0 mi. of Stack (mR/quarter)	Gamma 23	1.0	18.6 (23/23) (14.8-21.7)	D-46, 1 mi. WNW	20.8 (4/4) (19.5-21.7)	None	0
TLD, within 3.0 mi. of Stack (mR/quarter)	Gamma 40	1.0	15.7 (40/40) (12.9-20.4)	D-37, 3 mi. E	19.2 (4/4) (18.5-20.4)	None	0
Precipitation (pCi/L)	H-3 4	330	< LLD	-	-	< LLD	0
	GS 11						
	Mn-54	13.6	< LLD	-	-	< LLD	0
	Fe-59	29.9	< LLD	-	-	< LLD	0
	Co-58	13.7	< LLD	-	-	< LLD	0
	Co-60	15.8	< LLD	-	-	< LLD	0
	Zn-65	27.9	< LLD	-	-	< LLD	0
Nb-95	20.7	< LLD	-	-	< LLD	0	

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2000
 (County, State)

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e
				Location ^d	Mean (F) ^c Range ^c		
Precipitation (pCi/L) (continued)	Zr-95	28.3	< LLD	-	-	< LLD	0
	I-131	30.0	< LLD	-	-	< LLD	0
	Cs-134	16.4	< LLD	-	-	< LLD	0
	Cs-137	14.9	< LLD	-	-	< LLD	0
	Ba-140	77.2	< LLD	-	-	< LLD	0
	La-140	23.3	< LLD	-	-	< LLD	0
Milk (pCi/L)	I-131 86	0.5	< LLD	-	-	< LLD	0
	GS 86						
	K-40	100	1605 (68/68) (1037-2407)	D-101, Farm 4 mi. E	1865 (16/16) (1543-2407)	1399 (18/18) (1239-1562)	0
	Cs-134	15	< LLD	-	-	< LLD	0
	Cs-137	18	< LLD	-	-	< LLD	0
	Ba-140	60	< LLD	-	-	< LLD	0
	La-140	15	< LLD	-	-	< LLD	0
Ground Water (pCi/L)	GB 24	1.1	3.4 (16/24) (1.5-8.5)	D-58, Farm 1 mi. WSW-SW	5.9 (4/4) (1.9-8.5)	None	0
	H-3 24	330	< LLD	-	-	< LLD	0
Broadleaf Vegetation (pCi/g wet)	I-131 2	0.021	< LLD	-	-	None	0
	GS 2						
	K-40	0.5	4.04 (2/2) (3.21-4.87)	D-94, Farm 2.7 mi. N	4.87 (1/1)	None	0
	Mn-54	0.023	< LLD	-	-	< LLD	
	Co-58	0.011	< LLD	-	-	< LLD	
	Co-60	0.021	< LLD	-	-	< LLD	
	Nb-95	0.012	< LLD	-	-	< LLD	0
	Zr-95	0.031	< LLD	-	-	< LLD	0
	Ru-103	0.018	< LLD	-	-	< LLD	0
	Ru-106	0.17	< LLD	-	-	< LLD	0
	Cs-134	0.021	< LLD	-	-	< LLD	0
	Cs-137	0.014	< LLD	-	-	< LLD	0
	Ce-141	0.024	< LLD	-	-	< LLD	0
Ce-144	0.091	< LLD	-	-	< LLD	0	

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2000
 (County, State)

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e
				Location ^d	Mean (F) ^c Range ^c		
Vegetation (Forage) (pCi/g wet)	GS 5						
	K-40	0.5	12.92 (4/4) (5.90-16.95)	D-105, Farm 21.3 mi. SSW	19.31 (1/1)	19.31 (1/1)	0
	Mn-54	0.044	< LLD	-	-	< LLD	0
	Co-58	0.046	< LLD	-	-	< LLD	0
	Co-60	0.048	< LLD	-	-	< LLD	0
	Nb-95	0.051	< LLD	-	-	< LLD	0
	Zr-95	0.076	< LLD	-	-	< LLD	0
	Ru-103	0.060	< LLD	-	-	< LLD	0
	Ru-106	0.38	< LLD	-	-	< LLD	0
	Cs-134	0.054	< LLD	-	-	< LLD	0
	Cs-137	0.061	< LLD	-	-	< LLD	0
	Ce-141	0.079	< LLD	-	-	< LLD	0
	Ce-144	0.27	< LLD	-	-	< LLD	0
Vegetation (Grain) (pCi/g wet)	GS 6						
	K-40	0.5	4.32 (5/5) (2.77-9.66)	D-16, On-site 0.5 mi. SSE	9.66 (1/1)	3.26 (1/1)	0
	Mn-54	0.032	< LLD	-	-	< LLD	0
	Co-58	0.027	< LLD	-	-	< LLD	0
	Co-60	0.035	< LLD	-	-	< LLD	0
	Nb-95	0.038	< LLD	-	-	< LLD	0
	Zr-95	0.066	< LLD	-	-	< LLD	0
	Ru-103	0.035	< LLD	-	-	< LLD	0
	Ru-106	0.24	< LLD	-	-	< LLD	0
	Cs-134	0.021	< LLD	-	-	< LLD	0
	Cs-137	0.035	< LLD	-	-	< LLD	0
	Ce-141	0.066	< LLD	-	-	< LLD	0
	Ce-144	0.29	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility	<u>Duane Arnold Energy Center</u>	Docket No.	<u>50-331</u>
Location of Facility	<u>Linn, Iowa</u>	Reporting Period	<u>January-December, 2000</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e	
				Location ^d	Mean (F) ^c Range ^c			
Soil (pCi/gwet)	Sr-90	2	0.010	0.031 (1/1)	D-15, On-site 0.5 mi. NW	0.031 (1/1)	None	0
	GS	2						
	K-40		0.5	13.84 (2/2) (9.30-18.38)	D-15, On-site 0.5 mi. NW	18.38 (1/1)	None	0
	Mn-54		0.025	< LLD	-	-	None	0
	Fe-59		0.067	< LLD	-	-	None	0
	Co-58		0.032	< LLD	-	-	None	0
	Co-60		0.023	< LLD	-	-	None	0
	Zn-65		0.085	< LLD	-	-	None	0
	Nb-95		0.023	< LLD	-	-	None	0
	Zr-95		0.026	< LLD	-	-	None	0
	Ru-103		0.045	< LLD	-	-	None	0
	Ru-106		0.34	< LLD	-	-	None	0
	Cs-134		0.040	< LLD	-	-	None	0
	Cs-137		0.060	0.20 (2/2) (0.19-0.21)	D-15, On-site 0.5 mi. NW	0.21 (1/1)	None	0
Ce-141		0.089	< LLD	-	-	None	0	
Ce-144		0.19	< LLD	-	-	None	0	
Surface Water (pCi/L)	H-3	20	330	< LLD	-	-	< LLD	0
	K-40	12	0.5	19.3 (12/12) (4.1-33.7)	D-107, Onsite Sewage Effluent	19.3 (12/12) (4.1-33.7)	None	0
	I-131	60	15	< LLD	-	-	< LLD	0
	GS	60						
	Mn-54		15	< LLD	-	-	< LLD	0
	Fe-59		30	< LLD	-	-	< LLD	0
	Co-58		15	< LLD	-	-	< LLD	0
	Co-60		15	< LLD	-	-	< LLD	0
	Zn-65		30	< LLD	-	-	< LLD	0
	Nb-95		15	< LLD	-	-	< LLD	0
	Zr-95		30	< LLD	-	-	< LLD	0
	Cs-134		15	< LLD	-	-	< LLD	0
	Cs-137		15	< LLD	-	-	< LLD	0
	Ba-140		60	< LLD	-	-	< LLD	0
La-140		15	< LLD	-	-	< LLD	0	

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2000
 (County, State)

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e
				Location ^d	Mean (F) ^c Range ^c		
Sediments (pCi/g dry)	GS 6						
	K-40	1.0	8.10 (4/4) (7.38-8.8)	D-51, Plant Discharge	8.12 (2/2) (7.97-8.26)	4.06 (2/2) (7.68-8.3)	0
	Mn-54	0.024	< LLD	-	-	< LLD	0
	Fe-59	0.078	< LLD	-	-	< LLD	0
	Co-58	0.026	< LLD	-	-	< LLD	0
	Co-60	0.030	< LLD	-	-	< LLD	0
	Zn-65	0.071	< LLD	-	-	< LLD	0
	Nb-95	0.048	< LLD	-	-	< LLD	0
	Zr-95	0.062	< LLD	-	-	< LLD	0
	Ru-103	0.041	< LLD	-	-	< LLD	0
	Ru-106	0.19	< LLD	-	-	< LLD	0
	Cs-134	0.031	< LLD	-	-	< LLD	0
	Cs-137	0.028	0.076 (2/4) (0.060-0.092)	D-51, Plant Discharge	0.092 (1/2)	0.033 (1/2)	0
	Ce-141	0.054	< LLD	-	-	< LLD	0
Ce-144	0.11	< LLD	-	-	< LLD	0	
Fish (pCi/g wet)	GS 8						
	K-40	1.0	2.93 (4/4) (2.62-3.35)	D-49, Upstream	3.04 (4/4) (2.90-3.27)	3.04 (4/4) (2.90-3.27)	0
	Mn-54	0.014	< LLD	-	-	< LLD	0
	Fe-59	0.043	< LLD	-	-	< LLD	0
	Co-58	0.020	< LLD	-	-	< LLD	0
	Co-60	0.015	< LLD	-	-	< LLD	0
	Zn-65	0.038	< LLD	-	-	< LLD	0
	Nb-95	0.028	< LLD	-	-	< LLD	0
	Zr-95	0.047	< LLD	-	-	< LLD	0
	Ru-103	0.023	< LLD	-	-	< LLD	0
	Ru-106	0.12	< LLD	-	-	< LLD	0
	Cs-134	0.012	< LLD	-	-	< LLD	0
	Cs-137	0.016	< LLD	-	-	< LLD	0
	Ce-141	0.042	< LLD	-	-	< LLD	0
Ce-144	0.12	< LLD	-	-	< LLD	0	

^a GB = Gross beta; GS = Gamma spectroscopy

^b LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

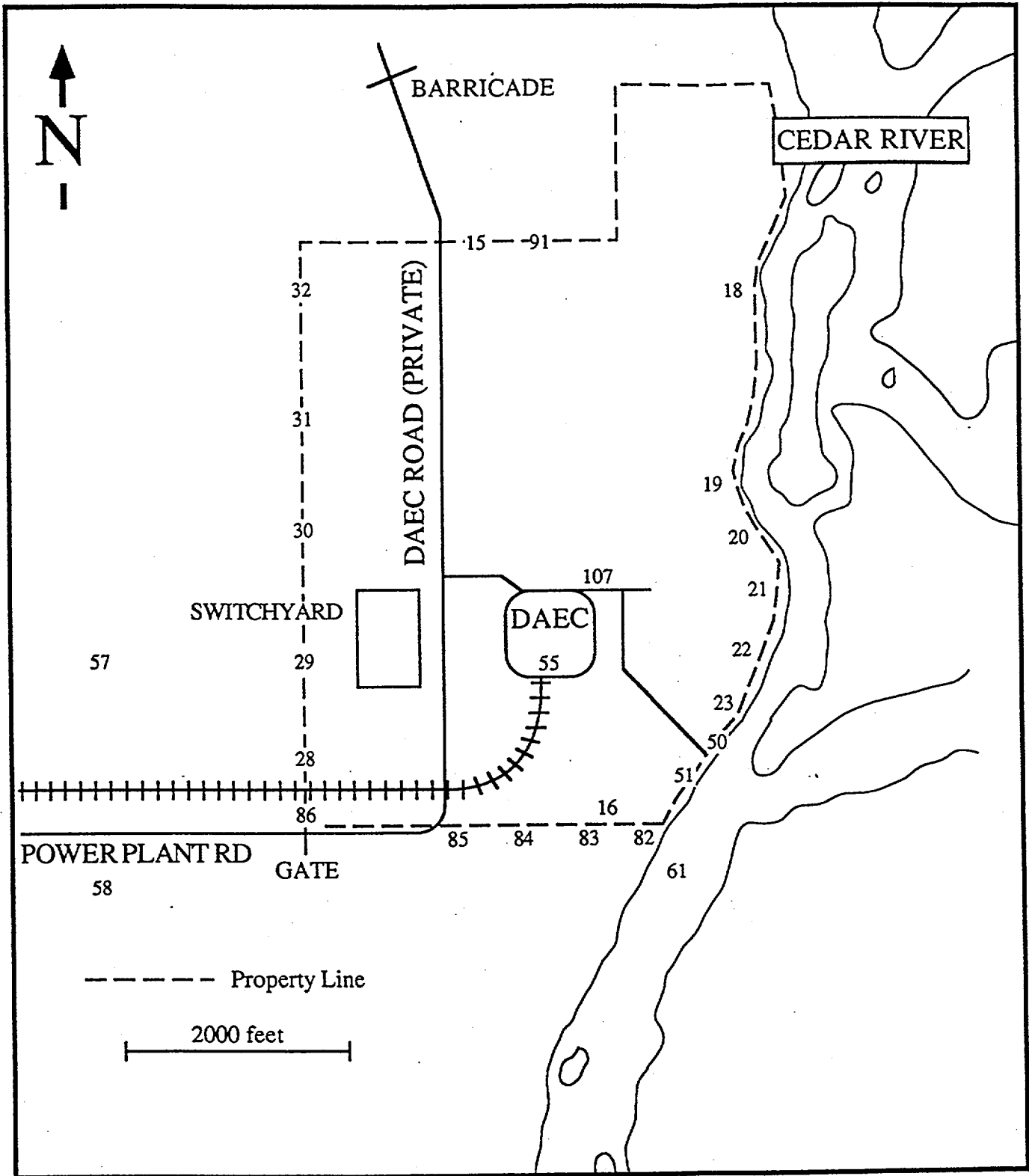
^c Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

^d Locations are specified by: (1) Name and code (Table 5.3); and (2) distance, direction and sector relative to reactor site.

^e Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

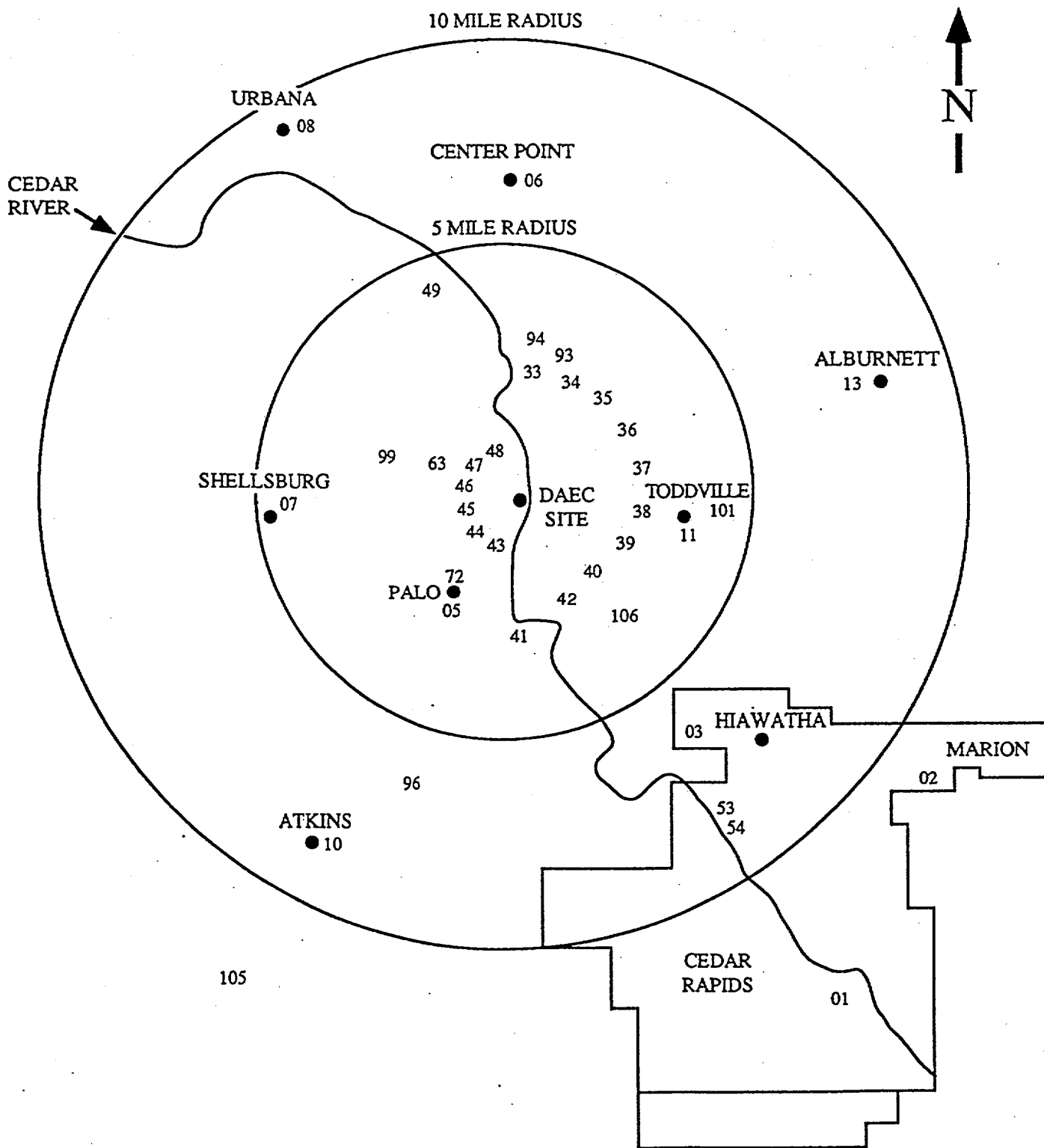
^f One result for gross beta (D-13, collected 03-02-00), was not included in the calculation for mean and standard deviation due to low volume.

Figure 5.1 Radiological Environmental Monitoring Program Sampling Stations near the Duane Arnold Energy Center.



See Table 5.3 for sampling locations and Table 5.4 for Type and Frequency of collection.

Figure 5.2 Radiological Environmental Monitoring Program Sampling Stations Outside 0.5 Miles.



See Table 5.3 for sampling locations and Table 5.4 for Type and Frequency of collection.

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental, Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2000 through December, 2000

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory, formerly Teledyne Brown Engineering Environmental Services Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December 1971. These programs are operated by agencies which supply environmental type samples (e.g., milk or water) containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

The results in Table A-1 were obtained through participation in the environmental sample crosscheck program for milk, water and air filters during the past twelve months. Data for previous years is available upon request.

This program was conducted by the U.S. Environmental Protection Agency Office of Research and Development National Exposure Research Laboratory Characterization Research Division-Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via various International Intercomparisons of Environmental Dosimeters under the sponsorships listed in Table A-2. Results of crosscheck testing with Teledyne Brown Engineering are also listed.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 list results of the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

Out-of-limit results are explained directly below the result.

12-31-00

ATTACHMENT A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES^a

Analysis	Level	One Standard Deviation for single determinations
Gamma Emitters	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89 ^b	5 to 50 pCi/liter or kg >50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90 ^b	2 to 30 pCi/liter or kg >30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	>0.1 g/liter or kg	5% of known value
Gross alpha	≤20 pCi/liter >20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤100 pCi/liter >100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤4,000 pCi/liter >4,000 pCi/liter	1s = (pCi/liter) = 169.85 x (known) ^{0.0933} 10% of known value
Radium-226,-228	<0.1 pCi/liter	15% of known value
Plutonium	0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129 ^b	≤55 pCi/liter >55 pCi/liter	6.0 pCi/liter 10% of known value
Uranium-238, Nickel-63 ^b Technetium-99 ^b	≤35 pCi/liter >35 pCi/liter	6.0 pCi/liter 15% of known value
Iron-55 ^b	50 to 100 pCi/liter >100 pCi/liter	10 pCi/liter 10% of known value
Others ^b	—	20% of known value

^a From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

^b Laboratory limit.

Table A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L ^b		
				Laboratory results ±2 Sigma ^c	ERA Result ^d 1s, N=1	Control Limits
STW-863	WATER	Jan, 2000	Gr. Alpha	39.3 ± 5.2	25.4 ± 6.4	14.5 - 36.3
The analysis was repeated and recalculated with Am-241 efficiency; result of reanalysis 29.32 ± 5.79 pCi/L. Internal spike program results do not indicate a problem.						
STW-863	WATER	Jan, 2000	Gr. Beta	40.7 ± 1.2	42.1 ± 4.2	33.4 - 50.8
STW-866	WATER	Jan, 2000	Sr-89	17.1 ± 2.2	22.5 ± 5.0	13.8 - 31.2
STW-866	WATER	Jan, 2000	Sr-90	8.1 ± 0.6	9.6 ± 5.0	0.9 - 18.3
STW-868	WATER	Feb, 2000	Ra-226	7.6 ± 0.5	8.3 ± 1.2	6.1 - 10.4
STW-868	WATER	Feb, 2000	Ra-228	5.6 ± 1.0	2.3 ± 0.6	1.3 - 3.2
Result of reanalysis: 6.34 ± 0.94. Activity confirmed by gamma spectroscopy (6.00 ± 1.42 pCi/L).						
STW-868	WATER	Feb, 2000	Uranium	5.4 ± 0.2	6.1 ± 3.0	0.9 - 11.3
STW-869	WATER	Mar, 2000	H-3	23,500.0 ± 306.0	23,800.0 ± 2,380.0	19,800.0 - 27,800.0
STW-867	WATER	Mar, 2000	Gr. Alpha	83.6 ± 5.8	58.4 ± 5.8	33.3 - 83.5
Results were recalculated with Am-241 efficiency; 57.80 ± 5.73 pCi/L. Refer to STW-863.						
STW-867	WATER	Mar, 2000	Gr. Beta	15.4 ± 0.9	16.8 ± 1.7	8.1 - 25.5
STW-876	WATER	Mar, 2000	I-131	18.7 ± 0.6	19.9 ± 2.0	18.1 - 28.5
STW-877	WATER	Apr, 2000	Gr. Alpha	52.3 ± 2.3	54.0 ± 13.5	30.8 - 77.2
STW-877	WATER	Apr, 2000	Ra-226	17.5 ± 1.1	18.6 ± 2.8	13.8 - 23.4
STW-877	WATER	Apr, 2000	Ra-228	3.7 ± 0.4	3.6 ± 0.9	2.0 - 5.1
STW-878	WATER	Apr, 2000	Co-60	19.2 ± 0.6	16.9 ± 5.0	8.2 - 25.6
STW-878	WATER	Apr, 2000	Cs-134	81.0 ± 1.3	86.4 ± 5.0	77.7 - 95.1
STW-878	WATER	Apr, 2000	Cs-137	119.0 ± 2.6	123.0 ± 6.2	112.0 - 134.0
STW-878	WATER	Apr, 2000	Gr. Beta	276.0 ± 9.6	289.0 ± 43.4	214.0 - 364.0
STW-878	WATER	Apr, 2000	Sr-89	32.3 ± 3.3	50.7 ± 5.0	42.0 - 59.4
STW-878	WATER	Apr, 2000	Sr-90	11.3 ± 1.0	32.8 ± 5.0	24.1 - 41.5
An error was found in calculation. Result of recalculation: Sr-89, 55.5 ± 7.2 pCi/L / Sr-90, 30.7 ± 3.0 pCi/L.						
Results of reanalysis: Sr-89, 47.4 ± 14.5 pCi/L / Sr-90, 33.0 ± 1.35 pCi/L. Both results are within limits.						
STW-879	WATER	Jun, 2000	Ba-133	22.4 ± 2.1	25.5 ± 5.0	16.8 - 34.2
STW-879	WATER	Jun, 2000	Co-60	69.9 ± 3.7	65.6 ± 5.0	56.9 - 74.3
STW-879	WATER	Jun, 2000	Cs-134	13.5 ± 0.8	13.8 ± 5.0	5.1 - 22.5
STW-879	WATER	Jun, 2000	Cs-137	232.0 ± 7.8	238.0 ± 11.9	217.0 - 259.0
STW-879	WATER	Jun, 2000	Zn-65	50.9 ± 3.8	54.6 ± 5.5	45.3 - 63.9
STW-880	WATER	Jun, 2000	Ra-226	2.8 ± 0.2	3.0 ± 0.5	2.2 - 3.8
STW-880	WATER	Jun, 2000	Ra-228	10.0 ± 0.9	13.0 ± 3.3	7.4 - 18.6
STW-880	WATER	Jun, 2000	Uranium	57.0 ± 4.4	63.4 ± 6.3	52.6 - 74.2
STW-883	WATER	Jul, 2000	Gr. Alpha	6.9 ± 1.1	7.2 ± 5.0	0.0 - 15.9
STW-883	WATER	Jul, 2000	Gr. Beta	88.8 ± 9.8	87.5 ± 10.0	70.2 - 105.0
STW-884	WATER	Aug, 2000	H-3	8,740.0 ± 174.0	8,320.0 ± 832.0	6,910.0 - 9,730.0
STW-891	WATER	Sep, 2000	Ra-226	17.9 ± 1.3	18.9 ± 2.8	14.0 - 23.8
STW-891	WATER	Sep, 2000	Ra-228	5.7 ± 0.5	6.2 ± 1.6	3.5 - 8.8

