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Duane Arnold Energy Center
2013 Annual Radiological Environmental Operating Report

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REPORT

to the

UNITED STATES
NUCLEAR REGULATORY COMMISSION

Annual Radiological Environmental Operating Report

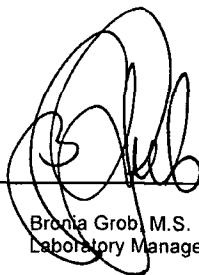
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PREFACE

Staff members of the Environmental, Inc., Midwest Laboratory were responsible for the acquisition of data presented in this report, with the exception of Appendices D and E which were completed by DAEC personnel. All environmental samples, with the exception of aquatic, were collected by personnel of DAEC. Aquatic samples were collected by the University of Iowa 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 (REMP) conducted by Environmental, Inc., Midwest Laboratory at the Duane Arnold Energy Center, Palo, Iowa, during the period January - December, 2013. 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.

The REMP fulfills the requirements of Sections IV.B.2 and IV.B.3 of Appendix I to 10 CFR 50 for the operation of the plant. The REMP also fulfills the requirements of 10 CFR 72.44(d)(2) for operation of the ISFSI.

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

The Duane Arnold Energy Center (DAEC) is a boiling water reactor, located in Linn County, Iowa, on the Cedar River, and owned and operated by NextEra Energy Resources. 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 2013 are summarized and discussed.

Program findings show only background levels of radioactivity in the environmental samples collected in the vicinity of the Duane Arnold Energy Center.

No effect on the environment is indicated in the areas surrounding the site of the Duane Arnold Energy Center.

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 provide a comparison between levels of naturally occurring radionuclides and radionuclides that could be attributed to the operation of the plant.

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

3.2.1 Environmental Monitoring

The sampling and analysis schedule for the Radiological Environmental Monitoring Program (REMP) 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 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 nine locations. Airborne iodine is collected by continuous pumping through charcoal filters. Eight of the nine locations are indicators and one is a control (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 filter samples are analyzed weekly for iodine-131.

Ambient gamma radiation is monitored at a total of 50 locations. A TLD is placed at each location and exchanged and analyzed quarterly. The TLD locations are distributed as follows:

- Two on-site locations
- Eighteen in a circle within a 0.5 mi. radius from the DAEC stack.
- Six in 22.5° sectors within 1 mi. from the DAEC stack.
- Ten in 22.5° sectors between 1 and 3 miles from the DAEC stack.
- Ten control locations greater than 3 miles from the DAEC stack.
- Four along sections of the Independent Spent Fuel Storage Installation (ISFSI) fence line.

Surface water is collected monthly from four river locations, D-49 (Lewis Access, Control, 4 mi. upstream), D-50 (Inlet), D-51 (Discharge) and D-61 (downstream of Discharge) and also from Pleasant Creek Lake (D-99). The monthly samples are analyzed for tritium and gamma-emitting isotopes. Additional analyses are performed on samples collected from the control and indicator locations, D-49 and D-61. Analyses for low-level iodine-131 are performed on monthly collections and quarterly composites are prepared and analyzed for strontium-89 and strontium-90.

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

Potable ground water is collected quarterly from a treated municipal water system (D-53), the inlet to the municipal water treatment system (D-54), three indicator locations (D-55, D-57, D-58) and one control location (D-72). The samples are analyzed for tritium and gamma emitting isotopes. Any positive identification of a reactor by-product material initiates analyses for hard to detect isotopes of Ni-63, Sr-89, Sr-90, Fe-55 and gross alpha.

Milk is collected monthly from one indicator and one control location during the non-grazing season, October through April, and biweekly during the grazing season, May 1 through September 30. The samples are analyzed for iodine-131 and gamma-emitting isotopes.

For additional monitoring of the terrestrial environment, grain, hay and broad leaf vegetation samples are collected annually, as available, from nine locations: one control (D-138) and eight indicators (D-16, D-57, D-58, D-72, D-96, D-109 and D-118). Grain, hay and broad leaf (green leafy) vegetation samples are analyzed for gamma-emitting isotopes and at least two broad leaf vegetation samples are analyzed for iodine-131.

If cattle are slaughtered for home use, a meat sample is collected annually, during or immediately following a period from animals grazing on-site. The sample is analyzed for gamma-emitting isotopes.

3.2.2 Ground Water Protection Program

Environmental, Inc., Midwest Laboratory provides laboratory services for the Duane Arnold Energy Center Ground Water Protection Program. For results from these analyses, refer to the Duane Arnold Energy Center, 2013 Annual Radioactive Material Release Report.

3.3 Program Execution

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

(1) Airborne Particulates / Airborne Iodine:

A partial air particulate / air iodine sample (50 m³) was collected at location D-3, for the week ending 06/28/13. No power was available to the sampling station from 06/22/13 to 06/28/13.

Air particulate / air iodine samples were not available at location D-3, for the week ending 10/31/13. There was no power to the sampler.

Air particulate / air iodine samples were not available at location D-3, for the week ending 12/26/13, due to sampler pump failure.

A partial air particulate / air iodine sample (112 m³) was collected at location D-11, for the week ending 05/23/13. The circuit breaker was tripped due to storms in the area.

A partial air particulate / air iodine sample (178 m³) was collected at location D-11, for the week ending 10/17/13. A faulty timer was suspected.

A partial air particulate / air iodine sample (181 m³) was collected at location D-13, for the week ending 10/03/13, due to a power outage.

Air particulate / air iodine samples were not available at location D-15, for the week ending 05/30/13. The circuit breaker was tripped due to storms in the area.

A partial air particulate / air iodine sample (42 m³) was collected at location D-15, for the week ending 09/05/13, due to a tripped circuit breaker.

A partial air particulate / air iodine sample (154 m³) was collected at location D-15, for the week ending 10/17/13, due to a power outage.

A partial air particulate / air iodine sample (84 m³) was collected at location D-15, for the week ending 10/31/13, due to a power outage.

(2) Thermoluminescent Dosimetry

The third quarter, 2013 TLDs for locations D-1, D-41 and D-82 were missing in the field. The TLDs were replaced.

The fourth quarter, 2013 TLD at location D-17 was missing in the field. The TLD was replaced.

(3) Vegetation

No vegetation samples were available from locations D-57, D-72 and D-96 for 2013.

3.4 Laboratory Procedures

The Iodine-131 analyses in milk and water were made using a sensitive radiochemical procedure involving separation of iodine using an ion-exchange method, solvent extraction and subsequent beta counting. Levels of iodine-131 in vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. The gamma isotopic analysis provides a spectrum with an energy range from 80 to 2048 KeV. Specific isotopes included in the gamma library are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. Naturally occurring gamma-emitters, such as Be-7, K-40 and Ra daughters, are frequently detected but may not be listed.

Tritium was measured 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, 2013). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in crosscheck programs are presented in Appendix A.

3.5 Program Modifications

An analysis for gamma emitting isotopes replaced the gross beta requirement for potable groundwater in 2013. Additional analyses for hard to detect isotopes are conditional, based on the tritium and/or gamma activity.

4.0 RESULTS AND DISCUSSION

All collections and analyses were made as scheduled, except for those listed 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.

Tabulated results of measurements are not included in this section, although reference to these results will be made in discussion. A complete tabulation of results for 2013 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 accidents involving significant release to the environment at nuclear reactor facilities in 2013. The Fukushima Daiichi nuclear accident occurred March 11, 2011.

There were no reported atmospheric nuclear tests in 2013. The last reported test was conducted on October 16, 1980 by the People's Republic of China.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected outside of the Owner Controlled Area in 2013. The trace levels of strontium-90 and cesium-137, still measurable in soil and sediments are attributed to deposition of fallout from previous decades.

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were almost identical at indicator and control locations (0.030 and 0.029 pCi/m³, respectively) and similar to levels observed from 1995 through 2012. 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)		
1998	0.024	0.024		2006	0.029	0.027
1999	0.026	0.027		2007	0.031	0.031
2000	0.026	0.027		2008	0.029	0.029
2001	0.026	0.026		2009	0.031	0.030
2002	0.027	0.027		2010	0.028	0.028
2003	0.029	0.029		2011	0.030	0.029
2004	0.028	0.028		2012	0.030	0.029
2005	0.031	0.031		2013	0.028	0.025

Average annual gross beta concentrations in airborne particulates.

4.2 Program Findings, Airborne Particulates (continued)

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955), was detected in all samples, with an average activity of 0.067 pCi/m³ for all locations. No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

Airborne Iodine

Levels of airborne iodine-131 measured below the required limit of 0.030 pCi/m³ for all samples.

Ambient Radiation (TLDs)

At ten control locations, thermoluminescent dosimeter (TLD) readings averaged 15.9 mR/quarter. At locations within a half mile, one mile and three mile radius of the stack, the measurements averaged 17.7, 18.6 and 16.4 mR/quarter, respectively. The two on-site locations D-15 and D-16 averaged 17.2 mR/quarter. The average for these locations was 17.1 mR/quarter. This is similar to 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.

ISFSI Facility Operations Monitoring

Four TLDs, placed directionally along the ISFSI fenceline, averaged 34.2 mR/quarter, a slight increase as compared to offsite dose rates around the plant. The TLD site D-30, located between the nearest residence and the ISFSI site averaged 18.4 mR/qtr. Calculated dose rates indicate the site is in compliance with 10 CFR 72.104 and 40 CFR 190.

Milk

There was no iodine-131 activity detected in milk samples. Iodine-131 measured below a detection limit of 0.5 pCi/L.

No gamma-emitting isotopes, excepting naturally occurring potassium-40, were detected in any milk samples. This is consistent with findings 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).

No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

Ground Water (potable)

The gross beta requirement was replaced with a gamma isotopic analysis in March, 2013. The first quarter samples averaged 2.0 pCi/L, similar to levels observed from 1991 through 2012. The location with the highest mean was D-58, a farm 1.0 mile distant from the plant.

No measurable tritium activity was detected above an LLD of 158 pCi/L. Gamma-emitting isotopes were below detection limits.

No reactor by-product radionuclides could be identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

4.2 Program Findings (continued)

Vegetation

Iodine-131 concentrations in broadleaf vegetation were below the LLD level of 0.030 pCi/g wet weight in all samples.

With the exception of potassium-40, which was observed in all vegetation samples (broadleaf, grain, and forage), all other gamma-emitting isotopes were below detection limits. No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

Surface Water

Surface water was tested for tritium and gamma emitting isotopes in sixty samples from five locations. No measurable tritium activity was detected above an LLD of 197 pCi/L. Gamma-emitting isotopes were below detection limits.

Analyses for I-131 were performed on samples from locations D-49 (control) and D-61 (0.5 mi. downstream, indicator). No iodine-131 activity was detected above LLD in 2013.

Quarterly composites were also prepared from the samples collected at locations D-49 and D-61 and tested for strontium-89 and strontium-90. All samples tested below detection limits.

No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

Fish

Fish were collected in June and September, 2013, and analyzed for gamma-emitting isotopes. With the exception of naturally-occurring potassium-40, no gamma-emitting isotopes were identified in edible portions of fish. The potassium-40 level was similar at both the indicator and control locations (3.19 and 3.39 pCi/g wet, respectively).

No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

River Sediments

River sediments were collected in June and October, 2013, and analyzed for gamma-emitting isotopes. Potassium-40 activity ranged from 4.80–8.51 pCi/g dry weight and averaged 6.97 pCi/g dry weight.

Trace Co-60 was measured in one June sample collected from location D-107a (on-site north drainage ditch) at a concentration of 0.027 pCi/g dry weight. The Co-60 is attributed to fallout of particulates present in gaseous effluent. No Cs-137 was detected at either the indicator or control locations in 2013. Low levels had been observed from 1991 through 2011, cesium-137 activity is generally attributable to deposition of fallout from previous decades.

No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the DAEC Offsite Dose Assessment Manual.

Ground Water Protection Program

Environmental, Inc., Midwest Laboratory provides laboratory services for the Duane Arnold Energy Center Ground Water Protection Program. For results from these analyses, refer to the Duane Arnold Energy Center, 2013 Annual Radioactive Material Release Report.

5.0 TABLES AND FIGURES

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

Designation	Comment	Isotope	Half-life ^a
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 accidents and 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.

Sampling Location ^a				
Exposure Pathway and/or Sample Type	Sample Point	Description	Sampling and Collection Frequency	Type and Frequency of Analysis ^b
Airborne Particulates	3 5 6 7 11 13 15 16 40	Hiawatha Palo Center Point Shellsburg Toddville Alburnett (C) On-site North On-site South Wickiup Hill	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 72 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.
Airborne Iodine	3 5 6 7 11 13 15 16 40	Hiawatha Palo Center Point Shellsburg Toddville Alburnett (C) On-site North On-site South Wickiup Hill	Continuous operation of sampler with sample collection at least once per week.	Analyze each cartridge for iodine-131.
Ambient Radiation	1-3, 5-8 10, 11, 13 15-23, 28-32, 33-42 43-48 82-86, 91 161-164	(Controls) (Indicators) Within 0.5 mile of Stack Within 3.0 miles of Stack Within 1.0 mile of Stack ISFSI Fence line	One dosimeter continuously at each location. Dosimeters are changed at least quarterly.	Read gamma radiation dose quarterly.
Surface Water	49 50 51 61 99	Lewis Access (C) Plant Intake Plant Discharge ~ ½ mi. downstream from Plant Discharge Pleasant Creek Lake	Once per month.	Gamma isotopic and tritium analysis for each sample (by location). Locations 49 and 61, analyses for low-level I-131. Quarterly composites for Sr-89, Sr-90.

Table 5:2 Sample collection and analysis program, (continued).

Sampling Location ^a				
Exposure Pathway and/or Sample Type	Sample Point	Description	Sampling and Collection Frequency	Type and Frequency of Analysis ^b
Ground Water	53 54 55 57, 58 72 (C)	Treated Municipal Water Water Inlet to Municipal Water Treatment System On-site well Wells off-site and within 4 km of DAEC	Grab sample at least once per quarter	Analysis for gamma emitting isotopes and tritium on quarterly samples. If reactor by-product gamma emitters are identified, or if tritium concentrations measure > MDA, then analyze for Ni-63, Sr-89, Sr-90 and alpha emitters.
River Sediment	50 51 107a	Plant Intake (C) Plant Discharge North Drainage Ditch (on-site)	At least once every six months.	Gamma isotopic analysis of each sample
Vegetation	16,57 58,72, 96,109 118 138 (C)	Farms raising food crops	Annually at harvest time. Two samples of each: grain, green leafy, and forage.	Gamma isotopic analysis, including iodine-131, on each sample.
Fish	49 61	Cedar River upstream of DAEC not influenced by effluent (C) Downstream of DAEC in influence of effluent	One sample per 6 months (once during January through July and once during August through December).	Gamma isotopic analysis on edible portions.
Milk ^c	138 (C) 110	Farm near Newhall, IA Dairy Farm within 7.8 miles from Site	At least once per two weeks during the grazing season. At least once per month during the non-grazing season.	<u>During the grazing season:</u> Gamma isotopic and iodine-131 analyses of each sample. <u>During the non-grazing season:</u> Gamma isotopic and iodine-131 analyses of each sample.
Meat ^d		On-site	Annually	Gamma Isotopic

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

^b Gamma isotopic analysis and analysis for gamma-emitting nuclides refer to high resolution gamma ray spectrum analysis.

