

April 30, 2003
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Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station 0-P1-17
Washington, DC 20555-0001

Subject: Duane Arnold Energy Center (DAEC)
Docket No: 50-331
Op. License No: DPR-49
2002 Annual Radioactive Environmental Monitoring Report

File: A-118e, RP-3g

In accordance with the requirements of Duane Arnold Energy Center Technical Specifications Section 5.6.2, a copy of the Annual Radioactive Environmental Monitoring Report for the period January 1, 2002 through December 31, 2002 is enclosed. This report satisfies the requirements stated in the DAEC Offsite Dose Assessment Manual (ODAM), section 8.2.2 and Technical Specification section 5.6.2.

No new commitments are made by this letter.

Please contact this office if you have any questions regarding this matter.

Sincerely,



Mark Peifer
Site Vice President

Enclosure: 2002 Annual Radioactive Environmental Monitoring Report

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2002 Annual Radioactive Environmental Monitoring Report

Duane Arnold Energy Center

Technical Lead: Frank Date 28-Apr-2003

Reviewed by: Don Johnson Date 04/28/03

Chemistry Manager: Dennis R. Wheeler Date 04/28/03

**2002 Rad. Environmental Report
Routing Review Comment Response
April 28th, 2003**

Steve Funk:

- No post route comments

Pre Route Comments: .

- 1.) Cover Page Delete the two lines at the top of the title:
IES UTILITIES CEDAR RAPIDS, IOWA
- 2.) Page 2. The first sentence of the first paragraph – Improve clarity.
- 3.) Page 5. add statement indicating the minimum number (or more) of analyses as required by the ODAM were performed.
- 4.) page 13 for point 107, could you please add the phrase (on-site) to the description for point 107? e.g.: Sewage Effluent Canal (on-site)

Dennis Wheeler:

- No unresolved comments

Jon Newman:

-
-

Steve Catron:

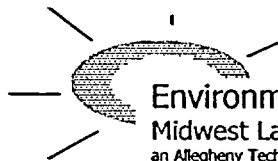
- A cover sheet with signature blocks has been added.
- Claire Bleau will assist in the stead of John Karrick

John Karrick:

- No response, Claire Bleau will assist in the stead of John Karrick.
- The number of letters will be reduced and the number of “CCs” will increased.

Russ Perry:

- No comments



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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, 2002

Prepared and submitted by

ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8001

Approved :

Bronia Grob, M.S.
Laboratory Manager

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 Hygienic 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, 2002. 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, as required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Duane Arnold Energy Center, is herein described. Results for the year 2002 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. 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.

3.1 Program Design and Data Interpretation (continued)

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-four special locations: eighteen 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 three 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-108) 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 seven locations: one control (D-108) and six indicators (D-16, D-57, D-58, D-72, D-94, and D-96). 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 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.

Program Description (continued)

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. In no instance did missed analyses affect minimum sampling requirements as specified in the O DAM.

(1) Milk:

No milk was available from location D-101, January through March of 2002. Goats were dry.

Milk was not available from location D-101 for the week of July 16, 2002.

(2) Air particulates / Air Iodine:

No AP/AI sample was available at location D-15 for the weeks ending 02-21 and 02-28, 2002. Power was not available to the sampler site, due to construction.

No AP/AI sample was available at location D-8 for the week ending 06-27-02. No power was available to the sampler site.

No AP/AI sample was available at location D-6 for the week ending 12-19-02. No power was available to the sampler site.

(3) Thermoluminescent Dosimetry:

Data was not available for the first quarter, 2002 from location D-40. Both emergency and regular TLDs were missing 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 liquid scintillation.

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 crosscheck programs are presented in Appendix A.

3.5 Program Modifications

There were no program modifications for the year 2002.

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 2002 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 2002.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in 2002.

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were identical at both indicator and control locations (0.027 pCi/m³) and similar to levels observed from 1987 through 2001. The results are tabulated below.

<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)		
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	0.026	0.027
1993	0.022	0.023		2001	0.026	0.026
1994	0.023	0.024		2002	0.027	0.027

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 17.2 and 15.7 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 19.0 mR/quarter, 20.1 mR/quarter and 16.7 mR/quarter, respectively. The average for all locations was 18.1 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 2002 show no radiological effects of plant operation.

Ground Water

The annual mean for gross beta activity measured 3.2 pCi/L and was similar to levels observed from 1987 through 2001. The location with the highest mean (5.3 pCi/L) was D-58, a farm 1.0 mile distant from the plant. Tritium activity measured 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 0.033 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 0.044 pCi/g dry weight. Cesium-137 activity averaged 0.18 pCi/g dry weight. Both strontium-90 and cesium-137 activities are similar to or less than levels observed from 1987 through 2001, these levels are generally attributable to deposition of fallout from previous decades.

Naturally-occurring potassium-40 averaged 11.56 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 10.3 to 31.3 pCi/L and averaged 21.6 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 (3.16 and 3.03 pCi/g wet, respectively). No plant effect on fish is indicated.

River Sediments

River sediments were collected in May and September, 2002, and analyzed for gamma-emitting isotopes. Co-60 was detected in one sample from location D-107 (sewage effluent) at a concentration of 0.046 pCi/g dry weight. Cesium-137 measured below detection levels in all samples. Potassium-40 activity ranged from 5.74-9.31 pCi/g dry weight and averaged 7.52 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 Ba-140	8.04 d 12.8 d
B. Other than Short-lived		Nb-95 Zr-95 Ru-103 Ru-106 Cs-134 Cs-137 Ce-141 Ce-144	35.15 d 65 d 39.35 d 368.2 d 2.061 y 30.174 y 32.5 d 284.31 d
III. Activation Products	Typically found in nuclear power plant effluents	Mn-54 Fe-59 Co-58 Co-60 Zn-65	312.5 d 45.0 d 70.78 d 5.26 y 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. Composite weekly samples to form a quarterly composite (by location). Analyze quarterly composite for gamma isotopic.		
	2	Marion (C)				
	3	Hiawatha				
	5	Palo				
	6	Center Point				
	7	Shellsburg				
	8	Urbana				
	10	Atkins				
	11	Toddville				
	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	Toddville				
	15	On-site North				
Ambient Radiation	1-2 (C)	Air Particulate Locations	Two dosimeters continuously at each location. Both dosimeters are changed at least quarterly.	Read gamma radiation dose quarterly.		
	3, 5-8					
	10, 11					
	13 (C)					
	15, 16					
	17-23, 28-32, 82-86, 91	≤ 0.5 mi. of Stack				
	43-48	≤ 1.0 mi. of Stack				
	33-42	≤ 3.0 mi. of Stack				
Surface Water	49	Lewis Access (C)	Once per month.	Gamma isotopic analyses of each sample (by location). Composite monthly samples to form quarterly composite (by location). Analyze quarterly composite for tritium.		
	50	Plant Intake (C)				
	51	Plant Discharge				
	99	Pleasant Creek				
	107	Plant Sewage Discharge				

(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 control samples, perform gamma isotopic and Sr-89 and Sr-90 analyses.
	54	Inlet to Municipal Water Treatment System		
	55 57, 58 72	On-site well 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 (on-site)		
Vegetation	16, 57, 58, 72, 94, 96	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.
	108 (C)			
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	108 (C)	Control Farm	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.
	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 2002; no animals slaughtered for home use.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

Code	Type	Sampling Location		
		Sampling Point	Location Description	Distance and Direction from Site Stack
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-17		17	On-site, N	0.5 mi N
D-18		18	On-site, NNE	0.5 mi NNE
D-19		19	On-site, NE	0.5 mi NE
D-20		20	On-site, ENE	0.5 mi ENE
D-21		21	On-site, ENE	0.5 mi ENE
D-22		22	On-site, E	0.5 mi E
D-23		23	On-site, ESE	0.5 mi ESE
D-28		28	On-site, WSW	0.5 mi WSW
D-29		29	On-site, W	0.5 mi W
D-30		30	On-site, WNW	0.5 mi WNW
D-31		31	On-site, NW	0.5 mi NW
D-32		32	On-site, NNW	0.5 mi NNW
D-33		33	3 miles N	3.0 mi N
D-34		34	3 miles NNE	3.0 mi NNE
D-35		35	3 miles NE	3.0 mi NE
D-36		36	3 miles ENE	3.0 mi ENE
D-37		37	3 miles E	3.0 mi E
D-38		38	3 miles ESE	3.0 mi ESE
D-39		39	3 miles SE	3.0 mi SE
D-40		40	3 miles SSE	3.0 mi SSE
D-41		41	3 miles S	3.0 mi S
D-42		42	3 miles SSE	3.0 mi SSE
D-43		43	1 mile SSW	1.0 mi SSW
D-44		44	1 mile WSW	1.0 mi WSW
D-45		45	1 mile W	1.0 mi W
D-46		46	1 mile WNW	1.0 mi WNW

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

Code	Type	Sampling Location		
		Sampling Point	Location Description	Distance and Direction from Site Stack
D-47		47	1 mile WNW	1.0 mi WNW
D-48		48	1 mile NW	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, Municipal Water Treatment System	
D-55		55	On-site Well	
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-72		72	Farm	2.0 mi SSW
D-82		82	On-site, SE	0.5 mi SE
D-83		83	On-site, SSE	0.5 mi SSE
D-84		84	On-site, S	0.5 mi S
D-85		85	On-site, SSW	0.5 mi SSW
D-86		86	On-site, SW	0.5 mi SW
D-91		91	On-site, N	0.5 mi N
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-106		106	Farm	4.5 mi SE
D-107		107	Sewage Effluent Canal	On-site
D-108	C	108	Farm	17.3 mi. SW

"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-17 to D-23				TLD		
D-28 to D-42				TLD		
D-43 to 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 to D-86				TLD		
D-91				TLD		
D-94						G
D-96			M			
D-99			SW			
D-101			M			
D-106			M			G
D-107			SW		RS	
D-108	C		M			G
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	01-08-02	Sample not available; goat dry.
MI	I-131, Gamma	D-101	02-05-02	Sample not available; goat dry.
AP/AI	Gross Beta, I-131	D-15	02-21-02	No power to sampler, due to construction.
AP/AI	Gross Beta, I-131	D-15	02-28-02	No power to sampler, due to construction.
MI	I-131, Gamma	D-101	03-12-02	Sample not available; goat dry.
TLD	Ambient Gamma	D-40	03-28-02	TLD missing in the field.
AP/AI	Gross Beta, I-131	D-8	06-27-02	No power available to sampler site.
MI	I-131, Gamma	D-101	07-16-02	Sample not available.
AP	Gross Beta, I-131	D-6	12-19-02	No power available to sampler site.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa	Reporting Period	January-December, 2002
	(County, State)		

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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, 2002
(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 ^d
				Location ^a	Mean (F) ^c Range ^c		
Precipitation (pCi/L) (continued)	Zr-95	17.6	< LLD	-	-	< LLD	0
	I-131	29.2	< LLD	-	-	< LLD	0
	Cs-134	8.1	< LLD	-	-	< LLD	0
	Cs-137	7.7	< LLD	-	-	< LLD	0
	Ba-140	40.9	< LLD	-	-	< LLD	0
	La-140	12.6	< LLD	-	-	< LLD	0
Milk (pCi/L)	I-131 50	1.0	< LLD	-	-	< LLD	0
	GS 50						
	K-40	100	1429 (32/32) (1148-1762)	D-101, Farm 4 mi. E	1526 (14/14) (1211-1762)	1329 (18/18) (1047-1456)	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	1.6	3.2 (13/24) (1.7-5.9)	D-58, Farm 1 mi. WSW-SW	5.3 (4/4) (4.5-5.9)	None	0
	H-3 24	330	< LLD	-	-	< LLD	0
Broadleaf Vegetation (pCi/g wet)	I-131 3	0.033	< LLD	-	-	< LLD	0
	GS 3						
	K-40	0.5	4.68 (3/3) (3.22-5.57)	D-57, Farm 1 mi WSW	5.57 (1/1)	None	0
	Mn-54	0.029	< LLD	-	-	< LLD	0
	Co-58	0.018	< LLD	-	-	< LLD	0
	Co-60	0.026	< LLD	-	-	< LLD	0
	Nb-95	0.028	< LLD	-	-	< LLD	0
	Zr-95	0.034	< LLD	-	-	< LLD	0
	Ru-103	0.017	< LLD	-	-	< LLD	0
	Ru-106	0.17	< LLD	-	-	< LLD	0
	Cs-134	0.030	< LLD	-	-	< LLD	0
	Cs-137	0.024	< LLD	-	-	< LLD	0
	Ce-141	0.047	< LLD	-	-	< LLD	0
	Ce-144	0.099	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Program Summary

Name of Facility Duane Arnold Energy Center
Location of Facility Linn, Iowa
(County, State)

Docket No. 50-331
Reporting Period January-December, 2002

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 ^a	Mean (F) ^c Range ^c		
Vegetation (Grain) (pCi/g wet)	GS 10						
	K-40	0.5	9.49 (10/10) (2.59-18.80)	D-57, Farm 1 mi. WSW	11.15 (2/2) (2.43-19.86)	9.15 (2/2) (2.46-15.84)	0
	Mn-54	0.063	< LLD	-	-	< LLD	0
	Co-58	0.049	< LLD	-	-	< LLD	0
	Co-60	0.053	< LLD	-	-	< LLD	0
	Nb-95	0.056	< LLD	-	-	< LLD	0
	Zr-95	0.10	< LLD	-	-	< LLD	0
	Ru-103	0.055	< LLD	-	-	< LLD	0
	Ru-106	0.40	< LLD	-	-	< LLD	0
	Cs-134	0.046	< LLD	-	-	< LLD	0
	Cs-137	0.058	< LLD	-	-	< LLD	0
	Ce-141	0.084	< LLD	-	-	< LLD	0
	Ce-144	0.35	< LLD	-	-	< LLD	0
Soil (pCi/gwet)	Sr-90 2	0.010	0.044 (2/2) (0.039-0.049)	D-15, On-site 0.5 mi. NW	0.049 (1/1)	None	0
	GS 2						
	K-40	0.5	11.56 (2/2) (8.48-14.64)	D-15, On-site 0.5 mi. NW	14.64 (1/1)	None	0
	Mn-54	0.016	< LLD	-	-	None	0
	Fe-59	0.033	< LLD	-	-	None	0
	Co-58	0.017	< LLD	-	-	None	0
	Co-60	0.012	< LLD	-	-	None	0
	Zn-65	0.039	< LLD	-	-	None	0
	Nb-95	0.013	< LLD	-	-	None	0
	Zr-95	0.031	< LLD	-	-	None	0
	Ru-103	0.010	< LLD	-	-	None	0
	Ru-106	0.14	< LLD	-	-	None	0
	Cs-134	0.015	< LLD	-	-	None	0
	Cs-137	0.060	0.18 (2/2) (0.16-0.20)	D-15, On-site 0.5 mi. NW	0.20 (1/1)	None	0
	Ce-141	0.039	< LLD	-	-	None	0
	Ce-144	0.075	< LLD	-	-	None	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility
Location of Facility

Duane Arnold Energy Center

Linn, Iowa

(County, State)

Docket No.

50-331

Reporting Period

January-December, 2002

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 ^d
				Location ^a	Mean (F) ^c Range ^c		
Surface Water (pCi/L)	H-3 20	330	< LLD	-	-	< LLD	0
	K-40 12	0.5	21.62 (12/12) (10.3-31.3)	D-107, Onsite Sewage Effluent	21.62 (12/12) (10.3-31.3)	None	0
	I-131 12	15	< LLD	-	-	< LLD	0
	GS 12						
	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
Sediments (pCi/g dry)	GS 6						
	K-40	1.0	7.32 (4/4) (5.74-9.31)	D-50, Plant Intake	7.93 (2/2) (7.67-8.18)	7.93 (2/2) (7.67-8.18)	0
	Mn-54	0.022	< LLD	-	-	< LLD	0
	Fe-59	0.055	< LLD	-	-	< LLD	0
	Co-58	0.026	< LLD	-	-	< LLD	0
	Co-60	0.028	0.046 (1/4)	D-107, Sewage Effluent Canal	0.046 (1/1)	< LLD	0
	Zn-65	0.056	< LLD	-	-	< LLD	0
	Nb-95	0.038	< LLD	-	-	< LLD	0
	Zr-95	0.054	< LLD	-	-	< LLD	0
	Ru-103	0.024	< LLD	-	-	< LLD	0
	Ru-106	0.18	< LLD	-	-	< LLD	0
	Cs-134	0.030	< LLD	-	-	< LLD	0
	Cs-137	0.028	< LLD	-	-	< LLD	0
	Ce-141	0.046	< LLD	-	-	< LLD	0
	Ce-144	0.12	< LLD	-	-	< LLD	0

Table 5 7 Radiological Environmental Program Summary

Name of Facility	Duane Arnold Energy Center
Location of Facility	Linn, Iowa
	(County, State)

Docket No.	50-331
Reporting Period	January-December, 2002

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		
Fish	GS 8						
(pCi/g wet)	K-40	1.0	3.16 (4/4) (2.83-3.38)	D-61, Downstream	3.16 (4/4) (2.83-3.38)	3.03 (4/4) (2.89-3.21)	0
	Mn-54	0.022	< LLD	-	-	< LLD	0
	Fe-59	0.091	< LLD	-	-	< LLD	0
	Co-58	0.023	< LLD	-	-	< LLD	0
	Co-60	0.019	< LLD	-	-	< LLD	0
	Zn-65	0.043	< LLD	-	-	< LLD	0
	Nb-95	0.039	< LLD	-	-	< LLD	0
	Zr-95	0.051	< LLD	-	-	< LLD	0
	Ru-103	0.030	< LLD	-	-	< LLD	0
	Ru-106	0.17	< LLD	-	-	< LLD	0
	Cs-134	0.021	< LLD	-	-	< LLD	0
	Cs-137	0.015	< LLD	-	-	< LLD	0
	Ce-141	0.057	< LLD	-	-	< LLD	0
	Ce-144	0.13	< LLD	-	-	< LLD	0

^a GB = Gross beta, GS = Gamma spectroscopy

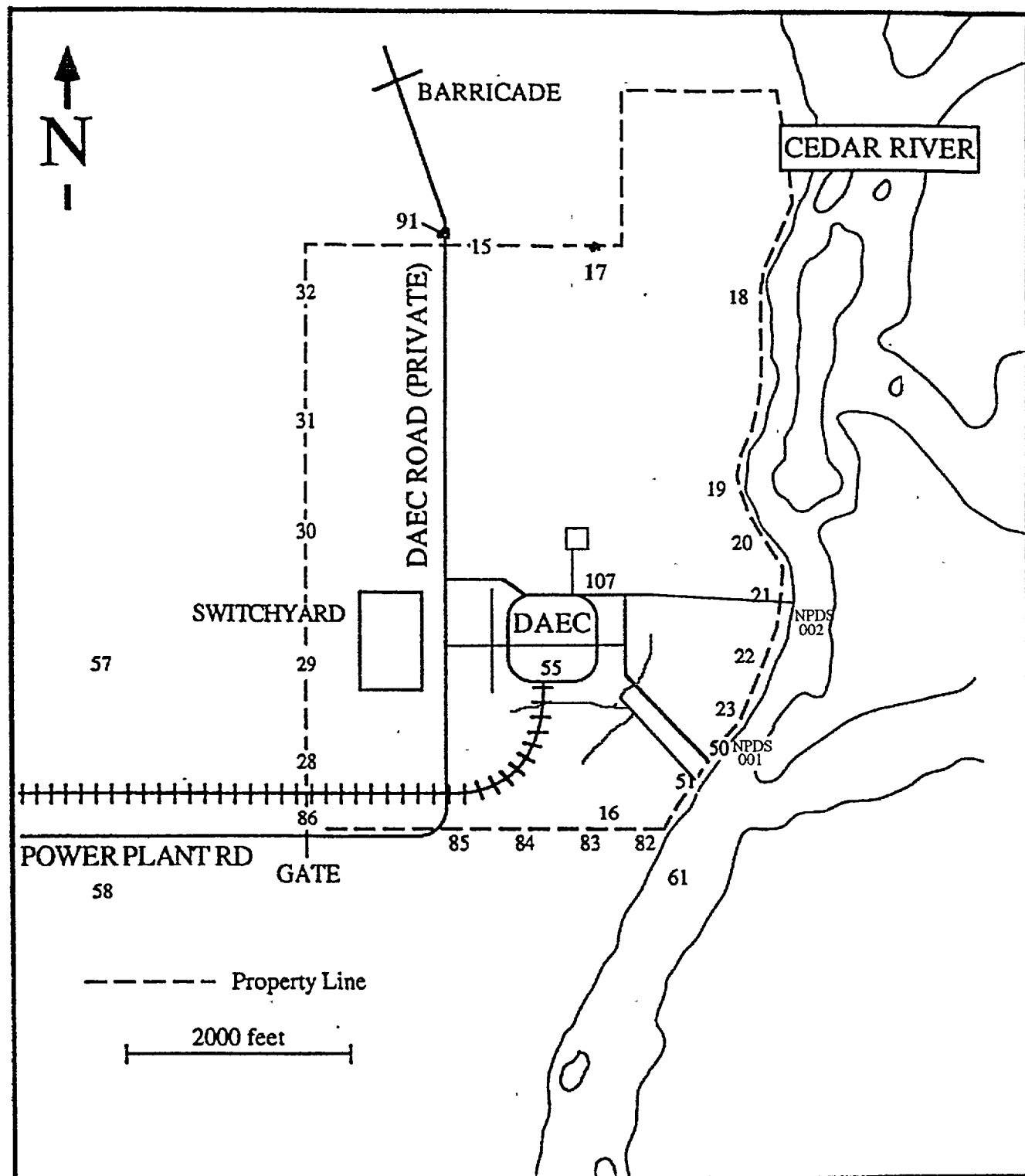
^b LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

^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.