Table A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L ^b		
				Laboratory results ±2 Sigma ^c	ERA Result ^d 1s, N=1	Control Limits
STW-891	WATER	Sep, 2000	Uranium	10.3 ± 0.1	11.9 ± 3.0	6.7 - 17.1
STW-892	WATER	Oct, 2000	I-131	16.9 ± 0.3	15.9 ± 1.6	10.7 - 21.1
STW-892	WATER	Oct, 2000	I-131(g)	17.1 ± 5.4	15.9 ± 1.6	10.7 - 21.1
STW-893	WATER	Oct, 2000	Gr. Alpha	66.3 ± 5.3	74.4 ± 18.6	42.2 - 107.0
STW-893	WATER	Oct, 2000	Ra-226	10.1 ± 1.0	10.5 ± 1.6	7.8 - 13.2
STW-893	WATER	Oct, 2000	Ra-228	21.2 ± 0.5	19.4 ± 4.9	11.0 - 27.8
STW-893	WATER	Oct, 2000	Uranium	41.4 ± 1.9	44.5 ± 4.5	36.8 - 52.2
STW-894	WATER	Oct, 2000	Co-60	93.4 ± 1.6	91.1 ± 5.0	82.4 - 99.8
STW-894	WATER	Oct, 2000	Cs-134	54.8 ± 0.3	59.8 ± 5.0	51.1 - 68.5
STW-894	WATER	Oct, 2000	Cs-137	45.5 ± 2.3	45.0 ± 5.0	36.3 - 53.7
STW-894	WATER	Oct, 2000	Cs-137	45.5 ± 2.3	45.0 ± 5.0	36.3 - 53.7
STW-894	WATER	Oct, 2000	Gr. Beta	209.0 ± 7.9	256.0 ± 38.4	189.0 - 323.0
STW-894	WATER	Oct, 2000	Sr-89	32.8 ± 3.0	41.3 ± 5.0	32.6 - 50.0
STW-894	WATER	Oct, 2000	Sr-90	16.0 ± 2.4	18.0 ± 5.0	9.3 - 26.7
STW-895	WATER	Nov, 2000	Gr. Alpha	50.3 ± 2.6	60.3 ± 15.1	34.4 - 86.2
STW-895	WATER	Nov, 2000	Gr. Beta	28.6 ± 1.3	25.5 ± 5.0	16.8 - 34.2
STW-896	WATER	Nov, 2000	Ba-133	78.0 ± 2.0	82.2 ± 8.2	68.0 - 96.4
STW-896	WATER	Nov, 2000	Co-60	30.8 ± 1.7	27.8 ± 5.0	19.1 - 36.5
STW-896	WATER	Nov, 2000	Cs-134	67.2 ± 3.3	76.0 ± 5.0	67.3 - 84.7
<p>The mean value for Cs-134 of all participating laboratories was 70.7 pCi/L. Other gamma emitters are within limits, the counting efficiency is not suspect. Library values were reviewed and found to be correct.</p>						
STW-896	WATER	Nov, 2000	Cs-137	109.0 ± 1.0	106.0 ± 5.3	96.8 - 115.0
STW-896	WATER	Nov, 2000	Zn-65	81.5 ± 7.4	79.0 ± 7.9	65.3 - 92.7

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the environmental samples crosscheck program operated by Environmental Resources Associates (ERA).

^b All results are in pCi/L, except for elemental potassium (K) data in milk, which are in mg/L; air filter samples, which are in pCi/Filter.

^c Unless otherwise indicated, the laboratory results are given as the mean ± 2 standard deviations for three determinations.

^d Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

Table A-2. Crosscheck program results; Thermoluminescent Dosimeters. (TLDs).

Lab Code	TLD Type	Date	Measurement	mR		
				Laboratory results ± 2 Sigma	Known Value	Average ± 2 Sigma (All Participants)
<u>Environmental, Inc.</u>						
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #1	14.5 ± 0.5	15.4	-
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #2	29.3 ± 1.0	31.8	-
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #3	60.0 ± 0.2	59.1	-
<u>Environmental, Inc.</u>						
1999-2	CaSO ₄ : Dy Cards	Mar, 1999	Reader 1, #1	18.3 ± 0.5	15.4	-
1999-2	CaSO ₄ : Dy Cards	Mar, 1999	Reader 1, #2	35.9 ± 1.3	31.8	-
1999-2	CaSO ₄ : Dy Cards	Mar, 1999	Reader 1, #3	66.5 ± 4.4	59.1	-
Chips and Cards were irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March, 1999.						
<u>Environmental, Inc.</u>						
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #1	14.4 ± 0.2	17.8	-
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #2	32.4 ± 0.1	35.5	-
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #3	61.8 ± 0.9	62.2	-
<u>Environmental, Inc.</u>						
2000-2	CaSO ₄ : Dy Cards	Mar, 2000	Reader 1, #1	21.3 ± 0.3	17.8	-
2000-2	CaSO ₄ : Dy Cards	Mar, 2000	Reader 1, #2	40.1 ± 1.9	35.5	-
2000-2	CaSO ₄ : Dy Cards	Mar, 2000	Reader 1, #3	69.9 ± 3.5	62.2	-

Chips and Cards were irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March, 2000.

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L ^a		
				Laboratory results 2s, n=1 ^b	Known Activity	Control ^c Limits
SPW-271	WATER	Jan, 2000	Ra-226	14.81 ± 0.44	13.76	9.63 - 17.89
SPW-271	WATER	Jan, 2000	Ra-228	16.97 ± 2.12	14.68	10.28 - 19.08
SPW-272	WATER	Jan, 2000	Gr. Alpha	44.35 ± 1.95	41.14	20.57 - 61.71
SPW-272	WATER	Jan, 2000	Gr. Beta	31.19 ± 5.02	29.50	19.50 - 39.50
SPW-756	WATER	Jan, 2000	H-3	56339.00 ± 666.00	57667.00	46133.60 - 69200.40
SPW-480	WATER	Jan, 2000	Co-60	32.33 ± 2.87	28.36	18.36 - 38.36
SPW-480	WATER	Jan, 2000	Cs-137	35.58 ± 4.20	36.83	26.83 - 46.83
SPMI-482	MILK	Jan, 2000	Sr-90	16.93 ± 1.07	14.10	4.10 - 24.10
SPAP-484	AIR FILTER	Jan, 2000	Cs-137	1.84 ± 0.01	1.72	1.03 - 2.41
SPW-917	WATER	Feb, 2000	Gr. Alpha	16.59 ± 1.90	41.10	20.55 - 61.65
An insufficient amount of Am-241 spike was available for an accurate test.						
SPW-917	WATER	Feb, 2000	Gr. Beta	32.61 ± 2.06	29.43	19.43 - 39.43
SPW-918	WATER	Feb, 2000	Ra-226	21.15 ± 0.49	20.68	14.48 - 26.88
SPW-918	WATER	Feb, 2000	Ra-228	14.24 ± 1.64	14.51	10.16 - 18.86
SPVE-1262	VEGETATION	Mar, 2000	I-131(g)	1.17 ± 0.07	1.12	0.67 - 1.57
SPCH-1264	CHARCOAL CANISTER	Mar, 2000	I-131(g)	0.56 ± 0.02	0.53	0.32 - 0.74
SPMI-1274	MILK	Mar, 2000	I-131	47.02 ± 3.36	48.00	36.00 - 60.00
SPW-1301	WATER	Mar, 2000	I-131	66.03 ± 1.06	76.84	61.47 - 92.21
SPW-1301	WATER	Mar, 2000	I-131(g)	80.31 ± 6.28	76.84	66.84 - 86.84
SPW-1477	WATER	Mar, 2000	Gr. Alpha	32.09 ± 1.82	41.13	20.57 - 61.70
SPW-1477	WATER	Mar, 2000	Gr. Beta	29.20 ± 1.56	29.38	19.38 - 39.38
SPW-1478	WATER	Mar, 2000	Ra-226	21.78 ± 0.47	20.69	14.48 - 26.90
SPW-1478	WATER	Mar, 2000	Ra-228	14.41 ± 1.70	14.39	10.07 - 18.71
SPMI-2275	MILK	Apr, 2000	Cs-134	33.53 ± 2.82	32.12	22.12 - 42.12
SPMI-2275	MILK	Apr, 2000	Cs-137	36.38 ± 4.94	36.66	26.66 - 46.66
SPMI-2275	MILK	Apr, 2000	I-131	46.06 ± 0.82	55.50	44.40 - 66.60
SPW-2277	WATER	Apr, 2000	Ra-226	20.51 ± 0.44	20.68	14.48 - 26.88
SPW-2278	WATER	Apr, 2000	Gr. Alpha	40.22 ± 2.50	38.44	19.22 - 57.66
SPW-2278	WATER	Apr, 2000	Gr. Beta	32.63 ± 1.81	29.30	19.30 - 39.30
SPW-2278	WATER	Apr, 2000	Ra-228	14.91 ± 1.70	14.25	9.98 - 18.53
SPW-2279	WATER	Apr, 2000	Co-60	37.12 ± 3.86	34.54	24.54 - 44.54
SPW-2279	WATER	Apr, 2000	Cs-134	34.70 ± 3.32	32.12	22.12 - 42.12
SPW-2279	WATER	Apr, 2000	Cs-137	39.60 ± 5.12	36.66	26.66 - 46.66
SPW-2279	WATER	Apr, 2000	I-131	49.92 ± 0.67	55.50	44.40 - 66.60
SPW-2279	WATER	Apr, 2000	I-131(g)	60.63 ± 6.58	55.50	45.50 - 65.50
SPW-2281	WATER	Apr, 2000	H-3	58829.00 ± 682.00	56996.00	45596.80 - 68395.20
SPAP-3097	AIR FILTER	Apr, 2000	Cs-137	1.81 ± 0.02	1.71	1.03 - 2.39
SPW-3093	WATER	May, 2000	I-131	83.39 ± 1.06	85.38	68.30 - 102.46
SPW-3094	WATER	May, 2000	Ra-226	20.86 ± 0.42	20.68	14.48 - 26.88
SPW-3094	WATER	May, 2000	Ra-228	14.17 ± 1.59	14.12	9.88 - 18.36
SPW-3095	WATER	May, 2000	Gr. Alpha	38.99 ± 2.09	38.44	19.22 - 57.66

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L ^a		
				Laboratory results 2s, n=1 ^b	Known Activity	Control ^c Limits
SPW-3095	WATER	May, 2000	Gr. Beta	30.65 ± 1.53	29.30	19.30 - 39.30
SPAP-274	AIR FILTER	May, 2000	Gr. Beta	5.08 ± 0.03	5.97	-4.03 - 15.97
SPMI-3138	MILK	May, 2000	I-131	85.08 ± 1.05	85.38	68.30 - 102.46
SPF-3180	FISH	May, 2000	Cs-134	0.52 ± 0.02	0.50	0.30 - 0.70
SPF-3180	FISH	May, 2000	Cs-137	0.65 ± 0.04	0.59	0.35 - 0.82
SPAP-3902	AIR FILTER	Jun, 2000	Gr. Beta	5.81 ± 0.03	5.35	-4.65 - 15.35
SPF-5182	FISH	Jun, 2000	Cs-134	0.60 ± 0.04	0.59	0.35 - 0.83
SPF-5182	FISH	Jun, 2000	Cs-137	0.60 ± 0.05	0.58	0.35 - 0.81
SPW-3911	WATER	Jun, 2000	Ra-226	23.73 ± 0.85	20.68	14.48 - 26.88
SPW-3911	WATER	Jun, 2000	Ra-228	20.43 ± 1.77	20.75	14.53 - 26.98
SPW-3910	WATER	Jun, 2000	Gr. Alpha	38.28 ± 2.12	38.44	19.22 - 57.66
SPW-3910	WATER	Jun, 2000	Gr. Beta	35.14 ± 1.74	29.22	19.22 - 39.22
SPW-4342	WATER	Jun, 2000	Sr-89	73.70 ± 4.77	81.00	64.80 - 97.20
SPW-4342	WATER	Jun, 2000	Sr-90	58.13 ± 2.17	55.90	44.72 - 67.08
SPW-4687	WATER	Jul, 2000	Ra-226	21.07 ± 0.56	20.68	14.48 - 26.88
SPW-4687	WATER	Jul, 2000	Ra-228	16.35 ± 1.70	20.75	14.53 - 26.98
SPW-4688	WATER	Jul, 2000	H-3	56205.00 ± 663.00	56228.00	44982.40 - 67473.60
SPAP-4807	AIR FILTER	Jul, 2000	Gr. Beta	6.07 ± 0.02	5.96	-4.04 - 15.96
SPAP-4809	AIR FILTER	Jul, 2000	Cs-137	1.82 ± 0.02	1.71	1.03 - 2.39
SPMI-4856	MILK	Jul, 2000	Cs-134	33.24 ± 3.74	29.56	19.56 - 39.56
SPMI-4856	MILK	Jul, 2000	Cs-137	39.80 ± 6.77	36.45	26.45 - 46.45
SPMI-4856	MILK	Jul, 2000	Sr-89	46.35 ± 5.10	56.34	45.07 - 67.61
SPMI-4856	MILK	Jul, 2000	Sr-90	70.47 ± 2.06	69.73	55.78 - 83.68
SPW-5372	WATER	Jul, 2000	Co-60	33.31 ± 4.61	33.24	23.24 - 43.24
SPW-5372	WATER	Jul, 2000	Cs-134	59.70 ± 4.57	58.26	48.26 - 68.26
SPW-5372	WATER	Jul, 2000	Cs-137	40.00 ± 5.58	36.42	26.42 - 46.42
SPW-4686	WATER	Aug, 2000	Gr. Alpha	34.12 ± 1.71	38.43	19.22 - 57.65
SPW-4686	WATER	Aug, 2000	Gr. Beta	35.42 ± 1.51	29.21	19.21 - 39.21
SPW-5564	WATER	Aug, 2000	Sr-89	62.97 ± 4.73	67.61	54.09 - 81.13
SPW-5564	WATER	Aug, 2000	Sr-90	65.40 ± 2.47	55.70	44.56 - 66.84
SPW-5792	WATER	Aug, 2000	Ra-226	12.82 ± 0.30	13.79	9.65 - 17.93
SPW-5792	WATER	Aug, 2000	Ra-228	15.00 ± 1.21	13.69	9.58 - 17.80
SPW-6631	WATER	Sep, 2000	Ra-228	22.20 ± 2.20	20.32	14.22 - 26.42
SPW-6632	WATER	Sep, 2000	Ra-226	13.58 ± 0.29	13.79	9.65 - 17.93
SPW-6632	WATER	Sep, 2000	Ra-228	18.84 ± 2.59	20.32	14.22 - 26.42
SPW-6633	WATER	Sep, 2000	Fe-55	1757.00 ± 674.00	1852.00	1481.60 - 2222.40
SPW-5791	WATER	Sep, 2000	Gr. Alpha	52.28 ± 9.41	69.00	34.50 - 103.50
SPW-5791	WATER	Sep, 2000	Gr. Beta	34.60 ± 4.71	29.10	19.10 - 39.10
SPW-6630	WATER	Sep, 2000	Gr. Alpha	71.54 ± 7.15	69.14	34.57 - 103.71
SPW-6630	WATER	Sep, 2000	Gr. Beta	37.78 ± 1.62	29.04	19.04 - 39.04
SPW-7744	WATER	Oct, 2000	Ra-226	12.36 ± 0.25	13.79	9.65 - 17.93

Table A-3. In-house "spike" samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L ^a		
				Laboratory results 2s, n=1 ^b	Known Activity	Control ^c Limits
SPW-7744	WATER	Oct, 2000	Ra-228	10.37 ± 1.15	13.40	9.38 - 17.42
SPW-7745	WATER	Oct, 2000	H-3	54650.00 ± 643.00	55391.00	44312.80 - 66469.20
SPAP-7764	AIR FILTER	Oct, 2000	Gr. Beta	6.14 ± 0.03	5.91	-4.09 - 15.91
SPAP-7766	AIR FILTER	Oct, 2000	Cs-137	1.84 ± 0.01	1.69	1.01 - 2.37
SPMI-8347	MILK	Oct, 2000	Cs-134	29.18 ± 6.51	26.83	16.83 - 36.83
SPMI-8347	MILK	Oct, 2000	Cs-134	29.37 ± 3.63	26.83	16.83 - 36.83
SPMI-8347	MILK	Oct, 2000	Cs-137	39.04 ± 8.76	36.20	26.20 - 46.20
SPMI-8347	MILK	Oct, 2000	Cs-137	34.89 ± 5.71	36.20	26.20 - 46.20
SPF-8349	FISH	Oct, 2000	Cs-134	0.56 ± 0.02	0.54	0.32 - 0.75
SPF-8349	FISH	Oct, 2000	Cs-137	0.92 ± 0.04	0.87	0.52 - 1.22
SPW-8369	WATER	Oct, 2000	Co-60	32.49 ± 1.86	32.19	22.19 - 42.19
SPW-8369	WATER	Oct, 2000	Cs-134	55.87 ± 1.71	53.66	43.66 - 63.66
SPW-8369	WATER	Oct, 2000	Cs-137	36.46 ± 2.73	36.21	26.21 - 46.21
SPW-7743	WATER	Oct, 2000	Gr. Alpha	51.28 ± 2.28	69.10	34.55 - 103.65
SPW-7743	WATER	Oct, 2000	Gr. Beta	36.86 ± 1.66	29.00	19.00 - 39.00
SPW-9101	WATER	Nov, 2000	Ra-226	14.35 ± 0.24	13.79	9.65 - 17.93
SPW-9101	WATER	Nov, 2000	Ra-228	22.14 ± 1.56	20.09	14.06 - 26.12
SPW-9102	WATER	Dec, 2000	Gr. Alpha	77.76 ± 3.02	69.14	34.57 - 103.71
SPW-9102	WATER	Dec, 2000	Gr. Beta	36.71 ± 1.65	28.99	18.99 - 38.99
SPW-9726	WATER	Dec, 2000	Gr. Alpha	43.03 ± 2.18	69.14	34.57 - 103.71
SPW-9726	WATER	Dec, 2000	Gr. Beta	32.17 ± 1.55	28.89	18.89 - 38.89
SPW-9727	WATER	Dec, 2000	Ra-226	13.35 ± 0.29	13.79	9.65 - 17.93
SPW-9727	WATER	Dec, 2000	Ra-228	15.44 ± 1.23	19.75	13.83 - 25.68
SPCH-10228	CHARCOAL CANISTER	Dec, 2000	Ba-133	1.80 ± 0.05	2.11	1.26 - 2.95

^a All results are in pCi/L, except for elemental potassium (K) in milk, which are in mg/L.; air filter samples, which are in pCi/Filter; and food products, which are in mg/kg.

^b All samples are the results of single determinations.

^c Control limits are based on Attachment A, page A2 of this report.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, Sawdust is used for the spike matrix.