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

^d Only sampled when meat is butchered for home use.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

Sampling Location		
Code	Location Description	Distance and Direction from Site Stack
D-1	Cedar Rapids	20,800 meters SE
D-2	Marion	16,900 meters ESE
D-3	Hiawatha	10,800 meters SE
D-5	Palo	4,500 meters SSW
D-6	Center Point	9,660 meters N
D-7	Shellsburg	7,950 meters W
D-8	Urbana	15,000 meters NNW
D-10	Atkins	13,600 meters SSW
D-11	Toddville	4,980 meters E
D-13	Alburnett	14,500 meters ENE
D-15	On-site, North-Northwest	1,050 meters NNW
D-16	On-site, South-Southeast	520 meters SSE
D-17	On-site, N	1,050 meters N
D-18	On-site, NNE	630 meters NNE
D-19	On-site, NE	590 meters NE
D-20	On-site, ENE	550 meters ENE
D-21	On-site, ENE	515 meters ENE
D-22	On-site, ESE	535 meters ESE
D-23	On-site, SE	490 meters SE
D-28	On-site, WSW	730 meters WSW
D-29	On-site, W	630 meters W
D-30	On-site, WNW	640 meters WNW
D-31	On-site, NW	1,020 meters NW
D-32	On-site, NNW	1,110 meters NNW
D-33	3 mile ring	4,340 meters N
D-34	3 mile ring	3,930 meters NNE
D-35	3 mile ring	2,800 meters NE
D-36	3 mile ring	3,500 meters ENE
D-37	3 mile ring	2,960 meters E
D-38	3 mile ring	3,180 meters ESE
D-39	3 mile ring	2,510 meters SE
D-40	3 mile ring	2,430 meters SSE
D-41	3 mile ring	5,680 meters S
D-42	3 mile ring	4,380 meters SSE
D-43	1 mile ring	1,590 meters SSW
D-44	1 mile ring	1,580 meters WSW
D-45	1 mile ring	1,420 meters W
D-46	1 mile ring	1,580 meters WNW
D-47	1 mile ring	1,760 meters NW
D-48	1 mile ring	1,680 meters NNW

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

Sampling Location		
Code	Location Description	Distance and Direction from Site Stack
D-49	Lewis Access, upstream of DAEC	6,750 meters NNW
D-50	Plant Intake	560 meters SE
D-51	Plant Discharge	600 meters SE
D-53	Treated Municipal Water	13,900 meters SE
D-54	Inlet, Municipal Water Treatment System	13,900 meters SE
D-55	Production Well	
D-57	Farm (Off-site Well)	805 meters W
D-58	Farm (Off-site Well)	974 meters WSW-SW
D-61	Downstream of plant discharge	670 meters SSE
D-72	Farm	3,200 meters SSW
D-82	On-site, SSE	660 meters SSE
D-83	On-site, SSE	620 meters SSE
D-84	On-site, S	610 meters S
D-85	On-site, SSW	660 meters SSW
D-86	On-site, SW	850 meters SW
D-91	On-site, NNW	1,090 meters NNW
D-96	Farm	11,400 meters SSW
D-99	Pleasant Creek Lake	3,880 meters WNW
D-107a	North Drainage Ditch	
D-109	Farm	5,890 meters SW
D-110	Farm	12,700 meters SW
D-118	Farm	2,230 meters NW
D-138	Farm	21,600 meters WSW
D-161	ISFSI Fence East	On-site
D-162	ISFSI Fence South	On-site
D-163	ISFSI Fence West	On-site
D-164	ISFSI Fence North	On-site

Table 5.4 Type and Frequency of collection.

Location	Weekly	Monthly	Quarterly	Semiannually	Annually
D-1			TLD		
D-2			TLD		
D-3	AP, AI		TLD		
D-5	AP, AI		TLD		
D-6	AP, AI		TLD		
D-7	AP, AI		TLD		
D-8			TLD		
D-10			TLD		
D-11	AP, AI		TLD		
D-13	AP, AI		TLD		
D-15	AP, AI		TLD		
D-16	AP, AI		TLD		G
D-17 to D-23			TLD		
D-28 to D-39			TLD		
D-40	AP, AI		TLD		
D-41 to D-48			TLD		
D-49		SW		F	
D-50		SW		BS	
D-51		SW		BS	
D-53			WW		
D-54			WW		
D-55			WW		
D-57			WW		G
D-58			WW		G
D-61		SW		F	
D-72			WW		G
D-82 to D-86			TLD		
D-91			TLD		
D-96					G
D-99		SW			
D-107A				BS	
D-109					G
D-110		MI*			
D-118					G
D-138		MI*			
D-161 to D-164			TLD		
On-site					ME

* Biweekly during the grazing season.

Table 5.5. Sample codes used in Table 5.4 and Table 5.6.

Code	Description
AP	Airborne Particulates
AI	Airborne Iodine
TLD	Thermoluminescent Dosimeter
MI	Milk
WW	Well Water
G	Vegetation
ME	Meat
SW	Surface Water
F	Fish
BS	River Sediment

Table 5.6. Program Deviations, Duane Arnold Energy Center.

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP/AI	Gross Beta / I-131	D-3	06-28-13	Partial sample (50 m ³), power outage.
AP/AI	Gross Beta / I-131	D-3	10-31-13	Power out at sampler station.
AP/AI	Gross Beta / I-131	D-3	12-26-13	Sampler pump failure.
AP/AI	Gross Beta / I-131	D-11	05-23-13	Partial sample (112 m ³), breaker found tripped after storm.
AP/AI	Gross Beta / I-131	D-11	10-17-13	Partial sample (178 m ³), faulty timer suspected.
AP/AI	Gross Beta / I-131	D-13	10-03-13	Partial sample (181 m ³), power outage.
AP/AI	Gross Beta / I-131	D-15	05-30-13	Breaker found tripped after storms.
AP/AI	Gross Beta / I-131	D-15	09-05-13	Partial sample (42 m ³), breaker tripped.
AP/AI	Gross Beta / I-131	D-15	10-17-13	Partial sample (154 m ³), power outage.
AP/AI	Gross Beta / I-131	D-15	10-31-13	Partial sample (84 m ³), power outage.
TLD	Ambient Gamma	D-1, D-41, D-82	3 rd Qtr. 2013	TLD missing in the field, TLD replaced.
TLD	Ambient Gamma	D-17	4th Qtr. 2013	TLD missing in the field, TLD replaced.
G	Gamma	D-57, D-72, D-96	2013	No vegetation was available.

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

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2013
 (County, State)

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e				
				Location ^d	Mean (F) ^c Range ^c						
Airborne Pathway											
Airborne Particulates (pCi/m ³)	GB	465	0.003	0.028 (413/413) (0.007-0.062)	D-16, On-site 0.5 mi. SSE	0.030 (52/52) (0.010-0.062)	0.025 (52/52) (0.008-0.055)	0			
	GS	36	0.020	0.068 (32/32) (0.048-0.093)	D-6, Center Point 7 mi. N	0.072 (4/4) (0.057-0.093)	0.059 (4/4) (0.042-0.072)	0			
	Be-7										
	Mn-54	0.0013							< LLD	< LLD	0
	Fe-59	0.0030							< LLD	< LLD	0
	Co-58	0.0012							< LLD	< LLD	0
	Co-60	0.0011							< LLD	< LLD	0
	Zn-65	0.0024							< LLD	< LLD	0
	Nb-95	0.0018							< LLD	< LLD	0
	Zr-95	0.0026							< LLD	< LLD	0
	Ru-103	0.0017							< LLD	< LLD	0
	Ru-106	0.0125							< LLD	< LLD	0
	Cs-134	0.0013							< LLD	< LLD	0
	Cs-137	0.0011							< LLD	< LLD	0
Ce-141	0.0027	< LLD	< LLD	0							
Ce-144	0.0065	< LLD	< LLD	0							
Airborne Iodine (pCi/m ³)	I-131	465	0.030	< LLD		< LLD	0				
Direct Radiation											
TLDs (mR/quarter)											
Control Locations	Gamma	39	1.0	None	D-8, Urbana 10 mi. NW	18.7 (4/4) (14.8-24.8)	15.9 (39/39) (9.3-24.8)	0			
Within 0.5 mi. of Stack	Gamma	78	1.0	17.7 (78/78) (8.6-28.1)	D-21, On-site 0.3 mi. ENE	20.4 (4/4) (15.8-27.9)	None	0			
Within 1.0 mi. of Stack	Gamma	24	1.0	18.6 (24/24) (11.2-27.4)	D-48, 1 mi. NNW	20.5 (4/4) (15.0-27.4)	None	0			
Within 3.0 mi. of Stack	Gamma	39	1.0	16.2 (39/39) (9.7-25.2)	D-41, 3.5 mi. S	20.9 (3/4) (16.3-25.2)	None	0			
ISFSI border	Gamma	16	1.0	34.2 (16/16) (11.0-63.8)	D-161 ISFSI Fence	54.2 (4/4) (48.3-63.8)	None	0			

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	<u>Duane Arnold Energy Center</u>	Docket No.	<u>50-331</u>
Location of Facility	<u>Linn, Iowa</u>	Reporting Period	<u>January-December, 2013</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e	
				Location ^d	Mean (F) ^c Range ^c			
Waterborne Pathway								
Ground Water, potable (pCi/L)	GB	6	0.5	2.0 (4/5) (0.6-4.2)	D-58, Farm 1 mi. WSW-SW	4.2 (1/1) -	< LLD	0
	H-3	24	158	< LLD	-	-	< LLD	0
	GS	24						
	Mn-54		3.7	< LLD	-	-	< LLD	0
	Fe-59		7.1	< LLD	-	-	< LLD	0
	Co-58		3.5	< LLD	-	-	< LLD	0
	Co-60		3.8	< LLD	-	-	< LLD	0
	Zn-65		7.8	< LLD	-	-	< LLD	0
	Nb-95		4.3	< LLD	-	-	< LLD	0
	Zr-95		6.9	< LLD	-	-	< LLD	0
	I-131		11.4	< LLD	-	-	< LLD	0
	Cs-134		3.7	< LLD	-	-	< LLD	0
	Cs-137		3.5	< LLD	-	-	< LLD	0
	Ba-140		25.6	< LLD	-	-	< LLD	0
La-140		6.2	< LLD	-	-	< LLD	0	
Ingestion Pathway								
Milk (pCi/L)	I-131	36	0.5	< LLD	-	-	< LLD	0
	GS	36						
	K-40		100	1407 (18/18) (1226-1583)	D-138, Farm 13.4 mi. WSW	1448 (18/18) (1297-1530)	1448 (18/18) (1297-1530)	0
	Cs-134		5	< LLD	-	-	< LLD	0
	Cs-137		5	< LLD	-	-	< LLD	0
	Ba-140		60	< LLD	-	-	< LLD	0
	La-140		5	< LLD	-	-	< LLD	0
Broadleaf Vegetation (pCi/g wet)	GS	3						
	K-40		0.5	3.04 (3/3) (2.07-4.95)	D-40, Farm 1.5 mi. SSE	4.95 (1/1)	none	0
	Mn-54		0.014	< LLD	-	-	none	0
	Fe-59		0.027	< LLD	-	-	none	0
	Co-58		0.011	< LLD	-	-	none	0
	Co-60		0.013	< LLD	-	-	none	0
	Zn-65		0.033	< LLD	-	-	none	0
	Nb-95		0.018	< LLD	-	-	none	0
	Zr-95		0.028	< LLD	-	-	none	0
	Ru-103		0.021	< LLD	-	-	none	0
	Ru-106		0.135	< LLD	-	-	none	0
	I-131		0.030	< LLD	-	-	none	0
	Cs-134		0.017	< LLD	-	-	none	0
	Cs-137		0.013	< LLD	-	-	none	0
	Ce-141		0.031	< LLD	-	-	none	0
Ce-144		0.095	< LLD	-	-	none	0	

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	<u>Duane Arnold Energy Center</u>	Docket No.	<u>50-331</u>
Location of Facility	<u>Linn, Iowa</u>	Reporting Period	<u>January-December, 2013</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e
				Location ^d	Mean (F) ^c Range ^c		
Ingestion Pathway (cont.)							
Vegetation (Grain and Forage) (pCi/g wet)	GS 11						
	K-40	0.5	5.75 (7/7) (2.11-16.31)	9.67 (2/2) (3.02-16.31)	9.67 (2/2) (3.02-16.31)	6.91 (2/2) (2.46-11.35)	0
	Mn-54	0.032	< LLD	-	-	< LLD	0
	Fe-59	0.063	< LLD	-	-	< LLD	0
	Co-58	0.018	< LLD	-	-	< LLD	0
	Co-60	0.023	< LLD	-	-	< LLD	0
	Zn-65	0.035	< LLD	-	-	< LLD	0
	Nb-95	0.019	< LLD	-	-	< LLD	0
	Zr-95	0.051	< LLD	-	-	< LLD	0
	Ru-103	0.033	< LLD	-	-	< LLD	0
	Ru-106	0.201	< LLD	-	-	< LLD	0
	I-131	0.053	< LLD	-	-	< LLD	0
	Cs-134	0.021	< LLD	-	-	< LLD	0
	Cs-137	0.031	< LLD	-	-	< LLD	0
	Ce-141	0.053	< LLD	-	-	< LLD	0
Ce-144	0.185	< LLD	-	-	< LLD	0	
Fish (pCi/g wet)	GS 8						
	K-40	1.0	3.19 (4/4) (2.90-3.70)	D-49, Upstream, 4.0 mi. NNW	3.39 (4/4) (2.87-3.78)	3.39 (4/4) (2.87-3.78)	0
	Mn-54	0.018	< LLD	-	-	< LLD	0
	Fe-59	0.050	< LLD	-	-	< LLD	0
	Co-58	0.022	< LLD	-	-	< LLD	0
	Co-60	0.012	< LLD	-	-	< LLD	0
	Zn-65	0.034	< LLD	-	-	< LLD	0
	Nb-95	0.031	< LLD	-	-	< LLD	0
	Zr-95	0.034	< LLD	-	-	< LLD	0
	Ru-103	0.030	< LLD	-	-	< LLD	0
	Ru-106	0.14	< LLD	-	-	< LLD	0
	Cs-134	0.016	< LLD	-	-	< LLD	0
	Cs-137	0.019	< LLD	-	-	< LLD	0
	Ce-141	0.058	< LLD	-	-	< LLD	0
	Ce-144	0.143	< LLD	-	-	< LLD	0

^a GB = Gross beta; GS = Gamma spectroscopy

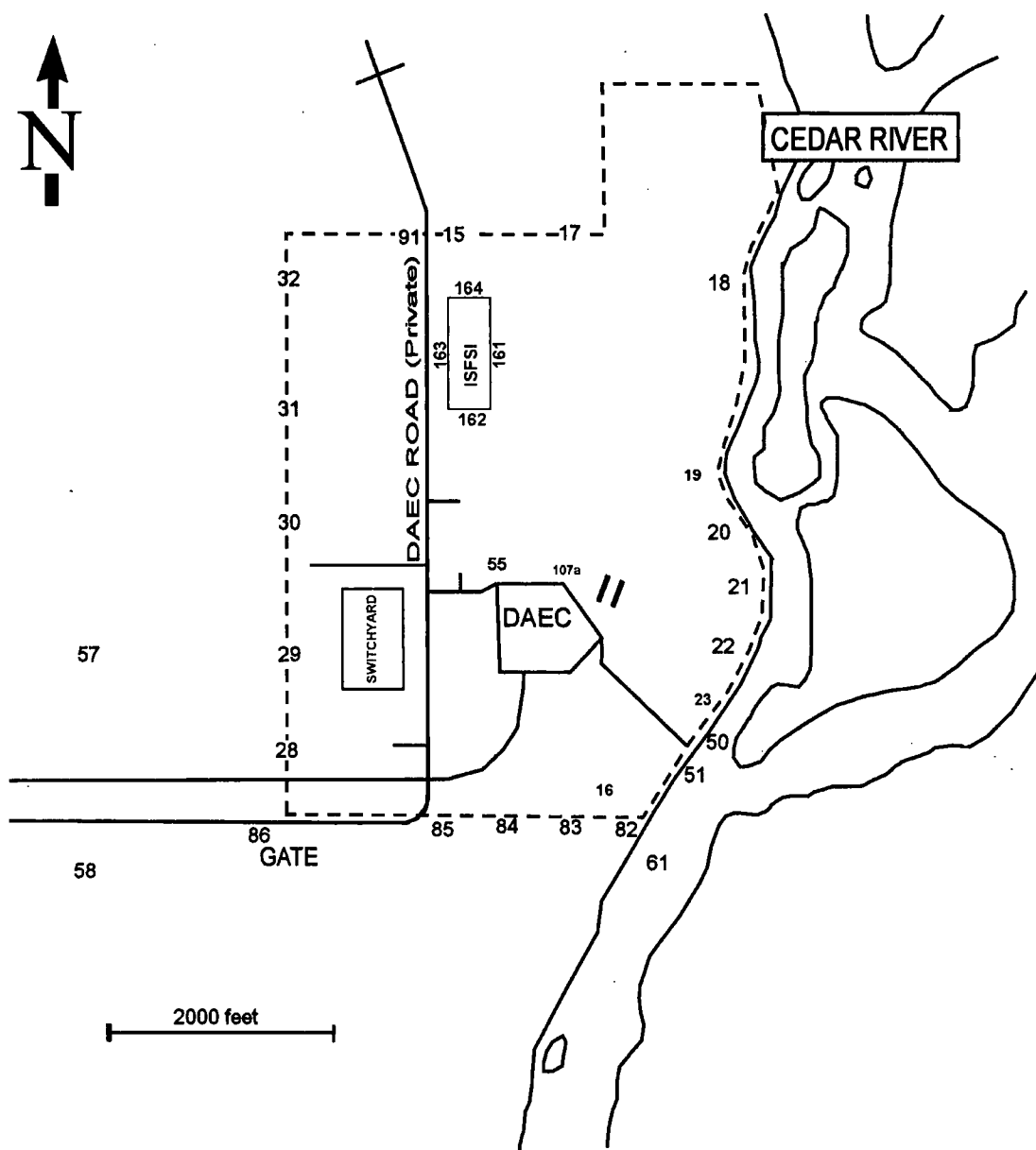
^b LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