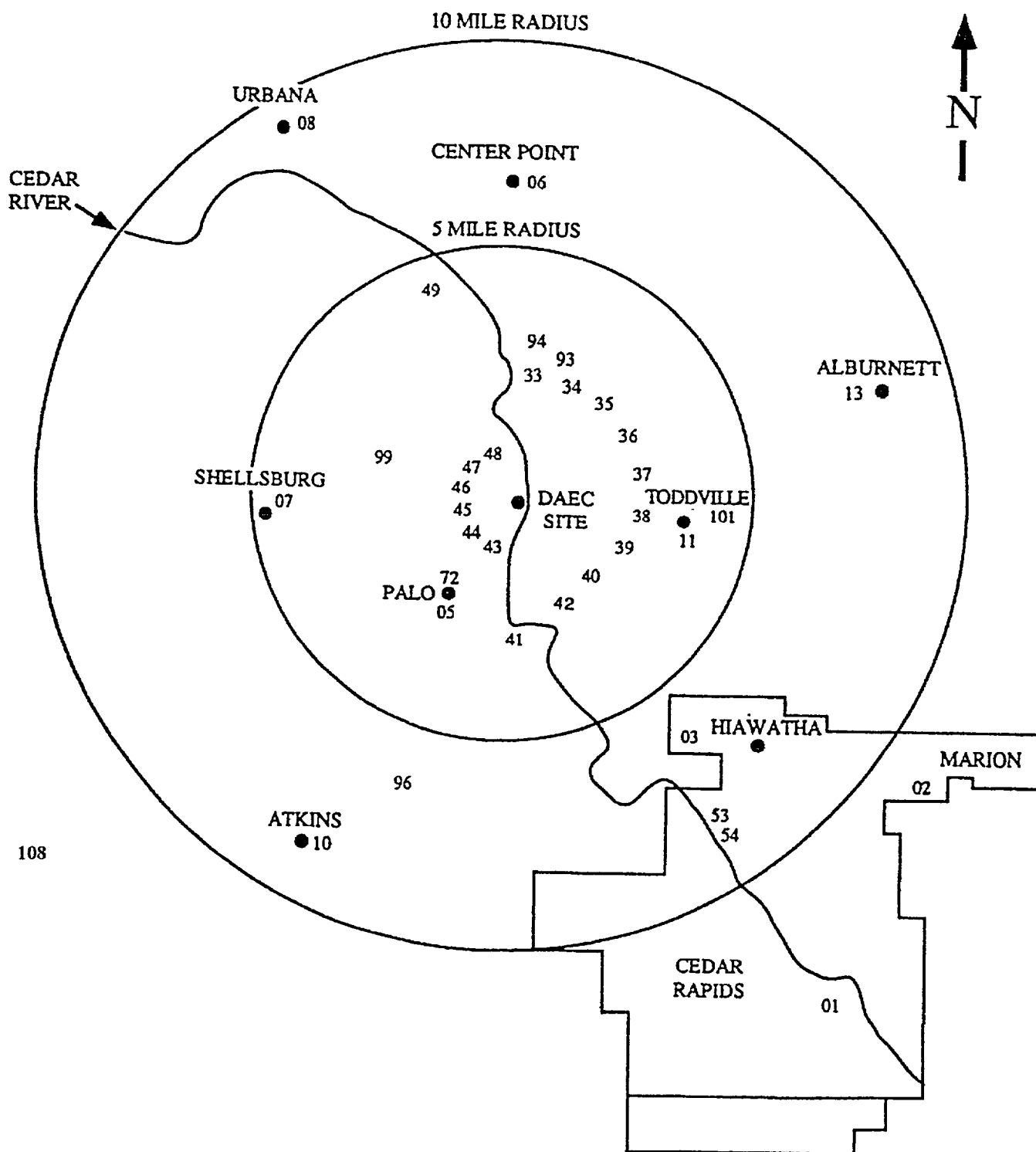
^a Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

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



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

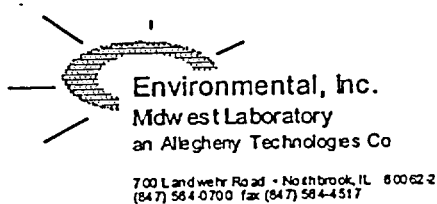
Figure 5.2 Radiological Environmental Monitoring Program Sampling Stations Outside 0.5 miles from the Duane Arnold Energy Center



Refer to 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, 2002 through December, 2002

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.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters under the sponsorships listed in Table A-2. Results of internal laboratory testing is 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.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

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

Analysis	Level	One standard deviation for single determination
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	Date	Analysis	Concentration (pCi/L)		Control Limits
			Laboratory Result ^b	ERA Result ^c	
STW-940	02/20/02	Sr-89	53.0 ± 2.5	55.3 ± 5.0	46.6 - 64.0
STW-940	02/20/02	Sr-90	16.6 ± 0.5	15.9 ± 5.0	7.2 - 24.6
STW-942	02/20/02	Gr. Alpha	6.5 ± 0.6	8.0 ± 5.0	0.0 - 16.7
STW-942	02/20/02	Gr. Beta	45.7 ± 3.1	48.3 ± 5.0	39.6 - 57.0
STW-944	02/20/02	Ba-133	25.8 ± 1.5	28.9 ± 5.0	20.2 - 37.6
STW-944	02/20/02	Co-60	76.9 ± 2.7	73.4 ± 5.0	64.7 - 82.1
STW-944	02/20/02	Cs-134	38.7 ± 1.6	42.1 ± 5.0	33.4 - 50.8
STW-944	02/20/02	Cs-137	92.9 ± 2.7	88.8 ± 5.0	80.1 - 97.5
STW-944	02/20/02	Ra-226	15.3 ± 0.7	14.3 ± 2.2	10.6 - 18.0
STW-944	02/20/02	Ra-228	17.5 ± 0.4	16.9 ± 4.2	9.6 - 24.2
STW-944	02/20/02	Uranium	23.8 ± 1.1	28.3 ± 3.0	23.1 - 33.5
STW-944	02/20/02	Zn-65	361.0 ± 9.2	359.0 ± 35.9	298.0 - 420.0
STW-951	05/22/02	Gr. Alpha	23.9 ± 2.5	22.8 ± 5.7	13.0 - 32.6
STW-951	05/22/02	Ra-226	5.9 ± 0.5	6.1 ± 0.9	4.5 - 7.7
STW-951	05/22/02	Ra-228	5.6 ± 0.9	4.5 ± 1.1	2.6 - 6.5
STW-951	05/22/02	Uranium	7.6 ± 0.2	9.3 ± 3.0	4.1 - 14.5
STW-952	05/22/02	Co-60	37.9 ± 0.7	39.1 ± 5.0	30.4 - 47.8
STW-952	05/22/02	Cs-134	14.5 ± 0.8	17.1 ± 5.0	8.4 - 25.8
STW-952	05/22/02	Cs-137	50.0 ± 2.0	52.1 ± 5.0	43.4 - 60.8
STW-952	05/22/02	Gr. Beta	171.0 ± 2.5	189.0 ± 28.4	140.0 - 238.0
STW-952	05/22/02	Sr-89	28.4 ± 4.8	31.7 ± 5.0	23.0 - 40.4
STW-952	05/22/02	Sr-90	32.4 ± 3.1	28.3 ± 5.0	19.6 - 37.0
STW-953 ^d	05/22/02	H-3	13900.0 ± 100.0	17400.0 ± 1740.0	14400.0 - 20400.0
STW-954	05/22/02	I-131	14.6 ± 0.3	14.7 ± 2.0	11.2 - 18.2
STW-965	08/21/02	Ba-133	71.9 ± 2.1	80.0 ± 8.0	66.4 - 93.6
STW-965	08/21/02	Co-60	23.8 ± 1.0	23.3 ± 5.0	14.6 - 32.0
STW-965	08/21/02	Cs-134 ^e	62.9 ± 1.2	71.7 ± 5.0	63.0 - 80.4
STW-965	08/21/02	Cs-137	219.3 ± 10.7	214.0 ± 10.7	195.0 - 233.0
STW-965	08/21/02	Gr. Alpha	74.4 ± 0.6	58.8 ± 14.7	33.5 - 84.1
STW-965	08/21/02	Gr. Beta	26.7 ± 0.4	21.9 ± 2.2	13.2 - 30.6
STW-965	08/21/02	Ra-226	5.0 ± 0.5	5.0 ± 0.8	3.7 - 6.3
STW-965	08/21/02	Ra-228	6.0 ± 0.7	4.7 ± 1.2	2.7 - 6.7
STW-965	08/21/02	Sr-89	28.4 ± 1.5	29.0 ± 5.0	20.3 - 37.7
STW-965	08/21/02	Sr-90	36.5 ± 1.1	36.4 ± 5.0	27.7 - 45.1
STW-965	08/21/02	Uranium	4.1 ± 0.1	5.0 ± 3.0	0.0 - 10.2
STW-965	08/21/02	Zn-65	92.4 ± 2.2	95.7 ± 9.6	79.4 - 112.0
STW-966	11/20/02	Gr. Alpha	9.3 ± 0.4	12.2 ± 5.0	3.5 - 20.9
STW-966	11/20/02	Gr. Beta	44.7 ± 1.0	47.0 ± 5.0	38.3 - 55.7
STW-967	11/20/02	H-3	10100.0 ± 38.7	10200.0 ± 1020.0	8440.0 - 12000.0
STW-968	11/20/02	Ra-226	11.6 ± 0.1	12.1 ± 1.8	9.0 - 15.2
STW-968	11/20/02	Ra-228	16.0 ± 1.4	15.1 ± 3.8	8.6 - 21.6
STW-968	11/20/02	Uranium	15.5 ± 0.5	19.2 ± 3.0	14.0 - 24.4
STW-969	11/20/02	I-131	6.0 ± 0.4	6.8 ± 2.0	3.3 - 10.2

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

Lab Code	Date	Analysis	Concentration (pCi/L)		
			Laboratory Result ^b	ERA Result ^c	Control Limits
STW-970	11/20/02	Co-60	104.0 ± 7.1	104.0 ± 5.2	95.0 - 113.0
STW-970	11/20/02	Cs-134	48.2 ± 2.3	55.5 ± 5.0	46.8 - 64.2
STW-970	11/20/02	Cs-137	109.0 ± 12.6	117.0 ± 5.9	107.0 - 127.0
STW-970	11/20/02	Gr. Beta	252.0 ± 26.8	288.0 ± 49.5	244.0 - 416.0
STW-970	11/20/02	Sr-89	43.2 ± 0.7	47.6 ± 5.0	38.9 - 56.3
STW-970	11/20/02	Sr-90	7.5 ± 0.2	7.6 ± 5.0	0.0 - 16.2
STW-971	11/20/02	Gr. Alpha	74.9 ± 1.5	103.0 ± 25.8	58.4 - 148.0
STW-971	11/20/02	Ra-226	8.9 ± 0.0	9.1 ± 1.4	6.7 - 11.5
STW-971	11/20/02	Ra-228	15.3 ± 0.1	17.8 ± 4.5	10.1 - 25.5
STW-971	11/20/02	Uranium	51.7 ± 1.6	61.7 ± 6.2	51.0 - 72.4

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

^b Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

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

^d Analysis was repeated; result of reanalysis: 16114±487 pCi/L.

^e ERA acknowledged an unacceptably high percentage of failure for Cs-134 and questioned its own control limits. No problems were identified in the analysis.

TABLE A-2. Crosscheck program results; Thermoluminescent Dosimetry, (TLDs).

Lab Code	TLD Type	Date	Measurement	Known Value	mR	Control Limits
					Lab Result ± 2 sigma	
<u>Environmental, Inc.</u>						
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #1	3.98	3.71 ± 0.12	2.79 - 5.17
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #1	3.98	3.38 ± 0.09	2.79 - 5.17
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #2	7.07	7.89 ± 0.18	4.95 - 9.19
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #2	7.07	7.64 ± 0.25	4.95 - 9.19
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #3	15.9	18.62 ± 0.40	11.13 - 20.67
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #3	15.9	19.58 ± 0.12	11.13 - 20.67
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #4	63.61	78.24 ± 1.23	44.53 - 82.69
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #4	63.61	79.89 ± 2.47	44.53 - 82.69
<u>Environmental, Inc.</u>						
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #1	4.84	4.44 ± 0.16	3.39 - 6.29
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #1	4.84	4.37 ± 0.20	3.39 - 6.29
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #2	8.60	9.08 ± 0.14	6.02 - 11.18
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #2	8.60	8.76 ± 0.16	6.02 - 11.18
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #3	19.34	22.14 ± 0.27	13.54 - 25.14
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #3	19.34	24.03 ± 0.30	13.54 - 25.14
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #4	77.36	92.77 ± 0.58	54.15 - 100.57
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #4	77.36	85.25 ± 0.37	54.15 - 100.57
<u>Environmental, Inc.</u>						
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 30	56.73	71.61 ± 1.79	39.71 - 73.75
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 45 ^a	25.21	33.49 ± 1.38	17.65 - 32.77
^a Precision of the distance (cm) measurement can significantly increase the error. The placement of the card holder on the table could account for the higher error.						
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 60	14.18	17.37 ± 1.24	9.93 - 18.43
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 75	9.08	10.65 ± 1.02	6.36 - 11.80
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 90	6.30	6.37 ± 0.54	4.41 - 8.19
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 120	3.55	4.60 ± 0.41	2.49 - 4.62
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 135	2.80	2.51 ± 0.23	1.96 - 3.64
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 150	2.28	2.22 ± 0.28	1.60 - 2.96

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

TABLE A-3. In-House "Spike" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L) ^a		
				Laboratory results 2s, n=1 ^b	Known Activity	Control Limits ^c
SPW-11552	Water	1/7/2002	Gr. Alpha	35.33 ± 1.83	34.57	17.29 - 51.86
SPW-11552	Water	1/7/2002	Gr. Beta	112.62 ± 2.44	107.70	96.93 - 118.47
SPMI-595	Milk	1/31/2002	Cs-134	29.63 ± 4.98	27.10	17.10 - 37.10
SPMI-595	Milk	1/31/2002	Cs-137	51.31 ± 7.55	50.89	40.89 - 60.89
SPMI-597	Milk	1/31/2002	Co-60	44.18 ± 7.76	41.36	31.36 - 51.36
SPMI-597	Milk	1/31/2002	Cs-134	20.15 ± 5.08	22.59	12.59 - 32.59
SPMI-597	Milk	1/31/2002	Cs-137	54.88 ± 8.32	50.89	40.89 - 60.89
SPAP-594	Air Filter	2/6/2002	Gr. Beta	1.58 ± 0.02	1.55	0.00 - 11.55
SPW-599	Water	2/19/2002	H-3	47607 ± 595	50189	40151 ± 60227
SPMI-1446	Milk	3/8/2002	I-131(G)	87.84 ± 11.47	85.20	75.20 - 95.20
SPW-1446	Water	3/8/2002	I-131	82.98 ± 1.20	85.20	68.16 - 102.24
SPW-1446	Water	3/8/2002	I-131(G)	92.75 ± 12.87	85.20	75.20 - 95.20
SPMI-1448	Milk	3/8/2002	I-131	88.00 ± 1.13	85.20	68.16 - 102.24
SPVE-1444	Vegetation	3/11/2002	I-131(G)	0.39 ± 0.04	0.42	0.25 - 0.58
SPAP-2078	Air Filter	4/8/2002	Gr. Beta	1.43 ± 0.01	1.55	0.00 - 11.55
SPW-2080	Water	4/5/2002	H-3	49121 ± 608	46912	37530 ± 56294
SPF-2082	Fish	4/5/2002	Cs-134	0.83 ± 0.04	0.83	0.50 - 1.16
SPF-2082	Fish	4/5/2002	Cs-137	1.29 ± 0.07	1.35	0.81 - 1.89
SPMI-2084	Milk	4/8/2002	Cs-134	20.93 ± 5.82	24.69	14.69 - 34.69
SPMI-2084	Milk	4/8/2002	Cs-137	51.83 ± 10.23	50.56	40.56 - 60.56
SPMI-2084	Milk	4/8/2002	I-131	87.72 ± 1.28	88.37	70.70 - 106.04
SPMI-2084	Milk	4/8/2002	I-131(G)	84.08 ± 10.75	88.37	78.37 - 98.37
SPMI-2084	Milk	4/8/2002	Sr-90	62.81 ± 1.99	66.85	53.48 - 80.22
SPW-2115	Water	4/8/2002	I-131	82.42 ± 1.27	88.37	70.70 - 106.04
SPW-2116	Water	4/8/2002	Co-60	32.47 ± 5.78	33.09	23.09 - 43.09
SPW-2116	Water	4/8/2002	Cs-134	30.80 ± 3.60	28.80	18.80 - 38.80
SPW-2116	Water	4/8/2002	Cs-137	53.85 ± 7.07	50.56	40.56 - 60.56
SPW-2116	Water	4/8/2002	I-131(G)	79.09 ± 7.58	88.37	78.37 - 98.37
SPW-2116	Water	4/8/2002	Sr-90	70.35 ± 2.32	66.85	53.48 - 80.22
SPW-2019	Water	5/3/2002	Gr. Alpha	25.89 ± 1.71	34.57	17.29 - 51.86
SPW-2019	Water	5/3/2002	Gr. Beta	101.19 ± 2.37	107.70	96.93 - 118.47
SPCH-3064	Charcoal	5/11/2002	I-131(G)	0.74 ± 0.04	0.85	0.51 - 1.18
SPW-4682	Water	7/17/2002	H-3	40856 ± 548	46179	36943 ± 55415
SPAP-4685	Air Filter	7/17/2002	Gr. Beta	1.58 ± 0.02	1.55	0.00 - 11.55
W-71702S	Water	7/17/2002	Fe-55	10463.00 ± 126.00	12200.60	9760.48 - 14640.72
W-71702S	Water	07/17/02	H-3	45779 ± 583	46179	36943 ± 55415
W-71702S	Water	07/17/02	Ni-63	17.02 ± 1.50	17.10	10.26 - 23.94
SPVE-4910	Vegetation	07/22/02	Sr-90	10.22 ± 0.80	9.04	0.00 - 19.04
W-72302S	Water	07/23/02	Sr-90	21.43 ± 0.97	26.55	16.55 - 36.55
W-80102S	Water	08/01/02	Gr. Alpha	41.25 ± 4.58	34.45	17.23 - 51.68
W-80102S	Water	08/01/02	Gr. Beta	113.66 ± 5.30	107.70	96.93 - 118.47
W-80202S	Water	08/02/02	Tc-99	16.39 ± 0.72	14.13	2.13 - 26.13
SPW-7188	Water	10/25/02	Fe-55	20396 ± 265	22778	18222 - 27334
SPW-7190	Water	10/25/02	Ni-63	227.18 ± 11.60	170.80	102.48 - 239.12

TABLE A-3. In-House "Spike" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L)		
				Laboratory results 2s, n=1 ^b	Known Activity	Control Limits ^c
SPW-7192	Water	10/25/02	H-3	96310 ± 871	90963	72770 - 109156
SPW-7194	Water	10/25/02	C-14	42938 ± 167	49661	29796 - 69525
SPAP-7198	Air Filter	10/25/02	Gr. Beta	1.65 ± 0.02	1.53	0.00 - 11.53
SPW-7335	Water	10/30/02	Co-60	39.67 ± 7.38	37.05	27.05 - 47.05
SPW-7335	Water	10/30/02	Cs-134	33.09 ± 5.96	34.11	24.11 - 44.11
SPW-7335	Water	10/30/02	Cs-137	46.80 ± 10.39	49.90	39.90 - 59.90
SPMI-7336	Milk	10/30/02	Cs-134	34.40 ± 4.99	34.11	24.11 - 44.11
SPMI-7336	Milk	10/30/02	Cs-137	46.52 ± 8.52	49.91	39.91 - 59.91
SPF-7340	Fish	10/30/02	Cs-134	0.66 ± 0.03	0.68	0.41 - 0.95
SPF-7340	Fish	10/30/02	Cs-137	1.35 ± 0.05	1.33	0.80 - 1.86
SPS-8102	Sediment	11/01/02	Sr-90	14.69 ± 0.67	13.45	3.45 - 23.45

^a Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g).