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L ^a		
				Laboratory results (4.66 Sigma)		Acceptance Criteria (4.66 Sigma)
				LLD	Activity ^b	
SPW-270	WATER	Jan 2000	Gr. Alpha	< 0.50	0.52 ± 0.41	< 1.0
SPW-270	WATER	Jan 2000	Gr. Beta	< 1.50	-0.34 ± 1.11	< 3.2
SPW-270	WATER	Jan 2000	Ra-226		0.06 ± 0.01	< 1.0
SPW-270	WATER	Jan 2000	Ra-228	< 0.94	0.14 ± 0.45	< 2.0
SPW-447	WATER	Jan 2000	H-3	< 184.00	-54.70 ± 88.60	< 200.0
SPW-481	WATER	Jan 2000	Co-60	< 2.42		< 10.0
SPW-481	WATER	Jan 2000	Cs-134	< 3.99		< 10.0
SPW-481	WATER	Jan 2000	Cs-137	< 2.90		< 10.0
SPMI-483	MILK	Jan 2000	Cs-137	< 2.73		< 10.0
SPMI-483	MILK	Jan 2000	Sr-90		1.03 ± 0.40	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPAP-485	AIR FILTER	Jan 2000	Cs-137	< 1.64		< 100.0
SPW-919	WATER	Feb 2000	Gr. Alpha	< 0.80	0.56 ± 0.61	< 1.0
SPW-919	WATER	Feb 2000	Gr. Beta	< 1.65	0.11 ± 1.16	< 3.2
SPW-919	WATER	Feb 2000	Ra-226	< 0.02	0.02 ± 0.01	< 1.0
SPW-919	WATER	Feb 2000	Ra-228	< 0.60	0.02 ± 0.01	< 2.0
SPVE-1263	VEGETATION	Mar 2000	Cs-134	< 11.48		< 100.0
SPVE-1263	VEGETATION	Mar 2000	Cs-137	< 24.82		< 100.0
SPCH-1265	CHARCOAL CANISTER	Mar 2000	I-131(g)	< 7.00		< 9.6
SPMI-1292	MILK	Mar 2000	I-131	< 0.32	0.05 ± 0.18	< 0.5
SPMI-1292	MILK	Mar 2000	I-131(g)	< 4.60		< 20.0
SPW-1302	WATER	Mar 2000	I-131	< 0.30	0.01 ± 0.14	< 0.5
SPW-1479	WATER	Mar 2000	Gr. Alpha	< 0.84	-0.32 ± 0.53	< 1.0
SPW-1479	WATER	Mar 2000	Gr. Beta	< 1.86	-1.39 ± 1.19	< 3.2
SPW-1479	WATER	Mar 2000	Ra-226	< 0.01	0.06 ± 0.01	< 1.0
SPW-1479	WATER	Mar 2000	Ra-228	< 1.00	1.17 ± 0.60	< 2.0
SPMI-2276	MILK	Apr 2000	Cs-134	< 4.20		< 10.0
SPMI-2276	MILK	Apr 2000	Cs-137	< 3.33		< 10.0
SPMI-2276	MILK	Apr 2000	I-131	< 0.50	0.32 ± 0.30	< 0.5
SPW-2280	WATER	Apr 2000	Co-60	< 2.78		< 10.0
SPW-2280	WATER	Apr 2000	Cs-134	< 3.56		< 10.0

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L ^a .		
				Laboratory results (4.66 Sigma)		Acceptance Criteria (4.66 Sigma)
				LLD	Activity ^b	
SPW-2280	WATER	Apr 2000	Cs-137	< 2.81		< 10.0
SPW-2280	WATER	Apr 2000	Gr. Alpha	< 0.60	0.55 ± 0.45	< 1.0
SPW-2280	WATER	Apr 2000	Gr. Beta	< 1.66	0.62 ± 1.11	< 3.2
SPW-2280	WATER	Apr 2000	I-131	< 0.29	-0.16 ± 0.19	< 0.5
SPW-2280	WATER	Apr 2000	I-131(g)	< 3.42		< 20.0
SPW-2280	WATER	Apr 2000	Ra-226		0.03 ± 0.01	< 1.0
SPW-2280	WATER	Apr 2000	Ra-228	< 0.87	0.65 ± 0.47	< 2.0
SPW-2282	WATER	Apr 2000	H-3	< 151.60	-5.40 ± 74.90	< 200.0
SPAP-3098	AIR FILTER	Apr 2000	Cs-137	< 1.37		< 100.0
SPW-3096	WATER	May 2000	Gr. Alpha	< 0.68		< 1.0
SPW-3096	WATER	May 2000	Gr. Beta	< 1.62		< 3.2
SPW-3096	WATER	May 2000	Ra-226		0.05 ± 0.01	< 1.0
SPW-3096	WATER	May 2000	Ra-228	< 0.90	0.05 ± 0.01	< 2.0
SPAP-273	AIR FILTER	May 2000	Gr. Beta	< 0.54	0.90 ± 0.32	< 3.2
SPMI-3139	MILK	May 2000	I-131	< 0.33		< 0.5
SPF-3181	FISH	May 2000	Cs-134	< 3.02		< 100.0
SPF-3181	FISH	May 2000	Cs-137	< 4.99		< 100.0
SPAP-3903	AIR FILTER	Jun 2000	Gr. Beta	< 0.48		< 3.2
SPW-3912	WATER	Jun 2000	Gr. Alpha	< 0.35	0.28 ± 0.28	< 1.0
SPW-3912	WATER	Jun 2000	Gr. Beta	< 1.22	0.54 ± 0.86	< 3.2
SPW-3912	WATER	Jun 2000	Ra-226		0.04 ± 0.02	< 1.0
SPW-3912	WATER	Jun 2000	Ra-228	< 0.65		< 2.0
SPMI-4343	MILK	Jun 2000	Sr-89	< 0.73		< 5.0
SPMI-4343	MILK	Jun 2000	Sr-90	< 0.56		< 1.0
SPW-4689	WATER	Jul 2000	Ra-226		0.03 ± 0.01	< 1.0
SPW-4689	WATER	Jul 2000	Ra-228	< 0.93	1.11 ± 0.55	< 2.0
SPW-4690	WATER	Jul 2000	H-3	< 178.00	18.57 ± 89.13	< 200.0
SPW-4808	WATER	Jul 2000	Gr. Alpha	< 0.45		< 1.0
SPAP-4810	AIR FILTER	Jul 2000	Cs-137	< 2.18		< 100.0
SPMI-4857	MILK	Jul 2000	Cs-137	< 6.13		< 10.0
SPMI-4857	MILK	Jul 2000	I-131(g)	< 7.19		< 20.0

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L ^a		
				Laboratory results (4.66 Sigma)		Acceptance Criteria (4.66 Sigma)
				LLD	Activity ^b	
SPMI-4857	MILK	Jul 2000	Sr-89	< 0.66		< 5.0
SPMI-4857	MILK	Jul 2000	Sr-90		1.15 ± 0.32	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPF-5183	FISH	Jul 2000	Cs-134	< 17.71		< 100.0
SPF-5183	FISH	Jul 2000	Cs-137	< 12.81		< 100.0
SPW-4689	WATER	Jul 2000	Gr. Alpha	< 0.50		< 1.0
SPW-4689	WATER	Jul 2000	Gr. Beta	< 1.20		< 3.2
SPW-5373	WATER	Jul 2000	Co-60	< 5.20		< 10.0
SPW-5373	WATER	Jul 2000	Cs-134	< 4.80		< 10.0
SPW-5373	WATER	Jul 2000	Cs-137	< 4.00		< 10.0
SPW-5565	WATER	Aug 2000	Sr-89	< 1.56	-0.64 ± 1.11	< 5.0
SPW-5565	WATER	Aug 2000	Sr-90	< 0.59	0.17 ± 0.30	< 1.0
SPW-5793	WATER	Aug 2000	Gr. Alpha	< 0.51	0.02 ± 0.36	< 1.0
SPW-5793	WATER	Aug 2000	Ra-226		0.05 ± 0.02	< 1.0
SPW-5793	WATER	Aug 2000	Ra-228	< 0.95	0.26 ± 0.47	< 2.0
SPW-5793	WATER	Aug 2000	Gr. Beta	< 1.40	-0.13 ± 1.01	< 3.2
SPW-6634	WATER	Sep 2000	Fe-55	< 617.00	-105.90 ± 453.40	< 1000.0
SPW-6634	WATER	Sep 2000	Ra-226	< 0.01	0.03 ± 0.01	< 1.0
SPW-6634	WATER	Sep 2000	Ra-228	< 0.99	0.36 ± 0.51	< 2.0
SPW-6634	WATER	Sep 2000	Gr. Alpha	< 0.67	-0.22 ± 0.45	< 1.0
SPW-6634	WATER	Sep 2000	Gr. Beta	< 1.60	-0.20 ± 1.12	< 3.2
SPSO-10595	SOIL	Oct 2000	Cs-134	< 16.87		< 100.0
SPSO-10595	SOIL	Oct 2000	Cs-137	< 9.40		< 100.0
SPW-7746	WATER	Oct 2000	Ra-226	< 0.03	0.04 ± 0.02	< 1.0
SPW-7746	WATER	Oct 2000	Ra-228	< 1.08	0.00 ± 0.87	< 2.0
SPW-7747	WATER	Oct 2000	H-3	< 158.00	-38.00 ± 77.00	< 200.0
SPAP-7765	AIR FILTER	Oct 2000	Gr. Beta	< 0.64	0.00 ± 0.00	< 3.2
SPAP-7767	AIR FILTER	Oct 2000	Co-60	< 0.19		< 100.0
SPAP-7767	AIR FILTER	Oct 2000	Cs-134	< 0.32		< 100.0
SPAP-7767	AIR FILTER	Oct 2000	Cs-137	< 2.32		< 100.0
SPMI-8348	MILK	Oct 2000	Cs-134	< 3.35		< 10.0
SPMI-8348	MILK	Oct 2000	Cs-137	< 3.07		< 10.0

Table A-4. In-house "blank" samples.

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L ^a		
				Laboratory results (4.66 Sigma)		Acceptance Criteria (4.66 Sigma)
				LLD	Activity ^b	
SPF-8350	FISH	Oct 2000	Cs-134	< 10.26		< 100.0
SPF-8350	FISH	Oct 2000	Cs-137	< 10.51		< 100.0
SPW-8370	WATER	Oct 2000	Co-60	< 4.67		< 10.0
SPW-8370	WATER	Oct 2000	Cs-134	< 5.28		< 10.0
SPW-8370	WATER	Oct 2000	Cs-137	< 4.93		< 10.0
SPW-7746	WATER	Oct 2000	Gr. Alpha	< 0.46	0.06 ± 0.33	< 1.0
SPW-7746	WATER	Oct 2000	Gr. Beta	< 1.24	0.00 ± 0.87	< 3.2
SPW-9103	WATER	Nov 2000	Ra-226	< 0.01	0.02 ± 0.01	< 1.0
SPW-9103	WATER	Nov 2000	Ra-228	< 1.00	0.14 ± 0.48	< 2.0
SPW-9729	WATER	Dec 2000	Gr. Alpha	< 0.46	0.23 ± 0.36	< 1.0
SPW-9729	WATER	Dec 2000	Gr. Beta	< 1.33	-0.46 ± 0.98	< 3.2
SPW-9729	WATER	Dec 2000	Ra-226	< 0.02	0.05 ± 0.01	< 1.0
SPW-9729	WATER	Dec 2000	Ra-228	< 0.70	0.22 ± 0.35	< 2.0
SPW-9103	WATER	Dec 2000	Gr. Alpha	< 0.51	-0.11 ± 0.37	< 1.0
SPW-9103	WATER	Dec 2000	Gr. Beta	< 1.21	0.55 ± 0.91	< 3.2
SPCH-10583	CHARCOAL CANISTER	Dec 2000	I-131(g)	< 1.49		< 9.6

^a Liquid sample results are reported in pCi/Liter, air filter sample results are in pCi/filter, charcoal sample results are in pCi/charcoal, and solid sample results are in pCi/kilogram.

^b The activity reported is the net activity result.

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L ^a		
			First Result	Second Result	Averaged Result
CF-23, 24	Jan, 2000	Gr. Beta	13.05 ± 0.39	12.46 ± 0.36	12.75 ± 0.26
CF-23, 24	Jan, 2000	K-40	13.00 ± 0.90	11.73 ± 0.79	12.36 ± 0.60
CF-23, 24	Jan, 2000	Sr-90	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00
WW-65, 66	Jan, 2000	Co-60	-0.53 ± 1.62	0.44 ± 2.11	-0.04 ± 1.33
WW-65, 66	Jan, 2000	Cs-137	-2.13 ± 1.70	0.41 ± 2.35	-0.86 ± 1.45
WW-65, 66	Jan, 2000	H-3	131.62 ± 84.13	182.81 ± 86.33	157.22 ± 60.27
WW-686, 687	Jan, 2000	Gr. Beta	4.76 ± 1.22	4.59 ± 1.27	4.67 ± 0.88
AP-1204, 1205	Jan, 2000	Be-7	0.19 ± 0.09	0.10 ± 0.07	0.14 ± 0.06
SW-68, 69	Jan, 2000	K-40 (FP)	1.30 ± 0.13	1.30 ± 0.13	1.30 ± 0.09
MI-277, 278	Jan, 2000	I-131	-0.08 ± 0.27	-0.00 ± 0.26	-0.04 ± 0.19
MI-277, 278	Jan, 2000	K-40	1,664.70 ± 113.20	1,431.30 ± 90.30	1,548.00 ± 72.40
MI-277, 278	Jan, 2000	Sr-90	0.63 ± 0.42	0.51 ± 0.40	0.57 ± 0.29
SW-728, 729	Jan, 2000	Co-60	0.39 ± 1.79	1.04 ± 1.53	0.72 ± 1.18
SW-728, 729	Jan, 2000	Cs-137	-0.67 ± 1.86	1.22 ± 1.38	0.27 ± 1.16
SW-403, 404	Jan, 2000	H-3	795.21 ± 109.04	857.22 ± 111.09	826.22 ± 77.83
SWT-437, 438	Jan, 2000	Gr. Beta	1.73 ± 0.57	2.60 ± 0.58	2.16 ± 0.41
PW-637, 638	Jan, 2000	Co-60	4.90 ± 2.92	-2.56 ± 2.80	1.17 ± 2.02
PW-637, 638	Jan, 2000	Cs-137	2.73 ± 2.51	-1.68 ± 2.71	0.53 ± 1.85
PW-637, 638	Jan, 2000	Gr. Beta	1.67 ± 1.31	4.00 ± 1.59	2.83 ± 1.03
SW-587, 588	Jan, 2000	Co-60	-1.24 ± 1.86	-0.27 ± 1.79	-0.76 ± 1.29
SW-587, 588	Jan, 2000	Cs-137	1.35 ± 1.94	0.23 ± 1.80	0.79 ± 1.32
SW-587, 588	Jan, 2000	Gr. Beta	3.80 ± 1.56	6.76 ± 1.75	5.28 ± 1.17
SW-611, 612	Jan, 2000	H-3	2,229.26 ± 158.61	2,115.19 ± 155.80	2,172.23 ± 111.16
SW-459, 460	Feb, 2000	Gr. Beta	2.15 ± 0.94	2.79 ± 0.94	2.47 ± 0.66
WW-774, 775	Feb, 2000	Co-60	4.26 ± 3.48	1.61 ± 4.46	2.93 ± 2.83
WW-774, 775	Feb, 2000	Cs-137	-1.19 ± 3.78	2.37 ± 4.65	0.59 ± 2.99
WW-774, 775	Feb, 2000	H-3	2,841.35 ± 174.48	2,566.76 ± 168.19	2,704.05 ± 121.17
SW-707, 708	Feb, 2000	Gr. Alpha	2.20 ± 1.73	0.16 ± 1.29	1.18 ± 1.08
SW-707, 708	Feb, 2000	Gr. Beta	7.90 ± 1.70	7.70 ± 1.70	7.80 ± 1.20
SW-707, 708	Feb, 2000	H-3	117.00 ± 92.00	69.00 ± 90.00	93.00 ± 64.35
CW-854, 855	Feb, 2000	Gr. Beta	2.13 ± 1.36	1.34 ± 1.25	1.74 ± 0.93
SW-881, 882	Feb, 2000	H-3	1,794.91 ± 145.81	1,762.31 ± 144.95	1,778.61 ± 102.80
SW-959, 960	Feb, 2000	Gr. Alpha	1.04 ± 1.00	0.92 ± 0.67	0.98 ± 0.60
SW-959, 960	Feb, 2000	Gr. Beta	1.24 ± 0.89	1.79 ± 0.90	1.51 ± 0.63
PW-1055, 1056	Feb, 2000	Co-60	-0.72 ± 3.18	1.73 ± 1.89	0.51 ± 1.85
PW-1055, 1056	Feb, 2000	Cs-137	0.55 ± 2.81	0.90 ± 1.86	0.72 ± 1.69
PW-1055, 1056	Feb, 2000	Gr. Beta	2.40 ± 1.52	2.20 ± 1.50	2.30 ± 1.07

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L ^a		
			First Result	Second Result	Averaged Result
MI-1079, 1080	Mar, 2000	Calcium	0.79 ± 0.08	0.78 ± 0.08	0.79 ± 0.06
MI-1079, 1080	Mar, 2000	K-40	1,229.00 ± 138.00	1,387.00 ± 162.00	1,308.00 ± 106.40
MI-1079, 1080	Mar, 2000	Sr-90	0.90 ± 0.40	1.70 ± 0.50	1.30 ± 0.32
CW-1156, 1157	Mar, 2000	H-3	1,994.51 ± 143.09	2,012.54 ± 143.55	2,003.53 ± 101.34
SW-1967, 1968	Mar, 2000	Gr. Beta	11.96 ± 1.31	12.57 ± 1.31	12.27 ± 0.93
SW-2468, 2469	Mar, 2000	Sr-90	0.93 ± 0.45	0.50 ± 0.29	0.72 ± 0.27
WW-1402, 1403	Mar, 2000	H-3	93.34 ± 97.05	60.63 ± 95.75	76.98 ± 68.17
LW-1269, 1270	Mar, 2000	Gr. Beta	1.97 ± 0.57	3.22 ± 0.69	2.60 ± 0.45
AP-,	Mar, 2000	Be-7	0.06 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
MI-1541, 1542	Mar, 2000	K-40	1,380.00 ± 122.00	1,476.00 ± 158.00	1,428.00 ± 99.81
CW-1571, 1572	Mar, 2000	Gr. Beta	2.29 ± 1.48	1.35 ± 1.27	1.82 ± 0.98
CW-1693, 1694	Mar, 2000	Gr. Beta	0.56 ± 1.18	1.91 ± 1.49	1.24 ± 0.95
SWT-,	Mar, 2000	Gr. Beta	2.36 ± 0.65	2.01 ± 0.57	2.19 ± 0.43
WW-1916, 1917	Mar, 2000	H-3	25.37 ± 90.21	3.90 ± 89.27	14.63 ± 63.46
AP-2155, 2156	Mar, 2000	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
SWU-2547, 2548	Mar, 2000	Sr-90	0.57 ± 0.24	0.55 ± 0.24	0.56 ± 0.17
CW-1798, 1799	Mar, 2000	Gr. Beta	2.73 ± 1.85	0.76 ± 1.71	1.75 ± 1.26
AP-2176, 2177	Mar, 2000	Be-7	0.06 ± 0.01	0.08 ± 0.02	0.07 ± 0.01
WW-2046, 2047	Mar, 2000	H-3	221.85 ± 101.64	185.19 ± 100.24	203.52 ± 71.38
SW-1967, 1968	Apr, 2000	K-40	9.20 ± 0.90	9.10 ± 0.90	9.15 ± 0.64
SW-2241, 2242	Apr, 2000	Gr. Alpha	2.49 ± 1.44	3.15 ± 1.53	2.82 ± 1.05
SW-2241, 2242	Apr, 2000	Gr. Beta	8.37 ± 1.36	7.20 ± 1.29	7.79 ± 0.94
WW-,	Apr, 2000	Gr. Beta	4.20 ± 0.64	4.68 ± 0.73	4.44 ± 0.49
WW-2711, 2712	Apr, 2000	Cs-137	-0.76 ± 2.19	1.43 ± 3.63	0.34 ± 2.12
WW-2711, 2712	Apr, 2000	H-3	3,877.05 ± 192.54	3,951.88 ± 193.99	3,914.46 ± 136.66
WW-2511, 2512	Apr, 2000	H-3	108.10 ± 79.80	127.80 ± 80.70	117.95 ± 56.75
SO-2435, 2436	Apr, 2000	K-40	4.73 ± 0.38	4.83 ± 0.53	4.78 ± 0.33
SS-2669, 2670	Apr, 2000	K-40	8.60 ± 0.55	9.18 ± 0.45	8.89 ± 0.36
SWU-2732, 2733	Apr, 2000	Gr. Beta	3.33 ± 0.68	3.19 ± 0.69	3.26 ± 0.48
PW-2605, 2606	Apr, 2000	Co-60	0.36 ± 1.10	1.05 ± 2.03	0.71 ± 1.16
PW-2605, 2606	Apr, 2000	Cs-137	-0.07 ± 0.93	-0.98 ± 2.37	-0.53 ± 1.27
PW-2605, 2606	Apr, 2000	Gr. Beta	1.51 ± 1.31	2.91 ± 1.39	2.21 ± 0.96
WW-2711, 2712	Apr, 2000	H-3	3,877.00 ± 192.50	3,951.90 ± 194.00	3,914.45 ± 136.65
WW-2711, 2712	Apr, 2000	Co-60	0.97 ± 1.93	0.82 ± 3.64	0.90 ± 2.06
BS-3212, 3213	Apr, 2000	Gr. Beta	7.90 ± 1.97	7.57 ± 1.88	7.74 ± 1.36
SW-,	May, 2000	K-40	1.30 ± 0.13	1.20 ± 0.12	1.25 ± 0.09
MI-2810, 2811	May, 2000	K-40	1,285.00 ± 111.00	1,338.00 ± 127.00	1,311.50 ± 84.34

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L ^a		
			First Result	Second Result	Averaged Result
SW-3003, 3004	May, 2000	Gr. Beta	5.06 ± 0.73	5.27 ± 0.73	5.17 ± 0.52
F-2831, 2832	May, 2000	Co-60	0.01 ± 0.01	0.00 ± 0.01	0.01 ± 0.01
F-2831, 2832	May, 2000	Cs-137	-0.00 ± 0.01	0.00 ± 0.01	0.00 ± 0.01
WW-3128, 3129	May, 2000	Gr. Beta	5.41 ± 1.35	4.43 ± 1.22	4.92 ± 0.91
BS-3411, 3412	May, 2000	Co-60	-0.00 ± 0.01	0.01 ± 0.01	0.00 ± 0.01
BS-3411, 3412	May, 2000	Cs-137	0.01 ± 0.01	0.00 ± 0.01	0.00 ± 0.00
F-3436, 3437	May, 2000	Co-60	0.01 ± 0.01	0.00 ± 0.01	0.01 ± 0.00
F-3436, 3437	May, 2000	Cs-137	0.00 ± 0.01	-0.00 ± 0.00	-0.00 ± 0.00
F-2978, 2979	May, 2000	K-40	2.72 ± 0.26	2.14 ± 0.30	2.43 ± 0.20
SS-3482, 3483	May, 2000	Cs-137	0.11 ± 0.03	0.12 ± 0.03	0.12 ± 0.02
SS-3482, 3483	May, 2000	K-40	11.26 ± 0.57	11.37 ± 0.54	11.32 ± 0.39
BS-3458, 3459	May, 2000	Co-60	0.01 ± 0.01	0.02 ± 0.01	0.01 ± 0.01
BS-3458, 3459	May, 2000	Cs-137	0.04 ± 0.01	0.03 ± 0.02	0.03 ± 0.01
MI-3510, 3511	May, 2000	Co-60	0.48 ± 3.05	-0.80 ± 2.74	-0.16 ± 2.05
MI-3510, 3511	May, 2000	Cs-137	1.17 ± 2.96	0.38 ± 2.60	0.77 ± 1.97
MI-3510, 3511	May, 2000	I-131	-0.06 ± 0.25	-0.04 ± 0.24	-0.05 ± 0.17
SO-3629, 3630	May, 2000	Cs-137	0.23 ± 0.03	0.20 ± 0.03	0.22 ± 0.02
SO-3629, 3630	May, 2000	Gr. Beta	20.49 ± 2.82	19.14 ± 2.73	19.82 ± 1.96
SO-3629, 3630	May, 2000	K-40	13.03 ± 0.61	12.25 ± 0.57	12.64 ± 0.42
SW-3904, 3905	May, 2000	Gr. Beta	6.27 ± 1.83	7.02 ± 1.90	6.65 ± 1.32
SW-3904, 3905	May, 2000	Co-60	-0.65 ± 1.54	1.32 ± 1.77	0.33 ± 1.17
SW-3904, 3905	May, 2000	Cs-137	0.19 ± 1.22	-0.16 ± 1.15	0.01 ± 0.84
SW-3904, 3905	May, 2000	Gr. Beta	6.27 ± 1.83	7.02 ± 1.90	6.64 ± 1.32
SP-3833, 3834	May, 2000	Gr. Alpha	4.19 ± 1.34	3.22 ± 1.20	3.71 ± 0.90
MI-3105, 3106	May, 2000	K-40	1,460.00 ± 173.00	1,452.00 ± 110.00	1,456.00 ± 102.50
VE-3191, 3192	May, 2000	Be-7	0.42 ± 0.23	0.39 ± 0.16	0.40 ± 0.14
VE-3191, 3192	May, 2000	Gr. Alpha	0.15 ± 0.06	0.28 ± 0.07	0.22 ± 0.05
VE-3191, 3192	May, 2000	Gr. Beta	3.76 ± 0.13	3.88 ± 0.14	3.82 ± 0.10
VE-3191, 3192	May, 2000	K-40	3.58 ± 0.43	3.47 ± 0.72	3.53 ± 0.42
MI-3718, 3719	May, 2000	K-40	1,447.00 ± 165.00	1,444.00 ± 177.00	1,445.50 ± 120.99
DW-3770, 3771	May, 2000	Gr. Beta	5.92 ± 1.32	4.54 ± 1.10	5.23 ± 0.86
MI-3653, 3654	Jun, 2000	K-40	1,407.00 ± 170.00	1,388.00 ± 102.00	1,397.50 ± 99.13
SW-4614, 4615	Jun, 2000	Sr-90	0.50 ± 0.27	0.55 ± 0.27	0.53 ± 0.19
WW-3883, 3884	Jun, 2000	H-3	4,401.80 ± 204.60	4,298.00 ± 202.70	4,349.90 ± 144.00
WW-3883, 3884	Jun, 2000	Co-60	0.91 ± 3.01	-0.28 ± 1.52	0.32 ± 1.69
WW-3883, 3884	Jun, 2000	Cs-137	0.49 ± 2.16	0.66 ± 1.82	0.57 ± 1.41
WW-3883, 3884	Jun, 2000	H-3	4,401.78 ± 204.63	4,297.96 ± 202.67	4,349.87 ± 144.00