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

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

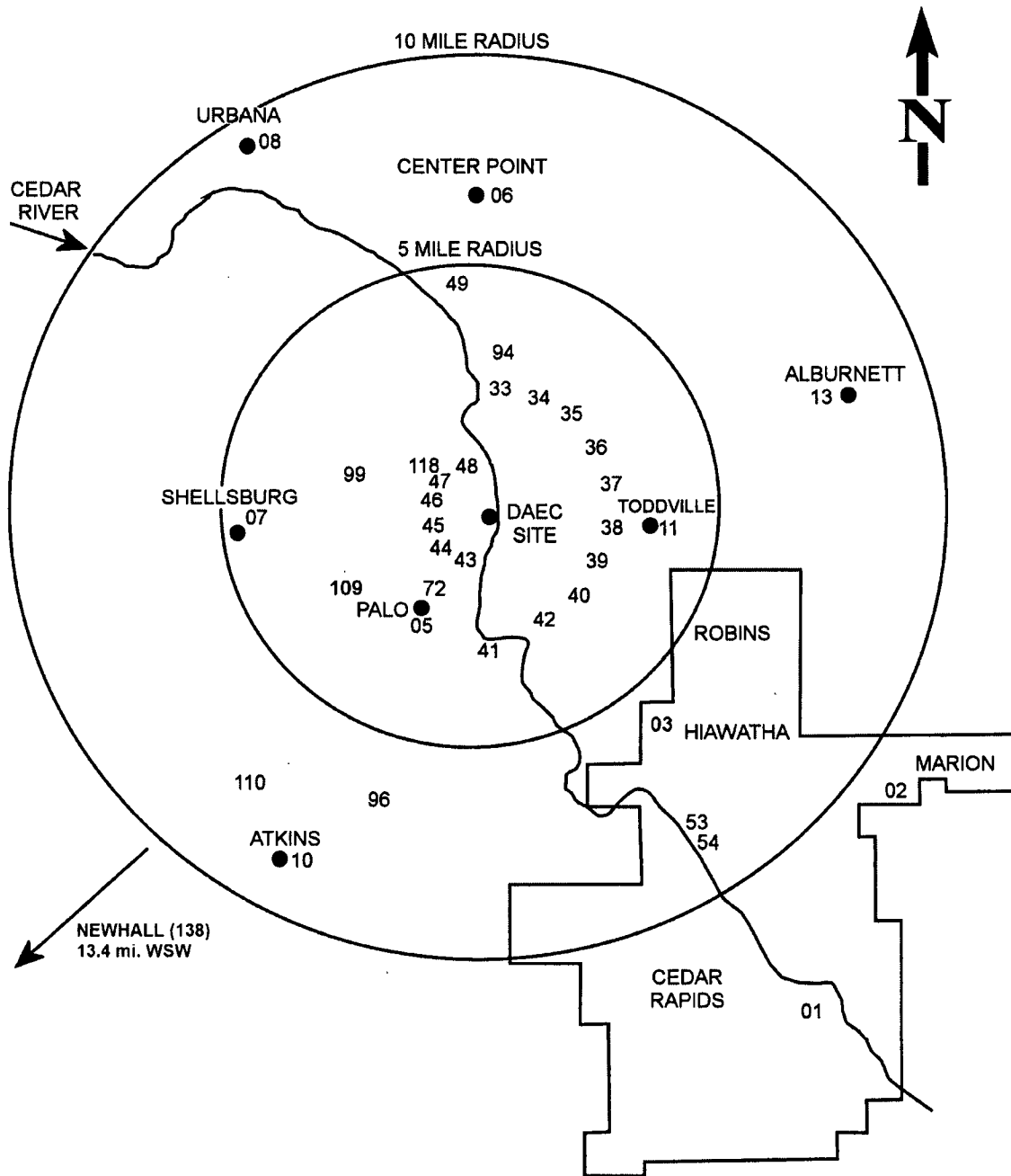
^e Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

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



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

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



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

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

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

January through December, 2013

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., 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 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.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters, when available, and internal laboratory testing.

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 lists REMP specific analytical results from 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. Complete analytical data for duplicate analyses is available upon request.

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

Results in Table A-7 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 Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

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	± 1σ = 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 pCi/liter 10% of known value
Uranium-238, Nickel-63 ^b Technetium-99 ^b	≤ 35 pCi/liter > 35 pCi/liter	6 pCi/liter 15% of known value
Iron-55 ^b	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Other Analyses ^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)			Acceptance
			Laboratory Result ^b	ERA Result ^c	Control Limits	
ERW-76	01/07/13	Ra-226	10.04 ± 0.55	9.91	7.42 - 11.60	Pass
ERW-76	01/07/13	Ra-228	6.11 ± 1.29	5.22	3.14 - 6.96	Pass
ERW-76	01/07/13	Uranium	5.90 ± 0.58	5.96	4.47 - 7.13	Pass
ERW-1593	04/08/13	Sr-89	43.60 ± 4.32	41.30	31.60 - 48.40	Pass
ERW-1593	04/08/13	Sr-90	23.20 ± 1.70	23.90	17.20 - 28.00	Pass
ERW-1596	04/08/13	Ba-133	74.80 ± 4.00	82.10	69.00 - 90.30	Pass
ERW-1596	04/08/13	Co-60	65.50 ± 3.42	65.90	59.30 - 75.00	Pass
ERW-1596	04/08/13	Cs-134	41.10 ± 3.47	42.80	34.20 - 47.10	Pass
ERW-1596	04/08/13	Cs-137	42.30 ± 4.03	41.70	37.00 - 48.80	Pass
ERW-1596	04/08/13	Zn-65	200.3 ± 10.1	189.0	170.0 - 222.0	Pass
ERW-1598	04/08/13	Gr. Alpha	34.30 ± 1.98	40.80	21.10 - 51.90	Pass
ERW-1598	04/08/13	Gr. Beta	18.70 ± 0.98	21.60	13.00 - 29.70	Pass
ERW-1600	04/08/13	I-131	23.00 ± 1.10	23.80	19.70 - 28.30	Pass
ERW-1600	04/08/13	I-131(G)	23.48 ± 9.44	23.80	19.70 - 28.30	Pass
ERW-1605	04/08/13	Ra-226	16.30 ± 0.70	15.40	11.50 - 17.70	Pass
ERW-1605	04/08/13	Ra-228	5.32 ± 1.30	4.36	2.54 - 5.98	Pass
ERW-1605	04/08/13	Uranium	57.30 ± 4.20	61.20	49.80 - 67.90	Pass
ERW-1606	04/08/13	H-3	4041 ± 194	4050	3450 - 4460	Pass
ERW-6009	10/07/13	Sr-89	22.00 ± 2.80	21.90	14.40 ± 28.20	Pass
ERW-6009	10/07/13	Sr-90	17.10 ± 2.55	18.10	12.80 ± 21.50	Pass
ERW-6012	10/07/13	Ba-133	48.20 ± 4.29	54.20	44.70 ± 59.90	Pass
ERW-6012	10/07/13	Co-60	100.8 ± 4.7	102.0	91.80 ± 114.00	Pass
ERW-6012	10/07/13	Cs-134	87.30 ± 4.35	86.70	71.10 ± 95.40	Pass
ERW-6012	10/07/13	Cs-137	199.6 ± 7.4	206.0	185.0 - 228.0	Pass
ERW-6012	10/07/13	Zn-65	356.2 ± 13.2	333.0	300.0 - 389.0	Pass
ERW-6015	10/07/13	Gr. Alpha	30.70 ± 11.90	42.80	22.20 ± 54.30	Pass
ERW-6015	10/07/13	Gr. Beta	25.70 ± 6.48	32.20	20.80 ± 39.90	Pass
ERW-6019	10/07/13	I-131	22.50 ± 1.01	23.60	19.60 ± 28.00	Pass
ERW-6022	10/07/13	Ra-226	12.70 ± 1.62	12.10	9.04 ± 14.00	Pass
ERW-6022 ^d	10/07/13	Ra-228	5.70 ± 0.56	4.02	2.30 ± 5.59	Fail
ERW-6022	10/07/13	Uranium	6.59 ± 0.38	6.24	4.70 ± 7.44	Pass
ERW-6024	10/07/13	H-3	18397 ± 695	17700	15500 - 19500	Pass

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted 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 The reported result was obtained in the first cycle of counting. It can be positively biased due to extra beta counts contributed by Pb-214 and Bi-214 daughters of Rn-222. Result of second cycle of counting 4.47 pCi/L.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, CaSO₄: Dy Cards).

Lab Code	Date	Description	Known Value	mR		Acceptance
				Lab Result ± 2 sigma	Control Limits	
<u>Environmental, Inc.</u>						
2013-1	5/6/2013	40 cm.	34.26	39.92 ± 2.67	23.98 - 44.54	Pass
2013-1	5/6/2013	50 cm.	21.93	25.44 ± 3.31	15.35 - 28.51	Pass
2013-1	5/6/2013	60 cm.	15.23	15.88 ± 1.12	10.66 - 19.80	Pass
2013-1	5/6/2013	70 cm.	11.19	10.89 ± 0.66	7.83 - 14.55	Pass
2013-1	5/6/2013	80 cm.	8.57	9.21 ± 0.41	6.00 - 11.14	Pass
2013-1	5/6/2013	90 cm.	6.77	6.52 ± 0.34	4.74 - 8.80	Pass
2013-1	5/6/2013	100 cm.	5.48	5.02 ± 0.53	3.84 - 7.12	Pass
2013-1	5/6/2013	110 cm.	4.53	4.51 ± 0.34	3.17 - 5.89	Pass
2013-1	5/6/2013	120 cm.	3.81	4.28 ± 0.35	2.67 - 4.95	Pass
2013-1	5/6/2013	135 cm.	3.01	2.64 ± 0.18	2.11 - 3.91	Pass
2013-1	5/6/2013	150 cm.	2.44	2.10 ± 0.25	1.71 - 3.17	Pass
2013-1	5/6/2013	180 cm.	1.69	1.78 ± 0.33	1.18 - 2.20	Pass
 <u>Environmental, Inc.</u>						
2013-2	11/18/2013	50 cm.	19.93	22.75 ± 3.67	13.95 - 25.91	Pass
2013-2	11/18/2013	60 cm.	13.84	15.75 ± 1.94	9.69 - 17.99	Pass
2013-2	11/18/2013	70 cm.	10.17	11.24 ± 0.88	7.12 - 13.22	Pass
2013-2	11/18/2013	75 cm.	8.86	9.18 ± 1.23	6.20 - 11.52	Pass
2013-2	11/18/2013	80 cm.	7.79	7.81 ± 1.10	5.45 - 10.13	Pass
2013-2	11/18/2013	90 cm.	6.15	5.98 ± 0.90	4.31 - 8.00	Pass
2013-2	11/18/2013	100 cm.	4.98	5.13 ± 0.73	3.49 - 6.47	Pass
2013-2	11/18/2013	110 cm.	4.12	3.87 ± 0.32	2.88 - 5.36	Pass
2013-2	11/18/2013	120 cm.	3.46	3.11 ± 0.39	2.42 - 4.50	Pass
2013-2	11/18/2013	135 cm.	2.73	2.71 ± 0.83	1.91 - 3.55	Pass
2013-2	11/18/2013	150 cm.	2.21	2.11 ± 0.63	1.55 - 2.87	Pass
2013-2	11/18/2013	180 cm.	1.54	1.81 ± 0.10	1.08 - 2.00	Pass

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

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d	
SPW-66	1/9/2013	Tc-99	1009 ± 5	1078	754.9 - 1402.0	Pass
SPW-1891	1/18/2013	Ra-228	35.60 ± 2.75	30.85	21.60 - 40.11	Pass
SPSO-12313S	1/23/2013	Tc-99	103.5 ± 2.2	107.8	75.46 - 140.14	Pass
SPMI-264	1/25/2013	Cs-134	110.9 ± 6.7	107.5	96.73 - 118.23	Pass
SPMI-264	1/25/2013	Cs-137	82.84 ± 7.47	77.48	67.48 - 87.48	Pass
SPMI-264	1/25/2013	Sr-90	38.19 ± 1.49	40.11	32.09 - 48.13	Pass
SPW-266	1/25/2013	Co-60	46.89 ± 4.68	44.48	34.48 - 54.48	Pass
SPW-266	1/25/2013	Cs-134	105.9 ± 8.0	107.5	96.73 - 118.23	Pass
SPW-266	1/25/2013	Cs-137	42.17 ± 5.65	39.49	29.49 - 49.49	Pass
SPW-266	1/25/2013	Sr-90	39.84 ± 1.65	40.11	32.09 - 48.13	Pass
SPAP-376	2/1/2013	Gr. Beta	44.20 ± 0.11	45.68	27.41 - 63.95	Pass
SPAP-378	2/1/2013	Cs-134	3.71 ± 0.65	3.87	2.32 - 5.42	Pass
SPAP-378	2/1/2013	Cs-137	97.47 ± 2.50	102.9	92.61 - 113.19	Pass
SPW-391	2/1/2013	H-3	63719 ± 703	65626	52501 - 78751	Pass
SPW-380	2/10/2013	Ni-63	217.0 ± 3.7	205.3	143.7 - 266.9	Pass
W-30413	3/4/2013	Gr. Alpha	19.77 ± 0.40	20.00	10.00 - 30.00	Pass
W-30413	3/4/2013	Gr. Beta	30.48 ± 0.34	30.90	20.90 - 40.90	Pass
W-30713	3/7/2013	Ra-226	18.06 ± 0.51	16.70	11.69 - 21.71	Pass
W-42713	4/27/2013	Gr. Alpha	20.67 ± 0.40	20.00	10.00 - 30.00	Pass
W-42713	4/27/2013	Gr. Beta	28.44 ± 0.32	30.90	20.90 - 40.90	Pass
WW-2870	5/7/2013	Co-60	166.1 ± 7.4	161.6	145.4 - 177.8	Pass
WW-2870	5/7/2013	Cs-137	161.2 ± 9.3	149.0	134.1 - 163.9	Pass
WW-2870	5/7/2013	H-3	6853 ± 250	6735	5388 - 8082	Pass
W-53113	5/31/2013	Ra-226	16.83 ± 0.41	16.70	11.69 - 21.71	Pass
SPAP-3332	6/19/2013	Am-241	4.60 ± 0.14	4.00	2.40 - 5.60	Pass
SPW-3334	6/19/2013	Th-230	4.36 ± 0.34	4.00	2.40 - 5.60	Pass
SPW-3458	6/24/2013	C-14	3825 ± 13	4736	2842 - 6630	Pass
SPAP-3529	6/27/2013	Cs-134	3.49 ± 1.26	3.30	1.98 - 4.62	Pass
SPAP-3529	6/27/2013	Cs-137	102.0 ± 2.9	101.1	90.99 - 111.21	Pass
SPAP-3531	6/27/2013	Gr. Beta	45.64 ± 0.11	45.42	27.25 - 63.59	Pass
SPF-3533	6/27/2013	Cs-134	1.31 ± 0.14	1.50	0.90 - 2.10	Pass
SPF-3533	6/27/2013	Cs-137	2.77 ± 0.27	2.43	1.46 - 3.40	Pass
SPW-3535	6/27/2013	Ni-63	204.3 ± 3.5	204.8	143.4 - 266.2	Pass
SPW-3537	6/27/2013	Tc-99	104.5 ± 1.7	107.8	75.46 - 140.14	Pass
SPW-3539	6/27/2013	Fe-55	97015 ± 860	90677	72542 - 108812	Pass
SPW-1893	6/28/2013	Ra-228	30.16 - 2.73	30.85	21.60 - 40.11	Pass