^b Results are based on 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, cabbage is used for the Spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L) ^a		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity ^b	Criteria (4.66 σ)
SPW-11551	water	1/7/2002	Gr. Alpha	0.47	0.45 ± 0.39	1
SPW-11551	water	1/7/2002	Gr. Beta	1.37	0.55 ± 1.03	3.2
SPAP-590	Air Filter	1/31/2002	Co-60	1.78		100
SPAP-590	Air Filter	1/31/2002	Cs-134	3.42		100
SPAP-590	Air Filter	1/31/2002	Cs-137	2.33		100
SPAP-590	Air Filter	1/31/2002	Gr. Beta	0.74	-0.096 ± 0.38	3.2
SPMI-596	Milk	1/31/2002	Co-60	3.54		10
SPMI-596	Milk	1/31/2002	Cs-134	3.24		10
SPMI-596	Milk	1/31/2002	Cs-137	3.89		10
SPMI-596	Milk	1/31/2002	K-40		1472.1 ± 101.50	0
SPW-598	water	1/31/2002	Co-60	2.30		10
SPW-598	water	1/31/2002	Cs-134	3.74		10
SPW-598	water	1/31/2002	Cs-137	3.23		10
SPW-600	water	1/31/2002	H-3	138.80	-96.5 ± 63.40	200
SPMI-1447	Milk	3/7/2002	I-131(G)	7.63		20
SPVE-1443	Vegetation	3/8/2002	I-131(G)	0.02		20
SPW-1445	water	3/8/2002	Co-60	2.76		10
SPW-1445	water	3/8/2002	Cs-134	2.87		10
SPW-1445	water	3/8/2002	Cs-137	4.34		10
SPW-1445	water	3/8/2002	I-131	0.45	0.17 ± 0.31	0.5
SPW-1445	water	3/8/2002	I-131(G)	6.50		20
SPMI-1447	Milk	3/8/2002	I-131	0.31	0.15 ± 0.22	0.5
SPAP-2077	Air Filter	4/8/2002	Gr. Beta	0.32	-0.055 ± 0.19	3.2
SPW-2079	water	4/5/2002	H-3	134.17	16.13 ± 67.39	200
SPF-2081	Fish	4/5/2002	Cs-134	7.67		100
SPF-2081	Fish	4/5/2002	Cs-137	9.54		100
SPMI-2083	Milk	4/8/2002	Cs-134	2.90		10
SPMI-2083	Milk	4/8/2002	Cs-137	3.03		10
SPMI-2083	Milk	4/8/2002	I-131	0.52	-0.38 ± 0.34	0.5
SPMI-2083	Milk ^c	4/8/2002	Sr-90	0.48	1.29 ± 0.36	1
SPW-2115	water	4/8/2002	Co-60	1.49		10
SPW-2115	water	4/8/2002	Cs-134	2.09		10
SPW-2115	water	4/8/2002	Cs-137	3.78		10
SPW-2115	water	4/8/2002	I-131	0.50	-0.16 ± 0.33	0.5
SPW-2115	water	4/8/2002	I-131(G)	3.30		20
SPW-2115	water	4/8/2002	Sr-90	0.66	0.10 ± 0.32	1
SPW-2018	water	4/22/2002	Gr. Alpha	0.56	-0.24 ± 0.38	1
SPW-2018	water	4/22/2002	Gr. Beta	1.38	3.19 ± 1.03	3.2
SPch-3063	Charcoal	5/11/2002	I-131(G)	8.27		9.6
SPW-4683	water	7/17/2002	H-3	129.00	-62.8 ± 60.30	200
W-71702	water	7/17/2002	Fe-55	33.61	-1.72 ± 15.63	1000
W-71702	water	7/17/2002	Ni-63	2.56	0.71 ± 1.37	20
W-71802B	water	7/18/2002	Gr. Alpha	0.48	0.31 ± 0.36	1
W-71802B	water	7/18/2002	Gr. Beta	1.33	0.9 ± 0.95	3.2

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L) ^a		
				Laboratory results (4.66σ)		Acceptance Criteria (4.66 σ)
				LLD	Activity ^b	
W-72302	water	7/23/2002	Sr-90	0.27	0.027 ± 0.13	1
W-80202	water	8/2/2002	Tc-99	0.34	-0.051 ± 0.16	10
SPW-7189	water	10/25/2002	Fe-55	978.21	21.77 ± 595.33	1000
SPW-7191	water	10/25/2002	Ni-63	11.74	4.47 ± 7.24	20
SPW-7193	water	10/25/2002	H-3	146.00	-92 ± 65.00	200
SPAP-7199	Air Filter	10/25/2002	Gr. Beta	0.00	-0.0024 ± 0.00	3.2
SPMI-7333	Milk	10/30/2002	Cs-134	5.30		10
SPMI-7333	Milk	10/30/2002	Cs-137	4.80		10
SPW-7334	water	10/30/2002	Co-60	3.69		10
SPW-7334	water	10/30/2002	Cs-134	5.37		10
SPW-7334	water	10/30/2002	Cs-137	3.90		10
SPF-7339	Fish	10/30/2002	Cs-134	4.69		100
SPF-7339	Fish	10/30/2002	Cs-137	11.18		100

^a Liquid sample results are reported in pCi/Liter, air filters (pCi/filter), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

^b The activity reported is the net activity result.

^c Low levels of Sr-90 are still detected in the environment. A concentration of (1-5 pCi/L) in milk is not unusual.

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a		Averaged Result
			First Result	Second Result	
CF-20, 21	1/2/2002	Be-7	0.47 ± 0.25	0.37 ± 0.12	0.42 ± 0.14
CF-20, 21	1/2/2002	Gr. Beta	7.82 ± 0.20	7.95 ± 0.21	7.89 ± 0.14
CF-20, 21	1/2/2002	K-40	6.65 ± 0.55	6.53 ± 0.36	6.59 ± 0.33
CF-20, 21	1/2/2002	Sr-90	0.01 ± 0.01	0.01 ± 0.01	0.01 ± 0.00
AP-11804, 11805	1/2/2002	Be-7	0.054 ± 0.011	0.049 ± 0.019	0.052 ± 0.011
AP-11825, 11826	1/2/2002	Be-7	0.053 ± 0.013	0.043 ± 0.013	0.048 ± 0.009
AP-11846, 11847	1/2/2002	Be-7	0.054 ± 0.018	0.048 ± 0.016	0.051 ± 0.012
WW-150, 151	1/7/2002	Gr. Beta	1.26 ± 0.50	1.04 ± 0.46	1.15 ± 0.34
MI-124, 125	1/8/2002	K-40	1332.30 ± 158.90	1271.70 ± 151.50	1302.00 ± 109.77
W-172, 173	1/8/2002	H-3	153.00 ± 68.00	148.00 ± 68.00	150.50 ± 48.08
SW-11698, 11699	1/8/2002	Gr. Alpha	2.51 ± 1.36	3.71 ± 1.80	3.11 ± 1.13
SW-11698, 11699	1/8/2002	Gr. Beta	7.68 ± 1.33	8.49 ± 1.43	8.09 ± 0.98
U-275, 276	1/10/2002	Gr. Alpha	1.40 ± 1.00	1.10 ± 1.20	1.25 ± 0.78
LW-356, 357	1/16/2002	Gr. Beta	3.47 ± 0.65	2.94 ± 0.61	3.21 ± 0.45
LW-377, 378	1/16/2002	Gr. Beta	2.75 ± 0.68	2.84 ± 0.61	2.79 ± 0.46
SW-525, 526	1/30/2002	Gr. Alpha	0.56 ± 0.35	0.24 ± 0.35	0.40 ± 0.25
SW-525, 526	1/30/2002	Gr. Beta	2.29 ± 0.41	2.58 ± 0.39	2.43 ± 0.28
DW-504, 505	1/31/2002	Gr. Alpha	2.30 ± 1.70	3.90 ± 1.40	3.10 ± 1.10
MI-649, 650	2/5/2002	K-40	1319.40 ± 176.70	1210.80 ± 118.20	1265.10 ± 106.29
DW-697, 698	2/6/2002	Gr. Beta	5.10 ± 1.20	4.70 ± 1.20	4.90 ± 0.85
DW-927, 928	2/8/2002	Sr-90	0.69 ± 0.29	0.71 ± 0.29	0.70 ± 0.21
W-973, 974	2/18/2002	Fe-55	7.29 ± 0.97	6.86 ± 0.94	7.08 ± 0.68
W-1673, 1674	2/25/2002	H-3	2640.00 ± 155.00	2908.00 ± 161.00	2774.00 ± 111.74
SWT-1395, 1396	2/26/2002	Gr. Beta	2.96 ± 0.59	2.29 ± 0.53	2.63 ± 0.40
MI-1268, 1269	2/27/2002	K-40	1460.50 ± 162.50	1573.00 ± 168.00	1516.75 ± 116.87
MI-1268, 1269	2/27/2002	Sr-90	0.77 ± 0.36	0.95 ± 0.40	0.86 ± 0.27
MI-1332, 1333	3/5/2002	K-40	1503.00 ± 164.00	1305.00 ± 168.00	1404.00 ± 117.39
MI-1332, 1333	3/5/2002	Sr-90	1.35 ± 0.38	1.07 ± 0.40	1.21 ± 0.28
MI-1458, 1459	3/6/2002	K-40	1411.70 ± 166.70	1390.00 ± 172.30	1400.85 ± 119.87
DW-10100, 10101	3/9/2002	Gr. Alpha	4.10 ± 1.70	1.80 ± 1.60	2.95 ± 1.17
DW-10111, 10112	3/9/2002	Gr. Alpha	7.10 ± 2.00	8.30 ± 2.30	7.70 ± 1.52
MI-1521, 1522	3/11/2002	K-40	1270.80 ± 103.30	1369.10 ± 121.60	1319.95 ± 79.78
MI-1521, 1522	3/11/2002	Sr-90	1.69 ± 0.46	2.46 ± 0.49	2.07 ± 0.34
MI-1541, 1542	3/11/2002	K-40	1562.20 ± 122.80	1529.30 ± 126.10	1545.75 ± 88.01
MI-1541, 1542	3/11/2002	Sr-90	0.85 ± 0.57	1.48 ± 0.43	1.16 ± 0.36
LW-1651, 1652	3/14/2002	Gr. Beta	2.90 ± 0.57	2.57 ± 0.56	2.74 ± 0.40
DW-10134, 10135	3/16/2002	Gr. Alpha	5.60 ± 1.90	5.40 ± 1.60	5.50 ± 1.24
WW-1694, 1695	3/18/2002	Gr. Beta	1.79 ± 0.59	1.53 ± 0.50	1.66 ± 0.39
SO-1715, 1716	3/19/2002	Cs-137	0.03 ± 0.01	0.02 ± 0.01	0.03 ± 0.01
SO-1715, 1716	3/19/2002	Gr. Beta	18.50 ± 1.70	19.10 ± 1.70	18.80 ± 1.20
DW-10302, 10303	3/20/2002	Gr. Alpha	2.30 ± 1.40	3.30 ± 1.60	2.80 ± 1.06
W-1758, 1759	3/25/2002	Gr. Alpha	2.50 ± 0.70	2.30 ± 0.60	2.40 ± 0.46
W-1758, 1759	3/25/2002	Gr. Beta	4.10 ± 1.20	2.50 ± 1.10	3.30 ± 0.81

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a		Averaged Result
			First Result	Second Result	
MI-1926, 1927	3/26/2002	K-40	1414.00 ± 115.00	1316.00 ± 128.00	1365.00 ± 86.04
MI-1926, 1927	3/26/2002	Sr-90	2.30 ± 0.70	2.40 ± 0.70	2.35 ± 0.49
SWU-2010, 2011	3/26/2002	Gr. Beta	2.90 ± 0.60	2.20 ± 0.50	2.55 ± 0.39
DW-10376, 10377	3/27/2002	Gr. Beta	10.50 ± 1.30	10.10 ± 1.50	10.30 ± 0.99
AP-2479, 2480	3/28/2002	Be-7	0.064 ± 0.023	0.068 ± 0.014	0.066 ± 0.013
DW-10395, 10396	3/29/2002	Gr. Alpha	10.20 ± 2.10	14.60 ± 2.40	12.40 ± 1.59
LW-2181, 2182	3/31/2002	Gr. Beta	2.98 ± 0.68	1.99 ± 0.70	2.48 ± 0.49
LW-2181, 2182	3/31/2002	H-3	2694.43 ± 156.53	2688.84 ± 156.40	2691.64 ± 110.64
CW-2437, 2438	3/31/2002	Gr. Beta	1.09 ± 0.61	1.14 ± 0.58	1.11 ± 0.42
CW-2437, 2438	3/31/2002	H-3	6456.70 ± 229.20	6292.80 ± 226.52	6374.75 ± 161.12
MI-1947, 1948	4/1/2002	K-40	1421.40 ± 130.90	1256.80 ± 104.20	1339.10 ± 83.65
AP-2458, 2459	4/1/2002	Be-7	0.077 ± 0.011	0.081 ± 0.010	0.079 ± 0.008
DW-10409, 10410	4/1/2002	Gr. Alpha	39.30 ± 4.00	35.30 ± 3.60	37.30 ± 2.69
MI-2052, 2053	4/3/2002	K-40	1283.70 ± 103.20	1434.80 ± 147.90	1359.25 ± 90.17
MI-2052, 2053	4/3/2002	Sr-90	0.81 ± 0.36	0.75 ± 0.35	0.78 ± 0.25
AP-2711, 2712	4/3/2002	Be-7	0.071 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
W-938, 939	4/9/2002	Ni-63	1.73 ± 0.10	1.82 ± 0.10	1.78 ± 0.07
SS-2202, 2203	4/9/2002	Gr. Beta	5.83 ± 1.16	5.52 ± 1.19	5.67 ± 0.83
SS-2202, 2203	4/9/2002	K-40	5.75 ± 0.48	6.11 ± 0.51	5.93 ± 0.35
F-2307, 2308	4/10/2002	K-40	2.75 ± 0.27	2.49 ± 0.32	2.62 ± 0.21
DW-10476, 10477	4/12/2002	Gr. Alpha	5.10 ± 1.30	3.90 ± 1.60	4.50 ± 1.03
W-2244, 2245	4/15/2002	Gr. Beta	1.70 ± 1.10	1.60 ± 1.00	1.65 ± 0.74
DW-10509, 10510	4/17/2002	Gr. Alpha	6.00 ± 2.00	7.30 ± 1.80	6.65 ± 1.35
SW-2690, 2691	4/24/2002	Gr. Beta	2.25 ± 0.68	2.15 ± 0.59	2.20 ± 0.45
SO-2903, 2904	4/24/2002	Be-7	1.22 ± 0.57	0.78 ± 0.43	1.00 ± 0.36
SO-2903, 2904	4/24/2002	Cs-137	0.13 ± 0.05	0.09 ± 0.05	0.11 ± 0.04
SO-2903, 2904	4/24/2002	K-40	21.06 ± 1.48	19.91 ± 1.16	20.48 ± 0.94
DW-10562, 10563	4/24/2002	Gr. Alpha	2.17 ± 1.13	3.25 ± 1.54	2.71 ± 0.96
DW-10578, 10579	4/29/2002	Gr. Alpha	8.20 ± 2.20	7.40 ± 2.00	7.80 ± 1.49
SO-2861, 2862	4/30/2002	Cs-137	236.40 ± 46.00	200.70 ± 52.60	218.55 ± 34.94
SO-2861, 2862	4/30/2002	K-40	10191.00 ± 784.60	11025.00 ± 941.30	10608.00 ± 612.71
SL-2819, 2820	5/1/2002	Be-7	805.70 ± 301.50	860.73 ± 164.80	833.22 ± 171.80
SL-2819, 2820	5/1/2002	Gr. Beta	5566.00 ± 124.00	5359.00 ± 122.00	5462.50 ± 86.98
SL-2819, 2820	5/1/2002	K-40	5524.00 ± 632.90	5277.50 ± 431.40	5400.75 ± 382.97
SL-2840, 2841	5/1/2002	Be-7	1010.00 ± 352.10	872.95 ± 181.70	941.48 ± 198.11
SL-2840, 2841	5/1/2002	Gr. Beta	4399.00 ± 221.80	4593.00 ± 276.00	4496.00 ± 177.04
SL-2840, 2841	5/1/2002	K-40	2422.80 ± 352.10	2254.10 ± 371.40	2338.45 ± 255.89
MI-2971, 2972	5/5/2002	K-40	1338.90 ± 83.44	1345.80 ± 100.90	1342.35 ± 65.47
MI-2971, 2972	5/5/2002	Sr-90	0.83 ± 0.47	1.65 ± 0.46	1.24 ± 0.33
DW-10603, 10604	5/6/2002	Gr. Alpha	6.30 ± 1.70	5.50 ± 1.60	5.90 ± 1.17
SS-3037, 3038	5/9/2002	K-40	11585.00 ± 749.00	11612.00 ± 787.00	11598.50 ± 543.22
MI-3124, 3125	5/13/2002	K-40	1329.50 ± 103.80	1373.00 ± 107.40	1351.25 ± 74.68
MI-3208, 3209	5/14/2002	K-40	1494.60 ± 158.40	1462.60 ± 182.50	1478.60 ± 120.83
LW-3250, 3251	5/15/2002	Gr. Beta	3.14 ± 0.55	3.28 ± 0.63	3.21 ± 0.42

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a		Averaged Result
			First Result	Second Result	
CF-3292, 3293	5/20/2002	K-40	1.33 ± 0.99	1.14 ± 0.91	1.23 ± 0.67
MI-3376, 3377	5/26/2002	K-40	1333.30 ± 159.40	1090.70 ± 143.40	1212.00 ± 107.21
MI-3418, 3419	5/28/2002	K-40	1423.70 ± 121.30	1443.30 ± 164.30	1433.50 ± 102.11
SWT-3461, 3462	5/28/2002	Gr. Beta	2.65 ± 0.54	3.28 ± 0.60	2.97 ± 0.40
SO-3503, 3504	5/29/2002	Cs-137	0.17 ± 0.04	0.18 ± 0.05	0.18 ± 0.03
SO-3503, 3504	5/29/2002	Gr. Beta	27.72 ± 2.26	25.45 ± 2.03	26.58 ± 1.52
SO-3503, 3504	5/29/2002	K-40	20.24 ± 1.19	20.54 ± 1.24	20.39 ± 0.86
SL-3545, 3546	6/3/2002	Gr. Beta	4436.00 ± 90.00	4281.00 ± 89.00	4358.50 ± 63.29
SL-3545, 3546	6/3/2002	K-40	4684.20 ± 734.40	5242.50 ± 884.50	4963.35 ± 574.82
DW-10754, 10755	6/6/2002	Sr-90	0.50 ± 0.30	0.60 ± 0.30	0.55 ± 0.21
SW-3777, 3778	6/11/2002	Gr. Alpha	4.42 ± 1.50	2.97 ± 1.40	3.70 ± 1.02
SW-3777, 3778	6/11/2002	Gr. Beta	7.57 ± 1.22	6.83 ± 1.16	7.20 ± 0.84
MI-3798, 3799	6/11/2002	K-40	1433.40 ± 124.20	1401.20 ± 96.96	1417.30 ± 78.78
LW-3924, 3925	6/13/2002	Gr. Beta	3.05 ± 0.59	3.38 ± 0.72	3.21 ± 0.46
MI-3966, 3967	6/18/2002	K-40	1245.20 ± 109.20	1340.20 ± 121.90	1292.70 ± 81.83
MI-3966, 3967	6/18/2002	Sr-90	2.38 ± 0.51	2.63 ± 0.52	2.51 ± 0.36
MI-3987, 3988	6/19/2002	Sr-90	0.98 ± 0.35	0.97 ± 0.35	0.98 ± 0.25
MI-4095, 4096	6/25/2002	K-40	1256.10 ± 138.20	1199.00 ± 128.30	1227.55 ± 94.29
SWU-4221, 4222	6/25/2002	Gr. Beta	6.89 ± 1.97	5.38 ± 1.93	6.13 ± 1.38
LW-4179, 4180	6/27/2002	Gr. Beta	2.37 ± 0.58	2.00 ± 0.62	2.19 ± 0.42
G-4329, 4330	7/1/2002	Be-7	1394.80 ± 538.40	1098.10 ± 437.40	1246.45 ± 346.84
G-4329, 4330	7/1/2002	Gr. Beta	8.10 ± 0.27	8.00 ± 0.25	8.05 ± 0.18
G-4329, 4330	7/1/2002	K-40	7758.20 ± 1100.00	8399.80 ± 929.30	8079.00 ± 720.00
SL-4337, 4338	7/1/2002	Be-7	1480.90 ± 223.80	1726.40 ± 552.60	1603.65 ± 298.10
SL-4337, 4338	7/1/2002	Cs-137	32.30 ± 14.70	50.97 ± 27.10	41.64 ± 15.42
SL-4337, 4338	7/1/2002	Gr. Beta	5262.40 ± 522.10	5432.40 ± 540.00	5347.40 ± 375.56
SL-4337, 4338	7/1/2002	K-40	2249.00 ± 381.90	2989.90 ± 509.60	2619.45 ± 318.41
AP-4864, 4865	7/1/2002	Be-7	0.085 ± 0.009	0.085 ± 0.006	0.085 ± 0.006
MI-4359, 4360	7/2/2002	K-40	1390.10 ± 168.30	1567.40 ± 194.30	1478.75 ± 128.53
AP-4569, 4570	7/2/2002	Be-7	0.068 ± 0.016	0.086 ± 0.018	0.077 ± 0.012
AP-4843, 4844	7/2/2002	Be-7	0.077 ± 0.016	0.090 ± 0.020	0.084 ± 0.013
AP-4789, 4790	7/3/2002	Be-7	0.080 ± 0.013	0.078 ± 0.015	0.079 ± 0.010
SWU-4810, 4811	7/3/2002	Gr. Beta	2.40 ± 0.84	2.47 ± 0.88	2.43 ± 0.61
MI-4548, 4549	7/9/2002	K-40	1511.80 ± 127.00	1446.80 ± 101.80	1479.30 ± 81.38
DW-4737, 4738	7/12/2002	I-131	0.52 ± 0.20	0.49 ± 0.29	0.51 ± 0.18
MI-4632, 4633	7/15/2002	K-40	1198.40 ± 114.10	1371.30 ± 146.90	1284.85 ± 93.00
MI-5054, 5055	7/30/2002	K-40	1428.80 ± 105.60	1344.30 ± 106.40	1386.55 ± 74.95
G-5075, 5076	7/30/2002	Gr. Beta	7.11 ± 0.07	6.99 ± 0.07	7.05 ± 0.05
SWU-5124, 5125	7/30/2002	Gr. Beta	1.75 ± 0.84	1.90 ± 0.78	1.82 ± 0.57
G-5151, 5152	7/31/2002	Be-7	1.82 ± 0.30	2.05 ± 0.32	1.93 ± 0.22
G-5151, 5152	7/31/2002	K-40	5.13 ± 0.66	5.72 ± 0.70	5.42 ± 0.48
MI-5103, 5104	8/2/2002	K-40	1415.90 ± 70.57	1423.80 ± 129.20	1419.85 ± 73.61
LW-5434, 5435	8/5/2002	Gr. Beta	2.77 ± 0.35	2.26 ± 0.35	2.52 ± 0.25
MI-5215, 5216	8/7/2002	K-40	1361.10 ± 111.90	1358.30 ± 115.80	1359.70 ± 80.52