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L ^a		
			First Result	Second Result	Averaged Result
BS-3980, 3981	Jun, 2000	Cs-137	0.07 ± 0.02	0.08 ± 0.02	0.08 ± 0.01
BS-3980, 3981	Jun, 2000	Cs-137	0.06 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
BS-3980, 3981	Jun, 2000	K-40	1,458.60 ± 69.40	1,421.90 ± 52.20	1,440.25 ± 43.42
VE-4065, 4066	Jun, 2000	K-40	6.37 ± 0.54	6.34 ± 0.51	6.36 ± 0.37
WW-4252, 4253	Jun, 2000	H-3	705.40 ± 114.10	718.90 ± 114.60	712.15 ± 80.86
TSWU-4283, 4284	Jun, 2000	Gr. Beta	3.24 ± 0.63	3.11 ± 0.62	3.18 ± 0.44
F-4438, 4439	Jun, 2000	Gr. Beta	2.25 ± 0.06	2.13 ± 0.06	2.19 ± 0.04
SW-4459, 4460	Jun, 2000	H-3	532.20 ± 108.10	670.50 ± 112.90	601.35 ± 78.15
WW-4480, 4481	Jun, 2000	H-3	601.50 ± 99.50	573.10 ± 108.50	587.30 ± 73.61
SW-4375, 4376	Jun, 2000	Gr. Beta	4.53 ± 1.59	4.43 ± 1.54	4.48 ± 1.11
SW-4375, 4376	Jun, 2000	Cs-137	-0.09 ± 1.61	-0.43 ± 1.39	-0.26 ± 1.06
AP-,	Jun, 2000	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
AP-4712, 4713	Jun, 2000	Be-7	0.07 ± 0.02	0.09 ± 0.02	0.08 ± 0.01
SW-4537, 4538	Jun, 2000	H-3	584.10 ± 108.80	599.20 ± 109.30	591.65 ± 77.11
SL-4636, 4637	Jul, 2000	Be-7	0.93 ± 0.18	0.56 ± 0.12	0.75 ± 0.11
SL-4636, 4637	Jul, 2000	Gr. Beta	2.41 ± 0.32	2.69 ± 0.32	2.55 ± 0.23
SL-4636, 4637	Jul, 2000	K-40	1.25 ± 0.24	1.13 ± 0.30	1.19 ± 0.19
SL-4636, 4637	Jul, 2000	Sr-90	0.04 ± 0.02	0.05 ± 0.03	0.05 ± 0.02
G-4667, 4668	Jul, 2000	Be-7	0.93 ± 0.20	0.98 ± 0.31	0.96 ± 0.18
G-4667, 4668	Jul, 2000	Gr. Beta	6.16 ± 0.13	6.68 ± 0.14	6.42 ± 0.10
G-4667, 4668	Jul, 2000	K-40	7.72 ± 0.51	8.43 ± 0.83	8.08 ± 0.49
WW-4818, 4819	Jul, 2000	H-3	13.30 ± 77.10	29.70 ± 77.90	21.50 ± 54.80
MI-4839, 4840	Jul, 2000	K-40	1,313.00 ± 173.00	1,398.00 ± 161.00	1,355.50 ± 118.16
MI-4949, 4950	Jul, 2000	K-40	1,307.00 ± 56.00	1,346.00 ± 58.00	1,326.50 ± 40.31
LW-4991, 4992	Jul, 2000	Gr. Beta	2.78 ± 0.66	2.22 ± 0.55	2.50 ± 0.43
MI-4903, 4904	Jul, 2000	K-40	1,383.10 ± 193.20	1,328.00 ± 153.10	1,355.55 ± 123.25
MI-4881, 4882	Jul, 2000	K-40	1,538.40 ± 103.00	1,438.00 ± 125.30	1,488.20 ± 81.10
MI-4881, 4882	Jul, 2000	Sr-90	1.01 ± 0.37	1.38 ± 0.42	1.19 ± 0.28
G-5388, 5389	Jul, 2000	Be-7	1.64 ± 0.16	1.52 ± 0.21	1.58 ± 0.13
G-5388, 5389	Jul, 2000	K-40	5.51 ± 0.33	5.86 ± 0.49	5.69 ± 0.30
G-5388, 5389	Jul, 2000	Gr. Beta	5.64 ± 0.15	5.81 ± 0.15	5.73 ± 0.11
SWU-5473, 5474	Jul, 2000	Gr. Beta	3.50 ± 0.67	3.17 ± 0.61	3.34 ± 0.45
SW-5410, 5411	Jul, 2000	Gr. Beta	1.95 ± 0.81	1.89 ± 1.04	1.92 ± 0.66
PW-5550, 5551	Jul, 2000	Gr. Beta	0.71 ± 1.15	2.50 ± 1.49	1.61 ± 0.94
WW-5623, 5624	Jul, 2000	H-3	22,713.90 ± 429.00	22,265.50 ± 424.90	22,489.70 ± 301.90
MI-5529, 5530	Aug, 2000	K-40	1,396.80 ± 103.80	1,278.20 ± 117.50	1,337.50 ± 78.39
VE-,	Aug, 2000	K-40	1.66 ± 0.32	1.93 ± 0.33	1.80 ± 0.23

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L ^a		
			First Result	Second Result	Averaged Result
MI-5808, 5809	Aug, 2000	K-40	1,261.90 ± 124.40	1,234.40 ± 152.80	1,248.15 ± 98.52
CW-6514, 6515	Aug, 2000	Gr. Beta	1.42 ± 0.37	1.44 ± 0.41	1.43 ± 0.28
MI-5933, 5934	Aug, 2000	Calcium	0.88 ± 0.09	0.89 ± 0.09	0.89 ± 0.06
MI-5933, 5934	Aug, 2000	Sr-90	3.29 ± 0.51	1.72 ± 0.47	2.51 ± 0.35
VE-6002, 6003	Aug, 2000	Sr-90	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
VE-6002, 6003	Aug, 2000	K-40	1.44 ± 0.23	1.78 ± 0.18	1.61 ± 0.14
PW-6209, 6210	Aug, 2000	H-3	528.20 ± 112.70	578.50 ± 114.50	553.35 ± 80.33
SW-6291, 6292	Aug, 2000	Gr. Beta	4.14 ± 1.58	1.95 ± 1.32	3.05 ± 1.03
WW-6312, 6313	Aug, 2000	H-3	7,804.20 ± 262.70	7,221.70 ± 253.80	7,512.95 ± 182.64
WW-5981, 5982	Aug, 2000	Gr. Beta	4.85 ± 0.78	5.87 ± 0.79	5.36 ± 0.56
PW-6341, 6342	Aug, 2000	Gr. Beta	2.45 ± 1.42	2.63 ± 1.37	2.54 ± 0.99
CW-6514, 6515	Aug, 2000	H-3	5,600.10 ± 226.80	5,434.30 ± 223.90	5,517.20 ± 159.35
MI-6409, 6410	Sep, 2000	I-131	-0.04 ± 0.23	0.19 ± 0.24	0.08 ± 0.17
MI-6409, 6410	Sep, 2000	K-40	1,367.80 ± 111.40	1,368.60 ± 107.50	1,368.20 ± 77.41
MI-6409, 6410	Sep, 2000	Sr-90	1.19 ± 0.35	0.80 ± 0.30	1.00 ± 0.23
MI-6542, 6543	Sep, 2000	K-40	1,298.00 ± 140.10	1,470.60 ± 139.70	1,384.30 ± 98.92
MI-6450, 6451	Sep, 2000	K-40	1,237.20 ± 102.10	1,328.10 ± 108.30	1,282.65 ± 74.42
MI-7102, 7103	Sep, 2000	I-131	-0.11 ± 0.23	-0.02 ± 0.25	-0.07 ± 0.17
MI-7102, 7103	Sep, 2000	K-40	1,473.10 ± 101.40	1,400.70 ± 168.60	1,436.90 ± 98.37
SWT-7262, 7263	Sep, 2000	Gr. Beta	3.45 ± 0.66	2.32 ± 0.57	2.89 ± 0.44
SWU-7283, 7284	Sep, 2000	Gr. Beta	2.75 ± 0.55	2.87 ± 0.56	2.81 ± 0.39
SWU-7283, 7284	Sep, 2000	H-3	197.76 ± 94.07	172.31 ± 93.00	185.04 ± 66.14
SW-7081, 7082	Sep, 2000	H-3	89.32 ± 92.99	42.38 ± 90.37	65.85 ± 64.83
AP-7685, 7686	Sep, 2000	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
AP-7706, 7707	Sep, 2000	Be-7	0.06 ± 0.01	0.05 ± 0.01	0.05 ± 0.01
SW-7482, 7483	Sep, 2000	Gr. Beta	5.31 ± 1.75	6.70 ± 1.85	6.01 ± 1.27
SP-7347, 7348	Sep, 2000	Gr. Alpha	6.12 ± 1.54	5.68 ± 1.49	5.90 ± 1.07
SW-7436, 7437	Sep, 2000	H-3	40.60 ± 79.90	72.00 ± 81.40	56.30 ± 57.03
CW-7748, 7749	Sep, 2000	Gr. Alpha	0.47 ± 0.28	0.65 ± 0.36	0.56 ± 0.23
CW-7748, 7749	Sep, 2000	Gr. Beta	2.35 ± 0.39	2.02 ± 0.38	2.19 ± 0.27
SL-7304, 7305	Oct, 2000	Gr. Beta	2.94 ± 0.23	2.90 ± 0.23	2.92 ± 0.17
SL-7304, 7305	Oct, 2000	K-40	1.14 ± 0.36	1.73 ± 0.58	1.44 ± 0.34
BS-7369, 7370	Oct, 2000	Cs-137	10.79 ± 4.96	20.04 ± 9.40	15.41 ± 5.31
SO-7950, 7951	Oct, 2000	Ac-228	0.66 ± 0.10	0.77 ± 0.10	0.72 ± 0.07
SO-7950, 7951	Oct, 2000	Bi-214	0.42 ± 0.06	0.57 ± 0.07	0.49 ± 0.05
SO-7950, 7951	Oct, 2000	Cs-137	0.20 ± 0.31	0.21 ± 0.04	0.20 ± 0.16
SO-7950, 7951	Oct, 2000	Gr. Beta	29.22 ± 1.98	28.02 ± 1.98	28.62 ± 1.40

Table A-5. In-house "duplicate" samples.

Lab Codes	Sample Date	Analysis	Concentration in pCi/L ^a		
			First Result	Second Result	Averaged Result
SO-7950, 7951	Oct, 2000	K-40	21.36 ± 0.93	21.77 ± 0.89	21.56 ± 0.64
SO-7950, 7951	Oct, 2000	Pb-212	0.72 ± 0.12	0.92 ± 0.12	0.82 ± 0.09
SO-7950, 7951	Oct, 2000	Ra-226	1.21 ± 0.33	1.30 ± 0.31	1.26 ± 0.22
SO-7950, 7951	Oct, 2000	Tl-208	0.21 ± 0.04	0.25 ± 0.03	0.23 ± 0.02
VE-7554, 7555	Oct, 2000	Gr. Beta	0.73 ± 0.02	0.74 ± 0.02	0.74 ± 0.01
MI-7622, 7623	Oct, 2000	K-40	1,505.90 ± 142.70	1,453.60 ± 172.00	1,479.75 ± 111.74
F-8219, 8220	Oct, 2000	K-40	2.94 ± 0.22	3.39 ± 0.38	3.16 ± 0.22
WW-7844, 7845	Oct, 2000	H-3	-68.13 ± 74.09	84.23 ± 81.38	8.05 ± 55.03
WW-8240, 8241	Oct, 2000	Gr. Beta	0.35 ± 1.89	1.61 ± 2.28	0.98 ± 1.48
WW-8240, 8241	Oct, 2000	H-3	72.46 ± 92.95	38.87 ± 91.51	55.66 ± 65.22
BS-8170, 8171	Oct, 2000	Gr. Beta	11.96 ± 2.55	11.30 ± 2.39	11.63 ± 1.75
BS-8170, 8171	Oct, 2000	K-40	8.36 ± 0.46	8.76 ± 0.47	8.56 ± 0.33
MI-8085, 8086	Oct, 2000	Calcium	0.94	0.94	0.94
MI-8085, 8086	Oct, 2000	Sr-90	1.04 ± 0.35	0.75 ± 0.31	0.90 ± 0.24
MI-8149, 8150	Oct, 2000	K-40	1,358.10 ± 95.81	1,341.80 ± 178.00	1,349.95 ± 101.07
SO-8967, 8968	Oct, 2000	Be-7	1.25 ± 0.37	1.27 ± 0.35	1.26 ± 0.26
SO-8967, 8968	Oct, 2000	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.02
SO-8967, 8968	Oct, 2000	K-40	4.53 ± 0.66	4.46 ± 0.58	4.50 ± 0.44
MI-8522, 8523	Oct, 2000	I-131	-0.05 ± 0.23	0.18 ± 0.25	0.07 ± 0.17
SWU-8894, 8895	Oct, 2000	Gr. Beta	3.63 ± 0.62	2.45 ± 0.61	3.04 ± 0.43
MI-8802, 8803	Nov, 2000	I-131	-0.22 ± 0.24	-0.25 ± 0.26	-0.24 ± 0.18
MI-8802, 8803	Nov, 2000	K-40	1,340.50 ± 113.80	1,453.50 ± 100.50	1,397.00 ± 75.91
MI-8802, 8803	Nov, 2000	Sr-89	0.19 ± 1.31	0.61 ± 1.34	0.40 ± 0.94
MI-8802, 8803	Nov, 2000	Sr-90	1.10 ± 0.39	0.90 ± 0.38	1.00 ± 0.27
LW-8823, 8824	Nov, 2000	Gr. Beta	2.13 ± 0.55	1.59 ± 0.52	1.86 ± 0.38
VE-9014, 9015	Nov, 2000	Gr. Alpha	0.10 ± 0.06	0.15 ± 0.07	0.12 ± 0.05
VE-9014, 9015	Nov, 2000	Gr. Beta	5.59 ± 0.17	5.90 ± 0.19	5.74 ± 0.13
PW-9991, 9992	Nov, 2000	Gr. Beta	2.50 ± 0.01	3.49 ± 1.18	3.00 ± 0.59
SW-9991, 9992	Nov, 2000	Co-60	1.16 ± 1.70	-2.94 ± 3.39	-0.89 ± 1.89
SW-9991, 9992	Nov, 2000	Cs-134	-0.07 ± 1.85	2.27 ± 3.73	1.10 ± 2.08
SW-9991, 9992	Nov, 2000	Cs-137	-0.88 ± 1.67	3.84 ± 3.45	1.48 ± 1.92
DW-9682, 9683	Dec, 2000	Gr. Beta	1.61 ± 1.02	2.10 ± 0.94	1.86 ± 0.69
MI-9749, 9750	Dec, 2000	K-40	1,562.40 ± 118.70	1,495.90 ± 168.30	1,529.15 ± 102.97
AP-10782, 10783	Dec, 2000	Be-7	0.21 ± 0.10	0.31 ± 0.14	0.26 ± 0.09
AP-10824, 10825	Dec, 2000	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.06 ± 0.01
WW-10424, 10425	Dec, 2000	H-3	1,690.87 ± 137.81	1,551.48 ± 1,339.42	1,621.18 ± 673.25

Table A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration ^b		
				Laboratory result ^c	MAPEP Result ^d 1s, N=1	Control Limits
STSO-882	SOIL	Jan, 2000	Am-241	64.90 ± 6.49	61.10	42.77 - 79.43
STSO-882	SOIL	Jan, 2000	Co-57	721.10 ± 83.80	949.00	664.30 - 1,233.70
The MAPEP soil sample (STSO-882), as received, did not closely match a standard gamma geometry. The results for gamma-emitting isotopes are reanalyses, with a reduced sample size.						
STSO-882	SOIL	Jan, 2000	Co-60	1,264.40 ± 78.60	1,180.00	826.00 - 1,534.00
STSO-882	SOIL	Jan, 2000	Cs-134	969.30 ± 76.90	1,047.00	732.90 - 1,361.10
STSO-882	SOIL	Jan, 2000	Cs-137	944.00 ± 92.00	930.00	651.00 - 1,209.00
STSO-882	SOIL	Jan, 2000	K-40	811.70 ± 79.90	652.00	456.40 - 847.60
STSO-882	SOIL	Jan, 2000	Mn-54	1,103.30 ± 64.20	1,023.00	716.10 - 1,329.90
STSO-882	SOIL	Jan, 2000	Ni-63	711.00 ± 71.10	960.00	672.00 - 1,248.00
STSO-882	SOIL	Jan, 2000	Pu-239/40	67.90 ± 6.79	74.40	52.08 - 96.72
STSO-882	SOIL	Jan, 2000	Sr-90	345.00 ± 34.50	304.00	212.80 - 395.20
STSO-882	SOIL	Jan, 2000	U-233/4	62.90 ± 6.29	90.00	63.00 - 117.00
Incomplete dissolution of the sample is suspected. Results of reanalysis: U-233/234 67.3 ± 3.3 pCi/g, U-238 68.1 ± 8.9 pCi/g.						
STSO-882	SOIL	Jan, 2000	U-238	63.20 ± 6.32	93.00	65.10 - 120.90
STSO-882	SOIL	Jan, 2000	Zn-65	1,544.30 ± 61.50	1,540.00	1,078.00 - 2,002.00

^a Results obtained by Environmental Inc., Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho.

^b All results are in Bq/kg or Bq/L as requested by the Department of Energy.

^c Unless otherwise indicated, laboratory results are given as the mean ± 1 standard deviations for three determinations.

^d Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination), and control limits as defined by the MAPEP.

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration ^b		Control Limits ^e
				Laboratory result ^c	EML Result ^d	
STSO-870	SOIL	Mar, 2000	Ac-228	98.300 ± 7.100	97.600	0.79 - 1.75
STSO-870	SOIL	Mar, 2000	Bi-212	98.500 ± 15.100	106.000	0.42 - 1.22
STSO-870	SOIL	Mar, 2000	Bi-214	88.000 ± 3.800	86.700	0.75 - 1.42
STSO-870	SOIL	Mar, 2000	Cs-137	324.000 ± 5.000	339.000	0.83 - 1.32
STSO-870	SOIL	Mar, 2000	K-40	872.000 ± 34.000	811.000	0.78 - 1.53
STSO-870	SOIL	Mar, 2000	Pb-212	93.700 ± 2.700	97.300	0.74 - 1.33
STSO-870	SOIL	Mar, 2000	Pb-214	100.100 ± 3.700	86.500	0.65 - 1.45
STSO-870	SOIL	Mar, 2000	Pu-238	19.800 ± 3.000	18.600	0.52 - 2.84
STSO-870	SOIL	Mar, 2000	Pu-239/40	8.100 ± 1.700	7.000	0.69 - 1.74
STSO-870	SOIL	Mar, 2000	Sr-90	13.600 ± 3.100	20.200	0.60 - 3.66
STVE-871	VEGETATION	Mar, 2000	Am-241	9.800 ± 0.900	10.400	0.68 - 2.70
STVE-871	VEGETATION	Mar, 2000	Co-60	46.500 ± 2.100	52.800	0.69 - 1.46
STVE-871	VEGETATION	Mar, 2000	Cs-137	1,872.000 ± 46.000	1,380.000	0.80 - 1.40
STVE-871	VEGETATION	Mar, 2000	K-40	506.400 ± 28.000	521.000	0.79 - 1.42
STVE-871	VEGETATION	Mar, 2000	Pu-239/40	14.300 ± 1.500	15.500	0.68 - 1.59
STVE-871	VEGETATION	Mar, 2000	Sr-90	1,198.000 ± 85.000	1,780.000	0.50 - 1.33
STAP-872	AIR FILTER	Mar, 2000	Co-57	5.900 ± 0.100	5.310	0.65 - 1.39
STAP-872	AIR FILTER	Mar, 2000	Co-60	5.900 ± 0.100	5.320	0.75 - 1.32
STAP-872	AIR FILTER	Mar, 2000	Cs-137	7.500 ± 0.100	6.100	0.73 - 1.37
STAP-872	AIR FILTER	Mar, 2000	Gr. Alpha	3.300 ± 0.100	3.020	0.50 - 1.55
STAP-872	AIR FILTER	Mar, 2000	Gr. Beta	2.700 ± 0.100	2.420	0.72 - 1.67
STAP-872	AIR FILTER	Mar, 2000	Mn-54	31.800 ± 0.300	27.200	0.76 - 1.33
STAP-872	AIR FILTER	Mar, 2000	Pu-238	0.060 ± 0.030	0.080	0.74 - 1.40
STAP-872	AIR FILTER	Mar, 2000	Pu-239/40	0.090 ± 0.010	0.089	0.76 - 1.44
STAP-872	AIR FILTER	Mar, 2000	Ru-106	3.500 ± 1.000	2.010	0.59 - 1.30
Result within activity ± error margin.						
STAP-872	AIR FILTER	Mar, 2000	Sr-90	0.310 ± 0.160	0.242	0.61 - 1.93
STAP-872	AIR FILTER	Mar, 2000	Uranium	0.120 ± 0.010	0.126	0.80 - 3.35
STW-874	WATER	Mar, 2000	Am-241	1.700 ± 0.220	1.950	0.75 - 1.49
STW-874	WATER	Mar, 2000	Co-60	51.000 ± 1.200	48.900	0.80 - 1.20

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration ^b		Control Limits ^e
				Laboratory result ^c	EML Result ^d	
STW-874	WATER	Mar, 2000	Cs-137	108.600 ± 1.800	103.000	0.80 - 1.26
STW-874	WATER	Mar, 2000	Fe-55	33.000 ± 1.200	33.100	0.44 - 1.53
STW-874	WATER	Mar, 2000	Gr. Alpha	1,217.000 ± 35.000	1,700.000	0.61 - 1.32
STW-874	WATER	Mar, 2000	Gr. Beta	792.000 ± 25.000	690.000	0.55 - 1.54
STW-874	WATER	Mar, 2000	H-3	147.000 ± 26.000	79.400	0.71 - 1.79
Analysis was repeated; result of reanalysis; 97.5 ± 11.6 Bq/l.						
STW-874	WATER	Mar, 2000	Ni-63	101.000 ± 6.000	112.000	0.25 - 1.75
STW-874	WATER	Mar, 2000	Pu-238	0.750 ± 0.170	0.944	0.78 - 1.25
STW-874	WATER	Mar, 2000	Pu-239/40	0.990 ± 0.090	0.918	0.80 - 1.39
STW-874	WATER	Mar, 2000	Sr-90	4.460 ± 0.990	3.390	0.75 - 1.50
STW-874	WATER	Mar, 2000	Uranium	0.270 ± 0.020	0.995	0.67 - 1.42
Result reported was for U-234. Result for U (total); 0.58 ± 0.02 pCi/L.						
STSO-885	SOIL	Sep, 2000	Ac-228	78.000 ± 1.500	80.200	0.80 - 1.50
STSO-885	SOIL	Sep, 2000	Bi-212	73.000 ± 3.300	80.500	0.45 - 1.23
STSO-885	SOIL	Sep, 2000	Bi-214	91.000 ± 4.000	83.300	0.78 - 1.50
STSO-885	SOIL	Sep, 2000	Cs-137	925.700 ± 14.200	1,020.000	0.80 - 1.29
STSO-885	SOIL	Sep, 2000	K-40	713.600 ± 7.100	713.000	0.80 - 1.37
STSO-885	SOIL	Sep, 2000	Pb-212	66.100 ± 4.300	79.300	0.74 - 1.36
STSO-885	SOIL	Sep, 2000	Pb-214	100.100 ± 3.700	86.300	0.76 - 1.53
STSO-885	SOIL	Sep, 2000	Pu-239/40	18.400 ± 0.400	16.800	0.71 - 1.33
STSO-885	SOIL	Sep, 2000	Sr-90	39.900 ± 5.300	50.400	0.61 - 3.91
STSO-885	SOIL	Sep, 2000	Th-234	154.700 ± 9.300	148.000	0.68 - 2.36
STSO-885	SOIL	Sep, 2000	Uranium	254.300 ± 13.000	327.000	0.62 - 1.35
STW-886	WATER	Sep, 2000	Am-241	1.300 ± 0.200	1.190	0.76 - 1.48
STW-886	WATER	Sep, 2000	Co-60	71.900 ± 7.200	73.700	0.80 - 1.20
STW-886	WATER	Sep, 2000	Cs-137	62.700 ± 6.300	67.000	0.80 - 1.24
STW-886	WATER	Sep, 2000	H-3	92.300 ± 8.900	91.300	0.74 - 2.29
STW-886	WATER	Sep, 2000	Pu-238	0.700 ± 0.100	0.786	0.74 - 1.22
STW-886	WATER	Sep, 2000	Pu-239/40	0.600 ± 0.100	0.591	0.75 - 1.26
STW-886	WATER	Sep, 2000	Sr-90	4.600 ± 0.400	4.530	0.64 - 1.50