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

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d	
SPW-72913S	7/29/2013	Tc-99	126.6 ± 2.2	107.8	75.46 ± 140.14	Pass
SPW-4373	7/31/2013	Cs-134	91.71 ± 6.02	90.94	80.94 ± 100.94	Pass
SPW-4373	7/31/2013	Cs-137	83.05 ± 7.20	76.57	66.57 ± 86.57	Pass
SPW-4373	7/31/2013	Sr-90	39.28 ± 1.77	39.64	31.71 ± 47.57	Pass
SPW-4374	7/31/2013	Sr-90	42.17 ± 1.71	39.64	31.71 ± 47.57	Pass
SPMI-4376	7/31/2013	Cs-134	82.22 - 7.23	90.94	80.94 ± 100.94	Pass
SPMI-4376	7/31/2013	Cs-137	83.31 - 8.29	76.57	66.57 ± 86.57	Pass
SPMI-4376A	7/31/2013	Sr-90	35.00 ± 1.63	39.64	31.71 ± 47.57	Pass
W-73113	7/31/2013	Ra-226	17.61 ± 0.41	16.70	11.69 ± 21.71	Pass
SPS-4514	8/5/2013	Sr-90	78.63 ± 2.95	79.28	63.42 ± 95.14	Pass
W-82013	8/20/2013	Gr. Alpha	21.53 ± 0.45	20.00	10.00 ± 30.00	Pass
W-82013	8/20/2013	Gr. Beta	28.03 ± 0.32	30.90	20.90 ± 40.90	Pass
SPW-1894	8/28/2013	Ra-228	32.49 ± 3.00	30.85	21.60 ± 40.11	Pass
W-90913	9/9/2013	Gr. Alpha	19.08 ± 0.51	20.10	10.05 ± 30.15	Pass
W-90913	9/9/2013	Gr. Beta	32.12 ± 0.35	32.10	22.10 ± 42.10	Pass
WW-5623	10/3/2013	Co-60	157.0 ± 7.0	155.3	139.8 - 170.8	Pass
WW-5623	10/3/2013	Cs-137	156.0 ± 8.8	148.1	133.3 - 162.9	Pass
WW-5623	10/3/2013	H-3	6590 ± 245	6322	5058 - 7586	Pass
WW-5750	10/3/2013	Co-60	87.00 ± 7.80	77.40	77.00 ± 97.00	Pass
WW-5750	10/3/2013	Cs-137	82.30 ± 7.80	78.80	68.80 ± 88.80	Pass
WW-5750	10/3/2013	H-3	6181 ± 238	6322	5058 - 7586	Pass
W-102813	10/28/2013	Ra-226	15.69 ± 0.37	16.70	11.69 ± 21.71	Pass
SPW-1898	12/17/2013	Ra-228	28.15 ± 2.37	30.85	21.60 ± 40.11	Pass
W-122313	12/23/2013	Gr. Alpha	20.96 ± 0.47	20.10	10.05 ± 30.15	Pass
W-122313	12/23/2013	Gr. Beta	31.00 ± 0.34	32.10	22.10 ± 42.10	Pass

^a Liquid sample results are reported in pCi/Liter, air filters(pCi/m³), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

^b Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

^c Results are based on single determinations.

^d Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2s.

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 ^b	Concentration (pCi/L) ^a		
				Laboratory results (4.66 σ)		Acceptance Criteria (4.66 σ)
				LLD	Activity ^c	
SPW-67	Water	1/9/2013	Tc-99	1.10	0.69 \pm 0.68	10
SPW-190	Water	1/18/2013	Ra-228	0.74	0.66 \pm 0.43	2
SPW-1901	Water	1/18/2013	Ra-228	0.74	0.66 \pm 0.43	2
SPMI-263	Milk	1/25/2013	Sr-90	0.64	0.31 \pm 0.34	1
SPMI-263	Milk	1/25/2013	Sr-90	0.64	0.31 \pm 0.34	1
SPW-265	Water	1/25/2013	Co-60	2.86	2.10 \pm 1.72	10
SPW-265	Water	1/25/2013	Cs-134	2.98	2.25 \pm 1.57	10
SPW-265	Water	1/25/2013	Cs-137	2.71	0.44 \pm 1.61	10
SPW-266	Water	1/25/2013	Sr-90	0.72	-0.12 \pm 0.32	1
SPAP-375	Air Filter	2/1/2013	Gr. Beta	0.003	0.016 \pm 0.003	0.010
SPAP-377	Air Filter	2/1/2013	Co-60	2.31	-0.34 \pm 1.75	100
SPAP-377	Air Filter	2/1/2013	Cs-134	2.72	1.22 \pm 1.62	100
SPAP-377	Air Filter	2/1/2013	Cs-137	1.50	-0.52 \pm 1.80	100
SPW-391	Water	2/1/2013	H-3	92.04	-29.44 \pm 69.24	200
SPW-379	Water	2/10/2013	Ni-63	2.11	0.91 \pm 1.30	20
W-30413	Water	3/4/2013	Gr. Alpha	0.35	0.08 \pm 0.26	1
W-30413	Water	3/4/2013	Gr. Beta	0.73	0.10 \pm 0.51	3.2
W-30713	Water	3/7/2013	Ra-226	0.031	0.032 \pm 0.024	1
W-42713	Water	4/27/2013	Gr. Alpha	0.45	-0.14 \pm 0.30	1
W-42713	Water	4/27/2013	Gr. Beta	0.72	-0.23 \pm 0.50	3.2
W-53113	Water	5/31/2013	Ra-226	0.03	0.01 \pm 0.02	1
SPW-3335	Water	6/19/2013	Th-230	0.01	0.01 \pm 0.01	1
SPW-3459	Water	6/24/2013	C-14	10.89	10.44 \pm 6.82	200
SPAP-3528	Air Filter	6/27/2013	Cs-134	2.10	-0.98 \pm 1.11	100
SPAP-3528	Air Filter	6/27/2013	Cs-137	2.71	-0.24 \pm 1.36	100
SPAP-3530	Air Filter	6/27/2013	Gr. Beta	0.004	0.018 \pm 0.003	0.010
SPF-3532	Fish	6/27/2013	Cs-134	8.38	-1.39 \pm 5.69	100
SPF-3532	Fish	6/27/2013	Cs-137	8.37	-1.88 \pm 6.41	100
SPW-3534	Water	6/27/2013	Ni-63	2.47	-1.04 \pm 1.48	20
SPW-3536	Water	6/27/2013	Tc-99	1.15	-1.11 \pm 0.68	10
SPW-3538	water	6/27/2013	Fe-55	170.27	-17.50 \pm 102.70	1000
SPW-1903	Water	6/28/2013	Ra-228	0.85	-0.02 \pm 0.39	2

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

Lab Code	Sample Type	Date	Analysis ^b	Concentration (pCi/L) ^a		
				Laboratory results (4.66σ)		Acceptance Criteria (4.66 σ)
				LLD	Activity ^c	
SPW-72913B	Water	7/29/2013	Tc-99	1.44	-0.33 ± 0.87	10
SPW-4372	Water	7/31/2013	Co-60	1.41	-1.42 ± 3.00	10
SPW-4372	Water	7/31/2013	Cs-134	3.68	-2.66 ± 3.46	10
SPW-4372	Water	7/31/2013	Cs-137	3.53	0.29 ± 3.31	10
SPMI-4375	Milk	7/31/2013	Co-60	3.92	2.65 ± 2.26	10
SPMI-4375	Milk	7/31/2013	Cs-134	4.67	0.68 ± 2.54	10
SPMI-4375	Milk	7/31/2013	Cs-137	4.79	1.30 ± 2.68	10
SPMI-4375	Milk	7/31/2013	Sr-90	0.57	0.32 ± 0.30	1
W-73113	Water	7/31/2013	Ra-226	0.02	0.04 ± 0.02	1
SPS-4515	Powder	8/5/2013	Sr-90	0.09	-0.01 ± 0.04	1
W-82013	Water	8/20/2013	Gr. Alpha	0.42	-0.15 ± 0.28	1
W-82013	Water	8/20/2013	Gr. Beta	0.74	-0.24 ± 0.51	3.2
SPW-1904	Water	8/28/2013	Ra-228	0.96	0.85 ± 0.56	2
CHW-90913	Water	9/9/2013	Gr. Alpha	0.25	0.20 ± 0.29	1
CHW-90913	Water	9/9/2013	Gr. Beta	0.49	-0.18 ± 0.53	3.2
CHW-102013	Water	10/20/2013	Gr. Alpha	0.29	0.24 ± 0.33	1
CHW-102013	Water	10/20/2013	Gr. Beta	0.54	-0.32 ± 0.54	3.2
W-102813	Water	10/28/2013	Ra-226	0.02	0.02 ± 0.01	1
SPW-1908	Water	12/17/2013	Ra-228	0.69	0.55 ± 0.39	2
CHW-122313	Water	12/23/2013	Gr. Alpha	0.25	-0.09 ± 0.26	1
CHW-122313	Water	12/23/2013	Gr. Beta	0.48	0.05 ± 0.53	3.2
CHW-122713	Water	12/27/2013	Gr. Alpha	0.28	0.04 ± 0.31	1
CHW-122713	Water	12/27/2013	Gr. Beta	0.49	-0.33 ± 0.53	3.2

^a Liquid sample results are reported in pCi/Liter, air filters(pCi/m³), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

^b I-131(G); iodine-131 as analyzed by gamma spectroscopy.

^c Activity reported is a net activity result.