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a		Averaged Result
			First Result	Second Result	
MI-5355, 5356	8/13/2002	K-40	1405.00 ± 165.80	1549.30 ± 114.40	1477.15 ± 100.72
F-5413, 5414	8/15/2002	Gr. Beta	2.37 ± 0.10	2.55 ± 0.10	2.46 ± 0.07
F-5413, 5414	8/15/2002	K-40	1.47 ± 0.32	1.73 ± 0.43	1.60 ± 0.27
MI-5603, 5604	8/26/2002	I-131	0.64 ± 0.34	0.52 ± 0.36	0.58 ± 0.25
MI-5603, 5604	8/26/2002	K-40	1353.60 ± 83.13	1261.40 ± 117.80	1307.50 ± 72.09
MI-5578, 5579	8/27/2002	K-40	1301.50 ± 161.70	1381.60 ± 111.20	1341.55 ± 98.12
VE-5682, 5683	8/28/2002	Be-7	0.29 ± 0.10	0.25 ± 0.11	0.27 ± 0.08
VE-5682, 5683	8/28/2002	Gr. Beta	3.79 ± 0.08	3.80 ± 0.08	3.79 ± 0.06
VE-5682, 5683	8/28/2002	K-40	3.06 ± 0.29	3.31 ± 0.42	3.18 ± 0.25
WW-6188, 6189	8/31/2002	Gr. Beta	2.70 ± 0.57	2.30 ± 0.57	2.50 ± 0.41
SL-5724, 5725	9/3/2002	Be-7	0.92 ± 0.19	1.04 ± 0.23	0.98 ± 0.15
SL-5724, 5725	9/3/2002	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.01
SL-5724, 5725	9/3/2002	K-40	2.09 ± 0.31	2.28 ± 0.48	2.19 ± 0.29
MI-5877, 5878	9/9/2002	K-40	1340.70 ± 165.00	1168.50 ± 172.50	1254.60 ± 119.35
MI-6157, 6158	9/19/2002	K-40	1372.10 ± 115.10	1136.50 ± 222.70	1254.30 ± 125.34
MI-6258, 6259	9/24/2002	K-40	1328.60 ± 201.00	1312.60 ± 118.60	1320.60 ± 116.69
LW-6278, 6279	9/30/2002	Gr. Beta	2.15 ± 0.51	1.70 ± 0.50	1.93 ± 0.36
MI-6385, 6386	10/1/2002	K-40	1297.10 ± 168.90	1310.10 ± 128.30	1303.60 ± 106.05
BS-6453, 6454	10/1/2002	Cs-137	0.43 ± 0.03	0.44 ± 0.03	0.44 ± 0.02
BS-6453, 6454	10/1/2002	K-40	16.50 ± 0.51	16.80 ± 0.61	16.65 ± 0.40
SO-6478, 6479	10/1/2002	Cs-137	0.074 ± 0.016	0.070 ± 0.016	0.072 ± 0.011
SO-6478, 6479	10/1/2002	Gr. Alpha	8.01 ± 4.36	7.55 ± 4.57	7.78 ± 3.16
SO-6478, 6479	10/1/2002	Gr. Beta	30.41 ± 4.07	33.04 ± 4.28	31.73 ± 2.95
SO-6478, 6479	10/1/2002	K-40	19.82 ± 0.53	20.39 ± 0.58	20.10 ± 0.39
SO-6478, 6479	10/1/2002	Sr-90	0.087 ± 0.017	0.094 ± 0.020	0.091 ± 0.013
AP-6641, 6642	10/1/2002	Be-7	0.070 ± 0.016	0.080 ± 0.015	0.075 ± 0.011
MI-6544, 6545	10/2/2002	K-40	1331.60 ± 125.20	1326.50 ± 171.60	1329.05 ± 106.21
AP-6857, 6858	10/3/2002	Be-7	0.062 ± 0.015	0.071 ± 0.015	0.066 ± 0.010
AP-6857, 6858	10/3/2002	Be-7	0.062 ± 0.015	0.071 ± 0.015	0.066 ± 0.010
AP-6857, 6858	10/3/2002	Be-7	0.062 ± 0.015	0.071 ± 0.015	0.066 ± 0.010
BS-6620, 6621	10/7/2002	Co-60	0.090 ± 0.020	0.11 ± 0.02	0.10 ± 0.01
BS-6620, 6621	10/7/2002	Cs-137	0.62 ± 0.04	0.63 ± 0.03	0.62 ± 0.02
BS-6620, 6621	10/7/2002	K-40	11.38 ± 0.48	10.78 ± 0.52	11.08 ± 0.35
MI-6651, 6652	10/8/2002	K-40	1565.50 ± 141.00	1640.60 ± 189.20	1603.05 ± 117.98
G-6760, 6761	10/9/2002	Be-7	2.17 ± 0.49	2.31 ± 0.34	2.24 ± 0.30
G-6760, 6761	10/9/2002	K-40	6.24 ± 1.00	6.61 ± 0.60	6.42 ± 0.58
SWU-7054, 7055	10/10/2002	Gr. Beta	3.09 ± 0.57	2.06 ± 0.52	2.57 ± 0.39
U-7126, 7127	10/11/2002	Gr. Beta	2.61 ± 1.24	2.61 ± 1.08	2.61 ± 0.82
XW-7768, 7769	10/14/2002	Cs-137	2.25 ± 0.25	2.09 ± 0.18	2.17 ± 0.15
XW-7768, 7769	10/14/2002	H-3	2.63 ± 0.10	2.64 ± 0.10	2.64 ± 0.07
F-7148, 7149	10/15/2002	K-40	2.57 ± 0.28	2.98 ± 0.44	2.77 ± 0.26
BS-7337, 7338	10/23/2002	Co-60	0.083 ± 0.025	0.073 ± 0.031	0.078 ± 0.020
BS-7337, 7338	10/23/2002	Cs-137	0.082 ± 0.019	0.11 ± 0.04	0.10 ± 0.02
BS-7337, 7338	10/23/2002	Gr. Beta	12.54 ± 2.34	12.99 ± 2.22	12.77 ± 1.61
SO-7407, 7408	10/29/2002	Cs-137	0.14 ± 0.03	0.15 ± 0.03	0.15 ± 0.02
SO-7407, 7408	10/29/2002	Gr. Beta	16.73 ± 2.21	16.62 ± 2.27	16.67 ± 1.58
SO-7407, 7408	10/29/2002	K-40	12.05 ± 0.61	12.27 ± 0.81	12.16 ± 0.51

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a		Averaged Result
			First Result	Second Result	
MI-7428, 7429	10/29/2002	K-40	1542.60 ± 213.00	1355.80 ± 185.70	1449.20 ± 141.29
pw-7621, 7622	10/30/2002	Gr. Beta	2.22 ± 0.92	2.08 ± 0.83	2.15 ± 0.62
TD-7653, 7654	10/31/2002	H-3	11122.00 ± 387.00	11259.00 ± 390.00	11190.50 ± 274.71
SW-7569, 7570	11/5/2002	Gr. Beta	15.90 ± 1.25	16.24 ± 1.27	16.07 ± 0.89
SW-7569, 7570	11/5/2002	K-40	14.79 ± 1.48	14.79 ± 1.48	14.79 ± 1.05
SO-8010, 8011	11/7/2002	Cs-137	0.11 ± 0.02	0.11 ± 0.03	0.11 ± 0.02
SO-8010, 8011	11/7/2002	K-40	6.91 ± 0.54	7.21 ± 0.54	7.06 ± 0.38
VE-7747, 7748	11/11/2002	Gr. Beta	3.59 ± 0.05	3.25 ± 0.05	3.42 ± 0.03
VE-7747, 7748	11/11/2002	K-40	3.17 ± 0.36	3.26 ± 0.46	3.22 ± 0.29
MI-7789, 7790	11/13/2002	K-40	1319.30 ± 167.60	1301.20 ± 140.70	1310.25 ± 109.41
DW-8082, 8083	11/29/2002	I-131	0.83 ± 0.24	0.98 ± 0.22	0.90 ± 0.16
SW-8054, 8055	12/2/2002	Gr. Beta	2.60 ± 0.46	2.21 ± 0.39	2.41 ± 0.30
SW-8054, 8055	12/2/2002	K-40	1.44 ± 0.14	1.43 ± 0.14	1.44 ± 0.10
MI-8105, 8106	12/4/2002	K-40	1300.60 ± 111.30	1315.40 ± 108.90	1308.00 ± 77.86
TD-8298, 8299	12/5/2002	H-3	355.00 ± 94.00	469.00 ± 99.00	412.00 ± 68.26
MI-8396, 8397	12/17/2002	K-40	1409.20 ± 117.30	1449.60 ± 108.60	1429.40 ± 79.93
SWT-8654, 8655	12/30/2002	Gr. Beta	1.63 ± 0.50	1.40 ± 0.47	1.51 ± 0.34
AP-8783, 8784	12/31/2002	Be-7	0.044 ± 0.009	0.042 ± 0.008	0.043 ± 0.006

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

^a Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g)

APPENDIX B

DATA REPORTING CONVENTIONS

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

Lab Code	Type	Date	Analysis	Concentration ^b		
				Laboratory results	EML Result ^c	Control Limits ^d
STW-959	Water	09/01/02	Am-241	3.00 ± 0.10	3.04	0.79 - 1.41
STW-959	Water	09/01/02	Co-60	258.40 ± 2.30	268.67	0.80 - 1.20
STW-959	Water	09/01/02	Cs-134	50.80 ± 3.30	60.20	0.80 - 1.30
STW-959	Water	09/01/02	Cs-137	80.10 ± 0.30	81.43	0.80 - 1.22
STW-959	Water	09/01/02	H-3	271.90 ± 20.90	227.30	0.78 - 2.45
STW-959	Water	09/01/02	Pu-238	4.40 ± 0.20	4.33	0.74 - 1.20
STW-959	Water	09/01/02	Pu-239/40	2.10 ± 0.10	2.07	0.79 - 1.20
STW-959	Water	09/01/02	Sr-90	9.70 ± 0.20	8.69	0.69 - 1.34
STW-959	Water	09/01/02	Uranium	5.60 ± 0.10	6.84	0.75 - 1.33
STW-960	Water	09/01/02	Gr. Alpha	204.90 ± 3.20	210.00	0.58 - 1.29
STW-960	Water	09/01/02	Gr. Beta	852.00 ± 26.50	900.00	0.61 - 1.43
STSO-961	Soil	09/01/02	Ac-228	47.60 ± 1.90	42.30	0.80 - 1.38
STSO-961	Soil	09/01/02	Am-241	7.80 ± 1.40	6.77	0.65 - 2.28
STSO-961	Soil	09/01/02	Bi-212	45.60 ± 1.70	45.93	0.50 - 1.34
STSO-961 ^e	Soil	09/01/02	Bi-214	48.80 ± 4.90	33.63	0.78 - 1.42
STSO-961	Soil	09/01/02	Cs-137	819.60 ± 16.60	829.33	0.80 - 1.25
STSO-961	Soil	09/01/02	K-40	705.30 ± 31.40	637.67	0.80 - 1.32
STSO-961	Soil	09/01/02	Pb-212	48.60 ± 3.40	43.43	0.78 - 1.32
STSO-961	Soil	09/01/02	Pb-214	51.10 ± 5.10	35.20	0.76 - 1.46
STSO-961 ^f	Soil	09/01/02	Pu-239/40	20.20 ± 0.80	12.90	0.71 - 1.30
STSO-961	Soil	09/01/02	Sr-90	38.50 ± 0.10	41.16	0.67 - 2.90
STSO-961 ^g	Soil	09/01/02	Uranium	58.90 ± 0.70	87.21	0.71 - 1.32
STVE-962	Vegetation	09/01/02	Am-241	2.10 ± 0.30	2.25	0.73 - 2.02
STVE-962	Vegetation	09/01/02	Cm-244	1.00 ± 0.30	1.25	0.61 - 1.59
STVE-962	Vegetation	09/01/02	Co-60	11.80 ± 1.50	9.66	0.80 - 1.44
STVE-962	Vegetation	09/01/02	Cs-137	340.30 ± 16.80	300.67	0.80 - 1.31
STVE-962	Vegetation	09/01/02	K-40	1646.00 ± 74.40	1480.00	0.79 - 1.39
STVE-962	Vegetation	09/01/02	Pu-239/40	3.00 ± 0.30	3.43	0.69 - 1.31
STVE-962	Vegetation	09/01/02	Sr-90	345.60 ± 97.80	476.26	0.55 - 1.21
STAP-963 ^h	Air Filter	09/01/02	Am-241	0.20 ± 0.01	0.19	0.70 - 2.34
STAP-963	Air Filter	09/01/02	Co-60	24.90 ± 0.60	23.00	0.80 - 1.26
STAP-963	Air Filter	09/01/02	Cs-137	38.00 ± 1.30	32.50	0.80 - 1.32
STAP-963	Air Filter	09/01/02	Mn-54	60.80 ± 1.90	52.20	0.80 - 1.35
STAP-963 ^h	Air Filter	09/01/02	Pu-238	0.11 ± 0.02	0.12	0.67 - 1.33
STAP-963 ^h	Air Filter	09/01/02	Pu-239/40	0.21 ± 0.01	0.21	0.73 - 1.26
STAP-963	Air Filter	09/01/02	Sr-90	5.20 ± 0.20	5.56	0.53 - 1.84
STAP-963 ^h	Air Filter	09/01/02	Uranium	0.41 ± 0.04	0.47	0.79 - 2.10
STAP-964	Air Filter	09/01/02	Gr. Alpha	0.40 ± 0.10	0.29	0.73 - 1.43
STAP-964	Air Filter	09/01/02	Gr. Beta	0.80 ± 0.10	0.87	0.76 - 1.36

^a Results are reported in Bq/L with the following exceptions: Air Filters (Bq/Filter), Soil and Vegetation (Bq/kg)^b The EML result listed is the mean of replicate determinations for each nuclide ± the standard error of the mean^c Control limits are reported by EML as the ratio of Reported Value / EML value.^d An error was found in the conversion from pCi/g to Bq/kg. Corrected result : 2.84 ± 0.59 Bq/kg^e Naturally-occurring radium daughters are present in the shield background, and a probable cause of the higher bias seen for isotopes of lead and bismuth^f Reporting error. The average result of the triplicate analyses was 14.1 ± 5.7 Bq/kg^g The analysis was repeated in duplicate, result of reanalysis, 87.05 ± 7.64 Bq/kg.^h STAP-963, Calculations for the transuranics analyses (Am-241, Uranium, Pu-238, -239/40) were not converted to Bq/total filter. The data listed is the result of recalculation.

TABLE A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)

Lab Code	Type	Date	Analysis	Concentration ^a		
				Laboratory results	EML Result ^b	Control Limits ^c
STW-945	Water	03/01/02	Am-241	1.68 ± 0.14	1.47	0.79 - 1.41
STW-945	Water	03/01/02	Co-60	349.20 ± 2.60	347.33	0.80 - 1.20
STW-945	Water	03/01/02	Cs-134	3.40 ± 0.60	3.36	0.80 - 1.30
STW-945	Water	03/01/02	Cs-137	57.20 ± 1.70	56.07	0.80 - 1.22
STW-945	Water	03/01/02	Pu-238	0.45 ± 0.11	0.49	0.74 - 1.20
STW-945	Water	03/01/02	Pu-239/40	4.47 ± 0.28	4.22	0.79 - 1.20
STW-945	Water	03/01/02	Sr-90	7.40 ± 1.30	7.58	0.69 - 1.34
STW-945	Water	03/01/02	Uranium	3.27 ± 0.43	2.84	0.75 - 1.33
STW-946	Water	03/01/02	Gr. Alpha	265.40 ± 7.70	375.00	0.58 - 1.29
STW-946	Water	03/01/02	Gr. Beta	930.60 ± 12.00	1030.00	0.61 - 1.43
STW-946	Water	03/01/02	H-3	226.30 ± 32.70	283.70	0.78 - 2.45
STSO-947	Soil	03/01/02	Ac-228	55.00 ± 5.50	51.17	0.80 - 1.38
STSO-947	Soil	03/01/02	Am-241	8.30 ± 3.30	10.93	0.65 - 2.28
STSO-947	Soil	03/01/02	Bi-212	49.20 ± 12.40	53.43	0.50 - 1.34
STSO-947	Soil	03/01/02	Bi-214	46.60 ± 3.10	53.93	0.78 - 1.42
STSO-947	Soil	03/01/02	Cs-137	1401.60 ± 9.10	1326.67	0.80 - 1.25
STSO-947	Soil	03/01/02	K-40	613.10 ± 28.10	621.67	0.80 - 1.32
STSO-947	Soil	03/01/02	Pb-212	51.60 ± 2.60	51.10	0.78 - 1.32
STSO-947	Soil	03/01/02	Pb-214	52.00 ± 3.60	54.37	0.76 - 1.46
STSO-947	Soil	03/01/02	Pu-239/40	14.70 ± 3.50	19.10	0.71 - 1.30
STSO-947	Soil	03/01/02	Sr-90	52.10 ± 6.30	53.76	0.67 - 2.90
STSO-947	Soil	03/01/02	Th-234	122.40 ± 6.30	89.30	0.63 - 2.35
STSO-947	Soil	03/01/02	Uranium	143.40 ± 9.40	194.77	0.71 - 1.32
STVE-948	Vegetation	03/01/02	Am-241	3.10 ± 2.20	2.23	0.73 - 2.02
STVE-948	Vegetation	03/01/02	Cm-244	0.90 ± 0.80	1.32	0.61 - 1.59
STVE-948	Vegetation	03/01/02	Co-60	13.50 ± 2.10	11.23	0.80 - 1.44
STVE-948	Vegetation	03/01/02	Cs-137	350.40 ± 6.30	313.67	0.80 - 1.31
STVE-948	Vegetation	03/01/02	K-40	940.80 ± 45.60	864.33	0.79 - 1.39
STVE-948 ^d	Vegetation	03/01/02	Pu-239/40	16.90 ± 0.70	3.54	0.69 - 1.31
STVE-948	Vegetation	03/01/02	Sr-90	543.40 ± 24.90	586.28	0.55 - 1.21
STAP-949	Air Filter	03/01/02	Am-241	0.09 ± 0.05	0.09	0.70 - 2.34
STAP-949	Air Filter	03/01/02	Co-60	30.10 ± 0.30	30.52	0.80 - 1.26
STAP-949	Air Filter	03/01/02	Cs-137	29.90 ± 0.30	28.23	0.80 - 1.32
STAP-949	Air Filter	03/01/02	Mn-54	40.40 ± 0.40	38.53	0.80 - 1.35
STAP-949	Air Filter	03/01/02	Pu-238	0.05 ± 0.02	0.06	0.67 - 1.33
STAP-949	Air Filter	03/01/02	Pu-239/40	0.15 ± 0.02	0.19	0.73 - 1.26
STAP-949	Air Filter	03/01/02	Sr-90	3.40 ± 0.40	4.83	0.53 - 1.84
STAP-949	Air Filter	03/01/02	Uranium	0.80 ± 0.20	0.61	0.79 - 2.10
STAP-950	Air Filter	03/01/02	Gr. Alpha	0.43 ± 0.04	0.53	0.73 - 1.43
STAP-950	Air Filter	03/01/02	Gr. Beta	1.34 ± 0.05	1.30	0.76 - 1.36
STW-959	Water	09/01/02	Am-241	3.00 ± 0.10	3.04	0.79 - 1.41
STW-959	Water	09/01/02	Co-60	258.40 ± 2.30	268.67	0.80 - 1.20
STW-959	Water	09/01/02	Cs-134	50.80 ± 3.30	60.20	0.80 - 1.30
STW-959	Water	09/01/02	Cs-137	80.10 ± 0.30	81.43	0.80 - 1.22
STW-959	Water	09/01/02	Cs-137	80.10 ± 0.30	81.43	0.80 - 1.22
STW-959	Water	09/01/02	Am-241	3.00 ± 0.10	3.04	0.79 - 1.41