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration ^b		Control Limits ^e
				Laboratory result ^c	EML Result ^d	
STW-886	WATER	Sep, 2000	Uranium	0.800 ± 0.100	0.916	0.73 - 1.37
STW-887	WATER	Sep, 2000	Gr. Alpha	1,113.700 ± 17.900	1,070.000	0.58 - 1.26
STW-887	WATER	Sep, 2000	Gr. Beta	1,129.400 ± 16.700	950.000	0.56 - 1.50
STAP-888	AIR FILTER	Sep, 2000	Am-241	0.060 ± 0.010	0.032	0.69 - 2.40
STAP-888	AIR FILTER	Sep, 2000	Co-57	16.500 ± 0.600	14.500	0.69 - 1.37
STAP-888	AIR FILTER	Sep, 2000	Co-60	9.200 ± 0.400	8.430	0.79 - 1.30
STAP-888	AIR FILTER	Sep, 2000	Cs-137	8.800 ± 0.500	7.410	0.78 - 1.35
STAP-888	AIR FILTER	Sep, 2000	Mn-54	50.200 ± 2.300	43.200	0.80 - 1.36
STAP-888	AIR FILTER	Sep, 2000	Pu-238	0.033 ± 0.010	0.045	0.66 - 1.35
STAP-888	AIR FILTER	Sep, 2000	Pu-239/40	0.080 ± 0.010	0.074	0.69 - 1.29
STAP-888	AIR FILTER	Sep, 2000	Sr-90	3.300 ± 0.100	1.640	0.55 - 2.05
STAP-888	AIR FILTER	Sep, 2000	U-233/4	0.034 ± 0.001	0.040	0.80 - 1.92
STAP-888	AIR FILTER	Sep, 2000	U-238	0.032 ± 0.010	0.041	0.80 - 1.59
Result within activity ± error margin.						
STAP-888	AIR FILTER	Sep, 2000	Uranium	0.070 ± 0.010	0.083	0.80 - 2.54
STAP-889	AIR FILTER	Sep, 2000	Gr. Alpha	2.840 ± 0.010	2.350	0.57 - 1.47
STAP-889	AIR FILTER	Sep, 2000	Gr. Beta	2.080 ± 0.020	1.520	0.76 - 1.52
STVE-890	VEGETATION	Sep, 2000	Am-241	5.900 ± 1.200	5.600	0.72 - 2.34
STVE-890	VEGETATION	Sep, 2000	Cm-244	3.200 ± 0.100	3.600	0.61 - 1.61
STVE-890	VEGETATION	Sep, 2000	Co-60	29.400 ± 0.400	32.800	0.75 - 1.51
STVE-890	VEGETATION	Sep, 2000	Cs-137	739.300 ± 23.000	867.000	0.80 - 1.37
STVE-890	VEGETATION	Sep, 2000	K-40	597.500 ± 49.300	639.000	0.78 - 1.43
STVE-890	VEGETATION	Sep, 2000	Pu-239/40	4.500 ± 0.200	9.600	0.67 - 1.49
No reason for deviation was found with original result. The result of reanalysis; 12.1 ± 1.1 Bq/kg.						
STVE-890	VEGETATION	Sep, 2000	Sr-90	1,201.500 ± 117.300	1,150.000	0.52 - 1.23

Table A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)^a.

Lab Code	Sample Type	Date Collected	Analysis	Concentration ^b		Control Limits ^e
				Laboratory result ^c	EML Result ^d	

^a The Environmental Measurements Laboratory provides the following nuclear species : Air Filters, Soil, Vegetation and Water.

^b Results are reported in Bq/L with the following exceptions: Air Filter results are reported in Bq/Filter, Soil results are reported in Bq/Kg, Vegetation results are reported in Bq/Kg.

^c Laboratory results are reported as the mean of three determinations ± standard deviation.

^d The EML result listed is the mean of replicate determinations for each nuclide±the standard error of the mean.

^e The control limits are reported by EML as the ratio of Reported Value / EML value.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

$s = 2s$ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L , it is reported as: $<L$, where L = the lower limit of detection based on $4.66s$ uncertainty for a background sample.

3.0. Duplicate analyses

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $<L_1, <L_2$ Reported result: $<L$, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s, <L$ Reported result: $x \pm s$ if $x \geq L$; $<L$ otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average \bar{x} and standard deviation s of a set of n numbers $x_1, x_2 \dots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the figure following those to be retained is less than 5, the figure is dropped, and the retained figures are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the figure following those to be retained is equal to or greater than 5, the figure is dropped and the last retained figure is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

**Maximum Permissible Concentrations
of Radioactivity in Air and Water
Above Background in Unrestricted Areas**

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas^a.

Air (pCi/m ³)		Water (pCi/L)	
Gross alpha	1 x 10 ⁻³	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131 ^b	2.8 x 10 ⁻¹	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40 ^c	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1 x 10 ⁶

^a Taken from Table II of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

^b Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

^c A natural radionuclide.

APPENDIX D

SUMMARY OF THE LAND USE CENSUS

Appendix D

Summary of the Land Use Census

The Duane Arnold Energy Center Land Use Census for 2000 was completed during the fourth week of September 2000. All milk animals and gardens greater than 500 square feet were identified within three miles of the plant for each of the 16 meteorological sectors. If none were identified within the three mile range, additional surveys were performed out to a distance of five miles. The Cedar River was surveyed by boat on July 24th, 2000 for water use downstream of the DAEC to Cedar Rapids.

There were 169 gardens found during the performance of the 2000 Census. This number exceeds the number of gardens found in the 1999 survey by 11. This difference can be attributed to the removal of 32 gardens and the addition of 33 new gardens.

Milk animal locations remained unchanged since the 1995 census. Two of the locations have goats that do not provide samples during the winter months.

The locations of the nearest resident for each sector remained the same in 2000.

16 new homes were built or were under construction within three miles of the DAEC, compared to the 18 new homes identified in 1999. Most of the new houses built were located in the sectors between the plant and Cedar Rapids (SSE and SE).

The Cedar River survey revealed no new withdrawals of river water compared to previous surveys. Irrigation of the strawberry farm in Palo and fishing remain the only food pathway uses of river water between the DAEC and Cedar Rapids.

As a result of this census, adjustments were made to the MIDAS dose projection software model for the affected changes in receptor distances.

Pursuant to ESP4.4, no changes were observed offsite that could adversely affect the safe operation of the DAEC or that would warrant a UFSAR update such as new gas pipelines, toxic gas installations or airfield strips.

APPENDIX E

ANNUAL RADIATION DOSE ASSESSMENT

Appendix E

Annual Radiation Dose Assessment

The annual offsite radiation dose to a member of the public was determined by assessment of environmental dosimeter results and by calculations based on monitored effluent releases.

Section A. Dose Contribution from Direct Radiation

Direct radiation dose from the operation of the DAEC was reported by TLDs placed at locations in the surrounding environment as described in the Offsite Dose Assessment Manual (ODAM).

1. Pre-operational and 2000 TLD results were compared using a paired difference test. No significant differences in the TLD populations were observed for the 0.5 mile and one mile TLD populations using a confidence level of 99%.
2. As stated in Part 1, page 8 of this report, no plant effect was indicated by the TLDs when dose results were compared to the estimated average natural background for Middle America.

Section B. Estimated Offsite Dose from Effluent Releases

The contribution of dose to a member of the public most likely to be exposed from effluent releases was calculated by the Meteorological Information and Dose Assessment System (MIDAS) computer program in accordance with ODA. The calculation methods follow those prescribed by Reg. Guide 1.109. Because there were no nuclides detected in the environment at or beyond the site boundary that were due to the operation of the DAEC, no comparison of calculated dose from stack releases and dose calculated from environmental contamination was performed.

Results of the MIDAS dose calculations are discussed below and are shown in tabular form on page E-3

- 1.) There were no releases of radioactive material to liquid effluents in 2000.
- 2.) The maximum dose to air at the site boundary from noble gases released was $4.51E-04$ mrad from gamma radiation at 455 meters ESE.
- 3.) The maximum dose to air at the site boundary from noble gases released was $8.13E-03$ mrad beta radiation at 455 meters South.

- 4.) The total body dose equivalent to the maximally exposed individual from noble gases was 3.74E-03 mrem, at 805 meters West.
- 5.) The skin dose equivalent to the maximally exposed individual from noble gases was 4.43E-03 mrem, at 805 meters West.
- 6.) The maximally exposed organ due to iodines and particulates with half-lives greater than eight days was the skin of a child at 805 meters West, with an estimated dose equivalent of 9.65E-03 mrem.

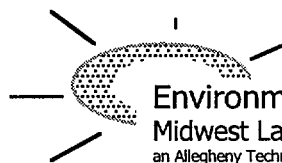
Conclusion:

No measurable dose due to the operation of the DAEC was detected by environmental TLDs in 2000. The calculated doses are below the regulatory limits stated in Appendix I to 10 CFR 50 and in 40 CFR 190.

Estimated Maximum Offsite Individual Doses for 2000

Type	Age Group	Distance (meters)	Direction	Dose or Dose Equivalent (mrem)	Annual 10 CFR 50, Appendix I Limit
Direct Radiation (as measured by TLDs)				None	*
Liquid Releases				None	
Noble Gas					
Gamma Air Dose		455	SSE	4.51E-04 mrad	10 mrad
Beta Air Dose		455	S	8.13E-03 mrad	20 mrad
Total Body	All	805	W	3.74E-03 mrem	*
Skin	All	805	W	4.43E-03 mrad	*
Particulates & Iodines					
Organ Dose	Child - Thyroid	805	W	9.65E-03 mrem	15 mrem

* No Appendix I limit but is used to determine compliance with 40 CFR 190 limits of 25 mrem total body and 75 mrem thyroid.



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REPORT
TO
IES UTILITIES, INC.
CEDAR RAPIDS, IOWA

RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM (REMP)
FOR THE
DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
Docket No. 50-331

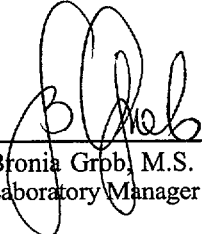
ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES

January 1 to December 31, 2000

Prepared and submitted by

ENVIRONMENTAL, Inc.
MIDWEST LABORATORY
PROJECT NO. 8001

Reviewed and
Approved



Bronia Grob, M.S.
Laboratory Manager

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1.0 INTRODUCTION

The following constitutes a supplement to the Annual Report for the Radiological Environmental Monitoring Program conducted at the Duane Arnold Energy Center, Palo, Iowa in 2000. Results of completed analyses are presented in the attached tables.

For information regarding sampling locations, type and frequency of collection, and sample codes, please refer to Part I, Tables 5.3 - 5.5 and Figures 5.1 and 5.2.

DUANE ARNOLD

2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
MI	D-101	02-01-00	Sample not available; goat dry
MI	D-101	03-07-00	Sample not available; goat dry
MI	D-93	05-31-00	Sample not available.
P	DAEC	09-26-00	Sample accidentally discarded by the utility.
TLD	D-18	09-28-00	Both regular and emergency TLD missing.
AP	D-01	11-22-00	Filter lost in wind.
MI	D-63	12-05-00	Sample not available; cows sold.

3.0 DATA TABLES

DUANE ARNOLD

Table 1. Airborne particulates, analysis for gross beta.

Location: D-1 (Cedar Rapids)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta	
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>	
01-06-00	285	0.033 ± 0.004	07-06-00	286	0.019 ± 0.003	
01-13-00	285	0.036 ± 0.004	07-13-00	287	0.017 ± 0.004	
01-20-00	287	0.042 ± 0.004	07-20-00	286	0.017 ± 0.003	
01-27-00	285	0.054 ± 0.005	07-27-00	284	0.020 ± 0.003	
02-03-00	282	0.034 ± 0.004	08-03-00	284	0.022 ± 0.003	
02-10-00	287	0.045 ± 0.004	08-10-00	286	0.022 ± 0.003	
02-17-00	286	0.034 ± 0.004	08-17-00	288	0.024 ± 0.004	
02-24-00	288	0.034 ± 0.005	08-24-00	282	0.024 ± 0.004	
03-02-00	283	0.018 ± 0.004	08-31-00	284	0.042 ± 0.005	
03-09-00	285	0.025 ± 0.003	09-07-00	288	0.022 ± 0.003	
03-16-00	286	0.025 ± 0.004	09-14-00	286	0.018 ± 0.003	
03-23-00	286	0.018 ± 0.003	09-21-00	286	0.029 ± 0.004	
03-30-00	284	0.022 ± 0.004	09-28-00	286	0.026 ± 0.003	
1st Quarter Mean ± s.d.		0.032 ± 0.011	3rd Quarter Mean ± s.d.		0.023 ± 0.007	
04-06-00	285	0.020 ± 0.003	10-05-00	284	0.036 ± 0.004	
04-13-00	286	0.020 ± 0.004	10-12-00	286	0.022 ± 0.003	
04-20-00	285	0.014 ± 0.004	10-19-00	286	0.037 ± 0.004	
04-27-00	282	0.027 ± 0.004	10-26-00	284	0.058 ± 0.005	
			11-02-00	285	0.027 ± 0.004	
05-04-00	288	0.024 ± 0.003	11-09-00	289	0.022 ± 0.003	
05-10-00	246	0.019 ± 0.004	11-16-00	282	0.030 ± 0.004	
05-18-00	324	0.028 ± 0.004	11-22-00	NS ^a	-	
05-25-00	287	0.021 ± 0.004	11-30-00	326	0.061 ± 0.005	
06-01-00	284	0.020 ± 0.003				
06-08-00	285	0.018 ± 0.003	12-07-00	286	0.021 ± 0.003	
06-15-00	285	0.015 ± 0.004	12-14-00	285	0.040 ± 0.004	
06-22-00	286	0.013 ± 0.003	12-21-00	286	0.048 ± 0.004	
06-29-00	284	0.017 ± 0.003	12-28-00	284	0.051 ± 0.004	
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.038 ± 0.014	
					Cumulative Average	0.028
					Previous Annual Average	0.029

^a "NS"=No sample; filter lost in wind.

DUANE ARNOLD

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-2 (Marion)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	284	0.038 ± 0.004	07-06-00	284	0.021 ± 0.003
01-13-00	285	0.042 ± 0.004	07-13-00	286	0.019 ± 0.004
01-20-00	286	0.045 ± 0.004	07-20-00	288	0.013 ± 0.003
01-27-00	286	0.049 ± 0.005	07-27-00	284	0.021 ± 0.003
02-03-00	285	0.034 ± 0.004	08-03-00	285	0.026 ± 0.003
02-10-00	285	0.049 ± 0.004	08-10-00	286	0.018 ± 0.003
02-17-00	286	0.036 ± 0.004	08-17-00	288	0.023 ± 0.003
02-24-00	288	0.042 ± 0.005	08-24-00	282	0.032 ± 0.004
03-02-00	284	0.022 ± 0.004	08-31-00	284	0.044 ± 0.005
03-09-00	285	0.026 ± 0.004	09-07-00	288	0.034 ± 0.004
03-16-00	286	0.027 ± 0.004	09-14-00	286	0.024 ± 0.003
03-23-00	286	0.023 ± 0.004	09-21-00	286	0.029 ± 0.004
03-30-00	284	0.012 ± 0.004	09-28-00	286	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.034 ± 0.011	3rd Quarter Mean ± s.d.		0.025 ± 0.008
04-06-00	285	0.022 ± 0.003	10-05-00	285	0.035 ± 0.004
04-13-00	286	0.016 ± 0.004	10-12-00	285	0.022 ± 0.003
04-20-00	285	0.017 ± 0.004	10-19-00	286	0.038 ± 0.004
04-27-00	281	0.027 ± 0.004	10-26-00	286	0.067 ± 0.005
			11-02-00	285	0.027 ± 0.004
05-04-00	290	0.025 ± 0.003	11-09-00	287	0.026 ± 0.003
05-10-00	243	0.019 ± 0.004	11-16-00	283	0.030 ± 0.004
05-18-00	324	0.026 ± 0.004	11-22-00	231	0.027 ± 0.004
05-25-00	287	0.020 ± 0.004	11-30-00	328	0.064 ± 0.005
06-01-00	284	0.018 ± 0.003			
06-08-00	285	0.018 ± 0.003	12-07-00	286	0.020 ± 0.003
06-15-00	285	0.015 ± 0.004	12-14-00	285	0.037 ± 0.004
06-22-00	286	0.012 ± 0.003	12-21-00	285	0.043 ± 0.004
06-29-00	284	0.013 ± 0.003	12-28-00	285	0.051 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.037 ± 0.015
Cumulative Average					0.029
Previous Annual Average					0.028

^a Iodine-131 concentrations are <0.07 pCi/m³ unless noted otherwise.

DUANE ARNOLD

Table 3. Airborne particulates, analysis for gross beta.

Location: D-3 (Hiawatha)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	285	0.030 ± 0.004	07-06-00	285	0.025 ± 0.003
01-13-00	285	0.034 ± 0.004	07-13-00	286	0.022 ± 0.004
01-20-00	286	0.034 ± 0.004	07-20-00	287	0.025 ± 0.003
01-27-00	285	0.042 ± 0.004	07-27-00	284	0.021 ± 0.003
02-03-00	286	0.032 ± 0.004	08-03-00	284	0.030 ± 0.004
02-10-00	285	0.038 ± 0.004	08-10-00	287	0.024 ± 0.003
02-17-00	286	0.029 ± 0.004	08-17-00	286	0.033 ± 0.004
02-24-00	288	0.027 ± 0.004	08-24-00	283	0.032 ± 0.004
03-02-00	283	0.013 ± 0.003	08-31-00	283	0.034 ± 0.004
03-09-00	286	0.027 ± 0.004	09-07-00	286	0.026 ± 0.004
03-16-00	285	0.029 ± 0.004	09-14-00	286	0.018 ± 0.003
03-23-00	286	0.019 ± 0.003	09-21-00	286	0.021 ± 0.003
03-30-00	282	0.014 ± 0.004	09-28-00	285	0.019 ± 0.003
1st Quarter Mean ± s.d.		0.028 ± 0.009	3rd Quarter Mean ± s.d.		0.025 ± 0.005
04-06-00	287	0.021 ± 0.003	10-05-00	285	0.026 ± 0.004
04-13-00	285	0.019 ± 0.004	10-12-00	286	0.016 ± 0.003
04-20-00	285	0.016 ± 0.004	10-19-00	286	0.025 ± 0.004
04-27-00	282	0.024 ± 0.004	10-26-00	284	0.050 ± 0.004
			11-02-00	287	0.019 ± 0.003
05-04-00	289	0.022 ± 0.003	11-09-00	286	0.017 ± 0.003
05-10-00	246	0.018 ± 0.004	11-16-00	284	0.019 ± 0.004
05-18-00	324	0.030 ± 0.004	11-22-00	243	0.028 ± 0.004
05-25-00	288	0.022 ± 0.004	11-30-00	328	0.059 ± 0.005
06-01-00	285	0.019 ± 0.003			
06-08-00	285	0.023 ± 0.003	12-07-00	286	0.015 ± 0.003
06-15-00	285	0.015 ± 0.004	12-14-00	285	0.036 ± 0.004
06-22-00	286	0.015 ± 0.003	12-21-00	286	0.042 ± 0.004
06-29-00	284	0.016 ± 0.003	12-28-00	283	0.042 ± 0.004
2nd Quarter Mean ± s.d.		0.020 ± 0.004	4th Quarter Mean ± s.d.		0.030 ± 0.014
Cumulative Average					0.026
Previous Annual Average					0.026

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Table 4. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-5 (Palo)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	286	0.039 ± 0.004	07-06-00	285	0.019 ± 0.003
01-13-00	284	0.043 ± 0.004	07-13-00	287	0.018 ± 0.004
01-20-00	286	0.042 ± 0.004	07-20-00	287	0.017 ± 0.003
01-27-00	284	0.054 ± 0.005	07-27-00	285	0.020 ± 0.003
02-03-00	286	0.037 ± 0.004	08-03-00	284	0.026 ± 0.004
02-10-00	285	0.052 ± 0.005	08-10-00	287	0.018 ± 0.003
02-17-00	285	0.033 ± 0.004	08-17-00	286	0.025 ± 0.004
02-24-00	288	0.035 ± 0.005	08-24-00	284	0.030 ± 0.004
03-02-00	284	0.020 ± 0.004	08-31-00	284	0.046 ± 0.005
03-09-00	285	0.031 ± 0.004	09-07-00	286	0.035 ± 0.004
03-16-00	285	0.030 ± 0.004	09-14-00	286	0.028 ± 0.004
03-23-00	286	0.021 ± 0.004	09-21-00	286	0.025 ± 0.004
03-30-00	284	0.016 ± 0.004	09-28-00	287	0.020 ± 0.003
1st Quarter Mean ± s.d.		0.035 ± 0.012	3rd Quarter Mean ± s.d.		0.025 ± 0.008
04-06-00	287	0.023 ± 0.003	10-05-00	284	0.034 ± 0.004
04-13-00	284	0.020 ± 0.004	10-12-00	285	0.021 ± 0.003
04-20-00	286	0.017 ± 0.004	10-19-00	285	0.035 ± 0.004
04-27-00	282	0.031 ± 0.004	10-26-00	286	0.059 ± 0.005
			11-02-00	287	0.025 ± 0.004
05-04-00	287	0.025 ± 0.003	11-09-00	285	0.024 ± 0.003
05-10-00	245	0.020 ± 0.004	11-16-00	286	0.024 ± 0.004
05-18-00	325	0.030 ± 0.004	11-22-00	245	0.024 ± 0.004
05-25-00	287	0.021 ± 0.004	11-30-00	326	0.055 ± 0.005
06-01-00	286	0.021 ± 0.003			
06-08-00	284	0.018 ± 0.003	12-07-00	287	0.021 ± 0.003
06-15-00	286	0.014 ± 0.004	12-14-00	285	0.037 ± 0.004
06-22-00	285	0.012 ± 0.003	12-21-00	286	0.049 ± 0.004
06-29-00	285	0.019 ± 0.003	12-28-00	285	0.050 ± 0.004
2nd Quarter Mean ± s.d.		0.021 ± 0.005	4th Quarter Mean ± s.d.		0.035 ± 0.014
Cumulative Average					0.029
Previous Annual Average					0.027

^a Iodine-131 concentrations are <0.07 pCi/m³ unless noted otherwise.

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Table 5. Airborne particulates, analysis for gross beta.