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
CF-41, 42	1/2/2013	Gr. Beta	8.45 ± 0.37	7.90 ± 0.35	8.17 ± 0.26	Pass
CF-41, 42	1/2/2013	Sr-90	0.030 ± 0.015	0.029 ± 0.014	0.030 ± 0.010	Pass
SWT-8243, 8244	1/2/2013	Gr. Beta	1.07 ± 0.54	0.98 ± 0.51	1.03 ± 0.37	Pass
AP-8454, 8455	1/2/2013	Be-7	0.053 ± 0.010	0.042 ± 0.010	0.048 ± 0.007	Pass
AP-8517, 8518	1/3/2013	Be-7	0.051 ± 0.015	0.049 ± 0.017	0.050 ± 0.011	Pass
MI-62, 63	1/8/2013	K-40	1317.70 ± 91.70	1351.90 ± 72.50	1334.80 ± 58.45	Pass
WW-151, 152	1/8/2013	H-3	222.70 ± 81.00	289.70 ± 84.10	256.20 ± 58.38	Pass
SG-107, 108	1/11/2013	Ra-226	55.20 ± 5.53	58.60 ± 5.94	56.90 ± 4.06	Pass
SG-107, 108	1/11/2013	Ra-228	71.60 ± 1.10	74.30 ± 1.70	72.95 ± 1.01	Pass
SG-130, 131	1/14/2013	Ra-226	3.91 ± 0.20	3.45 ± 0.27	3.68 ± 0.17	Pass
SG-130, 131	1/14/2013	Ra-228	2.40 ± 0.33	2.70 ± 0.39	2.55 ± 0.26	Pass
WW-277, 278	1/17/2013	H-3	159.71 ± 77.91	196.57 ± 79.72	178.14 ± 55.73	Pass
WW-256, 257	1/22/2013	H-3	502.70 ± 93.40	483.30 ± 92.60	493.00 ± 65.76	Pass
DW-40010, 40011	1/24/2013	Ra-226	2.55 ± 0.18	2.86 ± 0.20	2.71 ± 0.13	Pass
DW-40010, 40011	1/24/2013	Ra-228	1.78 ± 0.62	2.22 ± 0.62	2.00 ± 0.44	Pass
SWT-361, 362	1/29/2013	Gr. Beta	0.90 ± 0.40	1.01 ± 0.38	0.96 ± 0.28	Pass
DW-484, 485	1/29/2013	Gr. Beta	14.85 ± 1.93	14.81 ± 2.06	14.83 ± 1.41	Pass
S-945, 946	1/29/2013	Cs-137	14.50 ± 0.18	14.45 ± 0.19	14.48 ± 0.13	Pass
S-945, 946	1/29/2013	K-40	7.90 ± 0.74	8.00 ± 0.73	7.95 ± 0.52	Pass
S-340, 341	1/31/2013	Cs-137	0.16 ± 0.05	0.15 ± 0.06	0.15 ± 0.04	Pass
S-340, 341	1/31/2013	K-40	17.35 ± 1.34	19.75 ± 1.25	18.55 ± 0.92	Pass
AP-463, 464	1/31/2013	Be-7	0.27 ± 0.10	0.26 ± 0.10	0.26 ± 0.07	Pass
MI-631, 632	2/13/2013	K-40	1350.50 ± 105.20	1413.70 ± 85.94	1382.10 ± 67.92	Pass
WW-769, 770	2/25/2013	Gr. Beta	1.20 ± 0.33	1.35 ± 0.34	1.28 ± 0.24	Pass
DW-736, 737	2/26/2013	Gr. Beta	1.09 ± 0.54	1.57 ± 0.58	1.33 ± 0.40	Pass
SWU-790, 791	2/26/2013	Gr. Beta	2.68 ± 0.96	2.08 ± 0.95	2.38 ± 0.67	Pass
W-925, 926	2/27/2013	H-3	2265.00 ± 153.00	2329.00 ± 154.00	2297.00 ± 108.54	Pass
AP-1034, 1035	3/7/2013	Be-7	0.17 ± 0.08	0.16 ± 0.09	0.17 ± 0.06	Pass
MI-1076, 1077	3/13/2013	K-40	1347.70 ± 99.32	1396.10 ± 108.00	1371.90 ± 73.36	Pass
CH-1118, 1119	3/14/2013	I-131(G)	109.41 ± 5.69	103.88 ± 7.76	106.65 ± 4.81	Pass
WW-1221, 1222	3/14/2013	H-3	452.11 ± 97.43	403.29 ± 95.46	427.70 ± 68.20	Pass
P-1368, 1369	3/15/2013	H-3	735.24 ± 113.99	666.04 ± 111.41	700.64 ± 79.70	Pass
DW-40017, 40018	3/19/2013	Gr. Alpha	1.43 ± 0.94	1.61 ± 1.00	1.52 ± 0.69	Pass
MI-1473, 1474	4/1/2013	K-40	1618.00 ± 107.00	1767.00 ± 129.00	1692.50 ± 83.80	Pass
AP-2014, 2015	4/1/2013	Be-7	0.055 ± 0.008	0.057 ± 0.006	0.056 ± 0.005	Pass
DW-40023, 40024	4/1/2013	Ra-226	2.29 ± 0.18	2.54 ± 0.20	2.42 ± 0.13	Pass
DW-40023, 40024	4/1/2013	Ra-228	2.99 ± 0.69	2.96 ± 0.67	2.98 ± 0.48	Pass
SWU-736, 737	4/2/2013	Gr. Beta	4.80 ± 0.95	4.43 ± 0.86	4.62 ± 0.64	Pass
AP-2035, 2036	4/2/2013	Be-7	0.070 ± 0.013	0.065 ± 0.013	0.068 ± 0.009	Pass
BS-1680, 1681	4/8/2013	K-40	1995.30 ± 265.70	1992.00 ± 289.40	1993.65 ± 196.44	Pass
SW-1638, 1639	4/9/2013	H-3	1350.77 ± 130.08	1320.45 ± 129.25	1335.61 ± 91.69	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
WW-2394, 2395	4/9/2013	H-3	348.08 ± 88.40	302.43 ± 86.41	325.25 ± 61.81	Pass
DW-40035, 40036	4/12/2013	Ra-226	1.36 ± 0.15	1.29 ± 0.13	1.33 ± 0.10	Pass
DW-40035, 40036	4/12/2013	Ra-228	1.22 ± 0.49	1.38 ± 0.53	1.30 ± 0.36	Pass
MI-1825, 1826	4/15/2013	K-40	1290.20 ± 113.80	1378.60 ± 91.99	1334.40 ± 73.17	Pass
MI-1825, 1826	4/15/2013	Sr-90	0.68 ± 0.32	0.46 ± 0.31	0.57 ± 0.22	Pass
DW-40049, 40050	4/15/2013	Gr. Alpha	1.88 ± 0.69	2.51 ± 0.71	2.20 ± 0.50	Pass
WW-1909, 1910	4/16/2013	H-3	2145.68 ± 156.65	2108.32 ± 155.80	2127.00 ± 110.47	Pass
DW-40064, 40065	4/23/2013	Gr. Alpha	1.95 ± 0.79	1.80 ± 0.81	1.88 ± 0.57	Pass
DW-40066, 40067	4/23/2013	Ra-226	1.98 ± 0.17	1.66 ± 0.16	1.82 ± 0.12	Pass
DW-40066, 40067	4/23/2013	Ra-228	2.30 ± 0.59	2.32 ± 0.59	2.31 ± 0.42	Pass
F-2225, 2226	5/1/2013	K-40	2.81 ± 0.37	2.67 ± 0.39	2.74 ± 0.27	Pass
BS-2267, 2268	5/1/2013	K-40	13.46 ± 0.64	13.59 ± 0.62	13.52 ± 0.45	Pass
SG-2235, 2236	5/2/2013	Ac-228	18.30 ± 0.60	18.50 ± 0.60	18.40 ± 0.42	Pass
SG-2235, 2236	5/2/2013	Gr. Alpha	54.00 ± 3.70	51.90 ± 3.40	52.95 ± 2.51	Pass
SG-2235, 2236	5/2/2013	Pb-214	11.30 ± 0.30	11.20 ± 0.20	11.25 ± 0.18	Pass
AP-2288, 2289	5/2/2013	Be-7	0.19 ± 0.10	0.19 ± 0.08	0.19 ± 0.07	Pass
WW-3091, 3092	5/2/2013	H-3	1107.91 ± 153.49	1263.37 ± 157.43	1185.64 ± 109.94	Pass
SW-2373, 2374	5/8/2013	H-3	324.80 ± 86.81	364.61 ± 88.53	344.71 ± 62.00	Pass
W-2352, 2353	5/9/2013	Ra-226	0.91 ± 0.20	1.29 ± 0.22	1.10 ± 0.15	Pass
W-2352, 2353	5/9/2013	Ra-228	1.28 ± 0.87	1.03 ± 0.94	1.16 ± 0.64	Pass
CF-2499, 2500	5/13/2013	K-40	11.52 ± 0.45	12.55 ± 0.61	12.04 ± 0.38	Pass
F-3987, 3988	5/20/2013	K-40	3.07 ± 0.48	3.05 ± 0.43	3.06 ± 0.32	Pass
BS-4113, 4114	5/20/2013	K-40	8.06 ± 0.44	7.99 ± 0.44	8.02 ± 0.31	Pass
SO-2902, 2903	5/22/2013	Th-228	0.57 ± 0.07	0.51 ± 0.06	0.54 ± 0.05	Pass
SO-2902, 2903	5/22/2013	Th-230	0.39 ± 0.06	0.40 ± 0.05	0.40 ± 0.04	Pass
SO-2902, 2903	5/22/2013	Th-232	0.55 ± 0.07	0.62 ± 0.06	0.59 ± 0.05	Pass
WW-2776, 2777	5/23/2013	H-3	261.76 ± 100.85	283.17 ± 101.68	272.46 ± 71.61	Pass
WW-2818, 2819	5/23/2013	H-3	999.35 ± 126.15	880.63 ± 122.43	939.99 ± 87.90	Pass
S-7271, 7272	5/27/2013	Cs-137	2.82 ± 0.10	2.91 ± 0.09	2.86 ± 0.07	Pass
S-7271, 7272	5/27/2013	K-40	21.52 ± 0.97	21.13 ± 1.02	21.32 ± 0.70	Pass
P-2923, 2924	5/29/2013	H-3	441.31 ± 92.75	374.30 ± 89.94	407.80 ± 64.60	Pass
WW-3133, 3134	6/1/2013	H-3	278.42 ± 86.54	209.45 ± 83.44	243.93 ± 60.11	Pass
WW-3049, 3050	6/5/2013	H-3	156.08 ± 79.16	244.66 ± 83.86	200.37 ± 57.66	Pass
DW-40079, 40080	6/5/2013	Ra-226	6.67 ± 0.30	7.03 ± 0.35	6.85 ± 0.23	Pass
DW-40079, 40080	6/5/2013	Ra-228	5.55 ± 0.75	6.11 ± 0.77	5.83 ± 0.54	Pass
DW-40089, 40090	6/5/2013	Gr. Alpha	6.82 ± 0.90	5.64 ± 1.02	6.23 ± 0.68	Pass
DW-40091, 40092	6/5/2013	Ra-226	3.44 ± 0.19	3.66 ± 0.19	3.55 ± 0.13	Pass
DW-40091, 40092	6/5/2013	Ra-228	3.70 ± 0.68	4.69 ± 0.73	4.20 ± 0.50	Pass
DW-40103, 40104	6/5/2013	Ra-226	0.98 ± 0.22	0.62 ± 0.15	0.80 ± 0.13	Pass
MI-3154, 3155	6/12/2013	K-40	1513.00 ± 128.10	1456.70 ± 110.30	1484.85 ± 84.52	Pass
P-3385, 3386	6/14/2013	H-3	236.88 ± 87.87	242.87 ± 88.14	239.88 ± 62.23	Pass
F-3776, 3777	6/16/2013	Cs-137	0.039 ± 0.015	0.048 ± 0.019	0.044 ± 0.012	Pass
F-3776, 3777	6/16/2013	Gr. Beta	4.52 ± 0.09	4.63 ± 0.09	4.57 ± 0.06	Pass
F-3776, 3777	6/16/2013	K-40	3.40 ± 0.41	3.52 ± 0.39	3.46 ± 0.29	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
S-3238, 3239	6/17/2013	Be-7	1139.80 ± 215.00	1102.00 ± 194.70	1120.90 ± 145.03	Pass
S-3238, 3239	6/17/2013	Cs-134	26.23 ± 13.23	39.91 ± 11.73	33.07 ± 8.84	Pass
S-3238, 3239	6/17/2013	Cs-137	72.75 ± 25.99	85.91 ± 22.58	79.33 ± 17.21	Pass
S-3238, 3239	6/17/2013	K-40	21847.00 ± 656.50	22158.00 ± 622.80	22002.50 ± 452.46	Pass
SO-3343, 3344	6/17/2013	Cs-137	0.087 ± 0.022	0.084 ± 0.017	0.086 ± 0.014	Pass
SO-3343, 3344	6/17/2013	K-40	8.90 ± 0.53	9.47 ± 0.49	9.19 ± 0.36	Pass
DW-40118, 40119	6/26/2013	Gr. Alpha	3.56 ± 1.07	4.51 ± 0.96	4.04 ± 0.72	Pass
DW-40118, 40119	6/26/2013	Ra-226	2.52 ± 0.22	2.48 ± 0.19	2.50 ± 0.15	Pass
DW-40118, 40119	6/26/2013	Ra-228	2.75 ± 0.71	2.86 ± 0.75	2.81 ± 0.52	Pass
WW-3583, 3584	6/27/2013	H-3	6732.57 ± 246.74	6807.94 ± 247.98	6770.26 ± 174.91	Pass
AP-4092, 4093	6/28/2013	Be-7	0.078 ± 0.015	0.083 ± 0.017	0.080 ± 0.011	Pass
E-3608, 3609	7/1/2013	K-40	1.28 ± 0.13	1.29 ± 0.11	1.28 ± 0.09	Pass
MI-3629, 3630	7/1/2013	K-40	1840.70 ± 130.10	1804.90 ± 143.00	1822.80 ± 96.66	Pass
AP-4050, 4051	7/1/2013	Be-7	0.094 ± 0.009	0.093 ± 0.009	0.093 ± 0.006	Pass
DW-40134, 40135	7/1/2013	Ra-226	1.75 ± 0.15	1.56 ± 0.15	1.66 ± 0.11	Pass
DW-40134, 40135	7/1/2013	Ra-228	2.07 ± 0.60	1.61 ± 0.57	1.84 ± 0.41	Pass
AP-4071, 4072	7/3/2013	Be-7	0.066 ± 0.009	0.069 ± 0.011	0.067 ± 0.007	Pass
DW-40144, 40145	7/9/2013	Gr. Alpha	3.66 ± 0.85	2.85 ± 0.79	3.26 ± 0.58	Pass
DW-40146, 40147	7/9/2013	Ra-226	0.70 ± 0.11	0.72 ± 0.11	0.71 ± 0.08	Pass
DW-40146, 40147	7/9/2013	Ra-228	1.00 ± 0.58	0.70 ± 0.52	0.85 ± 0.39	Pass
VE-3818, 3819	7/9/2013	Be-7	0.41 ± 0.11	0.46 ± 0.18	0.43 ± 0.11	Pass
VE-3818, 3819	7/9/2013	K-40	4.67 ± 0.30	4.52 ± 0.43	4.60 ± 0.26	Pass
XW-4646, 4647	7/15/2013	H-3	465.00 ± 111.00	525.00 ± 114.00	495.00 ± 79.56	Pass
WW-4134, 4135	7/16/2013	H-3	315.86 ± 123.54	264.98 ± 121.78	290.42 ± 86.73	Pass
AP-4155, 4156	7/18/2013	Be-7	0.20 ± 0.11	0.16 ± 0.09	0.18 ± 0.07	Pass
MI-4218, 4219	7/22/2013	K-40	1426.80 ± 117.50	1335.70 ± 110.60	1381.25 ± 80.68	Pass
MI-4218, 4219	7/22/2013	Sr-90	0.62 ± 0.32	0.67 ± 0.32	0.65 ± 0.23	Pass
WW-4239, 4240	7/23/2013	H-3	223.71 ± 92.64	221.74 ± 92.56	222.73 ± 65.48	Pass
WW-4394, 4395	7/30/2013	Gr. Alpha	2.63 ± 1.49	2.57 ± 1.11	2.60 ± 0.93	Pass
WW-4394, 4395	7/30/2013	Gr. Beta	3.72 ± 1.17	2.63 ± 1.29	3.18 ± 0.87	Pass
WW-4394, 4395	7/30/2013	H-3	271.50 ± 91.30	297.60 ± 91.50	284.55 ± 64.63	Pass
SWU-4478, 4479	7/30/2013	Gr. Beta	2.07 ± 0.54	2.24 ± 0.55	2.16 ± 0.39	Pass
DW-40159, 40160	7/31/2013	Ra-226	3.39 ± 0.63	2.39 ± 0.45	2.89 ± 0.39	Pass
DW-40159, 40160	7/31/2013	Ra-228	3.29 ± 0.73	2.94 ± 0.68	3.12 ± 0.50	Pass
VE-4436, 4437	8/1/2013	Be-7	0.98 ± 0.21	0.89 ± 0.17	0.94 ± 0.14	Pass
VE-4436, 4437	8/1/2013	K-40	3.95 ± 0.39	3.75 ± 0.31	3.85 ± 0.25	Pass
G-4457, 4458	8/1/2013	Be-7	0.78 ± 0.19	0.67 ± 0.16	0.72 ± 0.12	Pass
G-4457, 4458	8/1/2013	Gr. Beta	6.15 ± 0.14	6.10 ± 0.14	6.13 ± 0.10	Pass
G-4457, 4458	8/1/2013	K-40	4.25 ± 0.36	4.60 ± 0.41	4.42 ± 0.27	Pass
VE-4520, 4521	8/1/2013	K-40	2.20 ± 0.16	2.09 ± 0.17	2.15 ± 0.12	Pass