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

Lab Code	Type	Date	Analysis	Concentration ^b		
				Laboratory result	Known Activity	Control Limits ^c
STW-939	water	12/01/01	Am-241	1.25 ± 0.0	1.19 ± 0.0	0.83 - 1.6
STW-939	water	12/01/01	Co-57	138.9 ± 0.5	143 ± 14.3	100.1 - 185.9
STW-939	water	12/01/01	Co-60	139.1 ± 0.5	141 ± 14.1	98.7 - 183.3
STW-939	water	12/01/01	Cs-134	25.16 ± 0.2	28.5 ± 0.3	19.95 - 37.1
STW-939	water	12/01/01	Cs-137	279.96 ± 0.9	286 ± 28.6	200.2 - 371.8
STW-939 ^d	water	12/01/01	Fe-55	19.68 ± 23.2	9.2 ± 0.9	6.44 - 12.0
STW-939	water	12/01/01	Mn-54	253.64 ± 0.9	246 ± 0.2	172.2 - 319.8
STW-939	water	12/01/01	Ni-63	65.88 ± 1.9	88.3 ± 8.8	61.81 - 114.8
STW-939 ^e	water	12/01/01	Pu-238	0.060 ± 0.01	0.0 ± 0.0	-
STW-939	water	12/01/01	Pu-239/40	2.79 ± 0.0	2.99 ± 0.3	2.09 - 3.9
STW-939	water	12/01/01	Sr-90	4.88 ± 0.3	4.8 ± 0.5	3.36 - 6.2
STW-939	water	12/01/01	U-233/4	0.89 ± 0.0	0.98 ± 0.1	0.69 - 1.3
STW-939	water	12/01/01	U-238	6.75 ± 0.0	7.8 ± 0.8	5.46 - 10.1
STW-939	water	12/01/01	Zn-65	70.6 ± 1.1	67.3 ± 6.7	47.11 - 87.5
STSO-955	soil	10/16/02	Am-241	40.54 ± 2.7	43.5 ± 4.4	30.45 - 56.6
STSO-955	soil	10/16/02	Co-57	210.58 ± 2.0	246 ± 24.6	172.2 - 319.8
STSO-955	soil	10/16/02	Co-60	84.38 ± 0.9	87.5 ± 8.8	61.25 - 113.8
STSO-955	soil	10/16/02	Cs-134	692.6 ± 2.1	862 ± 86.0	603.4 - 1120.6
STSO-955	soil	10/16/02	Cs-137	96.98 ± 1.7	111 ± 11.1	77.7 - 144.3
STSO-955	soil	10/16/02	Fe-55	1714.6 ± 299.6	1870 ± 187.0	1309 - 2431.0
STSO-955	soil	10/16/02	Mn-54	509.74 ± 3.4	546 ± 54.6	382.2 - 709.8
STSO-955	soil	10/16/02	Ni-63	890.6 ± 22.4	1180 ± 118.0	826 - 1534.0
STSO-955	soil	10/16/02	Pu-238	34.04 ± 6.0	33.3 ± 3.3	23.31 - 43.3
STSO-955	soil	10/16/02	Pu-239/40	68.7 ± 3.7	72.9 ± 7.3	51.03 - 94.8
STSO-955 ^e	soil	10/16/02	Sr-90	1.5 ± 3.0	0.0 ± 0.0	-
STSO-955	soil	10/16/02	U-233/4	166.33 ± 3.8	229 ± 22.9	160.3 - 297.7
STSO-955	soil	10/16/02	U-238	169.76 ± 3.8	220 ± 22.0	154 - 286.0
STSO-955	soil	10/16/02	Zn-65	783.59 ± 6.4	809 ± 80.9	566.3 - 1051.7

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

^d Known activity below the laboratory LLD. The sample was recounted for 2000 minutes; result : 11.52 ± 5.55 Bq /L

^e Included in the testing series as a "false positive". No activity expected.

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

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number 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 2 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 Land Use Census for 2002 was completed during the third week of September 2002. All milk animals and gardens greater than 500 square feet were identified within three miles 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 17th, 2002 for water use downstream of the DAEC to Cedar Rapids.

There were 178 gardens found during the performance of the 2002 Census. This number exceeds the number of gardens found in the 2001 survey by 7. This difference can be attributed to the removal of 12 gardens and the addition of 19 new gardens.

There were no changes in the milk animal locations in the past year.

The locations of the nearest resident for each sector remained the same in 2002.

37 new homes were built or were under construction within three miles of the DAEC, compared to the 31 new homes identified in 2001. Most of the new houses built were located in the sectors between the plant, Palo and Cedar Rapids (SSW to SE).

In an effort to increase the precision of the recorded location of receptors in relation to the DAEC, a hand held Global Positioning System (GPS) was used to more accurately describe the location of receptors.

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 changes in vegetation receptors and the more precise 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 2002 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.

- 1.) There were no releases of radioactive material to liquid effluents in 2002.
- 2.) The maximum dose to air at the site boundary from noble gases released was $2.8\text{E-}03$ mrad from gamma radiation at 535 meters SSW.
- 3.) The maximum dose to air at the site boundary from noble gases released was $3.9\text{E-}02$ mrad beta radiation at 535 meters SSW.
- 4.) The whole body dose equivalent to the maximally exposed individual from noble gases was $1.5\text{E-}03$ mrem, at 805 meters West.
- 5.) The skin dose equivalent to the maximally exposed individual from noble gases was $2.0\text{E-}03$ mrem, at 1620 meters NNW.
- 6.) The maximally exposed organ due to iodines and particulates with half-lives greater than eight days was the liver of a child at 1620 meters NNW, with an estimated dose equivalent of $3.4\text{E-}03$ mrem.

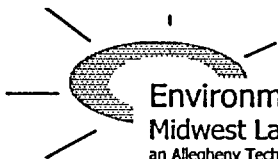
Conclusion:

No measurable dose due to the operation of the DAEC was detected by environmental TLDs in 2002. 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 2002

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		535	SSW	2.8E-03 mrad	10 mrad
Beta Air Dose		535	SSW	3.9E-02 mrad	20 mrad
Whole Body	All	805	W	1.5E-03 mrem	*
Skin	All	1620	NNW	2.0E-03 mrad	*
Particulates & Iodines					
Organ Dose	Child - Liver	1620	NNW	3.4E-03 mrem	15 mrem

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



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CEDAR RAPIDS, IOWA
Docket No. 50-331

RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM (REMP)

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES

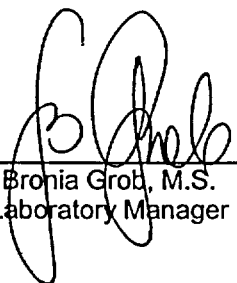
January 1 to December 31, 2002

Prepared and submitted by

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Project No. 8001

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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 2002. 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.

3.0 DATA TABLES

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Table 1. Airborne particulates, analysis for gross beta.
 Location: D-1 (Cedar Rapids)
 Units: pCi/m³
 Collection: Continuous, weekly exchange.

Date Collected	Volume (m³)	Gross Beta	Date Collected	Volume (m³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-10-02	289	0.040 ± 0.004	07-11-02	327	0.023 ± 0.003
01-17-02	283	0.023 ± 0.004	07-18-02	285	0.025 ± 0.003
01-24-02	284	0.040 ± 0.004	07-25-02	286	0.020 ± 0.004
01-30-02	244	0.025 ± 0.004	08-01-02	287	0.032 ± 0.004
02-07-02	327	0.051 ± 0.004	08-08-02	284	0.015 ± 0.003
02-14-02	286	0.027 ± 0.004	08-15-02	285	0.027 ± 0.004
02-21-02	285	0.018 ± 0.003	08-22-02	286	0.016 ± 0.003
02-28-02	286	0.020 ± 0.003	08-29-02	285	0.023 ± 0.003
03-07-02	283	0.039 ± 0.004	09-05-02	287	0.027 ± 0.003
03-14-02	289	0.037 ± 0.004	09-12-02	313	0.034 ± 0.004
03-21-02	285	0.027 ± 0.004	09-20-02	329	0.029 ± 0.004
03-28-02	284	0.029 ± 0.004	09-26-02	245	0.019 ± 0.004
			10-03-02	283	0.040 ± 0.004
1st Quarter Mean ± s.d.		0.031 ± 0.010	3rd Quarter Mean ± s.d.		0.025 ± 0.007
04-04-02	287	0.018 ± 0.003	10-10-02	393	0.028 ± 0.004
04-11-02	285	0.032 ± 0.004	10-17-02	284	0.025 ± 0.004
04-18-02	285	0.028 ± 0.004	10-24-02	286	0.019 ± 0.003
04-25-02	284	0.015 ± 0.003	10-31-02	287	0.025 ± 0.003
05-02-02	289	0.017 ± 0.003			
05-09-02	283	0.020 ± 0.003	11-07-02	285	0.053 ± 0.005
05-16-02	286	0.021 ± 0.003	11-14-02	285	0.042 ± 0.005
05-23-02	288	0.017 ± 0.003	11-21-02	286	0.028 ± 0.004
05-30-02	282	0.018 ± 0.003	11-27-02	245	0.016 ± 0.004
06-06-02	287	0.021 ± 0.003	12-05-02	325	0.018 ± 0.003
06-13-02	283	0.021 ± 0.003	12-12-02	287	0.045 ± 0.005
06-20-02	286	0.022 ± 0.004	12-19-02	284	0.043 ± 0.005
06-27-02	286	0.027 ± 0.003	12-26-02	284	0.022 ± 0.004
07-03-02	241	0.029 ± 0.004	01-02-03	287	0.048 ± 0.005
2nd Quarter Mean ± s.d.		0.022 ± 0.005	4th Quarter Mean ± s.d.		0.032 ± 0.013
Cumulative Average					0.027
Previous Annual Average					0.027

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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 (m³)	Gross Beta	Date Collected	Volume (m³)	Gross Beta
<u>Required LLD</u>		<u>0 010</u>	<u>Required LLD</u>		<u>0 010</u>
01-10-02	290	0.038 ± 0.004	07-11-02	350	0 021 ± 0.003
01-17-02	284	0 019 ± 0.004	07-18-02	286	0 026 ± 0.003
01-24-02	284	0 033 ± 0.004	07-25-02	286	0.017 ± 0.003
01-30-02	244	0 030 ± 0.004	08-01-02	286	0 028 ± 0.004
02-07-02	341	0 045 ± 0 004	08-08-02	285	0 015 ± 0.003
02-14-02	272	0 025 ± 0.004	08-15-02	285	0 028 ± 0.004
02-21-02	285	0 017 ± 0 003	08-22-02	287	0 019 ± 0.003
02-28-02	285	0 018 ± 0 003	08-29-02	284	0.022 ± 0 003
03-07-02	283	0 035 ± 0 004	09-05-02	288	0.026 ± 0 003
03-14-02	289	0 033 ± 0 004	09-12-02	313	0.027 ± 0 004
03-21-02	286	0 021 ± 0.004	09-20-02	328	0.029 ± 0 004
03-28-02	284	0 029 ± 0 004	09-26-02	246	0.019 ± 0 004
			10-03-02	282	0.032 ± 0.004
1st Quarter Mean ± s.d		0 029 ± 0.009	3rd Quarter Mean ± s.d.		0.024 ± 0 005
04-04-02	287	0 014 ± 0.003	10-10-02	286	0.023 ± 0 004
04-11-02	284	0 025 ± 0 003	10-17-02	286	0.024 ± 0 004
04-18-02	286	0.021 ± 0 004	10-24-02	287	0.019 ± 0 003
04-25-02	282	0 015 ± 0 003	10-31-02	288	0.024 ± 0.003
05-02-02	289	0.016 ± 0 003			
05-09-02	283	0.019 ± 0 003	11-07-02	285	0.052 ± 0 005
05-16-02	286	0.019 ± 0 003	11-14-02	286	0.039 ± 0.004
05-23-02	283	0.016 ± 0 003	11-21-02	286	0 028 ± 0.004
05-30-02	285	0.017 ± 0 003	11-27-02	245	0 016 ± 0.004
06-06-02	286	0.019 ± 0 003	12-05-02	326	0.027 ± 0.003
06-13-02	284	0 019 ± 0.003	12-12-02	286	0.051 ± 0.005
06-20-02	286	0.017 ± 0 003	12-19-02	285	0 041 ± 0.005
06-27-02	286	0.024 ± 0.003	12-26-02	283	0.022 ± 0.004
07-03-02	243	0 026 ± 0 004	01-02-03	287	0 048 ± 0.005
2nd Quarter Mean ± s d		0.019 ± 0 004	4th Quarter Mean ± s.d.		0 032 ± 0.013
			Cumulative Average		0.026
			Previous Annual Average		0.026

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

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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>Required LLD</u>		<u>0.010</u>
01-10-02	287	0.034 ± 0.004	07-11-02	328	0.021 ± 0.003
01-17-02	285	0.015 ± 0.003	07-18-02	285	0.023 ± 0.003
01-24-02	285	0.031 ± 0.004	07-25-02	286	0.017 ± 0.003
01-30-02	244	0.032 ± 0.004	08-01-02	286	0.023 ± 0.004
02-07-02	326	0.044 ± 0.004	08-08-02	285	0.013 ± 0.003
02-14-02	285	0.027 ± 0.004	08-15-02	285	0.023 ± 0.004
02-21-02	286	0.017 ± 0.003	08-22-02	287	0.017 ± 0.003
02-28-02	285	0.020 ± 0.003	08-29-02	284	0.019 ± 0.003
03-07-02	283	0.032 ± 0.004	09-05-02	287	0.025 ± 0.003
03-14-02	287	0.028 ± 0.004	09-12-02	284	0.032 ± 0.004
03-21-02	286	0.017 ± 0.003	09-20-02	328	0.025 ± 0.003
03-28-02	284	0.029 ± 0.004	09-26-02	246	0.017 ± 0.004
			10-03-02	282	0.029 ± 0.003
1st Quarter Mean ± s.d.		0.027 ± 0.009	3rd Quarter Mean ± s.d.		0.022 ± 0.005
04-04-02	286	0.016 ± 0.003	10-10-02	244	0.021 ± 0.004
04-11-02	284	0.026 ± 0.003	10-17-02	284	0.025 ± 0.004
04-18-02	285	0.018 ± 0.003	10-24-02	286	0.016 ± 0.003
04-25-02	284	0.018 ± 0.003	10-31-02	287	0.020 ± 0.003
05-02-02	289	0.018 ± 0.003			
05-09-02	283	0.018 ± 0.003	11-07-02	285	0.039 ± 0.004
05-16-02	285	0.018 ± 0.003	11-14-02	285	0.034 ± 0.004
05-23-02	286	0.016 ± 0.003	11-21-02	286	0.024 ± 0.004
05-30-02	284	0.014 ± 0.003	11-27-02	244	0.014 ± 0.004
06-06-02	287	0.019 ± 0.003	12-05-02	326	0.023 ± 0.003
06-13-02	285	0.021 ± 0.003	12-12-02	286	0.043 ± 0.004
06-20-02	286	0.021 ± 0.004	12-19-02	285	0.044 ± 0.005
06-27-02	285	0.023 ± 0.003	12-26-02	284	0.020 ± 0.003
07-03-02	243	0.028 ± 0.004	01-02-03	286	0.045 ± 0.005
2nd Quarter Mean ± s.d.		0.020 ± 0.004	4th Quarter Mean ± s.d.		0.028 ± 0.011
			Cumulative Average		0.024
			Previous Annual Average		0.024

DUANE ARNOLD

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 (m³)	Gross Beta	Date Collected	Volume (m³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-10-02	287	0.039 ± 0.004	07-11-02	327	0.023 ± 0.003
01-17-02	285	0.017 ± 0.003	07-18-02	286	0.025 ± 0.003
01-24-02	285	0.027 ± 0.004	07-25-02	285	0.022 ± 0.004
01-30-02	244	0.032 ± 0.004	08-01-02	286	0.026 ± 0.004
02-07-02	327	0.050 ± 0.004	08-08-02	285	0.014 ± 0.003
02-14-02	285	0.031 ± 0.004	08-15-02	285	0.029 ± 0.004
02-21-02	286	0.020 ± 0.003	08-22-02	286	0.018 ± 0.003
02-28-02	286	0.020 ± 0.003	08-29-02	284	0.021 ± 0.003
03-07-02	189	0.049 ± 0.006	09-05-02	286	0.029 ± 0.003
03-14-02	287	0.039 ± 0.004	09-12-02	286	0.030 ± 0.004
03-21-02	286	0.025 ± 0.004	09-20-02	329	0.029 ± 0.004
03-28-02	285	0.033 ± 0.004	09-26-02	245	0.019 ± 0.004
			10-03-02	282	0.032 ± 0.004
1st Quarter Mean ± s.d.		0.032 ± 0.011	3rd Quarter Mean ± s.d.		0.024 ± 0.005
04-04-02	285	0.020 ± 0.003	10-10-02	286	0.022 ± 0.004
04-11-02	284	0.026 ± 0.003	10-17-02	285	0.024 ± 0.004
04-18-02	286	0.026 ± 0.004	10-24-02	286	0.018 ± 0.003
04-25-02	285	0.019 ± 0.003	10-31-02	288	0.026 ± 0.003
05-02-02	287	0.024 ± 0.004			
05-09-02	283	0.019 ± 0.003	11-07-02	285	0.048 ± 0.005
05-16-02	286	0.018 ± 0.003	11-14-02	285	0.041 ± 0.005
05-23-02	286	0.017 ± 0.003	11-21-02	283	0.030 ± 0.004
05-30-02	283	0.016 ± 0.003	11-27-02	246	0.018 ± 0.004
06-06-02	286	0.020 ± 0.003	12-05-02	326	0.028 ± 0.003
06-13-02	284	0.020 ± 0.003	12-12-02	286	0.047 ± 0.005
06-20-02	286	0.020 ± 0.004	12-19-02	284	0.050 ± 0.005
06-27-02	286	0.026 ± 0.003	12-26-02	285	0.022 ± 0.004
07-03-02	244	0.026 ± 0.004	01-02-03	287	0.047 ± 0.005
2nd Quarter Mean ± s.d.		0.021 ± 0.004	4th Quarter Mean ± s.d.		0.032 ± 0.012
Cumulative Average					0.027
Previous Annual Average					0.026

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

DUANE ARNOLD

Table 5. Airborne particulates, analysis for gross beta.