Location: D-6 (Center Point)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta	
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>	
01-06-00	286	0.039 ± 0.004	07-06-00	286	0.022 ± 0.003	
01-13-00	284	0.043 ± 0.004	07-13-00	285	0.021 ± 0.004	
01-20-00	287	0.046 ± 0.004	07-20-00	287	0.019 ± 0.003	
01-27-00	284	0.063 ± 0.005	07-27-00	250	0.022 ± 0.003	
02-03-00	286	0.037 ± 0.004	08-03-00	241	0.026 ± 0.004	
02-10-00	286	0.053 ± 0.005	08-10-00	287	0.019 ± 0.003	
02-17-00	285	0.039 ± 0.004	08-17-00	287	0.027 ± 0.004	
02-24-00	289	0.040 ± 0.005	08-24-00	283	0.029 ± 0.004	
03-02-00	283	0.023 ± 0.004	08-31-00	284	0.044 ± 0.005	
03-09-00	285	0.024 ± 0.003	09-07-00	286	0.030 ± 0.004	
03-16-00	286	0.028 ± 0.004	09-14-00	287	0.026 ± 0.003	
03-23-00	285	0.018 ± 0.003	09-21-00	286	0.024 ± 0.003	
03-30-00	284	0.014 ± 0.004	09-28-00	287	0.018 ± 0.003	
1st Quarter Mean ± s.d.		0.036 ± 0.014	3rd Quarter Mean ± s.d.		0.025 ± 0.007	
04-06-00	286	0.021 ± 0.003	10-05-00	284	0.032 ± 0.004	
04-13-00	285	0.020 ± 0.004	10-12-00	288	0.022 ± 0.003	
04-20-00	285	0.015 ± 0.004	10-19-00	283	0.035 ± 0.004	
04-27-00	282	0.028 ± 0.004	10-26-00	285	0.053 ± 0.004	
			11-02-00	287	0.022 ± 0.004	
05-04-00	287	0.026 ± 0.003	11-09-00	286	0.021 ± 0.003	
05-10-00	245	0.021 ± 0.004	11-16-00	285	0.026 ± 0.004	
05-18-00	325	0.029 ± 0.004	11-22-00	245	0.023 ± 0.004	
05-25-00	287	0.020 ± 0.004	11-30-00	326	0.054 ± 0.005	
06-01-00	285	0.018 ± 0.003				
06-08-00	284	0.018 ± 0.003	12-07-00	287	0.020 ± 0.003	
06-15-00	286	0.017 ± 0.004	12-14-00	285	0.040 ± 0.004	
06-22-00	285	0.013 ± 0.003	12-21-00	278	0.046 ± 0.004	
06-29-00	286	0.015 ± 0.003	12-28-00	293	0.044 ± 0.004	
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.034 ± 0.013	
					Cumulative Average	0.029
					Previous Annual Average	0.026

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Table 6. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-7 (Shellsburg)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	286	0.030 ± 0.004	07-06-00	286	0.020 ± 0.003
01-13-00	284	0.034 ± 0.004	07-13-00	285	0.018 ± 0.004
01-20-00	286	0.036 ± 0.004	07-20-00	287	0.016 ± 0.003
01-27-00	284	0.049 ± 0.005	07-27-00	285	0.022 ± 0.003
02-03-00	286	0.031 ± 0.004	08-03-00	284	0.023 ± 0.003
02-10-00	285	0.047 ± 0.004	08-10-00	287	0.018 ± 0.003
02-17-00	285	0.025 ± 0.004	08-17-00	286	0.025 ± 0.004
02-24-00	289	0.032 ± 0.004	08-24-00	284	0.022 ± 0.004
03-02-00	283	0.015 ± 0.003	08-31-00	283	0.041 ± 0.005
03-09-00	285	0.029 ± 0.004	09-07-00	287	0.029 ± 0.004
03-16-00	285	0.027 ± 0.004	09-14-00	287	0.024 ± 0.003
03-23-00	286	0.015 ± 0.003	09-21-00	286	0.026 ± 0.004
03-30-00	284	0.013 ± 0.004	09-28-00	287	0.018 ± 0.003
1st Quarter Mean ± s.d.		0.029 ± 0.011	3rd Quarter Mean ± s.d.		0.023 ± 0.007
04-06-00	287	0.019 ± 0.003	10-05-00	284	0.032 ± 0.004
04-13-00	285	0.018 ± 0.004	10-12-00	287	0.021 ± 0.003
04-20-00	285	0.016 ± 0.004	10-19-00	284	0.029 ± 0.004
04-27-00	283	0.027 ± 0.004	10-26-00	285	0.054 ± 0.004
			11-02-00	287	0.025 ± 0.004
05-04-00	287	0.025 ± 0.003	11-09-00	285	0.022 ± 0.003
05-10-00	245	0.020 ± 0.004	11-16-00	286	0.025 ± 0.004
05-18-00	325	0.030 ± 0.004	11-22-00	245	0.026 ± 0.004
05-25-00	287	0.020 ± 0.004	11-30-00	326	0.057 ± 0.005
06-01-00	286	0.018 ± 0.003			
06-08-00	284	0.015 ± 0.003	12-07-00	287	0.018 ± 0.003
06-15-00	286	0.015 ± 0.004	12-14-00	285	0.038 ± 0.004
06-22-00	280	0.015 ± 0.003	12-21-00	286	0.041 ± 0.004
06-29-00	285	0.015 ± 0.003	12-28-00	285	0.039 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.033 ± 0.012
Cumulative Average					0.026
Previous Annual Average					0.025

^a Iodine-131 concentrations are <0.07 pCi/m³ unless noted otherwise.

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Table 7. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-8 (Urbana)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta	
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>	
01-06-00	286	0.036 ± 0.004	07-06-00	286	0.018 ± 0.003	
01-13-00	284	0.042 ± 0.004	07-13-00	286	0.014 ± 0.004	
01-20-00	287	0.045 ± 0.004	07-20-00	287	0.018 ± 0.003	
01-27-00	284	0.053 ± 0.005	07-27-00	285	0.020 ± 0.003	
02-03-00	286	0.036 ± 0.004	08-03-00	284	0.027 ± 0.004	
02-10-00	285	0.050 ± 0.005	08-10-00	287	0.022 ± 0.003	
02-17-00	285	0.033 ± 0.004	08-17-00	287	0.024 ± 0.004	
02-24-00	289	0.033 ± 0.005	08-24-00	283	0.026 ± 0.004	
03-02-00	283	0.014 ± 0.003	08-31-00	284	0.041 ± 0.005	
03-09-00	285	0.028 ± 0.004	09-07-00	287	0.028 ± 0.004	
03-16-00	285	0.025 ± 0.004	09-14-00	287	0.025 ± 0.003	
03-23-00	286	0.022 ± 0.004	09-21-00	285	0.025 ± 0.004	
03-30-00	284	0.016 ± 0.004	09-28-00	287	0.020 ± 0.003	
1st Quarter Mean ± s.d.		0.033 ± 0.012	3rd Quarter Mean ± s.d.		0.024 ± 0.007	
04-06-00	287	0.021 ± 0.003	10-05-00	284	0.031 ± 0.004	
04-13-00	285	0.020 ± 0.004	10-12-00	288	0.019 ± 0.003	
04-20-00	286	0.015 ± 0.004	10-19-00	283	0.035 ± 0.004	
04-27-00	281	0.029 ± 0.004	10-26-00	285	0.056 ± 0.005	
			11-02-00	287	0.025 ± 0.004	
05-04-00	287	0.020 ± 0.003	11-09-00	286	0.024 ± 0.003	
05-10-00	245	0.022 ± 0.004	11-16-00	285	0.026 ± 0.004	
05-18-00	325	0.030 ± 0.004	11-22-00	245	0.027 ± 0.004	
05-25-00	287	0.021 ± 0.004	11-30-00	326	0.056 ± 0.005	
06-01-00	286	0.018 ± 0.003				
06-08-00	284	0.014 ± 0.003	12-07-00	287	0.020 ± 0.003	
06-15-00	285	0.014 ± 0.004	12-14-00	285	0.039 ± 0.004	
06-22-00	283	0.013 ± 0.003	12-21-00	287	0.044 ± 0.004	
06-29-00	285	0.015 ± 0.003	12-28-00	284	0.054 ± 0.005	
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.035 ± 0.014	
					Cumulative Average	0.028
					Previous Annual Average	0.027

^a Iodine-131 concentrations are <0.07 pCi/m³ unless noted otherwise.

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Table 8. Airborne particulates, analysis for gross beta.

Location: D-10 (Atkins)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta	
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>	
01-06-00	286	0.031 ± 0.004	07-06-00	279	0.019 ± 0.003	
01-13-00	283	0.032 ± 0.004	07-13-00	293	0.015 ± 0.004	
01-20-00	287	0.040 ± 0.004	07-20-00	286	0.013 ± 0.003	
01-27-00	285	0.045 ± 0.004	07-27-00	278	0.019 ± 0.003	
02-03-00	285	0.031 ± 0.004	08-03-00	285	0.023 ± 0.003	
02-10-00	286	0.044 ± 0.004	08-10-00	280	0.025 ± 0.004	
02-17-00	286	0.025 ± 0.004	08-17-00	294	0.024 ± 0.003	
02-24-00	282	0.029 ± 0.004	08-24-00	283	0.036 ± 0.004	
03-02-00	290	0.015 ± 0.003	08-31-00	284	0.046 ± 0.005	
03-09-00	287	0.023 ± 0.003	09-07-00	287	0.034 ± 0.005	
03-16-00	284	0.028 ± 0.004	09-14-00	285	0.027 ± 0.004	
03-23-00	284	0.018 ± 0.003	09-21-00	286	0.029 ± 0.004	
03-30-00	283	0.014 ± 0.004	09-28-00	286	0.023 ± 0.003	
<u>1st Quarter Mean ± s.d.</u>		<u>0.029 ± 0.010</u>	<u>3rd Quarter Mean ± s.d.</u>		<u>0.026 ± 0.009</u>	
04-06-00	284	0.020 ± 0.003	10-05-00	284	0.035 ± 0.004	
04-13-00	286	0.018 ± 0.004	10-12-00	287	0.023 ± 0.003	
04-20-00	287	0.012 ± 0.003	10-19-00	277	0.043 ± 0.005	
04-27-00	281	0.026 ± 0.003	10-26-00	294	0.063 ± 0.005	
			11-02-00	286	0.032 ± 0.004	
05-04-00	288	0.021 ± 0.003	11-09-00	287	0.027 ± 0.003	
05-10-00	246	0.016 ± 0.004	11-16-00	282	0.032 ± 0.004	
05-18-00	324	0.028 ± 0.004	11-22-00	244	0.031 ± 0.004	
05-25-00	287	0.020 ± 0.004	11-30-00	327	0.069 ± 0.005	
06-01-00	285	0.017 ± 0.003				
06-08-00	286	0.013 ± 0.002	12-07-00	287	0.019 ± 0.003	
06-15-00	284	0.014 ± 0.004	12-14-00	285	0.047 ± 0.005	
06-22-00	287	0.011 ± 0.003	12-21-00	287	0.051 ± 0.004	
06-29-00	284	0.016 ± 0.003	12-28-00	284	0.046 ± 0.004	
<u>2nd Quarter Mean ± s.d.</u>		<u>0.018 ± 0.005</u>	<u>4th Quarter Mean ± s.d.</u>		<u>0.040 ± 0.015</u>	
					Cumulative Average	0.028
					Previous Annual Average	0.026

^a Light particulate deposit on filter.

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Table 9. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-11 (Toddville)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	285	0.034 ± 0.004	07-06-00	291	0.022 ± 0.003
01-13-00	285	0.040 ± 0.004	07-13-00	280	0.020 ± 0.004
01-20-00	286	0.038 ± 0.004	07-20-00	287	0.021 ± 0.003
01-27-00	285	0.054 ± 0.005	07-27-00	284	0.022 ± 0.003
02-03-00	286	0.031 ± 0.004	08-03-00	284	0.026 ± 0.003
02-10-00	285	0.039 ± 0.004	08-10-00	286	0.026 ± 0.004
02-17-00	252	0.033 ± 0.004	08-17-00	286	0.033 ± 0.004
02-24-00	322	0.026 ± 0.004	08-24-00	283	0.026 ± 0.004
03-02-00	284	0.016 ± 0.003	08-31-00	284	0.039 ± 0.004
03-09-00	286	0.025 ± 0.003	09-07-00	286	0.029 ± 0.004
03-16-00	285	0.027 ± 0.004	09-14-00	287	0.026 ± 0.003
03-23-00	286	0.019 ± 0.003	09-21-00	286	0.023 ± 0.003
03-30-00	282	0.013 ± 0.004	09-28-00	286	0.018 ± 0.003
<u>1st Quarter Mean ± s.d.</u>		<u>0.030 ± 0.011</u>	<u>3rd Quarter Mean ± s.d.</u>		<u>0.025 ± 0.006</u>
04-06-00	287	0.021 ± 0.003	10-05-00	285	0.032 ± 0.004
04-13-00	286	0.018 ± 0.004	10-12-00	286	0.019 ± 0.003
04-20-00	285	0.016 ± 0.004	10-19-00	285	0.031 ± 0.004
04-27-00	281	0.028 ± 0.004	10-26-00	284	0.054 ± 0.004
			11-02-00	287	0.026 ± 0.004
05-04-00	288	0.021 ± 0.003	11-09-00	286	0.022 ± 0.003
05-10-00	247	0.019 ± 0.004	11-16-00	285	0.028 ± 0.004
05-18-00	324	0.026 ± 0.004	11-22-00	243	0.024 ± 0.004
05-25-00	288	0.020 ± 0.004	11-30-00	327	0.059 ± 0.005
06-01-00	284	0.017 ± 0.003			
06-08-00	285	0.004 ± 0.002 ^b	12-07-00	286	0.022 ± 0.003
06-15-00	285	0.016 ± 0.004	12-14-00	285	0.046 ± 0.005
06-22-00	286	0.016 ± 0.003	12-21-00	286	0.046 ± 0.004
06-29-00	284	0.017 ± 0.003	12-28-00	283	0.047 ± 0.004
<u>2nd Quarter Mean ± s.d.</u>		<u>0.018 ± 0.006</u>	<u>4th Quarter Mean ± s.d.</u>		<u>0.035 ± 0.014</u>
<u>Cumulative Average</u>					<u>0.027</u>
<u>Previous Annual Average</u>					<u>0.026</u>

^a Iodine-131 concentrations are <0.07 pCi/m³ unless noted otherwise.

^b Very light particulate deposit on filter.

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Table 10. Airborne particulates, analysis for gross beta.

Location: D-13

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta	
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>	
01-06-00	285	0.030 ± 0.004	07-06-00	286	0.022 ± 0.003	
01-13-00	284	0.035 ± 0.004	07-13-00	286	0.018 ± 0.004	
01-20-00	287	0.037 ± 0.004	07-20-00	287	0.020 ± 0.003	
01-27-00	284	0.051 ± 0.005	07-27-00	286	0.021 ± 0.003	
02-03-00	286	0.032 ± 0.004	08-03-00	282	0.029 ± 0.004	
02-10-00	285	0.045 ± 0.004	08-10-00	287	0.022 ± 0.003	
02-17-00	285	0.028 ± 0.004	08-17-00	288	0.029 ± 0.004	
02-24-00	253	0.033 ± 0.005	08-24-00	282	0.028 ± 0.004	
03-02-00	80 ^a	0.019 ± 0.010	08-31-00	284	0.043 ± 0.005	
03-09-00	285	0.029 ± 0.004	09-07-00	286	0.027 ± 0.004	
03-16-00	286	0.031 ± 0.004	09-14-00	287	0.024 ± 0.003	
03-23-00	286	0.020 ± 0.004	09-21-00	286	0.025 ± 0.003	
03-30-00	284	0.013 ± 0.004	09-28-00	287	0.018 ± 0.003	
1st Quarter Mean ± s.d.		0.031 ± 0.010	3rd Quarter Mean ± s.d.		0.025 ± 0.007	
04-06-00	286	0.021 ± 0.003	10-05-00	284	0.031 ± 0.004	
04-13-00	285	0.017 ± 0.004	10-12-00	278	0.021 ± 0.003	
04-20-00	286	0.015 ± 0.004	10-19-00	286	0.029 ± 0.004	
04-27-00	281	0.024 ± 0.004	10-26-00	282	0.055 ± 0.004	
			11-02-00	287	0.023 ± 0.004	
05-04-00	288	0.023 ± 0.003	11-09-00	286	0.021 ± 0.003	
05-10-00	245	0.021 ± 0.004	11-16-00	285	0.028 ± 0.004	
05-18-00	326	0.027 ± 0.004	11-22-00	245	0.023 ± 0.004	
05-25-00	287	0.020 ± 0.004	11-30-00	326	0.049 ± 0.004	
06-01-00	281	0.018 ± 0.003				
06-08-00	284	0.017 ± 0.003	12-07-00	287	0.017 ± 0.003	
06-15-00	286	0.014 ± 0.004	12-14-00	285	0.036 ± 0.004	
06-22-00	285	0.014 ± 0.003	12-21-00	287	0.034 ± 0.004	
06-29-00	285	0.018 ± 0.003	12-28-00	284	0.047 ± 0.004	
2nd Quarter Mean ± s.d.		0.019 ± 0.004	4th Quarter Mean ± s.d.		0.032 ± 0.012	
					Cumulative Average	0.027
					Previous Annual Average	0.024

^a Volume low due to power interruption.

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Table 11. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.
 Location: D-15 (On-site)
 Units: pCi/m³
 Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	286	0.029 ± 0.004	07-06-00	284	0.015 ± 0.003
01-13-00	284	0.035 ± 0.004	07-13-00	286	0.012 ± 0.003
01-20-00	286	0.037 ± 0.004	07-20-00	288	0.016 ± 0.003
01-27-00	285	0.049 ± 0.005	07-27-00	284	0.014 ± 0.003
02-03-00	286	0.030 ± 0.004	08-03-00	284	0.023 ± 0.003
02-10-00	286	0.044 ± 0.004	08-10-00	287	0.016 ± 0.003
02-17-00	285	0.032 ± 0.004	08-17-00	285	0.022 ± 0.003
02-24-00	288	0.033 ± 0.005	08-24-00	284	0.023 ± 0.004
03-02-00	284	0.015 ± 0.003	08-31-00	284	0.037 ± 0.004
03-09-00	285	0.028 ± 0.004	09-07-00	286	0.029 ± 0.004
03-16-00	286	0.023 ± 0.004	09-14-00	286	0.022 ± 0.003
03-23-00	286	0.016 ± 0.003	09-21-00	285	0.022 ± 0.003
03-30-00	284	0.011 ± 0.004	09-28-00	287	0.018 ± 0.003
1st Quarter Mean ± s.d.		0.029 ± 0.011	3rd Quarter Mean ± s.d.		0.021 ± 0.007
04-06-00	285	0.018 ± 0.003	10-05-00	285	0.031 ± 0.004
04-13-00	286	0.016 ± 0.004	10-12-00	285	0.019 ± 0.003
04-20-00	285	0.015 ± 0.004	10-19-00	285	0.032 ± 0.004
04-27-00	284	0.025 ± 0.004	10-26-00	286	0.053 ± 0.004
			11-02-00	287	0.022 ± 0.004
05-04-00	287	0.019 ± 0.003	11-09-00	285	0.024 ± 0.003
05-10-00	244	0.015 ± 0.004	11-16-00	286	0.024 ± 0.004
05-18-00	325	0.024 ± 0.004	11-22-00	245	0.024 ± 0.004
05-25-00	287	0.016 ± 0.003	11-30-00	326	0.052 ± 0.005
06-01-00	286	0.013 ± 0.003			
06-08-00	285	0.014 ± 0.003	12-07-00	287	0.017 ± 0.003
06-15-00	285	0.011 ± 0.003	12-14-00	285	0.036 ± 0.004
06-22-00	286	0.012 ± 0.003	12-21-00	285	0.040 ± 0.004
06-29-00	285	0.013 ± 0.003	12-28-00	285	0.051 ± 0.004
2nd Quarter Mean ± s.d.		0.016 ± 0.004	4th Quarter Mean ± s.d.		0.033 ± 0.013
Cumulative Average					0.025
Previous Annual Average					0.023

^a Iodine-131 concentrations are <0.07 pCi/m³ unless noted otherwise.

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Table 12. Airborne particulates, analysis for gross beta.

Location: D-16 (On-site)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>			<u>0.010</u>
01-06-00	286	0.039 ± 0.004	07-06-00	285	0.020 ± 0.003
01-13-00	284	0.038 ± 0.004	07-13-00	287	0.016 ± 0.004
01-20-00	286	0.042 ± 0.004	07-20-00	287	0.021 ± 0.003
01-27-00	285	0.058 ± 0.005	07-27-00	284	0.022 ± 0.003
02-03-00	286	0.034 ± 0.004	08-03-00	274	0.025 ± 0.004
02-10-00	285	0.050 ± 0.005	08-10-00	287	0.021 ± 0.003
02-17-00	285	0.038 ± 0.004	08-17-00	285	0.029 ± 0.004
02-24-00	288	0.034 ± 0.005	08-24-00	285	0.025 ± 0.004
03-02-00	283	0.016 ± 0.003	08-31-00	284	0.042 ± 0.005
03-09-00	285	0.023 ± 0.003	09-07-00	287	0.030 ± 0.004
03-16-00	286	0.020 ± 0.004	09-14-00	286	0.024 ± 0.003
03-23-00	286	0.013 ± 0.003	09-21-00	285	0.027 ± 0.004
03-30-00	284	0.015 ± 0.004	09-28-00	287	0.019 ± 0.003
1st Quarter Mean ± s.d.		0.032 ± 0.014	3rd Quarter Mean ± s.d.		0.025 ± 0.007
04-06-00	285	0.021 ± 0.003	10-05-00	285	0.030 ± 0.004
04-13-00	286	0.014 ± 0.003	10-12-00	285	0.021 ± 0.003
04-20-00	285	0.016 ± 0.004	10-19-00	285	0.032 ± 0.004
04-27-00	283	0.023 ± 0.004	10-26-00	286	0.054 ± 0.004
			11-02-00	287	0.025 ± 0.004
05-04-00	287	0.019 ± 0.003			
05-10-00	245	0.022 ± 0.004	11-09-00	285	0.026 ± 0.003
05-18-00	326	0.025 ± 0.004	11-16-00	286	0.027 ± 0.004
05-25-00	286	0.019 ± 0.003	11-22-00	245	0.028 ± 0.004
06-01-00	286	0.016 ± 0.003	11-30-00	326	0.050 ± 0.004
06-08-00	285	0.018 ± 0.003	12-07-00	287	0.019 ± 0.003
06-15-00	286	0.018 ± 0.004	12-14-00	285	0.030 ± 0.004
06-22-00	284	0.015 ± 0.003	12-22-00	326	0.031 ± 0.003
06-29-00	285	0.018 ± 0.003	12-28-00	244	0.044 ± 0.005
2nd Quarter Mean ± s.d.		0.019 ± 0.003	4th Quarter Mean ± s.d.		0.032 ± 0.011
Cumulative Average					0.027
Previous Annual Average					0.027

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Table 13. Airborne particulates, analyses for gamma-emitting isotopes.
 Collection: Quarterly Composite
 Units: pCi/m³

Location		D-1			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2167	DAP-4764	DAP-7691	DAP-10824,5	
Volume (m ³)	3709	3707	3713	3463	
Be-7	0.076 ± 0.011	0.089 ± 0.022	0.067 ± 0.012	0.063 ± 0.011	
Nb-95	< 0.0012	< 0.0009	< 0.0014	< 0.0010	
Zr-95	< 0.0011	< 0.0018	< 0.0016	< 0.0018	
Ru-103	< 0.0009	< 0.0007	< 0.0005	< 0.0011	
Ru-106	< 0.0052	< 0.0077	< 0.0057	< 0.0066	
Cs-134	< 0.0006	< 0.0005	< 0.0004	< 0.0006	
Cs-137	< 0.0006	< 0.0005	< 0.0005	< 0.0006	
Ce-141	< 0.0007	< 0.0011	< 0.0017	< 0.0023	
Ce-144	< 0.0018	< 0.0035	< 0.0046	< 0.0053	