WW-4772, 4773	8/6/2013	H-3	143.80 ± 86.70	157.80 ± 87.30	150.80 ± 61.52	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
VE-4709, 4710	8/8/2013	Gr. Beta	31.40 ± 1.00	30.70 ± 1.00	31.05 ± 0.71	Pass
VE-4709, 4710	8/8/2013	H-3	1504.00 ± 132.00	1468.00 ± 131.00	1486.00 ± 92.99	Pass
VE-4709, 4710	8/8/2013	U-233/4	0.009 ± 0.002	0.005 ± 0.002	0.007 ± 0.001	Pass
VE-4709, 4710	8/8/2013	U-238	0.005 ± 0.002	0.004 ± 0.001	0.005 ± 0.001	Pass
WW-4562, 4563	8/8/2013	H-3	208.82 ± 105.55	213.13 ± 105.73	210.97 ± 74.70	Pass
SG-4651, 4652	8/13/2013	Gr. Alpha	29.00 ± 3.10	28.80 ± 3.20	28.90 ± 2.23	Pass
SG-4651, 4652	8/13/2013	Gr. Beta	34.10 ± 1.80	34.00 ± 1.80	34.05 ± 1.27	Pass
SG-4651, 4652	8/13/2013	Ra-226	9.00 ± 0.20	8.70 ± 0.20	8.85 ± 0.14	Pass
VE-4835, 4836	8/13/2013	K-40	3.01 ± 0.24	3.08 ± 0.28	3.04 ± 0.19	Pass
WW-4877, 4878	8/14/2013	H-3	217.35 ± 87.57	276.63 ± 90.20	246.99 ± 62.86	Pass
LW-4856, 4857	8/15/2013	Gr. Beta	0.96 ± 0.40	0.94 ± 0.38	0.95 ± 0.28	Pass
W-4982, 4983	8/16/2013	H-3	757.43 ± 112.40	767.56 ± 112.76	762.50 ± 79.60	Pass
VE-4919, 4920	8/19/2013	K-40	4891.90 ± 407.90	4907.40 ± 350.40	4899.65 ± 268.87	Pass
VE-4919, 4920	8/19/2013	Be-7	470.50 ± 159.60	325.10 ± 104.10	397.80 ± 95.27	Pass
DW-40184, 40185	8/19/2013	Ra-228	2.35 ± 0.72	2.53 ± 0.70	2.44 ± 0.50	Pass
DW-40184, 40185	8/19/2013	Ra-228	1.44 ± 0.35	2.30 ± 0.56	1.87 ± 0.33	Pass
AP-5003, 5004	8/22/2013	Be-7	0.23 ± 0.10	0.21 ± 0.10	0.22 ± 0.07	Pass
LW-5229, 5230	8/29/2013	Gr. Beta	1.09 ± 0.86	2.28 ± 0.96	1.69 ± 0.64	Pass
SS-5333, 5334	9/3/2013	Cs-137	89.20 ± 41.60	97.80 ± 34.60	93.50 ± 27.05	Pass
SS-5333, 5334	9/3/2013	K-40	11893.00 ± 681.30	12353.00 ± 778.90	12123.00 ± 517.41	Pass
VE-5313, 5314	9/3/2013	K-40	1.84 ± 0.20	1.85 ± 0.20	1.85 ± 0.14	Pass
VE-5313, 5314	9/3/2013	Gr. Beta	2.38 ± 0.04	2.43 ± 0.04	2.41 ± 0.03	Pass
WW-5617, 5618	9/5/2013	H-3	1987.00 ± 147.00	2094.00 ± 150.00	2040.50 ± 105.01	Pass
AP-5355, 5356	9/5/2013	Be-7	0.22 ± 0.12	0.27 ± 0.14	0.25 ± 0.09	Pass
XW-5694, 5695	9/8/2013	C-14	0.94 ± 0.09	0.78 ± 0.10	0.86 ± 0.07	Pass
VE-5409, 5410	9/9/2013	K-40	3.60 ± 0.26	3.33 ± 0.29	3.46 ± 0.19	Pass
AP-5430, 5431	9/12/2013	Be-7	0.26 ± 0.10	0.26 ± 0.10	0.26 ± 0.07	Pass
MI-5401, 5402	9/12/2013	K-40	1404.60 ± 114.10	1356.10 ± 128.60	1380.35 ± 85.96	Pass
WW-5451, 5452	9/12/2013	H-3	196.66 ± 84.44	200.78 ± 84.64	198.72 ± 59.78	Pass
MI-5484, 5485	9/16/2013	K-40	1398.50 ± 88.93	1364.60 ± 113.30	1381.55 ± 72.02	Pass
WW-5568, 5569	9/17/2013	H-3	274.69 ± 87.95	203.72 ± 84.71	239.20 ± 61.05	Pass
BS-5764, 5765	9/20/2013	Cs-137	0.40 ± 0.03	0.37 ± 0.02	0.39 ± 0.02	Pass
BS-5764, 5765	9/20/2013	K-40	17.97 ± 0.59	17.54 ± 0.55	17.76 ± 0.40	Pass
VE-5638, 5639	9/23/2013	K-40	4.15 ± 0.33	4.46 ± 0.38	4.31 ± 0.25	Pass
WW-5596, 5597	9/23/2013	Gr. Beta	5.97 ± 1.39	5.95 ± 1.45	5.96 ± 1.01	Pass
G-5680, 5681	9/25/2013	Be-7	0.36 ± 0.13	0.35 ± 0.09	0.35 ± 0.08	Pass
G-5680, 5681	9/25/2013	Gr. Beta	3.81 ± 0.11	3.77 ± 0.11	3.79 ± 0.08	Pass
G-5680, 5681	9/25/2013	K-40	3.23 ± 0.32	2.99 ± 0.24	3.11 ± 0.20	Pass
S-5659, 5660	9/26/2013	Ac-228	1.19 ± 0.21	1.06 ± 0.21	1.13 ± 0.15	Pass
S-5659, 5660	9/26/2013	Cs-137	0.13 ± 0.04	0.14 ± 0.05	0.14 ± 0.03	Pass
S-5659, 5660	9/26/2013	K-40	16.08 ± 1.39	16.65 ± 1.46	16.37 ± 1.01	Pass
S-5659, 5660	9/26/2013	Pb-214	0.97 ± 0.15	1.10 ± 0.16	1.04 ± 0.11	Pass
AP-6345, 6346	9/30/2013	Be-7	0.077 ± 0.010	0.081 ± 0.008	0.079 ± 0.006	Pass
AP-6366, 6367	9/30/2013	Be-7	0.078 ± 0.012	0.083 ± 0.014	0.081 ± 0.009	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
DW-5701, 5702	9/30/2013	Gr. Beta	14.48 ± 2.04	13.32 ± 1.84	13.90 ± 1.37	Pass
SG-5722, 5723	9/30/2013	Ra-226	12.41 ± 0.47	11.98 ± 0.59	12.20 ± 0.38	Pass
SG-5722, 5723	9/30/2013	Ra-228	7.84 ± 0.71	8.13 ± 0.97	7.99 ± 0.60	Pass
G-5806, 5807	10/1/2013	Be-7	3.26 ± 0.30	3.11 ± 0.13	3.19 ± 0.16	Pass
G-5806, 5807	10/1/2013	K-40	6.65 ± 0.21	6.68 ± 0.50	6.67 ± 0.27	Pass
SG-5827, 5828	10/1/2013	Ac-228	4.08 ± 0.33	3.92 ± 0.40	4.00 ± 0.26	Pass
SG-5827, 5828	10/1/2013	K-40	2.55 ± 0.65	2.37 ± 0.63	2.46 ± 0.45	Pass
SG-5827, 5828	10/1/2013	Pb-214	3.82 ± 0.17	3.93 ± 0.20	3.88 ± 0.13	Pass
VE-5848, 5849	10/1/2013	K-40	1.62 ± 0.16	1.57 ± 0.14	1.60 ± 0.11	Pass
AP-6408, 6409	10/3/2013	Be-7	0.072 ± 0.015	0.063 ± 0.012	0.068 ± 0.010	Pass
f-5954, 5955	10/3/2013	K-40	2.74 ± 0.36	3.02 ± 0.34	2.88 ± 0.25	Pass
P-6035, 6036	10/7/2013	H-3	198.41 ± 85.00	288.60 ± 89.15	243.51 ± 61.59	Pass
SG-6115, 6116	10/8/2013	Ac-228	5.22 ± 0.50	4.87 ± 0.48	5.05 ± 0.35	Pass
SG-6115, 6116	10/8/2013	K-40	5.61 ± 1.08	6.61 ± 1.04	6.11 ± 0.75	Pass
SG-6115, 6116	10/8/2013	Pb-214	4.29 ± 0.24	4.24 ± 0.20	4.27 ± 0.16	Pass
VE-6136, 6137	10/8/2013	Be-7	0.55 ± 0.18	0.60 ± 0.15	0.58 ± 0.12	Pass
VE-6136, 6137	10/8/2013	K-40	2.78 ± 0.35	2.61 ± 0.33	2.69 ± 0.24	Pass
WW-6198, 6199	10/8/2013	H-3	12973.70 ± 332.60	12757.80 ± 330.00	12865.75 ± 234.27	Pass
VE-6240, 6241	10/9/2013	K-40	14.29 ± 0.29	14.95 ± 0.54	14.62 ± 0.31	Pass
W-5996, 5997	10/9/2013	Gr. Alpha	3.87 ± 1.18	4.07 ± 1.08	3.97 ± 0.80	Pass
W-5996, 5997	10/9/2013	Gr. Beta	9.82 ± 0.85	8.53 ± 0.82	9.18 ± 0.59	Pass
W-5996, 5997	10/9/2013	Ra-228	3.42 ± 1.02	3.39 ± 1.01	3.41 ± 0.72	Pass
DW-40224, 40225	10/11/2013	Ra-226	0.62 ± 0.10	0.76 ± 0.10	0.69 ± 0.07	Pass
DW-40224, 40225	10/11/2013	Ra-228	0.87 ± 0.55	1.00 ± 0.54	0.94 ± 0.39	Pass
WW-6219, 6220	10/11/2013	H-3	455.41 ± 111.54	354.66 ± 107.84	405.03 ± 77.57	Pass
CF-6261, 6262	10/14/2013	Be-7	1.97 ± 0.24	2.06 ± 0.22	2.01 ± 0.16	Pass
CF-6261, 6262	10/14/2013	K-40	11.55 ± 0.56	12.06 ± 0.61	11.80 ± 0.41	Pass
MI-6303, 6304	10/14/2013	K-40	1507.30 ± 110.80	1482.40 ± 110.00	1494.85 ± 78.07	Pass
VE-6534, 6535	10/17/2013	K-40	15.96 ± 0.17	16.16 ± 0.36	16.06 ± 0.20	Pass
S-6471, 6472	10/18/2013	Ac-228	0.94 ± 0.19	0.78 ± 0.18	0.86 ± 0.13	Pass
S-6471, 6472	10/18/2013	K-40	12.82 ± 1.05	12.90 ± 1.17	12.86 ± 0.79	Pass
S-6471, 6472	10/18/2013	Pb-214	0.88 ± 0.11	0.72 ± 0.12	0.80 ± 0.08	Pass
VE-6597, 6598	10/22/2013	K-40	2.46 ± 0.22	2.58 ± 0.20	2.52 ± 0.15	Pass
WW-6576, 6577	10/22/2013	H-3	745.60 ± 110.70	663.30 ± 107.60	704.45 ± 77.19	Pass
LW-6681, 6682	10/29/2013	Gr. Beta	2.00 ± 0.92	2.17 ± 0.98	2.09 ± 0.67	Pass
SWU-6765, 6766	10/29/2013	Gr. Beta	3.07 ± 0.61	2.90 ± 0.65	2.99 ± 0.45	Pass
WW-6849, 6850	10/29/2013	H-3	863.00 ± 113.80	826.60 ± 112.50	844.80 ± 80.01	Pass
MI-6786, 6787	10/30/2013	K-40	1370.60 ± 109.60	1449.20 ± 105.50	1409.90 ± 76.06	Pass
SO-6744, 6745	10/30/2013	Ac-228	0.46 ± 0.11	0.51 ± 0.11	0.48 ± 0.08	Pass
SO-6744, 6745	10/30/2013	Bi-214	0.48 ± 0.10	0.30 ± 0.10	0.39 ± 0.07	Pass
SO-6744, 6745	10/30/2013	Cs-137	0.21 ± 0.04	0.24 ± 0.04	0.23 ± 0.03	Pass
SO-6744, 6745	10/30/2013	Gr. Beta	27.40 ± 1.14	27.44 ± 1.11	27.42 ± 0.80	Pass
SO-6744, 6745	10/30/2013	K-40	14.93 ± 0.88	15.20 ± 0.90	15.07 ± 0.63	Pass
SO-6744, 6745	10/30/2013	Pb-212	0.43 ± 0.04	0.40 ± 0.05	0.42 ± 0.03	Pass
SO-6744, 6745	10/30/2013	Ra-226	1.47 ± 0.35	1.31 ± 0.36	1.39 ± 0.25	Pass
SO-6744, 6745	10/30/2013	Tl-208	0.16 ± 0.04	0.16 ± 0.04	0.16 ± 0.03	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
DW-40238, 40239	10/31/2013	Ra-228	0.94 ± 0.41	1.60 ± 0.55	1.27 ± 0.34	Pass
WW-7018, 7019	11/1/2013	H-3	593.09 ± 104.72	648.69 ± 106.89	620.89 ± 74.82	Pass
CF-6870, 6871	11/4/2013	K-40	12.67 ± 0.49	13.30 ± 0.47	12.98 ± 0.34	Pass
XW-6828, 6829	11/4/2013	K-40	97.99 ± 55.33	160.21 ± 74.99	129.10 ± 46.60	Pass
BS-6891, 6892	11/5/2013	Cs-137	0.018 ± 0.010	0.018 ± 0.009	0.018 ± 0.007	Pass
BS-6891, 6892	11/5/2013	Gr. Beta	12.41 ± 1.74	9.97 ± 1.57	11.19 ± 1.17	Pass
BS-6891, 6892	11/5/2013	K-40	6.49 ± 0.33	6.28 ± 0.40	6.39 ± 0.26	Pass
WW-6912, 6913	11/5/2013	Gr. Alpha	2.87 ± 1.30	4.46 ± 1.47	3.67 ± 0.98	Pass
WW-6912, 6913	11/5/2013	Gr. Beta	3.18 ± 0.87	3.18 ± 0.87	3.18 ± 0.62	Pass
WW-6912, 6913	11/5/2013	H-3	349.01 ± 101.42	430.14 ± 98.06	389.58 ± 70.54	Pass
SO-6954, 6955	11/6/2013	Cs-137	0.14 ± 0.03	0.12 ± 0.02	0.13 ± 0.02	Pass
SO-6954, 6955	11/6/2013	K-40	15.16 ± 0.72	14.11 ± 0.64	14.64 ± 0.48	Pass
S-6976, 6977	11/13/2013	K-40	22.36 ± 0.69	22.62 ± 0.72	22.49 ± 0.50	Pass
DW-40246, 40247	11/15/2013	Gr. Alpha	15.00 ± 3.41	20.31 ± 4.00	17.65 ± 2.63	Pass
CF-7102, 7103	11/18/2013	Be-7	17.79 ± 0.51	18.09 ± 0.80	17.94 ± 0.48	Pass
DW-40250, 40251	11/18/2013	Ra-226	27.77 ± 2.84	26.15 ± 2.67	26.96 ± 1.95	Pass
DW-40250, 40251	11/18/2013	Ra-228	7.91 ± 0.94	6.32 ± 0.84	7.12 ± 0.63	Pass
WW-7164, 7165	11/19/2013	H-3	266.90 ± 91.10	268.90 ± 91.20	267.90 ± 64.45	Pass
SS-7334, 7335	11/20/2013	K-40	15.51 ± 0.72	14.14 ± 0.80	14.83 ± 0.54	Pass
WW-7558, 7559	11/22/2013	H-3	229.86 ± 83.89	191.77 ± 82.05	210.82 ± 58.67	Pass
LW-7292, 7293	11/26/2013	Gr. Beta	1.92 ± 0.75	2.38 ± 0.77	2.15 ± 0.54	Pass
W-7229, 7230	12/1/2013	Ra-226	0.87 ± 0.23	0.88 ± 0.25	0.88 ± 0.17	Pass
W-7229, 7230	12/1/2013	Ra-228	3.00 ± 0.98	3.27 ± 1.16	3.14 ± 0.76	Pass
SG-7313, 7314	12/2/2013	Ac-228	6.33 ± 0.23	6.69 ± 0.30	6.51 ± 0.19	Pass
SG-7313, 7314	12/2/2013	K-40	5.47 ± 0.61	6.24 ± 0.74	5.86 ± 0.48	Pass
SG-7313, 7314	12/2/2013	Pb-214	5.60 ± 0.14	5.37 ± 0.16	5.49 ± 0.11	Pass
W-7432, 7433	12/4/2013	Gr. Beta	5.35 ± 1.20	3.89 ± 1.23	4.62 ± 0.86	Pass
WW-7516, 7517	12/10/2013	H-3	369.30 ± 95.64	269.22 ± 91.35	319.26 ± 66.13	Pass
SG-7579, 7580	12/20/2013	Ra-226	3.72 ± 0.11	3.85 ± 0.30	3.79 ± 0.16	Pass
SG-7579, 7580	12/20/2013	Ra-228	2.38 ± 0.18	2.77 ± 0.44	2.58 ± 0.24	Pass
LW-7684, 7685	12/23/2013	Gr. Beta	0.84 ± 0.51	1.96 ± 0.61	1.40 ± 0.40	Pass
DW-40261, 40262	12/27/2013	Ra-226	0.54 ± 0.10	0.67 ± 0.10	0.61 ± 0.07	Pass
DW-40261, 40262	12/27/2013	Ra-228	1.09 ± 0.51	1.12 ± 0.43	1.11 ± 0.33	Pass
SWU-7663, 7664	12/30/2013	Gr. Beta	2.85 ± 0.71	3.88 ± 0.77	3.37 ± 0.52	Pass