Location: D-6 (Center Point)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m³)	Gross Beta	Date Collected	Volume (m³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-10-02	287	0.038 ± 0.004	07-11-02	327	0.019 ± 0.003
01-17-02	285	0.018 ± 0.003	07-18-02	285	0.025 ± 0.003
01-24-02	285	0.039 ± 0.004	07-25-02	286	0.019 ± 0.004
01-30-02	244	0.035 ± 0.005	08-01-02	286	0.028 ± 0.004
02-07-02	327	0.048 ± 0.004	08-08-02	286	0.019 ± 0.004
02-14-02	285	0.028 ± 0.004	08-15-02	285	0.030 ± 0.004
02-21-02	286	0.019 ± 0.003	08-22-02	287	0.021 ± 0.003
02-28-02	285	0.021 ± 0.003	08-29-02	285	0.030 ± 0.004
03-07-02	283	0.038 ± 0.004	09-05-02	286	0.033 ± 0.004
03-14-02	287	0.035 ± 0.004	09-12-02	286	0.040 ± 0.004
03-21-02	286	0.022 ± 0.004	09-20-02	329	0.033 ± 0.004
03-28-02	286	0.030 ± 0.004	09-26-02	246	0.028 ± 0.004
			10-03-02	281	0.043 ± 0.004
1st Quarter Mean ± s.d.		0.031 ± 0.009	3rd Quarter Mean ± s.d.		0.028 ± 0.008
04-04-02	285	0.019 ± 0.003	10-10-02	286	0.030 ± 0.004
04-11-02	284	0.030 ± 0.003	10-17-02	285	0.030 ± 0.004
04-18-02	286	0.018 ± 0.003	10-24-02	286	0.021 ± 0.004
04-25-02	285	0.017 ± 0.003	10-31-02	287	0.022 ± 0.003
05-02-02	288	0.015 ± 0.003			
05-09-02	284	0.016 ± 0.003	11-07-02	285	0.053 ± 0.005
05-16-02	285	0.017 ± 0.003	11-14-02	285	0.039 ± 0.004
05-23-02	286	0.014 ± 0.003	11-21-02	286	0.026 ± 0.004
05-30-02	285	0.013 ± 0.003	11-27-02	246	0.014 ± 0.004
06-06-02	286	0.019 ± 0.003	12-05-02	325	0.024 ± 0.003
06-13-02	285	0.019 ± 0.003	12-12-02	286	0.050 ± 0.005
06-20-02	286	0.019 ± 0.004	12-19-02		NS ^a
06-27-02	286	0.024 ± 0.003	12-26-02	285	0.026 ± 0.004
07-03-02	243	0.023 ± 0.004	01-02-03	287	0.054 ± 0.005
2nd Quarter Mean ± s.d.		0.019 ± 0.004	4th Quarter Mean ± s.d.		0.032 ± 0.013
Cumulative Average					0.027
Previous Annual Average					0.025

^a NS = No sample; electric off.

DUANE ARNOLD

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>Required LLD</u>		<u>0.010</u>
01-10-02	287	0.037 ± 0.004	07-11-02	327	0.024 ± 0.003
01-17-02	285	0.020 ± 0.004	07-18-02	286	0.025 ± 0.003
01-24-02	285	0.035 ± 0.004	07-25-02	287	0.022 ± 0.004
01-30-02	244	0.034 ± 0.005	08-01-02	286	0.027 ± 0.004
02-07-02	327	0.042 ± 0.004	08-08-02	285	0.020 ± 0.004
02-14-02	285	0.029 ± 0.004	08-15-02	285	0.030 ± 0.004
02-21-02	287	0.018 ± 0.003	08-22-02	286	0.022 ± 0.003
02-28-02	285	0.021 ± 0.003	08-29-02	284	0.026 ± 0.003
03-07-02	283	0.040 ± 0.004	09-05-02	286	0.031 ± 0.003
03-14-02	287	0.034 ± 0.004	09-12-02	286	0.037 ± 0.004
03-21-02	286	0.019 ± 0.004	09-20-02	329	0.029 ± 0.004
03-28-02	285	0.031 ± 0.004	09-26-02	246	0.022 ± 0.004
			10-03-02	281	0.035 ± 0.004
1st Quarter Mean ± s.d.		0.030 ± 0.009	3rd Quarter Mean ± s.d.		0.027 ± 0.005
04-04-02	285	0.021 ± 0.003	10-10-02	286	0.024 ± 0.004
04-11-02	285	0.028 ± 0.003	10-17-02	285	0.027 ± 0.004
04-18-02	286	0.023 ± 0.004	10-24-02	286	0.020 ± 0.004
04-25-02	285	0.016 ± 0.003	10-31-02	288	0.020 ± 0.003
05-02-02	288	0.020 ± 0.003	11-07-02	285	0.043 ± 0.005
05-09-02	284	0.019 ± 0.003	11-14-02	285	0.032 ± 0.004
05-16-02	285	0.019 ± 0.003	11-21-02	283	0.028 ± 0.004
05-23-02	286	0.018 ± 0.003	11-27-02	246	0.014 ± 0.004
05-30-02	283	0.018 ± 0.003	12-05-02	328	0.023 ± 0.003
06-06-02	286	0.020 ± 0.003	12-12-02	286	0.049 ± 0.005
06-13-02	284	0.021 ± 0.003	12-19-02	284	0.046 ± 0.005
06-20-02	286	0.023 ± 0.004	12-26-02	285	0.025 ± 0.004
06-27-02	286	0.029 ± 0.003	01-02-03	287	0.046 ± 0.005
07-03-02	233	0.033 ± 0.004			
2nd Quarter Mean ± s.d.		0.022 ± 0.005	4th Quarter Mean ± s.d.		0.031 ± 0.012
			Cumulative Average		0.027
			Previous Annual Average		0.026

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

DUANE ARNOLD

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>Required LLD</u>		<u>0.010</u>
01-10-02	287	0.040 ± 0.004	07-11-02	327	0.020 ± 0.003
01-17-02	284	0.021 ± 0.004	07-18-02	286	0.025 ± 0.003
01-24-02	283	0.039 ± 0.004	07-25-02	286	0.023 ± 0.004
01-30-02	245	0.037 ± 0.005	08-01-02	286	0.026 ± 0.004
02-07-02	327	0.051 ± 0.004	08-08-02	285	0.018 ± 0.003
02-14-02	285	0.030 ± 0.004	08-15-02	285	0.030 ± 0.004
02-21-02	287	0.021 ± 0.003	08-22-02	285	0.015 ± 0.003
02-28-02	284	0.022 ± 0.003	08-29-02	284	0.020 ± 0.003
03-07-02	283	0.041 ± 0.004	09-05-02	286	0.029 ± 0.003
03-14-02	287	0.040 ± 0.004	09-12-02	286	0.036 ± 0.004
03-21-02	286	0.024 ± 0.004	09-20-02	328	0.025 ± 0.003
03-28-02	285	0.029 ± 0.004	09-26-02	246	0.021 ± 0.004
			10-03-02	281	0.038 ± 0.004
1st Quarter Mean ± s.d.		0.033 ± 0.010	3rd Quarter Mean ± s.d.		0.025 ± 0.007
04-04-02	285	0.022 ± 0.003	10-10-02	286	0.024 ± 0.004
04-11-02	284	0.027 ± 0.003	10-17-02	285	0.028 ± 0.004
04-18-02	286	0.022 ± 0.004	10-24-02	286	0.021 ± 0.004
04-25-02	285	0.017 ± 0.003	10-31-02	288	0.026 ± 0.003
05-02-02	288	0.016 ± 0.003			
05-09-02	283	0.018 ± 0.003	11-07-02	284	0.046 ± 0.005
05-16-02	285	0.017 ± 0.003	11-14-02	285	0.041 ± 0.005
05-23-02	286	0.017 ± 0.003	11-21-02	285	0.029 ± 0.004
05-30-02	283	0.016 ± 0.003	11-27-02	246	0.017 ± 0.004
06-06-02	286	0.016 ± 0.003	12-05-02	326	0.021 ± 0.003
06-13-02	285	0.020 ± 0.003	12-12-02	286	0.046 ± 0.005
06-20-02	241 ^b	0.017 ± 0.004	12-19-02	284	0.049 ± 0.005
06-27-02	ND ^c	-	12-26-02	285	0.021 ± 0.004
07-03-02	199 ^d	0.029 ± 0.004	01-02-03	287	0.043 ± 0.005
2nd Quarter Mean ± s.d.		0.020 ± 0.004	4th Quarter Mean ± s.d.		0.032 ± 0.012
			Cumulative Average		0.027
			Previous Annual Average		0.027

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

^b Electric off.

^c "ND" = No data; electric off.

^d Fuse replaced.

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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>Required LLD</u>		<u>0.010</u>
01-10-02	289	0.039 ± 0.004	07-11-02	326	0.023 ± 0.003
01-17-02	283	0.021 ± 0.004	07-18-02	287	0.025 ± 0.003
01-24-02	284	0.041 ± 0.004	07-25-02	285	0.019 ± 0.004
01-30-02	244	0.031 ± 0.004	08-01-02	285	0.030 ± 0.004
02-07-02	326	0.049 ± 0.004	08-08-02	284	0.014 ± 0.003
02-14-02	286	0.027 ± 0.004	08-15-02	286	0.028 ± 0.004
02-21-02	286	0.016 ± 0.003	08-22-02	285	0.020 ± 0.003
02-28-02	284	0.020 ± 0.003	08-29-02	281	0.020 ± 0.003
03-07-02	284	0.036 ± 0.004	09-05-02	277	0.031 ± 0.004
03-14-02	288	0.032 ± 0.004	09-12-02	276	0.036 ± 0.004
03-21-02	285	0.025 ± 0.004	09-20-02	316	0.028 ± 0.003
03-28-02	286	0.028 ± 0.003	09-26-02	226	0.023 ± 0.004
			10-03-02	273	0.039 ± 0.004
1st Quarter Mean ± s.d.		0.030 ± 0.010	3rd Quarter Mean ± s.d.		0.026 ± 0.007
04-04-02	285	0.015 ± 0.003	10-10-02	262	0.029 ± 0.004
04-11-02	284	0.028 ± 0.003	10-17-02	253	0.032 ± 0.004
04-18-02	285	0.024 ± 0.004	10-24-02	248	0.024 ± 0.004
04-25-02	284	0.019 ± 0.003	10-31-02	286	0.028 ± 0.004
05-02-02	289	0.019 ± 0.003			
05-09-02	283	0.018 ± 0.003	11-07-02	285	0.050 ± 0.005
05-16-02	287	0.017 ± 0.003	11-14-02	286	0.036 ± 0.004
05-23-02	286	0.016 ± 0.003	11-21-02	286	0.029 ± 0.004
05-30-02	284	0.018 ± 0.003	11-27-02	243	0.016 ± 0.004
06-06-02	285	0.021 ± 0.004	12-05-02	325	0.026 ± 0.003
06-13-02	283	0.024 ± 0.003	12-12-02	287	0.055 ± 0.005
06-20-02	286	0.023 ± 0.004	12-19-02	285	0.045 ± 0.005
06-27-02	288	0.027 ± 0.003	12-26-02	283	0.022 ± 0.004
07-03-02	242	0.027 ± 0.004	01-02-03	287	0.044 ± 0.005
2nd Quarter Mean ± s.d.		0.021 ± 0.004	4th Quarter Mean ± s.d.		0.034 ± 0.012
			Cumulative Average		0.028
			Previous Annual Average		0.026

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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>Required LLD</u>		<u>0.010</u>
01-10-02	256	0.045 ± 0.004	07-11-02	327	0.020 ± 0.003
01-17-02	285	0.021 ± 0.004	07-18-02	285	0.024 ± 0.003
01-24-02	285	0.037 ± 0.004	07-25-02	285	0.019 ± 0.004
01-30-02	244	0.037 ± 0.005	08-01-02	287	0.029 ± 0.004
02-07-02	326	0.053 ± 0.005	08-08-02	284	0.016 ± 0.003
02-14-02	284	0.028 ± 0.004	08-15-02	286	0.023 ± 0.004
02-21-02	287	0.020 ± 0.003	08-22-02	287	0.019 ± 0.003
02-28-02	286	0.021 ± 0.003	08-29-02	285	0.020 ± 0.003
03-07-02	283	0.039 ± 0.004	09-05-02	286	0.028 ± 0.003
03-14-02	288	0.035 ± 0.004	09-12-02	284	0.032 ± 0.004
03-21-02	286	0.027 ± 0.004	09-20-02	328	0.027 ± 0.004
03-28-02	285	0.030 ± 0.004	09-26-02	246	0.020 ± 0.004
			10-03-02	282	0.036 ± 0.004
1st Quarter Mean ± s.d.		0.033 ± 0.010	3rd Quarter Mean ± s.d.		0.024 ± 0.006
04-04-02	286	0.016 ± 0.003	10-10-02	284	0.022 ± 0.004
04-11-02	284	0.024 ± 0.003	10-17-02	284	0.029 ± 0.004
04-18-02	286	0.025 ± 0.004	10-24-02	287	0.017 ± 0.003
04-25-02	284	0.017 ± 0.003	10-31-02	287	0.023 ± 0.003
05-02-02	288	0.022 ± 0.004			
05-09-02	284	0.020 ± 0.003	11-07-02	285	0.052 ± 0.005
05-16-02	285	0.019 ± 0.003	11-14-02	285	0.041 ± 0.005
05-23-02	286	0.017 ± 0.003	11-21-02	285	0.026 ± 0.004
05-30-02	282	0.018 ± 0.003	11-27-02	245	0.015 ± 0.004
06-06-02	287	0.021 ± 0.003	12-05-02	326	0.024 ± 0.003
06-13-02	285	0.022 ± 0.003	12-12-02	287	0.047 ± 0.005
06-20-02	286	0.018 ± 0.003	12-19-02	285	0.047 ± 0.005
06-27-02	285	0.025 ± 0.003	12-26-02	284	0.018 ± 0.003
07-03-02	243	0.030 ± 0.004	01-02-03	287	0.046 ± 0.005
2nd Quarter Mean ± s.d.		0.021 ± 0.004	4th Quarter Mean ± s.d.		0.031 ± 0.013
			Cumulative Average		0.027
			Previous Annual Average		0.029

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

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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 (m³)	Gross Beta	Date Collected	Volume (m³)	Gross Beta
<u>Required LLD</u>		<u>0 010</u>	<u>Required LLD</u>		<u>0 010</u>
01-10-02	287	0.041 ± 0.004	07-11-02	317	0.025 ± 0.004
01-17-02	285	0.021 ± 0.004	07-18-02	285	0.022 ± 0.003
01-24-02	285	0 034 ± 0.004	07-25-02	286	0.019 ± 0.004
01-30-02	244	0 034 ± 0.005	08-01-02	286	0.027 ± 0.004
02-07-02	327	0 056 ± 0.005	08-08-02	286	0.014 ± 0.003
02-14-02	285	0.030 ± 0.004	08-15-02	285	0.027 ± 0.004
02-21-02	286	0 019 ± 0 003	08-22-02	287	0.018 ± 0.003
02-28-02	285	0 018 ± 0.003	08-29-02	285	0.021 ± 0.003
03-07-02	283	0 039 ± 0.004	09-05-02	286	0 027 ± 0.003
03-14-02	287	0 041 ± 0.004	09-12-02	286	0 031 ± 0.004
03-21-02	286	0 024 ± 0 004	09-20-02	329	0.028 ± 0 004
03-28-02	286	0.030 ± 0 004	09-26-02	246	0.019 ± 0.004
			10-03-02	281	0 034 ± 0.004
1st Quarter Mean ± s.d.		0.032 ± 0.011	3rd Quarter Mean ± s d		0 024 ± 0 006
04-04-02	285	0.019 ± 0 003	10-10-02	286	0 020 ± 0 004
04-11-02	226 ^a	0.034 ± 0.004	10-17-02	285	0 025 ± 0 004
04-18-02	284	0.025 ± 0 004	10-24-02	286	0 019 ± 0 003
04-25-02	285	0.018 ± 0 003	10-31-02	288	0 023 ± 0 003
05-02-02	288	0.020 ± 0.003			
05-09-02	284	0.019 ± 0.003	11-07-02	284	0.053 ± 0.005
05-16-02	285	0.017 ± 0.003	11-14-02	285	0 035 ± 0.004
05-23-02	286	0.020 ± 0.003	11-21-02	286	0.023 ± 0.004
05-30-02	285	0.017 ± 0.003	11-27-02	246	0.014 ± 0.004
06-06-02	286	0 020 ± 0.003	12-05-02	325	0 026 ± 0.003
06-13-02	283	0.019 ± 0.003	12-12-02	286	0 052 ± 0.005
06-20-02	275	0.025 ± 0.004	12-19-02	284	0 048 ± 0.005
06-27-02	236 ^a	0.037 ± 0.004	12-26-02	285	0 022 ± 0.004
07-03-02	221	0.032 ± 0.004	01-02-03	287	0.047 ± 0 005
2nd Quarter Mean ± s d.		0 023 ± 0.007	4th Quarter Mean ± s d.		0.031 ± 0 014
			Cumulative Average		0 027
			Previous Annual Average		0 026

^a Electric off

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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>Required LLD</u>		<u>0.010</u>
01-10-02	286	0.041 ± 0.004	07-11-02	327	0.019 ± 0.003
01-17-02	285	0.022 ± 0.004	07-18-02	286	0.023 ± 0.003
01-24-02	286	0.040 ± 0.004	07-25-02	285	0.018 ± 0.003
01-31-02	244	0.038 ± 0.005	08-01-02	286	0.025 ± 0.004
02-07-02	327	0.059 ± 0.005	08-08-02	285	0.017 ± 0.003
02-14-02	169 ^b	0.038 ± 0.006	08-15-02	285	0.027 ± 0.004
02-21-02	NS ^c	-	08-22-02	285	0.019 ± 0.003
02-28-02	NS ^c	-	08-29-02	285	0.021 ± 0.003
03-07-02	277	0.038 ± 0.004	09-05-02	286	0.024 ± 0.003
03-14-02	286	0.034 ± 0.004	09-12-02	287	0.029 ± 0.004
03-21-02	286	0.023 ± 0.004	09-20-02	327	0.028 ± 0.004
03-28-02	285	0.034 ± 0.004	09-26-02	246	0.020 ± 0.004
			10-03-02	282	0.036 ± 0.004
1st Quarter Mean ± s.d.		0.037 ± 0.010	3rd Quarter Mean ± s.d.		0.024 ± 0.005
04-04-02	285	0.018 ± 0.003	10-10-02	286	0.025 ± 0.004
04-11-02	285	0.026 ± 0.003	10-17-02	263	0.028 ± 0.004
04-18-02	285	0.027 ± 0.004	10-24-02	282	0.020 ± 0.004
04-25-02	286	0.016 ± 0.003	10-31-02	278	0.025 ± 0.004
05-02-02	287	0.013 ± 0.003	11-07-02	280	0.042 ± 0.005
05-09-02	283	0.020 ± 0.003	11-14-02	277	0.039 ± 0.005
05-16-02	286	0.017 ± 0.003	11-21-02	280	0.030 ± 0.004
05-23-02	285	0.016 ± 0.003	11-27-02	243	0.016 ± 0.004
05-30-02	284	0.016 ± 0.003	12-05-02	326	0.023 ± 0.003
06-06-02	286	0.012 ± 0.003	12-12-02	285	0.050 ± 0.005
06-13-02	285	0.019 ± 0.003	12-19-02	285	0.049 ± 0.005
06-20-02	285	0.022 ± 0.004	12-26-02	284	0.020 ± 0.003
06-27-02	285	0.024 ± 0.004	01-02-03	282	0.049 ± 0.005
07-03-02	244	0.029 ± 0.004			
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.032 ± 0.012
			Cumulative Average		0.027
			Previous Annual Average		0.025

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

^b Power to air monitor found off.

^c No power due to construction.

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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>Required LLD</u>		<u>0 010</u>
01-10-02	286	0 040 ± 0.004	07-11-02	327	0 020 ± 0.003
01-17-02	285	0 021 ± 0.004	07-18-02	285	0 024 ± 0.003
01-24-02	286	0.041 ± 0.004	07-25-02	286	0 020 ± 0.004
01-30-02	244	0 036 ± 0.005	08-01-02	286	0 026 ± 0.004
02-07-02	327	0 053 ± 0.005	08-08-02	285	0 014 ± 0.003
02-14-02	285	0 028 ± 0.004	08-15-02	285	0.027 ± 0.004
02-21-02	286	0 020 ± 0 003	08-22-02	285	0.018 ± 0 003
02-28-02	285	0 020 ± 0 003	08-29-02	285	0.023 ± 0.003
03-07-02	283	0 037 ± 0 004	09-05-02	286	0 025 ± 0.003
03-14-02	287	0 037 ± 0 004	09-12-02	285	0.030 ± 0.004
03-21-02	286	0 024 ± 0 004	09-20-02	328	0.026 ± 0 003
03-28-02	284	0 033 ± 0 004	09-26-02	246	0 020 ± 0 004
			10-03-02	282	0.037 ± 0 004
1st Quarter Mean ± s.d.		<u>0 033 ± 0 010</u>	3rd Quarter Mean ± s.d.		<u>0.024 ± 0 006</u>
04-04-02	286	0.018 ± 0.003	10-10-02	286	0.022 ± 0 004
04-11-02	284	0 025 ± 0 003	10-17-02	285	0.030 ± 0 004
04-18-02	285	0 024 ± 0.004	10-24-02	285	0.021 ± 0 004
04-25-02	286	0 016 ± 0.003	10-31-02	288	0.026 ± 0 003
05-02-02	287	0.016 ± 0.003			
05-09-02	283	0.020 ± 0.003	11-07-02	285	0.054 ± 0.005
05-16-02	286	0.018 ± 0.003	11-14-02	285	0.039 ± 0.004
05-23-02	285	0.019 ± 0.003	11-21-02	286	0.027 ± 0 004
05-30-02	285	0 018 ± 0.003	11-27-02	245	0.017 ± 0.004
06-06-02	286	0.020 ± 0.003	12-05-02	328	0.026 ± 0.003
06-13-02	285	0.022 ± 0.003	12-12-02	284	0.050 ± 0.005
06-20-02	285	0.020 ± 0.004	12-19-02	285	0.046 ± 0.005
06-27-02	279 ^a	0 025 ± 0.004	12-26-02	285	0.023 ± 0.004
07-03-02	244	<u>0.029 ± 0 004</u>	01-02-03	287	0.045 ± 0.005
2nd Quarter Mean ± s.d.		<u>0.021 ± 0.004</u>	4th Quarter Mean ± s.d.		<u>0.033 ± 0 012</u>
			Cumulative Average		0 027
			Previous Annual Average		0.027

^a Electric off.