Location		D-2			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2168	DAP-4765	DAP-7692	DAP-10826	
Volume (m ³)	3710	3705	3713	3697	
Be-7	0.072 ± 0.012	0.076 ± 0.017	0.060 ± 0.012	0.066 ± 0.020	
Nb-95	< 0.0010	< 0.0008	< 0.0011	< 0.0010	
Zr-95	< 0.0007	< 0.0010	< 0.0012	< 0.0017	
Ru-103	< 0.0009	< 0.0010	< 0.0005	< 0.0009	
Ru-106	< 0.0031	< 0.0045	< 0.0058	< 0.0078	
Cs-134	< 0.0006	< 0.0004	< 0.0008	< 0.0007	
Cs-137	< 0.0008	< 0.0007	< 0.0004	< 0.0007	
Ce-141	< 0.0015	< 0.0012	< 0.0007	< 0.0020	
Ce-144	< 0.0036	< 0.0021	< 0.0029	< 0.0053	

Location		D-3			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2169	DAP-4766	DAP-7693	DAP-10827	
Volume (m ³)	3708	3711	3708	3709	
Be-7	0.057 ± 0.012	0.071 ± 0.019	0.058 ± 0.013	0.053 ± 0.020	
Nb-95	< 0.0005	< 0.0013	< 0.0010	< 0.0011	
Zr-95	< 0.0016	< 0.0031	< 0.0015	< 0.0022	
Ru-103	< 0.0006	< 0.0010	< 0.0013	< 0.0014	
Ru-106	< 0.0022	< 0.0035	< 0.0087	< 0.0055	
Cs-134	< 0.0007	< 0.0005	< 0.0006	< 0.0006	
Cs-137	< 0.0004	< 0.0005	< 0.0005	< 0.0007	
Ce-141	< 0.0013	< 0.0013	< 0.0012	< 0.0025	
Ce-144	< 0.0038	< 0.0022	< 0.0040	< 0.0060	

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Table 13. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite
Units: pCi/m³

Location		D-5			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2170	DAP-4767	DAP-7694	DAP-10828	
Volume (m ³)	3708	3709	3714	3712	
Be-7	0.079 ± 0.013	0.096 ± 0.020	0.062 ± 0.014	0.050 ± 0.017	
Nb-95	< 0.0006	< 0.0013	< 0.0012	< 0.0012	
Zr-95	< 0.0007	< 0.0012	< 0.0012	< 0.0017	
Ru-103	< 0.0008	< 0.0008	< 0.0010	< 0.0008	
Ru-106	< 0.0057	< 0.0061	< 0.0049	< 0.0062	
Cs-134	< 0.0006	< 0.0004	< 0.0003	< 0.0005	
Cs-137	< 0.0007	< 0.0007	< 0.0008	< 0.0007	
Ce-141	< 0.0018	< 0.0017	< 0.0013	< 0.0021	
Ce-144	< 0.0044	< 0.0053	< 0.0025	< 0.0034	

Location		D-6			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2171	DAP-4768	DAP-7695	DAP-10829	
Volume (m ³)	3710	3708	3636	3712	
Be-7	0.081 ± 0.015	0.082 ± 0.017	0.068 ± 0.012	0.053 ± 0.021	
Nb-95	< 0.0005	< 0.0006	< 0.0009	< 0.0013	
Zr-95	< 0.0014	< 0.0015	< 0.0018	< 0.0016	
Ru-103	< 0.0012	< 0.0010	< 0.0012	< 0.0010	
Ru-106	< 0.0043	< 0.0050	< 0.0071	< 0.0055	
Cs-134	< 0.0007	< 0.0004	< 0.0009	< 0.0008	
Cs-137	< 0.0006	< 0.0003	< 0.0008	< 0.0009	
Ce-141	< 0.0008	< 0.0021	< 0.0020	< 0.0020	
Ce-144	< 0.0038	< 0.0041	< 0.0028	< 0.0045	

Location		D-7			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2172	DAP-4769	DAP-7696	DAP-10830	
Volume (m ³)	3708	3705	3714	3712	
Be-7	0.065 ± 0.010	0.083 ± 0.021	0.053 ± 0.012	0.047 ± 0.013	
Nb-95	< 0.0008	< 0.0012	< 0.0008	< 0.0012	
Zr-95	< 0.0008	< 0.0011	< 0.0010	< 0.0020	
Ru-103	< 0.0006	< 0.0010	< 0.0004	< 0.0007	
Ru-106	< 0.0038	< 0.0047	< 0.0032	< 0.0076	
Cs-134	< 0.0005	< 0.0007	< 0.0003	< 0.0005	
Cs-137	< 0.0004	< 0.0005	< 0.0005	< 0.0007	
Ce-141	< 0.0013	< 0.0018	< 0.0014	< 0.0024	
Ce-144	< 0.0027	< 0.0033	< 0.0028	< 0.0038	

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Table 13. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite
Units: pCi/m³

Location		D-8			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2173	DAP-4770	DAP-7697	DAP-10831	
Volume (m ³)	3709	3706	3715	3712	
Be-7	0.075 ± 0.012	0.075 ± 0.020	0.069 ± 0.013	0.053 ± 0.016	
Nb-95	< 0.0010	< 0.0008	< 0.0011	< 0.0012	
Zr-95	< 0.0013	< 0.0025	< 0.0015	< 0.0012	
Ru-103	< 0.0005	< 0.0015	< 0.0009	< 0.0009	
Ru-106	< 0.0040	< 0.0059	< 0.0051	< 0.0054	
Cs-134	< 0.0004	< 0.0005	< 0.0003	< 0.0010	
Cs-137	< 0.0004	< 0.0007	< 0.0006	< 0.0006	
Ce-141	< 0.0010	< 0.0027	< 0.0009	< 0.0019	
Ce-144	< 0.0022	< 0.0069	< 0.0021	< 0.0056	

Location		D-10			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2174	DAP-4771	DAP-7698	DAP-10832	
Volume (m ³)	3708	3709	3706	3711	
Be-7	0.073 ± 0.015	0.077 ± 0.016	0.076 ± 0.014	0.065 ± 0.017	
Nb-95	< 0.0009	< 0.0006	< 0.0015	< 0.0014	
Zr-95	< 0.0017	< 0.0013	< 0.0025	< 0.0019	
Ru-103	< 0.0013	< 0.0008	< 0.0011	< 0.0009	
Ru-106	< 0.0044	< 0.0048	< 0.0071	< 0.0046	
Cs-134	< 0.0004	< 0.0004	< 0.0009	< 0.0005	
Cs-137	< 0.0008	< 0.0006	< 0.0003	< 0.0005	
Ce-141	< 0.0020	< 0.0016	< 0.0009	< 0.0022	
Ce-144	< 0.0039	< 0.0036	< 0.0036	< 0.0051	

Location		D-11			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2175	DAP-4772	DAP-7699	DAP-10833	
Volume (m ³)	3709	3710	3710	3708	
Be-7	0.068 ± 0.013	0.088 ± 0.018	0.066 ± 0.013	0.055 ± 0.016	
Nb-95	< 0.0006	< 0.0010	< 0.0015	< 0.0012	
Zr-95	< 0.0012	< 0.0007	< 0.0015	< 0.0018	
Ru-103	< 0.0008	< 0.0009	< 0.0013	< 0.0010	
Ru-106	< 0.0065	< 0.0022	< 0.0081	< 0.0055	
Cs-134	< 0.0003	< 0.0010	< 0.0007	< 0.0006	
Cs-137	< 0.0004	< 0.0005	< 0.0008	< 0.0006	
Ce-141	< 0.0011	< 0.0023	< 0.0020	< 0.0020	
Ce-144	< 0.0040	< 0.0030	< 0.0040	< 0.0031	

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Table 13. Airborne particulates, analyses for gamma-emitting isotopes.
 Collection: Quarterly Composite
 Units: pCi/m³

Location		D-13			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2176, 7	DAP-4773	DAP-7700	DAP-10834	
Volume (m ³)	3390	3705	3714	3702	
Be-7	0.073 ± 0.011	0.078 ± 0.015	0.066 ± 0.014	0.044 ± 0.017	
Nb-95	< 0.0006	< 0.0008	< 0.0010	< 0.0010	
Zr-95	< 0.0011	< 0.0010	< 0.0017	< 0.0017	
Ru-103	< 0.0007	< 0.0009	< 0.0006	< 0.0008	
Ru-106	< 0.0055	< 0.0052	< 0.0055	< 0.0056	
Cs-134	< 0.0003	< 0.0005	< 0.0003	< 0.0006	
Cs-137	< 0.0008	< 0.0004	< 0.0005	< 0.0006	
Ce-141	< 0.0011	< 0.0012	< 0.0011	< 0.0030	
Ce-144	< 0.0025	< 0.0027	< 0.0025	< 0.0043	

Location		D-15			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2178	DAP-4774	DAP-7701	DAP-10835	
Volume (m ³)	3711	3710	3710	3712	
Be-7	0.070 ± 0.013	0.072 ± 0.019	0.053 ± 0.015	0.049 ± 0.016	
Nb-95	< 0.0008	< 0.0015	< 0.0015	< 0.0011	
Zr-95	< 0.0011	< 0.0009	< 0.0016	< 0.0017	
Ru-103	< 0.0012	< 0.0015	< 0.0010	< 0.0011	
Ru-106	< 0.0062	< 0.0069	< 0.0046	< 0.0055	
Cs-134	< 0.0004	< 0.0007	< 0.0007	< 0.0006	
Cs-137	< 0.0008	< 0.0008	< 0.0004	< 0.0008	
Ce-141	< 0.0011	< 0.0025	< 0.0014	< 0.0015	
Ce-144	< 0.0030	< 0.0046	< 0.0044	< 0.0050	

Location		D-16			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Lab Code	DAP-2170	DAP-4775	DAP-7702	DAP-10836	
Volume (m ³)	3709	3709	3703	3712	
Be-7	0.060 ± 0.014	0.078 ± 0.017	0.063 ± 0.014	0.043 ± 0.015	
Nb-95	< 0.0006	< 0.0010	< 0.0013	< 0.0010	
Zr-95	< 0.0016	< 0.0021	< 0.0010	< 0.0019	
Ru-103	< 0.0005	< 0.0013	< 0.0010	< 0.0014	
Ru-106	< 0.0050	< 0.0047	< 0.0064	< 0.0064	
Cs-134	< 0.0005	< 0.0004	< 0.0010	< 0.0005	
Cs-137	< 0.0003	< 0.0005	< 0.0007	< 0.0012	
Ce-141	< 0.0015	< 0.0012	< 0.0014	< 0.0011	
Ce-144	< 0.0028	< 0.0035	< 0.0029	< 0.0049	

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Table 14. Area monitors (TLD), Quarterly
Units: mR/91 days

<u>Air Stations</u>	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
D-1 (C)	12.4 ± 0.3	12.0 ± 0.2	13.5 ± 0.4	13.8 ± 0.2
D-2 (C)	14.1 ± 0.2	12.8 ± 0.2	14.7 ± 0.2	14.5 ± 0.3
D-3	14.1 ± 0.2	12.8 ± 0.2	13.7 ± 0.2	14.7 ± 0.3
D-5	13.9 ± 0.2	15.1 ± 0.2	15.2 ± 0.2	15.9 ± 0.2
D-6	13.4 ± 0.2	15.1 ± 0.2	13.7 ± 0.3	17.2 ± 0.3
D-7	13.4 ± 0.2	16.3 ± 0.2 ^a	13.1 ± 0.2	14.5 ± 0.3
D-8	17.8 ± 0.2	19.2 ± 0.2	19.1 ± 0.2	21.1 ± 0.2
D-10	15.3 ± 0.2	16.4 ± 0.2	16.3 ± 0.3	18.6 ± 0.2
D-11	10.8 ± 0.2	10.9 ± 0.2	11.4 ± 0.2	18.1 ± 0.2
D-13 (C)	14.5 ± 0.2	16.4 ± 0.2	16.3 ± 0.2	17.3 ± 0.2
D-15	14.3 ± 0.2	15.5 ± 0.2	15.2 ± 0.3	17.2 ± 0.2
D-16	14.8 ± 0.2	14.4 ± 0.2	16.0 ± 0.2	16.0 ± 0.2
Mean ± s.d.	14.1 ± 1.7	14.7 ± 2.3	14.9 ± 2.0	16.6 ± 2.1
<u>Within 0.5 mi. of Stack</u>				
D-18	15.2 ± 0.2	15.5 ± 0.3	NS ^b	12.3 ± 0.2
D-19	14.5 ± 0.2	14.7 ± 0.2	15.5 ± 0.2	11.5 ± 0.2
D-20	17.4 ± 0.2	16.8 ± 0.2	18.5 ± 0.2	14.0 ± 0.3
D-21	17.4 ± 0.2	15.9 ± 0.2	18.7 ± 0.2	13.8 ± 0.4
D-22	16.5 ± 0.2	14.9 ± 0.2	16.3 ± 0.2	17.3 ± 0.2
D-23	14.6 ± 0.2	12.7 ± 0.2	15.5 ± 0.4	15.4 ± 0.2
D-28	17.0 ± 0.2	18.0 ± 0.2	19.8 ± 0.2	19.4 ± 0.3
D-29	18.5 ± 0.2	20.0 ± 0.2	21.3 ± 0.3	21.5 ± 0.2
D-30	18.8 ± 0.2	20.9 ± 0.2	22.6 ± 0.2	23.0 ± 0.3
D-31	21.2 ± 0.2	21.5 ± 0.3	21.4 ± 0.3	19.7 ± 0.2
D-32	19.6 ± 0.2	20.8 ± 0.2	21.2 ± 0.3	19.0 ± 0.5
D-82	15.2 ± 0.2	15.6 ± 0.2	15.6 ± 0.2	17.2 ± 0.2
D-83	16.5 ± 0.4	16.3 ± 0.2	17.1 ± 0.3	19.3 ± 0.4
D-84	16.0 ± 0.2	16.0 ± 0.2	17.3 ± 0.4	17.2 ± 0.2
D-85	15.2 ± 0.2	16.1 ± 0.2	15.5 ± 0.3	17.2 ± 0.2
D-86	17.0 ± 0.2	20.7 ± 0.2 ^a	17.7 ± 0.3	17.6 ± 0.2
D-91	17.8 ± 0.2	17.4 ± 0.4	18.3 ± 0.2	19.5 ± 0.4
Mean ± s.d.	17.0 ± 1.8	17.3 ± 2.6	18.3 ± 2.4	17.3 ± 3.1

^aRegular TLD lost in field; reading from emergency TLD.

^bBoth regular and emergency TLD missing.

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Table 14. Area monitors (TLD), Quarterly
Units: mR/91 days

<u>Within 1.0 mi. of Stack</u>	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
D-43	15.8 ± 0.2	15.1 ± 0.2	16.7 ± 0.2	16.8 ± 0.2
D-44	19.2 ± 0.2	20.3 ± 0.2	21.0 ± 0.2	21.1 ± 0.2
D-45	14.9 ± 0.2	14.8 ± 0.2	15.7 ± 0.2	NS ^a
D-46	19.5 ± 0.3	21.3 ± 0.3	20.6 ± 0.2	21.7 ± 0.2
D-47	18.5 ± 0.2	20.4 ± 0.2	19.4 ± 0.3	21.0 ± 0.3
D-48	17.7 ± 0.2	19.3 ± 0.2	19.3 ± 0.3	20.6 ± 0.2
Mean ± s.d.	17.6 ± 1.9	18.5 ± 2.8	18.8 ± 2.1	20.2 ± 2.0
<u>Within 3.0 mi. of Stack</u>				
D-33	13.0 ± 0.2	14.5 ± 0.2	13.6 ± 0.4	15.8 ± 0.2
D-34	13.3 ± 0.2	14.5 ± 0.2	14.7 ± 0.2	15.2 ± 0.4
D-35	13.7 ± 0.2	14.4 ± 0.2	15.5 ± 0.2	15.1 ± 0.3
D-36	13.5 ± 0.2	15.2 ± 0.2	15.1 ± 0.2	16.4 ± 0.2
D-37	18.5 ± 0.2	18.9 ± 0.2	20.4 ± 0.2	19.1 ± 0.2
D-38	16.7 ± 0.2	16.7 ± 0.2	17.3 ± 0.4	16.7 ± 0.2
D-39	17.4 ± 0.2	16.4 ± 0.2	18.3 ± 0.2	17.3 ± 0.2
D-40	12.9 ± 0.3	13.7 ± 0.3	14.3 ± 0.2	14.6 ± 0.3
D-41	15.6 ± 0.2	15.9 ± 0.2	16.3 ± 0.2	16.4 ± 0.2
D-42	14.4 ± 0.2	14.7 ± 0.2	15.1 ± 0.2	17.2 ± 0.2
Mean ± s.d.	14.9 ± 2.0	15.5 ± 1.5	16.1 ± 2.1	16.4 ± 1.3

^aBoth regular and emergency TLD missing.

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Table 15. Milk samples, analyses for iodine-131 and gamma emitting isotopes.
 Collection: Monthly during non-grazing season (October 1 through April 30): biweekly during grazing season (May 1 through September 30)

Location		D-63					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-00	DMI -58	< 1.0	1037 ± 151	< 15	< 18	< 60	< 15
02-01-00	-567	< 1.0	1509 ± 126	< 15	< 18	< 60	< 15
03-07-00	-1227	< 1.0	1486 ± 115	< 15	< 18	< 60	< 15
04-04-00	-1977	< 1.0	1402 ± 170	< 15	< 18	< 60	< 15
05-02-00	-2906	< 1.0	1471 ± 163	< 15	< 18	< 60	< 15
05-16-00	-3419	< 1.0	1286 ± 117	< 15	< 18	< 60	< 15
05-31-00	-3658	< 1.0	1616 ± 138	< 15	< 18	< 60	< 15
06-13-00	-3942	< 1.0	1480 ± 102	< 15	< 18	< 60	< 15
06-27-00	-4361	< 1.0	1331 ± 161	< 15	< 18	< 60	< 15
07-11-00	-4901	< 1.0	1695 ± 173	< 15	< 18	< 60	< 15
07-25-00	-5321	< 1.0	1398 ± 87	< 15	< 18	< 60	< 15
08-08-00	-5768	< 1.0	1527 ± 158	< 15	< 18	< 60	< 15
08-22-00	-6038	< 1.0	1511 ± 171	< 15	< 18	< 60	< 15
09-05-00	-6423	< 1.0	1352 ± 181	< 15	< 18	< 60	< 15
09-19-00	-6880	< 1.0	1447 ± 101	< 15	< 18	< 60	< 15
10-03-00	-7307	< 1.0	1339 ± 131	< 15	< 18	< 60	< 15
11-07-00	-8815	< 1.0	1500 ± 114	< 15	< 18	< 60	< 15
12-05-00	NS ^a	-	-	-	-	-	-

Location		D-93					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-00	DMI -59	< 1.0	1640 ± 168	< 15	< 18	< 60	< 15
02-01-00	-568	< 1.0	1585 ± 116	< 15	< 18	< 60	< 15
03-07-00	-1228	< 1.0	1652 ± 129	< 15	< 18	< 60	< 15
04-04-00	-1978	< 1.0	1738 ± 190	< 15	< 18	< 60	< 15
05-02-00	-2907	< 1.0	1783 ± 186	< 15	< 18	< 60	< 15
05-16-00	-3420	< 1.0	1670 ± 181	< 15	< 18	< 60	< 15
05-31-00	NS ^a	-	-	-	-	-	-
06-13-00	-3943	< 1.0	1710 ± 106	< 15	< 18	< 60	< 15
06-27-00	-4362	< 1.0	1641 ± 162	< 15	< 18	< 60	< 15
07-11-00	-4902	< 1.0	1928 ± 201	< 15	< 18	< 60	< 15
07-25-00	-5322	< 1.0	1572 ± 112	< 15	< 18	< 60	< 15
08-08-00	-5769	< 1.0	1755 ± 169	< 15	< 18	< 60	< 15
08-22-00	-6039	< 1.0	1721 ± 181	< 15	< 18	< 60	< 15
09-05-00	-6424	< 1.0	1754 ± 134	< 15	< 18	< 60	< 15
09-19-00	-6881	< 1.0	1780 ± 125	< 15	< 18	< 60	< 15
10-03-00	-7308	< 1.0	1821 ± 118	< 15	< 18	< 60	< 15
11-07-00	-8816	< 1.0	1789 ± 152	< 15	< 18	< 60	< 15
12-05-00	-9534	< 1.0	1696 ± 123	< 15	< 18	< 60	< 15

^a NS=No sample; Sample not available.

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Table 15. Milk samples, analyses for iodine-131 and gamma emitting isotopes.
 Collection: Monthly during non-grazing season (October 1 through April 30): biweekly
 during grazing season (May 1 through September 30)

Location		D-96					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-00	DMI -60	< 1.0	1429 ± 175	< 15	< 18	< 60	< 15
02-01-00	-569	< 1.0	1496 ± 168	< 15	< 18	< 60	< 15
03-07-00	-1229	< 1.0	1291 ± 162	< 15	< 18	< 60	< 15
04-04-00	-1979	< 1.0	1510 ± 167	< 15	< 18	< 60	< 15
05-02-00	-2908	< 1.0	1373 ± 161	< 15	< 18	< 60	< 15
05-16-00	-3421	< 1.0	1449 ± 176	< 15	< 18	< 60	< 15
05-31-00	-3659	< 1.0	1413 ± 172	< 15	< 18	< 60	< 15
06-13-00	-3944	< 1.0	1527 ± 147	< 15	< 18	< 60	< 15
06-27-00	-4363	< 1.0	1281 ± 103	< 15	< 18	< 60	< 15
07-11-00	-4903, 4	< 1.0	1356 ± 123	< 15	< 18	< 60	< 15
07-25-00	-5323	< 1.0	1455 ± 125	< 15	< 18	< 60	< 15
08-08-00	-5770	< 1.0	1329 ± 109	< 15	< 18	< 60	< 15
08-22-00	-6040	< 1.0	1399 ± 119	< 15	< 18	< 60	< 15
09-05-00	-6425	< 1.0	1321 ± 121	< 15	< 18	< 60	< 15
09-19-00	-6882	< 1.0	1407 ± 150	< 15	< 18	< 60	< 15
10-03-00	-7309	< 1.0	1413 ± 152	< 15	< 18	< 60	< 15
11-07-00	-8817	< 1.0	1298 ± 98	< 15	< 18	< 60	< 15
12-05-00	-9535	< 1.0	1445 ± 115	< 15	< 18	< 60	< 15

Location		D-101					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-00	DMI -58	< 1.0	1543 ± 109	< 15	< 18	< 60	< 15
02-01-00	NS ^a	-	-	-	-	-	-
03-07-00	NS	-	-	-	-	-	-
04-04-00	-1980	< 1.0	1670 ± 138	< 15	< 18	< 60	< 15
05-02-00	-2909	< 1.0	1773 ± 117	< 15	< 18	< 60	< 15
05-16-00	-3422	< 1.0	2407 ± 198	< 15	< 18	< 60	< 15
05-31-00	-3660	< 1.0	1939 ± 206	< 15	< 18	< 60	< 15
06-13-00	-3945	< 1.0	1787 ± 156	< 15	< 18	< 60	< 15
06-27-00	-4364	< 1.0	1938 ± 184	< 15	< 18	< 60	< 15
07-11-00	-4905	< 1.0	2004 ± 125	< 15	< 18	< 60	< 15
07-25-00	-5324	< 1.0	1905 ± 128	< 15	< 18	< 60	< 15
08-08-00	-5771	< 1.0	1838 ± 144	< 15	< 18	< 60	< 15
08-22-00	-6041	< 1.0	1946 ± 234	< 15	< 18	< 60	< 15
09-05-00	-6426	< 1.0	1801 ± 176	< 15	< 18	< 60	< 15
09-19-00	-6883	< 1.0	1814 ± 189	< 15	< 18	< 60	< 15
10-03-00	-7310	< 1.0	1759 ± 169	< 15	< 18	< 60	< 15
11-07-00	-8818	< 1.0	1628 ± 178	< 15	< 18	< 60	< 15
12-05-00	-9536	< 1.0	2088 ± 306	< 15	< 18	< 60	< 15

^a NS=No sample; Sample not available.