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).

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

Lab Code ^b	Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MAAP-738	02/01/13	Am-241	0.10 ± 0.02	0.10	0.07 - 0.14	Pass
MAAP-738	02/01/13	Co-57	2.58 ± 0.06	2.36	1.65 - 3.07	Pass
MAAP-738	02/01/13	Co-60	0.01 ± 0.03	0.00	NA ^c	Pass
MAAP-738	02/01/13	Cs-134	1.82 ± 0.13	1.78	1.25 - 2.31	Pass
MAAP-738	02/01/13	Cs-137	2.93 ± 0.10	2.60	1.82 - 3.38	Pass
MAAP-738	02/01/13	Mn-54	4.87 ± 0.13	4.26	2.98 - 5.54	Pass
MAAP-738	02/01/13	Pu-238	0.12 ± 0.02	0.13	0.09 - 0.17	Pass
MAAP-738	02/01/13	Pu-239/40	0.11 ± 0.02	0.12	0.09 - 0.16	Pass
MAAP-738	02/01/13	Sr-90	1.39 ± 0.14	1.49	1.04 - 1.94	Pass
MAAP-738	02/01/13	U-233/4	0.03 ± 0.01	0.03	0.02 - 0.04	Pass
MAAP-738	02/01/13	U-238	0.23 ± 0.03	0.23	0.16 - 0.30	Pass
MAAP-738	02/01/13	Zn-65	3.84 ± 0.20	3.13	2.19 - 4.07	Pass
MAAP-738 ^e	02/01/13	Gr. Alpha	0.14 ± 0.03	1.20	0.36 - 2.04	Fail
MAAP-738	02/01/13	Gr. Beta	0.93 ± 0.06	0.85	0.43 - 1.28	Pass
MAW-806	02/01/13	Am-241	0.71 ± 0.08	0.69	0.48 - 0.90	Pass
MAW-806	02/01/13	Co-57	31.20 ± 0.40	30.90	21.60 - 40.20	Pass
MAW-806	02/01/13	Co-60	19.70 ± 0.30	16.56	13.69 - 25.43	Pass
MAW-806	02/01/13	Cs-134	23.20 ± 0.50	24.40	17.10 - 31.70	Pass
MAW-806	02/01/13	Cs-137	0.03 ± 0.12	0.00	NA ^c	Pass
MAW-806	02/01/13	Fe-55	34.00 ± 3.30	44.00	30.80 - 57.20	Pass
MAW-806	02/01/13	H-3	511.60 ± 12.50	507.00	355.00 - 659.00	Pass
MAW-806	02/01/13	K-40	2.20 ± 0.90	0.00	NA ^c	Pass
MAW-806	02/01/13	Mn-54	27.60 ± 0.50	27.40	19.20 - 35.60	Pass
MAW-806	02/01/13	Ni-63	34.30 ± 2.80	33.40	23.40 - 43.40	Pass
MAW-806	02/01/13	Pu-238	0.83 ± 0.10	0.88	0.62 - 1.15	Pass
MAW-806	02/01/13	Pu-239/40	0.02 ± 0.02	0.01	NA ^d	Pass
MAW-806	02/01/13	Sr-90	9.30 ± 0.80	10.50	7.40 - 13.70	Pass
MAW-806	02/01/13	Tc-99	10.25 ± 0.40	13.10	9.20 - 17.00	Pass
MAW-806	02/01/13	U-233/4	0.31 ± 0.05	0.32	0.22 - 0.41	Pass
MAW-806	02/01/13	U-238	1.91 ± 0.13	1.95	1.37 - 2.54	Pass
MAW-806	02/01/13	Zn-65	31.60 ± 0.80	30.40	21.30 - 39.50	Pass
MAW-811	02/01/13	Gr. Alpha	1.87 ± 0.09	2.31	0.69 - 3.93	Pass
MAW-811	02/01/13	Gr. Beta	13.04 ± 0.13	13.00	6.50 - 19.50	Pass
MAW-811	02/01/13	I-129	4.60 ± 0.19	6.06	4.24 - 7.88	Pass

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

Lab Code ^b	Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MASO-739	02/01/13	Am-241	106.90 ± 11.40	113.00	79.00 - 147.00	Pass
MASO-739	02/01/13	Co-57	0.60 ± 0.50	0.00	NA ^c	Pass
MASO-739	02/01/13	Co-60	739.20 ± 28.50	691.00	484.00 - 898.00	Pass
MASO-739	02/01/13	Cs-134	863.30 ± 34.10	887.00	621.00 - 1153.00	Pass
MASO-739	02/01/13	Cs-137	661.80 ± 25.70	587.00	411.00 - 763.00	Pass
MASO-739	02/01/13	K-40	745.80 ± 33.30	625.30	437.70 - 812.90	Pass
MASO-739	02/01/13	Mn-54	1.10 ± 1.00	0.00	NA ^c	Pass
MASO-739	02/01/13	Zn-65	1109.60 ± 44.10	995.00	697.00 - 1294.00	Pass
MASO-744	02/01/13	Ni-63	682.60 ± 16.80	670.00	469.00 - 871.00	Pass
MASO-744	02/01/13	Pu-238	0.20 ± 0.90	0.52	NA ^d	Pass
MASO-744	02/01/13	Pu-239/40	88.30 ± 9.00	79.50	55.70 - 103.40	Pass
MASO-744 ^f	02/01/13	Sr-90	408.40 ± 14.00	628.00	440.00 - 816.00	Fail
MASO-744	02/01/13	Tc-99	380.50 ± 16.80	444.00	311.00 - 577.00	Pass
MASO-744	02/01/13	U-233/4	53.20 ± 4.80	62.50	43.80 - 81.30	Pass
MASO-744	02/01/13	U-238	242.10 ± 10.20	281.00	197.00 - 365.00	Pass
MAVE-747	02/01/13	Co-57	10.37 ± 0.17	8.68	6.08 - 11.28	Pass
MAVE-747	02/01/13	Co-60	6.48 ± 0.17	5.85	4.10 - 7.61	Pass
MAVE-747	02/01/13	Cs-134	0.02 ± 0.04	0.00	NA ^c	Pass
MAVE-747	02/01/13	Cs-137	7.79 ± 0.21	6.87	4.81 - 8.93	Pass
MAVE-747	02/01/13	Mn-54	0.00 ± 0.05	0.00	NA ^c	Pass
MAVE-747	02/01/13	Zn-65	7.29 ± 0.33	6.25	4.38 - 8.13	Pass
MASO-5043	08/01/13	Am-241	1.40 ± 1.70	0.00	NA ^c	Pass
MASO-5043 ^g	08/01/13	Co-57	699.60 ± 3.90	0.00	NA ^c	Fail
MASO-5043	08/01/13	Cs-134	1191.70 ± 23.00	1172.00	820.00 - 1524.00	Pass
MASO-5043	08/01/13	Cs-137	1072.00 ± 5.10	977.00	684.00 - 1270.00	Pass
MASO-5043	08/01/13	K-40	760.00 ± 16.20	633.00	443.00 - 823.00	Pass
MASO-5043	08/01/13	Mn-54	753.80 ± 4.90	674.00	472.00 - 876.00	Pass
MASO-5043	08/01/13	Ni-63	560.00 ± 23.70	571.00	400.00 - 742.00	Pass
MASO-5043	08/01/13	Pu-238	68.40 ± 7.50	61.50	43.10 - 80.00	Pass
MASO-5043	08/01/13	Pu-239/40	0.40 ± 0.80	0.36	NA ^d	Pass
MASO-5043	08/01/13	Sr-90	383.90 ± 14.50	460.00	322.00 - 598.00	Pass
MASO-5043	08/01/13	Tc-99	-1.00 ± 10.50	0.00	NA ^c	Pass
MASO-5043	08/01/13	U-233/4	23.80 ± 3.30	30.00	21.00 - 39.00	Pass
MASO-5043	08/01/13	U-238	26.80 ± 3.50	34.00	23.80 - 44.20	Pass
MASO-5043	08/01/13	Zn-65	-351.50 ± 5.50	0.00	NA ^c	Pass

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

Lab Code ^b	Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MAW-5052	08/01/13	I-129	2.75 ± 0.20	3.79	2.65 - 4.93	Pass
MAW-5094	08/01/13	Am-241	0.00 ± 0.01	0.00	NA ^c	Pass
MAW-5094	08/01/13	Co-57	0.01 ± 0.09	0.00	NA ^c	Pass
MAW-5094	08/01/13	Co-60	23.20 ± 0.32	23.58	16.51 - 30.65	Pass
MAW-5094	08/01/13	Cs-134	27.60 ± 0.58	30.40	21.00 - 39.00	Pass
MAW-5094	08/01/13	Cs-137	32.31 ± 0.52	31.60	22.10 - 41.10	Pass
MAW-5094	08/01/13	Fe-55	39.20 ± 3.50	53.30	37.30 - 69.30	Pass
MAW-5094	08/01/13	Gr. Alpha	0.54 ± 0.05	0.70	0.21 - 1.19	Pass
MAW-5094	08/01/13	Gr. Beta	5.85 ± 0.09	5.94	2.97 - 8.91	Pass
MAW-5094	08/01/13	H-3	1.20 ± 3.00	0.00	NA ^c	Pass
MAW-5094	08/01/13	K-40	2.22 ± 0.90	0.00	NA ^c	Pass
MAW-5094	08/01/13	Mn-54	0.01 ± 0.11	0.00	NA ^c	Pass
MAW-5094	08/01/13	Ni-63	21.80 ± 3.30	26.40	18.50 - 34.30	Pass
MAW-5094	08/01/13	Pu-238	1.30 ± 0.11	1.22	0.85 - 1.58	Pass
MAW-5094	08/01/13	Pu-239/40	0.98 ± 0.09	1.00	0.70 - 1.30	Pass
MAW-5094	08/01/13	Sr-90	6.40 ± 0.60	7.22	5.05 - 9.39	Pass
MAW-5094	08/01/13	Tc-99	13.10 ± 0.70	16.20	11.30 - 21.10	Pass
MAW-5094	08/01/13	U-233/4	0.08 ± 0.02	0.07	NA ^d	Pass
MAW-5094	08/01/13	U-238	0.03 ± 0.01	0.03	NA ^d	Pass
MAW-5094	08/01/13	Zn-65	35.30 ± 0.90	34.60	24.20 - 45.00	Pass
MAVE-5046	08/01/13	Co-57	0.01 ± 0.03	0.00	NA ^c	Pass
MAVE-5046	08/01/13	Co-60	0.00 ± 0.04	0.00	NA ^c	Pass
MAVE-5046	08/01/13	Cs-134	5.71 ± 0.23	5.20	3.64 - 6.76	Pass
MAVE-5046	08/01/13	Cs-137	7.64 ± 0.20	6.60	4.62 - 8.58	Pass
MAVE-5046	08/01/13	Mn-54	9.08 ± 0.24	7.88	5.52 - 10.24	Pass
MAVE-5046	08/01/13	Zn-65	2.92 ± 0.25	2.63	1.84 - 3.42	Pass

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

Lab Code ^b	Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MAAP-5046	08/01/13	Am-241	0.01 ± 0.02	0.00	NA ^c	Pass
MAAP-5046	08/01/13	Co-57	3.48 ± 0.14	3.40	1.90 - 3.50	Pass
MAAP-5046	08/01/13	Co-60	2.44 ± 0.08	3.40	1.60 - 3.00	Pass
MAAP-5046	08/01/13	Cs-134	0.01 ± 0.03	0.00	NA ^c	Pass
MAAP-5046	08/01/13	Cs-137	3.09 ± 0.13	2.70	1.90 - 3.50	Pass
MAAP-5046	08/01/13	Gr. Alpha	0.28 ± 0.04	0.90	0.27 - 1.53	Pass
MAAP-5046	08/01/13	Gr. Beta	1.90 ± 0.08	1.63	0.82 - 2.45	Pass
MAAP-5046	08/01/13	Mn-54	3.95 ± 0.12	3.50	2.50 - 4.60	Pass
MAAP-5046	08/01/13	Pu-238	0.14 ± 0.028	0.12	0.087 - 0.16	Pass
MAAP-5046	08/01/13	Pu-239/40	0.10 ± 0.022	0.092	0.064 - 0.12	Pass
MAAP-5046	08/01/13	Sr-90	1.69 ± 4.10	1.81	1.27 - 2.35	Pass
MAAP-5046 ^h	08/01/13	U-233/4	0.04 ± 0.01	0.03	0.02 - 0.04	Fail
MAAP-5046	08/01/13	U-238	0.19 ± 0.027	0.21	0.14 - 0.27	Pass
MAAP-5046	08/01/13	Zn-65	3.27 ± 0.18	2.70	2.50 - 4.60	Pass

^a Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

^b Laboratory codes as follows: MAW (water), MAAP (air filter), MASO (soil), MAVE (vegetation).

^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. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

^d Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

^e The filter was recounted overnight, no significant alpha activity could be detected.

^f The sample was reanalyzed using additional fuming nitric separations. Result of reanalysis: 574.4 ± 35.2 Bq/kg.

^g Interference from Eu-152 resulted in misidentification of Co-57.

^h Result of repeat analysis: 0.031 ± 0.013 pCi/filter.