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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-2472	DAP-4791	DAP-6846	DAP-8858
Volume (m ³)	3425	3952	3782	3818
Be-7	0.069 ± 0.017	0.086 ± 0.016	0.070 ± 0.014	0.059 ± 0.017
Nb-95	< 0.0013	< 0.0012	< 0.0009	< 0.0004
Zr-95	< 0.0025	< 0.0013	< 0.0009	< 0.0010
Ru-103	< 0.0015	< 0.0006	< 0.0005	< 0.0007
Ru-106	< 0.0058	< 0.0082	< 0.0051	< 0.0057
Cs-134	< 0.0009	< 0.0007	< 0.0003	< 0.0005
Cs-137	< 0.0007	< 0.0009	< 0.0004	< 0.0007
Ce-141	< 0.0022	< 0.0014	< 0.0010	< 0.0018
Ce-144	< 0.0064	< 0.0034	< 0.0047	< 0.0056

Location D-2				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2473	DAP-4792	DAP-6847	DAP-8859
Volume (m ³)	3427	3950	3806	3716
Be-7	0.085 ± 0.021	0.082 ± 0.015	0.072 ± 0.013	0.039 ± 0.014
Nb-95	< 0.0009	< 0.0009	< 0.0008	< 0.0004
Zr-95	< 0.0018	< 0.0011	< 0.0014	< 0.0022
Ru-103	< 0.0016	< 0.0013	< 0.0009	< 0.0011
Ru-106	< 0.0069	< 0.0055	< 0.0040	< 0.0049
Cs-134	< 0.0008	< 0.0006	< 0.0004	< 0.0006
Cs-137	< 0.0009	< 0.0006	< 0.0006	< 0.0007
Ce-141	< 0.0026	< 0.0022	< 0.0012	< 0.0018
Ce-144	< 0.0033	< 0.0037	< 0.0023	< 0.0052

Location D-3				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2474	DAP-4793	DAP-6848	DAP-8860
Volume (m ³)	3423	3952	3753	3668
Be-7	0.054 ± 0.020	0.067 ± 0.017	0.059 ± 0.012	0.049 ± 0.018
Nb-95	< 0.0009	< 0.0005	< 0.0008	< 0.0007
Zr-95	< 0.0016	< 0.0016	< 0.0012	< 0.0010
Ru-103	< 0.0013	< 0.0004	< 0.0004	< 0.0008
Ru-106	< 0.0087	< 0.0055	< 0.0037	< 0.0052
Cs-134	< 0.0014	< 0.0008	< 0.0004	< 0.0004
Cs-137	< 0.0006	< 0.0007	< 0.0003	< 0.0006
Ce-141	< 0.0013	< 0.0014	< 0.0016	< 0.0014
Ce-144	< 0.0044	< 0.0033	< 0.0047	< 0.0046

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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-2475	DAP-4794	DAP-6849	DAP-8861
Volume (m ³)	3332	3951	3752	3712
Be-7	0.063 ± 0.015	0.089 ± 0.018	0.071 ± 0.013	0.061 ± 0.017
Nb-95	< 0.0012	< 0.0006	< 0.0006	< 0.0016
Zr-95	< 0.0020	< 0.0014	< 0.0015	< 0.0011
Ru-103	< 0.0009	< 0.0005	< 0.0009	< 0.0011
Ru-106	< 0.0052	< 0.0079	< 0.0037	< 0.0045
Cs-134	< 0.0009	< 0.0003	< 0.0003	< 0.0005
Cs-137	< 0.0008	< 0.0008	< 0.0008	< 0.0006
Ce-141	< 0.0015	< 0.0017	< 0.0010	< 0.0020
Ce-144	< 0.0070	< 0.0037	< 0.0050	< 0.0056

Location D-6				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2476	DAP-4795	DAP-6850	DAP-8862
Volume (m ³)	3426	3954	3755	3429
Be-7	0.078 ± 0.018	0.067 ± 0.015	0.082 ± 0.016	0.062 ± 0.016
Nb-95	< 0.0006	< 0.0006	< 0.0007	< 0.0010
Zr-95	< 0.0014	< 0.0016	< 0.0018	< 0.0015
Ru-103	< 0.0014	< 0.0008	< 0.0009	< 0.0013
Ru-106	< 0.0088	< 0.0053	< 0.0056	< 0.0096
Cs-134	< 0.0011	< 0.0006	< 0.0007	< 0.0009
Cs-137	< 0.0004	< 0.0007	< 0.0003	< 0.0005
Ce-141	< 0.0017	< 0.0014	< 0.0018	< 0.0022
Ce-144	< 0.0043	< 0.0041	< 0.0055	< 0.0054

Location D-7				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2477	DAP-4796	DAP-6851	DAP-8863
Volume (m ³)	3426	3942	3754	3714
Be-7	0.062 ± 0.017	0.098 ± 0.017	0.073 ± 0.013	0.047 ± 0.012
Nb-95	< 0.0006	< 0.0011	< 0.0011	< 0.0009
Zr-95	< 0.0016	< 0.0013	< 0.0016	< 0.0012
Ru-103	< 0.0010	< 0.0009	< 0.0005	< 0.0010
Ru-106	< 0.0060	< 0.0060	< 0.0043	< 0.0047
Cs-134	< 0.0009	< 0.0009	< 0.0008	< 0.0004
Cs-137	< 0.0006	< 0.0005	< 0.0005	< 0.0005
Ce-141	< 0.0018	< 0.0016	< 0.0009	< 0.0019
Ce-144	< 0.0049	< 0.0040	< 0.0044	< 0.0045

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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-2478	DAP-4797	DAP-6852	DAP-8864
Volume (m ³)	3423	3576	3751	3713
Be-7	0.080 ± 0.019	0.079 ± 0.018	0.078 ± 0.014	0.056 ± 0.012
Nb-95	< 0.0009	< 0.0008	< 0.0008	< 0.0010
Zr-95	< 0.0015	< 0.0009	< 0.0013	< 0.0015
Ru-103	< 0.0011	< 0.0005	< 0.0009	< 0.0009
Ru-106	< 0.0053	< 0.0055	< 0.0030	< 0.0072
Cs-134	< 0.0010	< 0.0008	< 0.0007	< 0.0006
Cs-137	< 0.0006	< 0.0003	< 0.0005	< 0.0006
Ce-141	< 0.0017	< 0.0022	< 0.0014	< 0.0015
Ce-144	< 0.0043	< 0.0037	< 0.0035	< 0.0050

Location D-10				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2479,80	DAP-4798	DAP-6853	DAP-8865
Volume (m ³)	3425	3951	3687	3616
Be-7	0.066 ± 0.013	0.079 ± 0.016	0.074 ± 0.016	0.045 ± 0.015
Nb-95	< 0.0006	< 0.0007	< 0.0006	< 0.0016
Zr-95	< 0.0010	< 0.0010	< 0.0015	< 0.0013
Ru-103	< 0.0010	< 0.0008	< 0.0008	< 0.0005
Ru-106	< 0.0029	< 0.0062	< 0.0035	< 0.0066
Cs-134	< 0.0007	< 0.0007	< 0.0004	< 0.0005
Cs-137	< 0.0005	< 0.0006	< 0.0004	< 0.0008
Ce-141	< 0.0018	< 0.0020	< 0.0015	< 0.0021
Ce-144	< 0.0020	< 0.0051	< 0.0043	< 0.0046

Location D-11				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2481	DAP-4799	DAP-6854	DAP-8866
Volume (m ³)	3395	3951	3752	3711
Be-7	0.084 ± 0.019	0.074 ± 0.015	0.070 ± 0.017	0.048 ± 0.021
Nb-95	< 0.0010	< 0.0006	< 0.0008	< 0.0024
Zr-95	< 0.0017	< 0.0020	< 0.0011	< 0.0011
Ru-103	< 0.0010	< 0.0008	< 0.0006	< 0.0015
Ru-106	< 0.0029	< 0.0066	< 0.0058	< 0.0090
Cs-134	< 0.0008	< 0.0005	< 0.0004	< 0.0006
Cs-137	< 0.0009	< 0.0005	< 0.0004	< 0.0007
Ce-141	< 0.0013	< 0.0019	< 0.0015	< 0.0022
Ce-144	< 0.0047	< 0.0027	< 0.0025	< 0.0059

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

D-13				
Location				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2482	DAP-4800	DAP-6855	DAP-8867
Volume (m ³)	3426	3809	3745	3713
Be-7	0.071 ± 0.022	0.086 ± 0.017	0.075 ± 0.016	0.056 ± 0.019
Nb-95	< 0.0006	< 0.0006	< 0.0006	< 0.0013
Zr-95	< 0.0017	< 0.0014	< 0.0009	< 0.0054
Ru-103	< 0.0010	< 0.0006	< 0.0007	< 0.0015
Ru-106	< 0.0050	< 0.0057	< 0.0031	< 0.0061
Cs-134	< 0.0008	< 0.0004	< 0.0005	< 0.0008
Cs-137	< 0.0007	< 0.0007	< 0.0007	< 0.0007
Ce-141	< 0.0020	< 0.0023	< 0.0017	< 0.0017
Ce-144	< 0.0057	< 0.0064	< 0.0048	< 0.0030

D-15				
Location				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2483	DAP-4801	DAP-6856	DAP-8868
Volume (m ³)	2731	3951	3752	3651
Be-7	0.081 ± 0.025	0.074 ± 0.016	0.065 ± 0.014	0.049 ± 0.022
Nb-95	< 0.0007	< 0.0005	< 0.0008	< 0.0013
Zr-95	< 0.0030	< 0.0013	< 0.0012	< 0.0018
Ru-103	< 0.0009	< 0.0006	< 0.0007	< 0.0018
Ru-106	< 0.0057	< 0.0054	< 0.0031	< 0.0056
Cs-134	< 0.0012	< 0.0007	< 0.0003	< 0.0009
Cs-137	< 0.0009	< 0.0005	< 0.0003	< 0.0008
Ce-141	< 0.0028	< 0.0017	< 0.0008	< 0.0017
Ce-144	< 0.0083	< 0.0050	< 0.0036	< 0.0059

D-16				
Location				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP-2484	DAP-4802	DAP-6857,8	DAP-8869,70
Volume (m ³)	3424	3946	3751	3714
Be-7	0.075 ± 0.020	0.082 ± 0.017	0.066 ± 0.010	0.046 ± 0.012
Nb-95	< 0.0010	< 0.0008	< 0.0008	< 0.0012
Zr-95	< 0.0016	< 0.0008	< 0.0011	< 0.0008
Ru-103	< 0.0012	< 0.0004	< 0.0007	< 0.0010
Ru-106	< 0.0029	< 0.0057	< 0.0040	< 0.0051
Cs-134	< 0.0009	< 0.0011	< 0.0003	< 0.0004
Cs-137	< 0.0007	< 0.0007	< 0.0006	< 0.0004
Ce-141	< 0.0015	< 0.0020	< 0.0014	< 0.0013
Ce-144	< 0.0039	< 0.0030	< 0.0026	< 0.0042

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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)	13.4 ± 0.3	15.2 ± 1.0	15.1 ± 1.0	13.4 ± 1.6
D-2 (C)	15.3 ± 0.3	15.3 ± 0.6	17.8 ± 1.2	14.7 ± 1.2
D-3	14.5 ± 0.2	14.1 ± 1.0	17.5 ± 1.2	12.7 ± 0.7
D-5	15.4 ± 0.5	16.1 ± 0.6	18.1 ± 0.9	15.5 ± 1.0
D-6	15.6 ± 0.3	17.6 ± 0.7	18.7 ± 0.8	16.5 ± 0.7
D-7	16.2 ± 0.3	16.2 ± 0.9	19.2 ± 1.0	14.7 ± 1.0
D-8	19.0 ± 0.4	21.5 ± 1.2	23.1 ± 0.7	20.3 ± 1.3
D-10	17.9 ± 0.3	17.9 ± 0.6	20.7 ± 0.9	17.5 ± 0.8
D-11	14.5 ± 0.2	17.3 ± 2.5	17.6 ± 0.7	14.9 ± 2.1
D-13 (C)	16.3 ± 0.3	16.9 ± 1.7	19.7 ± 0.8	15.7 ± 0.8
D-15	16.9 ± 0.3	16.3 ± 1.0	18.6 ± 1.4	15.1 ± 0.7
D-16	16.5 ± 0.3	17.4 ± 1.8	19.7 ± 0.7	16.2 ± 2.1
Mean ± s.d.	16.0 ± 1.5	16.8 ± 1.9	18.8 ± 2.0	15.6 ± 2.0
<u>Within 0.5 mi. of Stack</u>				
D-17	17.9 ± 0.3	17.5 ± 0.7	19.8 ± 1.4	17.6 ± 1.2
D-18	16.8 ± 0.2	19.2 ± 2.4	17.5 ± 1.1	17.6 ± 2.1
D-19	16.2 ± 0.2	16.4 ± 1.1	16.7 ± 0.9	15.3 ± 0.9
D-20	17.9 ± 0.3	19.2 ± 1.0	17.5 ± 1.1	19.7 ± 1.1
D-21	18.0 ± 0.3	19.7 ± 2.1	19.0 ± 1.0	18.1 ± 1.1
D-22	17.3 ± 0.3	17.1 ± 0.6	18.6 ± 1.0	16.0 ± 0.9
D-23	15.1 ± 0.5	16.1 ± 1.1	16.7 ± 1.2	16.5 ± 1.5
D-28	18.9 ± 0.5	22.3 ± 0.9	22.1 ± 1.1	22.2 ± 0.6
D-29	21.0 ± 0.3	21.4 ± 1.2	23.6 ± 1.1	22.9 ± 2.0
D-30	21.8 ± 0.3	19.0 ± 1.1	24.8 ± 1.1	18.3 ± 1.4
D-31	22.7 ± 0.5	23.3 ± 1.4	24.0 ± 1.3	23.1 ± 1.6
D-32	22.0 ± 0.3	21.2 ± 1.2	25.2 ± 0.7	21.5 ± 0.7
D-82	16.4 ± 0.3	17.8 ± 1.1	18.6 ± 0.9	17.5 ± 1.0
D-83	17.1 ± 0.4	16.6 ± 0.7	19.9 ± 0.8	15.9 ± 0.8
D-84	18.3 ± 0.3	17.4 ± 1.0	20.5 ± 1.2	16.7 ± 0.9
D-85	16.9 ± 0.3	17.1 ± 1.0	19.6 ± 0.9	17.7 ± 1.4
D-86	18.6 ± 0.5	16.9 ± 0.7	22.9 ± 1.7	16.5 ± 1.0
D-91	18.6 ± 0.5	17.5 ± 0.9	19.3 ± 1.0	17.3 ± 0.9
Mean ± s.d.	18.4 ± 2.1	18.7 ± 2.2	20.4 ± 2.8	18.4 ± 2.5

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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	16.1 ± 0.2	15.7 ± 0.8	18.3 ± 0.8	16.4 ± 1.2
D-44	20.5 ± 0.2	20.2 ± 0.7	22.4 ± 0.9	21.6 ± 0.8
D-45	15.6 ± 0.3	14.6 ± 1.2	18.1 ± 1.0	13.9 ± 1.1
D-46	21.1 ± 0.3	21.8 ± 1.1	25.4 ± 1.9	21.5 ± 1.1
D-47	20.1 ± 0.3	21.2 ± 0.9	22.9 ± 0.9	22.4 ± 1.2
D-48	21.1 ± 0.3	23.6 ± 1.2	25.1 ± 0.7	23.6 ± 1.4
Mean ± s.d.	19.1 ± 2.5	19.5 ± 3.6	22.0 ± 3.2	19.9 ± 3.8
<u>Within 3.0 mi. of Stack</u>				
D-33	14.3 ± 0.3	15.3 ± 0.6	16.3 ± 0.9	15.4 ± 0.7
D-34	14.6 ± 0.3	14.2 ± 0.9	17.3 ± 0.9	13.9 ± 0.9
D-35	14.8 ± 0.5	15.3 ± 0.6	17.0 ± 0.8	15.7 ± 0.7
D-36	16.2 ± 0.3	18.2 ± 0.7	17.5 ± 0.7	17.0 ± 0.9
D-37	19.1 ± 0.3	21.1 ± 1.6	22.8 ± 1.6	20.6 ± 2.4
D-38	16.4 ± 0.3	19.2 ± 1.1	18.6 ± 1.3	19.1 ± 1.0
D-39	17.5 ± 0.3	18.0 ± 0.8	19.0 ± 1.2	17.9 ± 0.9
D-40	ND ^a	14.7 ± 0.9	16.6 ± 1.1	15.0 ± 0.9
D-41	16.1 ± 0.3	14.1 ± 0.8	18.6 ± 1.0	14.2 ± 1.4
D-42	16.2 ± 0.3	14.0 ± 0.9	16.3 ± 0.7	14.3 ± 1.6
Mean ± s.d.	16.1 ± 1.5	16.4 ± 2.5	18.0 ± 2.0	16.3 ± 2.3

^a ND = No data; both 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-96					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-08-02	DMI -184	< 1.0	1288 ± 111	< 15	< 18	< 60	< 15
02-05-02	DMI 649,50	< 1.0	1265 ± 106	< 15	< 18	< 60	< 15
03-12-02	DMI -1519	< 1.0	1267 ± 154	< 15	< 18	< 60	< 15
04-02-02	DMI -1921	< 1.0	1148 ± 112	< 15	< 18	< 60	< 15
05-07-02	DMI -2992	< 1.0	1374 ± 141	< 15	< 18	< 60	< 15
05-21-02	DMI -3286	< 1.0	1238 ± 100	< 15	< 18	< 60	< 15
06-04-02	DMI -3555	< 1.0	1284 ± 203	< 15	< 18	< 60	< 15
06-18-02	DMI -3959	< 1.0	1562 ± 152	< 15	< 18	< 60	< 15
07-02-02	DMI -4358	< 1.0	1653 ± 184	< 15	< 18	< 60	< 15
07-16-02	DMI -4688	< 1.0	1381 ± 167	< 15	< 18	< 60	< 15
07-30-02	DMI -5038	< 1.0	1394 ± 187	< 15	< 18	< 60	< 15
08-13-02	DMI -5329	< 1.0	1266 ± 108	< 15	< 18	< 60	< 15
08-27-02	DMI -5576	< 1.0	1361 ± 170	< 15	< 18	< 60	< 15
09-10-02	DMI -5843	< 1.0	1299 ± 169	< 15	< 18	< 60	< 15
09-24-02	DMI -6221	< 1.0	1259 ± 164	< 15	< 18	< 60	< 15
10-08-02	DMI -6602	< 1.0	1253 ± 209	< 15	< 18	< 60	< 15
11-05-02	DMI -7521	< 1.0	1297 ± 179	< 15	< 18	< 60	< 15
12-03-02	DMI -8062	< 1.0	1374 ± 184	< 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
01-08-02	NSa	-	-	-	-	-	-
02-05-02	NSa	-	-	-	-	-	-
03-12-02	NSa	-	-	-	-	-	-
04-02-02	DMI -1922	< 1.0	1211 ± 154	< 15	< 18	< 60	< 15
05-07-02	DMI -2993	< 1.0	1559 ± 121	< 15	< 18	< 60	< 15
05-21-02	DMI -3287	< 1.0	1475 ± 165	< 15	< 18	< 60	< 15
06-04-02	DMI -3556	< 1.0	1567 ± 172	< 15	< 18	< 60	< 15
06-18-02	DMI -3960	< 1.0	1260 ± 163	< 15	< 18	< 60	< 15
07-02-02	DMI 4359,0	< 1.0	1479 ± 129	< 15	< 18	< 60	< 15
07-16-02	NSa	-	-	-	-	-	-
07-30-02	DMI -5039	< 1.0	1532 ± 173	< 15	< 18	< 60	< 15
08-13-02	DMI -5330	< 1.0	1536 ± 159	< 15	< 18	< 60	< 15
08-27-02	DMI -5577	< 1.0	1466 ± 159	< 15	< 18	< 60	< 15
09-10-02	DMI -5844	< 1.0	1739 ± 185	< 15	< 18	< 60	< 15
09-24-02	DMI -6222	< 1.0	1589 ± 189	< 15	< 18	< 60	< 15
10-08-02	DMI -6603	< 1.0	1762 ± 193	< 15	< 18	< 60	< 15
11-05-02	DMI -7522	< 1.0	1707 ± 138	< 15	< 18	< 60	< 15
12-03-02	DMI -8063	< 1.0	1481 ± 184	< 15	< 18	< 60	< 15

^a NS= No sample; sample not available. See Table 2.0, "Listing of Missed Samples."