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Table 15. Milk samples, analyses for iodine-131 and gamma emitting isotopes.
 Collection: Monthly during non-grazing season (October 1 through April 30); biweekly during grazing season (May 1 through September 30)

Location		D-105					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-00	DMI -62	< 1.0	1562 ± 121	< 15	< 18	< 60	< 15
02-01-00	-570	< 1.0	1436 ± 174	< 15	< 18	< 60	< 15
03-07-00	-1230	< 1.0	1447 ± 185	< 15	< 18	< 60	< 15
04-04-00	-1981	< 1.0	1409 ± 113	< 15	< 18	< 60	< 15
05-02-00	-2910	< 1.0	1484 ± 149	< 15	< 18	< 60	< 15
05-16-00	-3423	< 1.0	1325 ± 110	< 15	< 18	< 60	< 15
05-31-00	-3661	< 1.0	1319 ± 192	< 15	< 18	< 60	< 15
06-13-00	-3946	< 1.0	1430 ± 166	< 15	< 18	< 60	< 15
06-27-00	-4365	< 1.0	1305 ± 138	< 15	< 18	< 60	< 15
07-11-00	-4906	< 1.0	1239 ± 148	< 15	< 18	< 60	< 15
07-25-00	-5325	< 1.0	1471 ± 75	< 15	< 18	< 60	< 15
08-08-00	-5772	< 1.0	1250 ± 141	< 15	< 18	< 60	< 15
08-22-00	-6042	< 1.0	1435 ± 169	< 15	< 18	< 60	< 15
09-05-00	-6427	< 1.0	1313 ± 117	< 15	< 18	< 60	< 15
09-19-00	-6884	< 1.0	1489 ± 164	< 15	< 18	< 60	< 15
10-03-00	-7311	< 1.0	1335 ± 132	< 15	< 18	< 60	< 15
11-07-00	-8819	< 1.0	1438 ± 123	< 15	< 18	< 60	< 15
12-05-00	-9537	< 1.0	1491 ± 183	< 15	< 18	< 60	< 15

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Table 16. Well water samples, analyses for gross beta and tritium.

Collection: Quarterly

Units: pCi/L

<u>Location</u>				
<u>D-53 Treated Municipal Water</u>				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1702	DWW-4134	DWW-7471	DWW-10109
Gross Beta	2.3 ± 0.6	2.5 ± 0.6	2.8 ± 0.6	2.6 ± 0.6
H-3	< 183	< 181	< 157	< 179
<u>Location</u>				
<u>D-54 Inlet to Municipal Water</u>				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1703	DWW-4135	DWW-7133	DWW-10110
Gross Beta	3.4 ± 0.7	2.8 ± 0.6	3.1 ± 0.7	3.8 ± 0.7
H-3	< 183	< 181	< 179	< 179
<u>Location</u>				
<u>D-55 On-site Well</u>				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1704	DWW-4136, 7	DWW-7472	DWW-10111
Gross Beta	1.0 ± 0.5	< 0.9	< 1.0	< 1.0
H-3	< 183	< 181	< 157	< 179
<u>Location</u>				
<u>D-57 Bull Farm</u>				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1705	DWW-4138	DWW-7134	DWW-10112
Gross Beta	2.0 ± 0.7	1.8 ± 0.6	1.5 ± 0.6	2.2 ± 0.6
H-3	< 183	< 181	< 179	< 179
<u>Location</u>				
<u>D-58 Franz Farm</u>				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1706	DWW-4139	DWW-7135	DWW-10113
Gross Beta	5.5 ± 0.8	7.6 ± 0.8	8.5 ± 0.9	1.9 ± 0.6
H-3	< 183	< 181	< 179	< 179
<u>Location</u>				
<u>D-72 Van Note Farm</u>				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1707	DWW-4140	DWW-7136	DWW-10111
Gross Beta	< 1.0	< 1.1	< 1.0	< 0.9
H-3	< 183	< 181	< 179	< 179

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Table 17. Vegetation (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	Indicator		
	D-93	D-94	D-101
Lab Code		DVE-5319	DVE-5320
Date Collected		7/25/00	7/25/00
Sample Type		Green Leafy	Green Leafy
K-40		4.87 ± 0.53	3.21 ± 0.43
Mn-54		< 0.023	< 0.013
Co-58		< 0.011	< 0.009
Co-60		< 0.021	< 0.006
Nb-95		< 0.012	< 0.011
Zr-95		< 0.018	< 0.031
Ru-103		< 0.018	< 0.007
Ru-106		< 0.17	< 0.084
I-131		< 0.021	< 0.014
Cs-134		< 0.021	< 0.011
Cs-137		< 0.014	< 0.010
Ce-141		< 0.024	< 0.016
Ce-144		< 0.091	< 0.087

Location	Control		
	D-105		
Lab Code			
Date Collected			
Sample Type			
K-40			
Mn-54			
Co-58			
Co-60			
Nb-95			
Zr-95			
Ru-103			
Ru-106			
I-131			
Cs-134			
Cs-137			
Ce-141			
Ce-144			

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Table 18. Vegetation (hay and grain), analyses for gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-16	D-57	D-58	D-63	D-72
Lab Code	DVE-5812	DVE-5813		DVE-5814	DVE-5815
Date Collected	8/9/00	8/9/00		8/9/00	8/9/00
Sample Type	Forage	Forage		Forage	Forage
K-40	5.90 ± 0.58	12.35 ± 1.21		16.95 ± 1.32	16.48 ± 1.75
Mn-54	< 0.020	< 0.031		< 0.044	< 0.042
Co-58	< 0.014	< 0.042		< 0.031	< 0.043
Co-60	< 0.022	< 0.021		< 0.032	< 0.048
Nb-95	< 0.018	< 0.035		< 0.016	< 0.035
Zr-95	< 0.012	< 0.072		< 0.041	< 0.076
Ru-103	< 0.014	< 0.049		< 0.016	< 0.060
Ru-106	< 0.20	< 0.32		< 0.376	< 0.338
Cs-134	< 0.015	< 0.039		< 0.044	< 0.052
Cs-137	< 0.015	< 0.027		< 0.037	< 0.061
Ce-141	< 0.036	< 0.053		< 0.064	< 0.079
Ce-144	< 0.15	< 0.19		< 0.21	< 0.27

Location	D-105	D-106
Lab Code	DVE-5816	
Date Collected	8/9/00	
Sample Type	Forage	
K-40	19.31 ± 1.35	
Mn-54	< 0.044	
Co-58	< 0.046	
Co-60	< 0.028	
Nb-95	< 0.051	
Zr-95	< 0.060	
Ru-103	< 0.036	
Ru-106	< 0.34	
Cs-134	< 0.054	
Cs-137	< 0.053	
Ce-141	< 0.045	
Ce-144	< 0.20	

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Table 18. Vegetation (hay and grain), analyses for gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-16	D-57	D-58	D-63	D-72
Lab Code	DVE-7317	DVE-7318	DVE-7319	DVE-7320	DVE-7321
Date Collected	10/2/00	10/2/00	10/2/00	10/2/00	10/2/00
Sample Type	Soybeans	Corn	Corn	Corn	Corn
K-40	9.66 ± 1.14	2.77 ± 0.28	2.94 ± 0.46	3.15 ± 0.30	3.09 ± 0.40
Mn-54	< 0.032	< 0.006	< 0.012	< 0.011	< 0.013
Co-58	< 0.027	< 0.006	< 0.014	< 0.009	< 0.009
Co-60	< 0.035	< 0.007	< 0.022	< 0.007	< 0.005
Nb-95	< 0.038	< 0.010	< 0.019	< 0.005	< 0.010
Zr-95	< 0.066	< 0.013	< 0.031	< 0.017	< 0.029
Ru-103	< 0.035	< 0.009	< 0.013	< 0.011	< 0.008
Ru-106	< 0.24	< 0.093	< 0.16	< 0.067	< 0.072
Cs-134	< 0.021	< 0.010	< 0.019	< 0.008	< 0.010
Cs-137	< 0.035	< 0.008	< 0.008	< 0.011	< 0.010
Ce-141	< 0.066	< 0.013	< 0.017	< 0.013	< 0.017
Ce-144	< 0.29	< 0.039	< 0.074	< 0.050	< 0.047

Location	D-105
Lab Code	DVE-7322
Date Collected	10/2/00
Sample Type	Corn
K-40	3.26 ± 0.34
Mn-54	< 0.011
Co-58	< 0.007
Co-60	< 0.011
Nb-95	< 0.008
Zr-95	< 0.013
Ru-103	< 0.009
Ru-106	< 0.10
Cs-134	< 0.011
Cs-137	< 0.010
Ce-141	< 0.015
Ce-144	< 0.044

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Table 19. Surface water samples, analyses for iodine-131 and gamma-emitting isotopes.

Collection Monthly

Units: pCi/L

Location: D-49

Date Collected	01-10-00	02-08-00	03-15-00	04-14-00	05-09-00	06-13-00
Lab Code	DSW-298	DSW-816	DSW-1696	DSW-2429	DSW-3235	DSW-3947
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

Date Collected	08-03-00	08-21-00	09-26-00	10-17-00	11-14-00	12-15-00
Lab Code	DSW-5734	DSW-6043	DSW-7129	DSW-7860	DSW-9064,5	DSW-10104
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

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Table 19. Surface water samples, analyses for iodine-131 and gamma-emitting isotopes.

Collection Monthly

Units: pCi/L

Location: D-50

Date Collected	01-10-00	02-08-00	03-15-00	04-14-00	05-10-00	06-14-00
Lab Code	DSW-299	DSW-817	DSW-1697	DSW-2430	DSW-3236	DSW-4141
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15
Date Collected	07-25-00	08-21-00	09-26-00	10-17-00	11-14-00	12-15-00
Lab Code	DSW-5326	DSW-6044	DSW-7130	DSW-7861	DSW-9066	DSW-10105
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

DUANE ARNOLD

Table 19. Surface water samples, analyses for iodine-131 and gamma-emitting isotopes.

Collection Monthly

Units: pCi/L

Location: D-51

Date Collected	01-10-00	02-08-00	03-15-00	04-14-00	05-10-00	06-14-00
Lab Code	DSW-300	DSW-818	DSW-1698	DSW-2431	DSW-3237	DSW-4142
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15
Date Collected	07-25-00	08-21-00	09-26-00	10-17-00	11-14-00	12-15-00
Lab Code	DSW-5327	DSW-6045	DSW-7131	DSW-7862	DSW-9067	DSW-10106
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

DUANE ARNOLD

Table 19. Surface water samples, analyses for iodine-131 and gamma-emitting isotopes.

Collection Monthly

Units: pCi/L

Location: D-99

Date Collected	01-10-00	02-08-00	03-15-00	04-14-00	05-09-00	06-13-00
Lab Code	DSW-301	DSW-819	DSW-1699	DSW-2432	DSW-3238	DSW-3948
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15
Date Collected	08-03-00	08-21-00	10-06-00	10-17-00	11-14-00	12-15-00
Lab Code	DSW-5735	DSW-6046	DSW-7470 ^a	DSW-7863	DSW-9068	DSW-10107
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

^a Original sample collected 09-26-2000 lost in transit; resampled for September on 10-06-2000.

DUANE ARNOLD

Table 20. Surface water, analyses for potassium-40 by flame photometry and gamma-emitting isotopes.

Collection: Monthly

Units: pCi/L

Location: D-107

Date Collected	01-10-00	02-08-00	03-17-00	04-01-00	05-09-00	06-14-00
Lab Code	DSW-302	DSW-820	DSW-1700	DSW-2433	DSW-3239	DSW-4143
K-40 (fp)	18.2	25.1	33.7	24.2	10.4	13.8
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

Date Collected	08-03-00	08-21-00	09-26-00	10-17-00	11-14-00	12-18-00
Lab Code	DSW-5736	DSW-6047	DSW-7132	DSW-7864	DSW-9069	DSW-10108
K-40 (fp)	17.3	15.6	19.0	25.1	4.1	25.1
Mn-54	< 15	< 15	< 15	< 15	< 15	< 15
Fe-59	< 30	< 30	< 30	< 30	< 30	< 30
Co-58	< 15	< 15	< 15	< 15	< 15	< 15
Co-60	< 15	< 15	< 15	< 15	< 15	< 15
Zn-65	< 30	< 30	< 30	< 30	< 30	< 30
Nb-95	< 15	< 15	< 15	< 15	< 15	< 15
Zr-95	< 30	< 30	< 30	< 30	< 30	< 30
I-131	< 15	< 15	< 15	< 15	< 15	< 15
Cs-134	< 15	< 15	< 15	< 15	< 15	< 15
Cs-137	< 15	< 15	< 15	< 15	< 15	< 15
Ba-140	< 60	< 60	< 60	< 60	< 60	< 60
La-140	< 15	< 15	< 15	< 15	< 15	< 15

DUANE ARNOLD

Table 21. Surface water, analysis for tritium.
 Collection: Quarterly composites of monthly samples.
 Units: pCi/L

Location D-49				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1734	DSW-4144	DSW-7473	DSW-10760,1
H-3	< 177	< 181	< 159	< 164

Location D-50				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1735	DSW-4145	DSW-7474	DSW-10762
H-3	< 177	< 181	< 159	< 164

Location D-51				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1736	DSW-4146	DSW-7475	DSW-10763
H-3	< 177	< 181	< 159	< 164

Location D-99				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1737	DSW-4147	DSW-7476	DSW-10764
H-3	< 176	< 181	< 159	< 164

Location D-107				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1738	DSW-4148	DSW-7477	DSW-10765
H-3	< 176	< 181	264 ± 90	< 164

DUANE ARNOLD

Table 22. Fish, analyses of edible portion for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g wet

Location	Upstream, D-49			
Lab Code	DF-3570	DF-3571	DF-7323	DF-7324
Date Collected	5/18/00	5/18/00	9/18/00	9/18/00
Sample Type	Carp	Carp sucker	Carp	Carp sucker
K-40	2.92 ± 0.35	3.27 ± 0.44	2.90 ± 0.42	3.08 < 0.51
Mn-54	< 0.014	< 0.014	< 0.014	< 0.011
Fe-59	< 0.025	< 0.021	< 0.018	< 0.043
Co-58	< 0.012	< 0.016	< 0.014	< 0.020
Co-60	< 0.008	< 0.012	< 0.008	< 0.009
Zn-65	< 0.022	< 0.023	< 0.031	< 0.035
Nb-95	< 0.017	< 0.025	< 0.022	< 0.028
Zr-95	< 0.020	< 0.032	< 0.024	< 0.035
Ru-103	< 0.020	< 0.019	< 0.013	< 0.023
Ru-106	< 0.10	< 0.084	< 0.056	< 0.114
Cs-134	< 0.009	< 0.009	< 0.010	< 0.007
Cs-137	< 0.010	< 0.012	< 0.009	< 0.016
Ce-141	< 0.028	< 0.029	< 0.017	< 0.023
Ce-144	< 0.061	< 0.091	< 0.047	< 0.086

Location	Downstream, D-61			
Lab Code	DF-3572	DF-3573	DF-7325	DF-7327
Date Collected	5/18/00	5/18/00	9/18/00	9/18/00
Sample Type	Carp	Carp sucker	Carp	Carp sucker
K-40	2.73 ± 0.37	3.03 ± 0.40	2.62 ± 0.40	3.35 ± 0.40
Mn-54	< 0.009	< 0.012	< 0.009	< 0.010
Fe-59	< 0.017	< 0.042	< 0.032	< 0.024
Co-58	< 0.009	< 0.019	< 0.020	< 0.016
Co-60	< 0.005	< 0.010	< 0.015	< 0.015
Zn-65	< 0.023	< 0.038	< 0.037	< 0.030
Nb-95	< 0.017	< 0.014	< 0.023	< 0.021
Zr-95	< 0.031	< 0.033	< 0.030	< 0.047
Ru-103	< 0.015	< 0.009	< 0.020	< 0.022
Ru-106	< 0.12	< 0.12	< 0.10	< 0.12
Cs-134	< 0.006	< 0.012	< 0.010	< 0.010
Cs-137	< 0.013	< 0.010	< 0.012	< 0.012
Ce-141	< 0.027	< 0.018	< 0.042	< 0.041
Ce-144	< 0.046	< 0.046	< 0.117	< 0.078

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Table 23. River sediment, analysis for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g dry

Location	D-50	
Lab Code	DBS-3241	DBS-9130
Date Collected	5/9/00	11/15/00
K-40	7.68 ± 0.41	8.30 ± 0.43
Mn-54	< 0.009	< 0.013
Fe-59	< 0.014	< 0.021
Co-58	< 0.012	< 0.014
Co-60	< 0.010	< 0.005
Zn-65	< 0.025	< 0.026
Nb-95	< 0.014	< 0.018
Zr-95	< 0.016	< 0.026
Ru-103	< 0.006	< 0.010
Ru-106	< 0.078	< 0.068
Cs-134	< 0.013	< 0.006
Cs-137	0.033 ± 0.013	< 0.017
Ce-141	< 0.033	< 0.024
Ce-144	< 0.080	< 0.066

Location	D-51	
Lab Code	DBS-3242	DBS-9131
Date Collected	5/9/00	11/15/00
K-40	8.26 ± 0.63	7.97 ± 0.44
Mn-54	< 0.016	< 0.017
Fe-59	< 0.044	< 0.017
Co-58	< 0.022	< 0.016
Co-60	< 0.020	< 0.014
Zn-65	< 0.050	< 0.032
Nb-95	< 0.024	< 0.014
Zr-95	< 0.048	< 0.030
Ru-103	< 0.026	< 0.016
Ru-106	< 0.19	< 0.068
Cs-134	< 0.031	< 0.018
Cs-137	< 0.011	0.09 ± 0.020
Ce-141	< 0.044	< 0.028
Ce-144	< 0.10	< 0.11

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Table 23. River sediment, analysis for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g dry

Location	D-107	
Lab Code	DBS-3243	DBS-8921
Date Collected	5/9/00	10/26/00
K-40	8.80 ± 0.49	7.38 ± 0.70
Mn-54	< 0.008	< 0.024
Fe-59	< 0.037	< 0.078
Co-58	< 0.014	< 0.026
Co-60	< 0.017	< 0.030
Zn-65	< 0.031	< 0.071
Nb-95	< 0.015	< 0.048
Zr-95	< 0.030	< 0.062
Ru-103	< 0.015	< 0.041
Ru-106	< 0.13	< 0.17
Cs-134	< 0.019	< 0.028
Cs-137	0.060 ± 0.018	< 0.028
Ce-141	< 0.040	< 0.054
Ce-144	< 0.098	< 0.10

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Table 24. Precipitation, analyses for gamma emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: DAEC

Date Collected	01-10-00	02-08-00	03-07-00	04-14-00	05-09-00	06-13-00
Lab Code	DP-303	DP-821 ^a	DP-1701 ^a	DP-2434	DP-3240	DP-3949
Mn-54	< 3.8	< 12.2	< 13.6	< 4.6	< 2.1	< 2.4
Fe-59	< 7.4	< 16.8	< 29.9	< 6.5	< 3.8	< 2.7
Co-58	< 3.0	< 8.8	< 13.7	< 5.3	< 1.8	< 1.4
Co-60	< 3.2	< 15.8	< 15.7	< 6.4	< 2.3	< 2.5
Zn-65	< 6.2	< 27.0	< 27.9	< 11.8	< 5.4	< 4.3
Nb-95	< 4.3	< 16.3	< 20.7	< 6.3	< 2.5	< 1.8
Zr-95	< 4.9	< 28.3	< 20.0	< 11.8	< 5.2	< 3.6
I-131	< 8.4	< 30.0	< 19.7	< 8.9	< 4.1	< 2.7
Cs-134	< 4.1	< 16.4	< 12.9	< 3.4	< 2.7	< 2.2
Cs-137	< 2.5	< 13.9	< 14.9	< 5.5	< 2.0	< 2.4
Ba-140	< 13.4	< 49.4	< 77.2	< 15.6	< 12.9	< 8.3
La-140	< 5.3	< 23.3	< 20.9	< 7.7	< 3.6	< 2.6
Date Collected	07-26-00	08-21-00	09-26-00	10-17-00	11-14-00	12-18-00
Lab Code	DP-5482	DP-6048	NS ^b	DP-7865	DP-9070	DP-10116
Mn-54	< 2.7	< 8.1	-	< 3.1	< 3.3	< 9.4
Fe-59	< 3.8	< 15.7	-	< 8.3	< 10.9	< 17.4
Co-58	< 3.1	< 6.1	-	< 3.7	< 3.8	< 8.6
Co-60	< 1.8	< 4.0	-	< 5.2	< 4.1	< 7.5
Zn-65	< 3.1	< 15.2	-	< 3.8	< 3.2	< 12.5
Nb-95	< 1.8	< 7.2	-	< 3.4	< 3.2	< 6.6
Zr-95	< 5.3	< 11.4	-	< 6.2	< 5.5	< 10.2
I-131	< 6.9	< 9.0	-	< 7.4	< 5.6	< 10.5
Cs-134	< 2.5	< 8.6	-	< 4.0	< 4.5	< 6.1
Cs-137	< 2.5	< 7.4	-	< 3.7	< 3.5	< 7.4
Ba-140	< 17.2	< 32.3	-	< 19.6	< 11.1	< 33.1
La-140	< 3.0	< 4.2	-	< 3.3	< 3.7	< 4.9

^a No precipitation, empty container rinsed with demineralized water.

^b NS=No sample; lost in transit.

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Table 25. Precipitation, analysis for tritium.
Collection: Quarterly composites of monthly samples.
Units: pCi/L

Location	Duane Arnold			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DP-2462	DP-4149	DP-7478	DP-10766
H-3	< 176	< 181	< 159	< 164

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Table 26. Meat, analysis for gamma-emitting isotopes.

Collection: Annually, when available.

Units: pCi/g wet

Lab Code	NS ^a
Date Collected	
Sample Type	
K-40	-
Mn-54	-
Fe-59	-
Co-58	-
Co-60	-
Zn-65	-
Nb-95	-
Zr-95	-
Ru-103	-
Ru-106	-
Cs-134	-
Cs-137	-
Ce-141	-
Ce-144	-

^a NS= No sample; Meat not collected in 2000. No animals slaughtered for home use.

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Table 27. Soil, analysis for strontium-90 and gamma-emitting isotopes.

Collection: Annually

Units: pCi/g dry

Location	D-15	D-16
Lab Code	DSO-9062	DSO-9063
Date Collected	11/15/00	11/15/00
Sr-90	0.031 ± 0.015	< 0.025
K-40	18.38 ± 1.18	9.30 ± 0.47
Mn-54	< 0.025	< 0.012
Fe-59	< 0.067	< 0.024
Co-58	< 0.032	< 0.011
Co-60	< 0.023	< 0.015
Zn-65	< 0.085	< 0.022
Nb-95	< 0.023	< 0.016
Zr-95	< 0.026	< 0.021
Ru-103	< 0.045	< 0.016
Ru-106	< 0.34	< 0.082
Cs-134	< 0.040	< 0.009
Cs-137	0.21 ± 0.051	0.19 ± 0.029
Ce-141	< 0.089	< 0.033
Ce-144	< 0.19	< 0.085