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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-108					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-08-02	DMI -185	< 1.0	1287 ± 114	< 15	< 18	< 60	< 15
02-05-02	DMI -651	< 1.0	1454 ± 125	< 15	< 18	< 60	< 15
03-12-02	DMI -1520	< 1.0	1320 ± 157	< 15	< 18	< 60	< 15
04-02-02	DMI -1923	< 1.0	1319 ± 124	< 15	< 18	< 60	< 15
05-07-02	DMI -2994	< 1.0	1269 ± 114	< 15	< 18	< 60	< 15
05-21-02	DMI -3288	< 1.0	1271 ± 118	< 15	< 18	< 60	< 15
06-04-02	DMI -3557	< 1.0	1300 ± 108	< 15	< 18	< 60	< 15
06-18-02	DMI -3961	< 1.0	1430 ± 168	< 15	< 18	< 60	< 15
07-02-02	DMI -4361	< 1.0	1399 ± 174	< 15	< 18	< 60	< 15
07-16-02	DMI -4689	< 1.0	1262 ± 148	< 15	< 18	< 60	< 15
07-30-02	DMI -5040	< 1.0	1351 ± 163	< 15	< 18	< 60	< 15
08-13-02	DMI -5331	< 1.0	1279 ± 149	< 15	< 18	< 60	< 15
08-27-02	DMI 5578,9	< 1.0	1342 ± 98	< 15	< 18	< 60	< 15
09-12-02	DMI -5845	< 1.0	1047 ± 203	< 15	< 18	< 60	< 15
09-24-02	DMI -6223	< 1.0	1400 ± 160	< 15	< 18	< 60	< 15
10-08-02	DMI -6604	< 1.0	1303 ± 176	< 15	< 18	< 60	< 15
11-05-02	DMI -7523	< 1.0	1426 ± 188	< 15	< 18	< 60	< 15
12-03-02	DMI -8064	< 1.0	1456 ± 137	< 15	< 18	< 60	< 15

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

Collection: Quarterly

Units: pCi/L

Location D-53 Treated Municipal Water				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1691	DWW-3513	DWW-6113	DWW-8385
Gross Beta	2.1 ± 0.5	2.3 ± 0.6	2.7 ± 0.6	3.2 ± 0.6
H-3	< 132	< 136	< 144	< 158
Location D-54 Inlet to Municipal Water				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1692	DWW-3514	DWW-6114	DWW-8386
Gross Beta	2.8 ± 0.6	2.9 ± 0.7	3.2 ± 0.6	3.4 ± 0.6
H-3	< 132	< 136	< 144	< 158
Location D-55 On-site Well				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1693	DWW-3515	DWW-6115	DWW-8387
Gross Beta	< 0.9	< 1.1	< 1.6 ^a	< 0.8
H-3	< 132	< 136	< 144	< 158
Location D-57 Bull Farm				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1694,5	DWW-3516	DWW-6116	DWW-8388
Gross Beta	1.7 ± 0.4	1.0 ± 0.5	1.0 ± 0.6	1.0 ± 0.5
H-3	< 132	< 136	< 144	< 158
Location D-58 Franz Farm				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1696	DWW-3517	DWW-6117	DWW-8389
Gross Beta	4.9 ± 0.6	5.7 ± 0.8	5.9 ± 0.8	4.5 ± 0.6
H-3	< 132	< 136	< 144	< 158
Location D-72 Van Note Farm				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DWW-1697	DWW-3518	DWW-6118	DWW-8390
Gross Beta	< 0.8	< 1.0	< 1.5 ^a	< 0.9
H-3	< 132	< 136	< 144	< 158

^a Samples counted longer to achieve lower LLD.

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

Collection: Annually

Units: pCi/g wet

Location	D-16	D-57	D-58
Lab Code	DVE-4097	DVE-4098	DVE-4099
Date Collected	6/19/2002	6/20/2002	6/19/2002
Sample Type	Green Leafy	Green Leafy	Green Leafy
K-40	5.25 ± 0.40	5.57 ± 0.52	3.22 ± 0.24
Mn-54	< 0.015	< 0.029	< 0.010
Co-58	< 0.011	< 0.018	< 0.007
Co-60	< 0.019	< 0.026	< 0.012
Nb-95	< 0.014	< 0.028	< 0.005
Zr-95	< 0.026	< 0.034	< 0.020
Ru-103	< 0.010	< 0.017	< 0.007
Ru-106	< 0.14	< 0.17	< 0.085
I-131	< 0.022	< 0.033	< 0.010
Cs-134	< 0.012	< 0.030	< 0.010
Cs-137	< 0.012	< 0.024	< 0.008
Ce-141	< 0.018	< 0.047	< 0.015
Ce-144	< 0.081	< 0.099	< 0.044

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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-57	D-58	D-58
Lab Code	DVE-6918	DVE-6914	DVE-6919		DVE-6920
Date Collected	10/10/2002	10/14/2002	10/14/2002	10/14/2002	10/14/2002
Sample Type	Beans	Hay	Crop	Hay	Crop
K-40	10.52 ± 0.99	19.86 ± 1.32	2.43 ± 0.48	ND ^a	2.75 ± 0.40
Mn-54	< 0.026	< 0.032	< 0.011	-	< 0.011
Co-58	< 0.025	< 0.040	< 0.016	-	< 0.012
Co-60	< 0.043	< 0.047	< 0.011	-	< 0.013
Nb-95	< 0.032	< 0.056	< 0.019	-	< 0.012
Zr-95	< 0.039	< 0.055	< 0.024	-	< 0.034
Ru-103	< 0.049	< 0.051	< 0.016	-	< 0.015
Ru-106	< 0.17	< 0.38	< 0.10	-	< 0.11
Cs-134	< 0.030	< 0.018	< 0.013	-	< 0.014
Cs-137	< 0.017	< 0.058	< 0.011	-	< 0.010
Ce-141	< 0.076	< 0.081	< 0.018	-	< 0.013
Ce-144	< 0.29	< 0.35	< 0.072	-	< 0.063

Location	D-72	D-72	D-94	D-96	D-96
Lab Code	DVE-6915	DVE-6921		DVE-6916	DVE-6922
Date Collected	10/14/2002	10/14/2002	10/14/2002	10/14/2002	10/14/2002
Sample Type	Hay	Crop	Hay/Crop	Hay	Crop
K-40	18.80 ± 1.22	2.59 ± 0.29	ND ^a	15.75 ± 1.41	2.20 ± 0.46
Mn-54	< 0.044	< 0.005	-	< 0.063	< 0.017
Co-58	< 0.042	< 0.005	-	< 0.033	< 0.018
Co-60	< 0.053	< 0.010	-	< 0.047	< 0.013
Nb-95	< 0.025	< 0.007	-	< 0.044	< 0.009
Zr-95	< 0.056	< 0.015	-	< 0.10	< 0.023
Ru-103	< 0.037	< 0.007	-	< 0.055	< 0.017
Ru-106	< 0.40	< 0.062	-	< 0.35	< 0.11
Cs-134	< 0.044	< 0.005	-	< 0.043	< 0.013
Cs-137	< 0.045	< 0.005	-	< 0.052	< 0.011
Ce-141	< 0.056	< 0.008	-	< 0.084	< 0.021
Ce-144	< 0.26	< 0.052	-	< 0.22	< 0.075

^a ND = No data; sample(s) not available; not grown on site.

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

Collection: Annually

Units: pCi/g wet

Location	D-108	D-108
Lab Code	DVE-6917	DVE-6923
Date Collected	10/14/2002	10/14/2002
Sample Type	Hay	Crop
K-40	15.84 ± 1.24	2.46 ± 0.34
Mn-54	< 0.041	< 0.008
Co-58	< 0.049	< 0.009
Co-60	< 0.047	< 0.015
Nb-95	< 0.043	< 0.008
Zr-95	< 0.070	< 0.012
Ru-103	< 0.035	< 0.009
Ru-106	< 0.40	< 0.082
Cs-134	< 0.046	< 0.011
Cs-137	< 0.046	< 0.008
Ce-141	< 0.077	< 0.016
Ce-144	< 0.25	< 0.079

DUANE ARNOLD

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

Collection Monthly

Units: pCi/L

Location: D-49

Date Collected	01-08-02	02-12-02	03-13-02	04-12-02	05-10-02	05-31-02
Lab Code	DSW-187	DSW-892	DSW-1699	DSW-2223,4	DSW-3079	DSW-3507
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	07-12-02	08-09-02	09-13-02	10-11-02	11-08-02	12-13-02
Lab Code	DSW-4626	DSW-5245	DSW-6108	DSW-6954	DSW-7671	DSW-8379
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-50

Date Collected	01-08-02	02-12-02	03-13-02	04-12-02	05-10-02	05-31-02
Lab Code	DSW-188	DSW-893	DSW-1700	DSW-2225	DSW-3080	DSW-3508
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	07-12-02	08-09-02	09-13-02	10-11-02	11-08-02	12-13-02
Lab Code	DSW-4627	DSW-5246	DSW-6109	DSW-6955	DSW-7672	DSW-8380
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	01-08-02	02-12-02	03-13-02	04-12-02	05-10-02	05-31-02
Lab Code	DSW-189	DSW-894	DSW-1701	DSW-2226	DSW-3081	DSW-3509
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	07-12-02	08-09-02	09-13-02	10-11-02	11-08-02	12-13-02
Lab Code	DSW-4628	DSW-5247	DSW-6110	DSW-6956	DSW-7673	DSW-8381
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	01-08-02	02-12-02	03-13-02	04-12-02	05-10-02	05-31-02
Lab Code	DSW-190	DSW-895	DSW-1702	DSW-2227	DSW-3082,3	DSW-3510
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	07-12-02	08-09-02	09-13-02	10-11-02	11-08-02	12-13-02
Lab Code	DSW-4629	DSW-5248	DSW-6111	DSW-6957	DSW-7674,5	DSW-8382
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 20. Surface water, analyses for potassium-40 by flame photometry and gamma-emitting isotopes.

Collection: Monthly

Units: pCi/L

Location: D-107

Date Collected	01-08-02	02-12-02	03-18-02	04-12-02	05-10-02	05-31-02
Lab Code	DSW-191	DSW-896	DSW-1703	DSW-2228	DSW-3084	DSW-3511
K-40 (fp)	10.3	20.2	23.9	22.4	26.3	22.3
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	07-12-02	08-09-02	09-13-02	10-11-02	11-08-02	12-13-02
Lab Code	DSW-4630	DSW-5249	DSW-6112	DSW-6958	DSW-7676	DSW-8383
K-40 (fp)	15.7	18.5	21.0	20.5	27.2	31.3
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-2373	DSW-3519	DSW-6120	DSW-8728
H-3	< 135	< 165	< 135	< 164

Location D-50				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-2374,5	DSW-3520	DSW-6121	DSW-8729
H-3	< 135	< 165	< 135	< 166

Location D-51				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-2376	DSW-3521	DSW-6122	DSW-8730
H-3	< 135	< 165	< 135	< 166

Location D-99				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-2377	DSW-3522	DSW-6123	DSW-8731
H-3	< 135	< 165	< 135	< 166

Location D-107				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-2378	DSW-3523	DSW-6124	DSW-8732
H-3	< 135	< 165	< 135	< 166

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-3705	DF-3706	DF-6376	DF-6377	
Date Collected	5/31/2002	5/31/2002	9/12/2002	9/12/2002	
Sample Type	Carp sucker	Carp	Carp	Carp sucker	
K-40	3.21 ± 0.51	2.93 ± 0.34	3.10 ± 0.29	2.89 ± 0.38	
Mn-54	< 0.017	< 0.010	< 0.010	< 0.011	
Fe-59	< 0.071	< 0.035	< 0.029	< 0.026	
Co-58	< 0.017	< 0.015	< 0.010	< 0.009	
Co-60	< 0.019	< 0.012	< 0.007	< 0.011	
Zn-65	< 0.029	< 0.029	< 0.023	< 0.031	
Nb-95	< 0.020	< 0.016	< 0.010	< 0.012	
Zr-95	< 0.033	< 0.035	< 0.026	< 0.020	
Ru-103	< 0.027	< 0.020	< 0.010	< 0.018	
Ru-106	< 0.127	< 0.076	< 0.075	< 0.089	
Cs-134	< 0.021	< 0.013	< 0.008	< 0.012	
Cs-137	< 0.013	< 0.009	< 0.011	< 0.015	
Ce-141	< 0.022	< 0.026	< 0.020	< 0.034	
Ce-144	< 0.092	< 0.083	< 0.067	< 0.062	

Location		Downstream, D-61			
Lab Code	DF-3707	DF-3708	DF-6378	DF-6379	
Date Collected	5/31/2002	5/31/2002	9/12/2002	9/12/2002	
Sample Type	Carp sucker	Carp	Carp	Carp sucker	
K-40	3.24 ± 0.48	3.38 ± 0.45	3.20 ± 0.42	2.83 ± 0.39	
Mn-54	< 0.022	< 0.011	< 0.015	< 0.017	
Fe-59	< 0.091	< 0.045	< 0.029	< 0.023	
Co-58	< 0.017	< 0.023	< 0.011	< 0.011	
Co-60	< 0.010	< 0.012	< 0.018	< 0.012	
Zn-65	< 0.033	< 0.043	< 0.022	< 0.019	
Nb-95	< 0.039	< 0.031	< 0.010	< 0.025	
Zr-95	< 0.051	< 0.046	< 0.042	< 0.048	
Ru-103	< 0.030	< 0.027	< 0.018	< 0.013	
Ru-106	< 0.109	< 0.146	< 0.083	< 0.167	
Cs-134	< 0.012	< 0.014	< 0.015	< 0.017	
Cs-137	< 0.009	< 0.011	< 0.009	< 0.013	
Ce-141	< 0.030	< 0.057	< 0.025	< 0.033	
Ce-144	< 0.079	< 0.098	< 0.044	< 0.130	

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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-3352	DBS-6224
Date Collected		5/22/2002	9/20/2002
K-40		7.67 ± 0.53	8.18 ± 0.65
Mn-54		< 0.008	< 0.018
Fe-59		< 0.036	< 0.051
Co-58		< 0.016	< 0.021
Co-60		< 0.012	< 0.009
Zn-65		< 0.045	< 0.044
Nb-95		< 0.016	< 0.015
Zr-95		< 0.021	< 0.020
Ru-103		< 0.021	< 0.014
Ru-106		< 0.138	< 0.126
Cs-134		< 0.025	< 0.029
Cs-137		< 0.019	< 0.019
Ce-141		< 0.029	< 0.020
Ce-144		< 0.068	< 0.068

Location		D-51	
Lab Code		DBS-3353	DBS-6225
Date Collected		5/22/2002	9/20/2002
K-40		7.64 ± 0.65	6.59 ± 0.39
Mn-54		< 0.017	< 0.011
Fe-59		< 0.055	< 0.024
Co-58		< 0.025	< 0.012
Co-60		< 0.023	< 0.009
Zn-65		< 0.048	< 0.028
Nb-95		< 0.015	< 0.015
Zr-95		< 0.041	< 0.018
Ru-103		< 0.019	< 0.013
Ru-106		< 0.181	< 0.094
Cs-134		< 0.028	< 0.016
Cs-137		< 0.020	< 0.012
Ce-141		< 0.040	< 0.030
Ce-144		< 0.089	< 0.079

DUANE ARNOLD

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

Collection: Semiannually

Units: pCi/g dry

Location		D-107	
Lab Code	DBS-3354	DBS-6226	
Date Collected	5/22/2002	9/20/2002	
K-40	5.74 ± 0.69	9.31 ± 0.63	
Mn-54	< 0.022	< 0.022	
Fe-59	< 0.027	< 0.034	
Co-58	< 0.026	< 0.012	
Co-60	0.046 ± 0.024	< 0.028	
Zn-65	< 0.041	< 0.056	
Nb-95	< 0.018	< 0.038	
Zr-95	< 0.054	< 0.021	
Ru-103	< 0.024	< 0.022	
Ru-106	< 0.139	< 0.144	
Cs-134	< 0.030	< 0.027	
Cs-137	< 0.028	< 0.022	
Ce-141	< 0.046	< 0.037	
Ce-144	< 0.122	< 0.120	

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Table 24. Precipitation, analyses for gamma emitting isotopes.

Collection:	Monthly					
Units:	pCi/L					
Location:	DAEC					
Date Collected	01-08-02	02-12-02	03-13-02	04-12-02	05-10-02	05-31-02
Lab Code	DP-186	DP-897	DP-1698	DP-2229	DP-3085	DP-3512
Mn-54	< 2.9	< 3.2	< 5.4	< 2.6	< 1.7	< 3.5
Fe-59	< 6.3	< 5.7	< 9.1	< 5.3	< 3.7	< 4.1
Co-58	< 2.5	< 3.2	< 4.0	< 2.7	< 2.0	< 3.5
Co-60	< 3.2	< 3.4	< 4.9	< 2.1	< 2.6	< 2.0
Zn-65	< 5.4	< 6.0	< 8.1	< 5.3	< 4.2	< 5.8
Nb-95	< 2.2	< 4.3	< 7.4	< 4.1	< 3.2	< 3.4
Zr-95	< 6.2	< 3.9	< 9.0	< 4.5	< 3.1	< 5.1
I-131	< 6.3	< 5.0	< 29.2	< 12.0	< 5.5	< 6.1
Cs-134	< 2.6	< 3.0	< 5.6	< 3.3	< 2.6	< 3.4
Cs-137	< 2.9	< 3.1	< 4.1	< 2.7	< 2.3	< 2.7
Ba-140	< 16.0	< 10.9	< 39.6	< 24.8	< 16.3	< 15.4
La-140	< 3.1	< 2.9	< 7.1	< 4.0	< 3.6	< 3.6
Date Collected	07-12-02	08-09-02	09-13-02	10-11-02	11-08-02	12-13-02
Lab Code	DP-4631	DP-5250	DP-6119	DP-6959,60	DP-7677	DP-8384
Mn-54	< 3.3	< 3.0	< 5.1	< 5.8	< 7.4	< 4.2
Fe-59	< 7.5	< 8.0	< 10.4	< 14.5	< 4.4	< 11.4
Co-58	< 2.8	< 3.1	< 4.8	< 5.1	< 6.3	< 6.5
Co-60	< 4.0	< 1.8	< 3.2	< 3.9	< 6.0	< 6.3
Zn-65	< 2.4	< 4.5	< 4.6	< 7.8	< 20.4	< 9.6
Nb-95	< 3.9	< 3.5	< 4.1	< 3.0	< 7.9	< 4.8
Zr-95	< 5.7	< 5.1	< 7.5	< 14.0	< 17.6	< 10.4
I-131	< 13.6	< 7.7	< 8.7	< 22.6	< 8.5	< 11.0
Cs-134	< 3.7	< 3.5	< 5.1	< 8.1	< 6.5	< 7.6
Cs-137	< 3.6	< 3.2	< 6.1	< 6.2	< 7.7	< 4.0
Ba-140	< 28.3	< 14.2	< 26.6	< 40.9	< 31.7	< 20.1
La-140	< 12.6	< 1.8	< 4.4	< 8.1	< 4.3	< 5.3

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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-2379	DP-3524,5	DP-6125	DP-8727
H-3		< 135	< 165	< 135	< 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 2002. 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-7600	DSO-7601
Date Collected	11/6/2002	11/6/2002
<hr/>		
Sr-90	0.049 ± 0.016	0.039 ± 0.019
K-40	14.64 ± 0.64	8.48 ± 0.42
Mn-54	< 0.016	< 0.008
Fe-59	< 0.033	< 0.018
Co-58	< 0.017	< 0.011
Co-60	< 0.006	< 0.012
Zn-65	< 0.039	< 0.028
Nb-95	< 0.013	< 0.008
Zr-95	< 0.031	< 0.019
Ru-103	< 0.010	< 0.008
Ru-106	< 0.14	< 0.082
Cs-134	< 0.015	< 0.008
Cs-137	0.20 ± 0.022	0.16 ± 0.021
Ce-141	< 0.039	< 0.025
Ce-144	< 0.075	< 0.041