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^b		Control Limits	Acceptance
			Laboratory Result ^c	ERA Result ^d		
ERAP-1174	03/18/13	Am-241	65.2 ± 4.4	66.8	41.2 - 90.4	Pass
ERAP-1174	03/18/13	Co-60	226.5 ± 4.1	214.0	166.0 - 267.0	Pass
ERAP-1174	03/18/13	Cs-134	1101.2 ± 23.6	1110.0	706.0 - 1380.0	Pass
ERAP-1174	03/18/13	Cs-137	1065.6 ± 21.4	940.0	706.0 - 1230.0	Pass
ERAP-1174	03/18/13	Fe-55	178.8 ± 88.0	225.0	69.8 - 440.0	Pass
ERAP-1174	03/18/13	Mn-54	< 3.1	0.0	0.0 - 50.0	Pass
ERAP-1174	03/18/13	Pu-238	50.0 ± 3.0	51.1	34.3 - 65.9	Pass
ERAP-1174	03/18/13	Pu-239/40	65.7 ± 2.6	65.2	47.2 - 85.2	Pass
ERAP-1174	03/18/13	U-233/4	54.0 ± 2.5	59.4	36.8 - 89.6	Pass
ERAP-1174	03/18/13	U-238	55.6 ± 2.6	58.9	38.1 - 81.4	Pass
ERAP-1174	03/18/13	Uranium	112.0 ± 5.6	121.0	67.0 - 184.0	Pass
ERAP-1174	03/18/13	Zn-65	236.6 ± 13.8	199.0	142.0 - 275.0	Pass
ERAP-1175	03/18/13	Gr. Alpha	52.3 ± 2.8	42.3	14.2 - 65.7	Pass
ERAP-1175	03/18/13	Gr. Beta	36.2 ± 2.0	25.1	15.9 - 36.6	Pass
ERSO-1176	03/18/13	Am-241	293.1 ± 97.4	229.0	134.0 - 297.0	Pass
ERSO-1176	03/18/13	Pu-238	909.0 ± 180.0	788.0	474.0 - 1090.0	Pass
ERSO-1176	03/18/13	Pu-239/40	432.0 ± 120.0	366.0	239.0 - 506.0	Pass
ERSO-1176	03/18/13	Sr-90	8050.8 ± 376.0	8530.0	3250.0 - 13500.0	Pass
ERSO-1176	03/18/13	U-233/4	1662.6 ± 150.0	1920.0	1170.0 - 2460.0	Pass
ERSO-1176	03/18/13	U-238	1682.8 ± 160.0	1900.0	1180.0 - 2410.0	Pass
ERSO-1176	03/18/13	Uranium	3404.0 ± 330.5	3920.0	2130.0 - 5170.0	Pass
ERSO-1176	03/18/13	Ac-228	1335.0 ± 132.0	1240.0	795.0 - 1720.0	Pass
ERSO-1176	03/18/13	Bi-212	1420.0 ± 311.0	1240.0	330.0 - 1820.0	Pass
ERSO-1176	03/18/13	Bi-214	2626.0 ± 60.0	3660.0	2200.0 - 5270.0	Pass
ERSO-1176	03/18/13	Co-60	7951.0 ± 45.4	7920.0	5360.0 - 10900.0	Pass
ERSO-1176	03/18/13	Cs-134	5785.0 ± 51.0	6370.0	4160.0 - 7650.0	Pass
ERSO-1176	03/18/13	Cs-137	6106.0 ± 47.9	6120.0	4690.0 - 7870.0	Pass
ERSO-1176	03/18/13	K-40	11756.0 ± 284.3	10300.0	7520.0 - 13800.0	Pass
ERSO-1176	03/18/13	Mn-54	< 28.0	0.0	0.0 - 1000.0	Pass
ERSO-1176	03/18/13	Pb-212	1096.0 ± 29.1	1240.0	812.0 - 1730.0	Pass
ERSO-1176	03/18/13	Pb-214	2875.0 ± 60.0	3660.0	2140.0 - 5460.0	Pass
ERSO-1176	03/18/13	Th-234	2404.0 ± 218.3	1900.0	601.0 - 3570.0	Pass
ERSO-1176	03/18/13	Zn-65	1542.0 ± 56.4	1400.0	1110.0 - 1860.0	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^b		Control Limits	Acceptance
			Laboratory Result ^c	ERA Result ^d		
ERVE-1180	03/18/13	Am-241	569.8 ± 81.7	553.0	338.0 - 735.0	Pass
ERVE-1180	03/18/13	Cm-244	1260.9 ± 107.3	1340.0	657.0 - 2090.0	Pass
ERVE-1180	03/18/13	Co-60	2130.5 ± 48.0	1920.0	1320.0 - 2680.0	Pass
ERVE-1180	03/18/13	Cs-134	1296.5 ± 68.0	1240.0	797.0 - 1610.0	Pass
ERVE-1180	03/18/13	Cs-137	600.1 ± 34.3	544.0	394.0 - 757.0	Pass
ERVE-1180	03/18/13	K-40	34078.0 ± 787.0	31900.0	23000.0 - 44800.0	Pass
ERVE-1180	03/18/13	Mn-54	< 28.7	0.0	0.0 - 300.0	Pass
ERVE-1180	03/18/13	Pu-238	2476.5 ± 259.4	1980.0	1180.0 - 2710.0	Pass
ERVE-1180	03/18/13	Pu-239/40	2659.3 ± 273.2	2260.0	1390.0 - 3110.0	Pass
ERVE-1180	03/18/13	Sr-90	3809.7 ± 420.5	3840.0	2190.0 - 5090.0	Pass
ERVE-1180	03/18/13	U-233/4	2460.6 ± 205.0	2460.0	1620.0 - 3160.0	Pass
ERVE-1180	03/18/13	U-238	2319.1 ± 189.6	2440.0	1630.0 - 3100.0	Pass
ERVE-1180	03/18/13	Uranium	4866.3 ± 375.6	5010.0	3390.0 - 6230.0	Pass
ERVE-1180	03/18/13	Zn-65	1052.5 ± 82.1	878.0	633.0 - 1230.0	Pass
ERW-1184	03/18/13	Am-241	114.5 ± 8.1	118.0	79.5 - 158.0	Pass
ERW-1184	03/18/13	Co-60	2221.8 ± 17.0	2270.0	1970.0 - 2660.0	Pass
ERW-1184	03/18/13	Cs-134	1309.4 ± 58.4	1400.0	1030.0 - 1610.0	Pass
ERW-1184	03/18/13	Cs-137	1865.9 ± 22.0	1880.0	1600.0 - 2250.0	Pass
ERW-1184	03/18/13	Fe-55	503.1 ± 105.0	712.0	424.0 - 966.0	Pass
ERW-1184	03/18/13	Mn-54	< 9.4	0.0	0.0 - 100.0	Pass
ERW-1184	03/18/13	Pu-238	98.4 ± 5.6	98.8	73.1 - 123.0	Pass
ERW-1184	03/18/13	Pu-239/40	184.5 ± 7.7	185.0	144.0 - 233.0	Pass
ERW-1184	03/18/13	Sr-90	125.7 ± 6.0	137.0	89.2 - 181.0	Pass
ERW-1184	03/18/13	U-233/4	44.9 ± 3.4	48.8	36.7 - 62.9	Pass
ERW-1184	03/18/13	U-238	46.5 ± 3.5	48.4	36.9 - 59.4	Pass
ERW-1184	03/18/13	Uranium	93.3 ± 7.1	99.5	73.1 - 129.0	Pass
ERW-1184	03/18/13	Zn-65	412.8 ± 32.0	384.0	320.0 - 484.0	Pass
ERW-1186	03/18/13	Gr. Alpha	109.1 ± 5.7	130.0	46.2 - 201.0	Pass
ERW-1186	03/18/13	Gr. Beta	74.5 ± 6.4	78.9	45.2 - 117.0	Pass
ERW-1188	03/18/13	H-3	12279.0 ± 319.0	12300.0	8240.0 - 17500.0	Pass

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

^b Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

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

^d Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". Control limits are not provided.

APPENDIX B. DATA REPORTING CONVENTIONS

Data Reporting Conventions

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

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$
where: x = value of the measurement;
 s = 2σ 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 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

- 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 numbers 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

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 2012 Land Use Census

The Duane Arnold Energy Land Use Census for 2013 was completed during August and September of 2013. All residences, 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.

There were 149 vegetable gardens identified during the performance of the 2013 Census. This number is more than the number of gardens found in the 2011 survey by 9. The distance to the nearest vegetation receptor did not change.

There was one new goat herd observed at 2940 meters towards the east. There were no observed changes in milk cow locations.

There were no changes to the location of the nearest resident in any sectors.

No new drinking water wells were identified within a two mile radius of the site.

The Cedar River was surveyed by boat on October 10th of 2013 for water use downstream of the DAEC to Cedar Rapids. This survey identified no new usages of river water from previous surveys. Recreational fishing is the only identified food pathway use of Cedar River water between the DAEC and the City of Cedar Rapids eight miles down-river.

In accordance with the DAEC's Environmental Sampling Procedure ESP 4.4, "Land Use Census", no changes in land use were identified that would adversely affect the safe operation of the DAEC, or that would warrant an update of the DAEC Updated Final Safety Analysis Report (UFSAR). Examples of land use that would warrant an UFSAR update include new hazards near the DAEC such as new gas pipelines or new installations utilizing toxic gases.

NextEra Energy Resources, Duane Arnold has committed to compliance with NEI 07-07, "Nuclear Energy Institute's Industry Ground Water Protection Initiative". Per NEI 07-07, the following information is presented:

- No radioactive reactor by-product material was identified in samples collected by the DAEC's Radiological Environmental Monitoring Program (REMP) or the site Ground Water Protection Program (GWPP) above the threshold concentration levels for reporting.

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 dosimetry 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 2013 TLD results were evaluated with a paired difference statistical test. The evaluation concluded that there were no significant differences in the TLD populations for the 0.5 mile and 1 mile TLD populations.
2. As stated in Part 1 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

1. The contribution of dose to a member of the public most likely to be exposed from liquid and gaseous effluent releases was calculated using the Meteorological Information and Dose Assessment System (MIDAS) computer program in accordance with the ODAM. The calculation methods follow those prescribed by Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I".
2. Following calculation of offsite doses, the appropriateness of REMP sampling station types and locations was reviewed. The current sampling scheme was determined to be adequate for the identified receptors.

Results of the MIDAS dose calculations are displayed below.

- 1.) There were no releases of radioactive material to liquid effluents in 2013.
- 2.) The maximum dose to air at the site boundary from noble gases released was 0.000102 mrad from gamma radiation at 535 meters towards the South-South-West.
- 3.) The maximum dose to air at the site boundary from noble gases released was 0.0000166 mrad beta radiation at 2416 meters towards the North.
- 4.) The whole body dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.000053 mrem, at 1620 meters towards the North-North-West.
- 5.) The skin dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.000054 mrem, at 1620 meters towards the North-North-West.

- 6.) The hypothetical maximally exposed organ due to airborne iodines and particulates with half-lives greater than eight days (excluding carbon-14) was the thyroid of a child at 1620 meters towards the North-North-West, with an estimated dose equivalent of 0.00222 mrem.
- 7.) The hypothetical maximally exposed organ due to airborne carbon-14 was the bone of a child located 4700 meters to the West-North-West of the site. The dose was 0.11 mrem.

Conclusion

No measurable dose due to the operation of the DAEC or the DAEC ISFSI was detected by environmental TLDs in 2013. The calculated doses are below the regulatory limits stated in Appendix I to 10CFR50, 40CFR190 and 10 CFR 72.104.

Estimated Maximum Offsite Individual Doses for 2013

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					
Whole Body Dose	Child		S	0.000000 mrem	3 mrem
Organ Dose	Child - Liver		S	0.000000 mrem	10 mrem
Noble Gas					
Gamma Air Dose		2416	SSW	0.000102 mrad	10 mrad
Beta Air Dose		1620	N	0.0000166mrad	20 mrad
Whole Body	All	1620	NNW	0.000053 mrem	5 mrem
Skin	Child	1620	NNW	0.000054 mrem	15 mrem
Particulates & Iodines					
Organ Dose	Child - Thyroid	1620	NNW	0.00222 mrem	15 mrem
Carbon 14					
Organ Dose	Child - Bone	4700	WNW	0.11 mrem	15 mrem

** There is no Appendix I limit for direct radiation. It is listed here to demonstrate compliance with 40 CFR 190 and 10 CFR 72.104 limits of 25 mrem whole body and 75 mrem thyroid.



DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
Docket No. 50-331

RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM (REMP)

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES

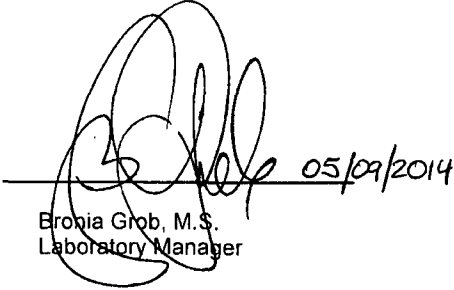
January 1 to December 31, 2013

Prepared 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 2013. 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.

All concentrations, except gross beta and airborne iodine, are decay corrected to the time of collection. Airborne I-131 is decayed to the midpoint of the collection period.

The required values for lower limits of detection (LLD) for gamma emitting isotopes are established through the Offsite Dose Assessment Manual (ODAM). Naturally occurring radioisotopes, such as Be-7, K-40 and Ra daughters, are frequently detected, but may not be listed for every sample medium.

2.0 PROGRAM DEVIATIONS

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP/AI	Gross Beta / I-131	D-3	06-28-13	Partial sample (50 m ³), power outage.
AP/AI	Gross Beta / I-131	D-3	10-31-13	Power out at sampler station.
AP/AI	Gross Beta / I-131	D-3	12-26-13	Sampler pump failure.
AP/AI	Gross Beta / I-131	D-11	05-23-13	Partial sample (112 m ³), breaker found tripped after storm.
AP/AI	Gross Beta / I-131	D-11	10-17-13	Partial sample (178 m ³), faulty timer suspected.
AP/AI	Gross Beta / I-131	D-13	10-03-13	Partial sample (181 m ³), power outage.
AP/AI	Gross Beta / I-131	D-15	05-30-13	Breaker found tripped after storms.
AP/AI	Gross Beta / I-131	D-15	09-05-13	Partial sample (42 m ³), breaker tripped.
AP/AI	Gross Beta / I-131	D-15	10-17-13	Partial sample (154 m ³), power outage.
AP/AI	Gross Beta / I-131	D-15	10-31-13	Partial sample (84 m ³), power outage.
TLD	Ambient Gamma	D-1, D-41, D-82	3 rd Qtr. 2013	TLD missing in the field, TLD replaced.
TLD	Ambient Gamma	D-17	4th Qtr. 2013	TLD missing in the field, TLD replaced.
G	Gamma	D-57, D-72, D-96	2013	No vegetation was available.

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

3.0 DATA TABLES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

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>
01-10-13	277	0.049 ± 0.005	07-05-13	287	0.017 ± 0.003
01-18-13	315	0.033 ± 0.004	07-12-13	291	0.026 ± 0.004
01-24-13	236	0.035 ± 0.005	07-19-13	291	0.021 ± 0.004
02-01-13	313	0.039 ± 0.004	07-26-13	290	0.020 ± 0.004
			08-02-13	275	0.022 ± 0.004
02-07-13	237	0.034 ± 0.005			
02-14-13	271	0.043 ± 0.005	08-09-13	273	0.030 ± 0.004
02-22-13	315	0.021 ± 0.003	08-16-13	274	0.026 ± 0.004
03-01-13	277	0.029 ± 0.004	08-23-13	275	0.039 ± 0.005
			08-30-13	274	0.026 ± 0.004
03-08-13	271	0.013 ± 0.003			
03-15-13	276	0.029 ± 0.004	09-05-13	235	0.023 ± 0.004
03-22-13	244	0.042 ± 0.005 ^b	09-13-13	311	0.045 ± 0.004
03-29-13	277	0.012 ± 0.003	09-20-13	272	0.026 ± 0.004
			09-27-13	278	0.027 ± 0.004
			10-03-13	233	0.028 ± 0.005
1st Quarter Mean ± s.d.		0.032 ± 0.012	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-05-13	272	0.029 ± 0.004	10-11-13	313	0.028 ± 0.004
04-12-13	274	0.019 ± 0.004	10-17-13	236	0.025 ± 0.004
04-18-13	237	0.012 ± 0.003	10-23-13	234	0.016 ± 0.004
04-26-13	336	0.020 ± 0.003	10-31-13		ND ^d
05-03-13	288	0.027 ± 0.004			
			11-08-13	328	0.040 ± 0.004
05-10-13	292	0.017 ± 0.003	11-14-13	243	0.030 ± 0.004
05-17-13	292	0.025 ± 0.004	11-22-13	321	0.035 ± 0.004
05-23-13	249	0.019 ± 0.004	11-27-13	198	0.028 ± 0.005
05-30-13	290	0.014 ± 0.004			
			12-05-13	327	0.051 ± 0.004
06-07-13	335	0.011 ± 0.003	12-13-13	320	0.054 ± 0.004
06-14-13	291	0.025 ± 0.004	12-20-13	285	0.046 ± 0.005
06-21-13	293	0.019 ± 0.004	12-26-13		ND ^d
06-22-13	50	0.016 ± 0.016 ^c	01-03-14	326	0.031 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.035 ± 0.012
			Cumulative Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Timer reading suspect, volume based on sampler run time.

^c Power to box lost; restored 06-28-13. I-131 = < 0.064 pCi/m³.

^d ND = No data; see Table 2.0, Listing of Missed Samples.

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

Location: D-5 (Palo)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		0.010
01-10-13	289	0.061 ± 0.005	07-05-13	275	0.021 ± 0.004
01-18-13	328	0.033 ± 0.004	07-12-13	278	0.034 ± 0.004
01-24-13	246	0.031 ± 0.004	07-19-13	277	0.026 ± 0.004
02-01-13	329	0.029 ± 0.004	07-26-13	276	0.025 ± 0.004
			08-02-13	193	0.030 ± 0.006 ^b
02-07-13	250	0.035 ± 0.004			
02-14-13	291	0.023 ± 0.004	08-09-13	275	0.033 ± 0.004
02-22-13	325	0.024 ± 0.003	08-16-13	277	0.026 ± 0.004
03-01-13	290	0.033 ± 0.004	08-23-13	271	0.055 ± 0.005
			08-30-13	277	0.044 ± 0.005
03-08-13	287	0.027 ± 0.004			
03-15-13	289	0.028 ± 0.004	09-05-13	236	0.020 ± 0.004
03-22-13	286	0.030 ± 0.004	09-13-13	315	0.044 ± 0.004
03-29-13	291	0.014 ± 0.003	09-20-13	281	0.024 ± 0.004
			09-27-13	280	0.034 ± 0.004
			10-03-13	240	0.041 ± 0.005
1st Quarter Mean ± s.d.		0.031 ± 0.011	3rd Quarter Mean ± s.d.		0.033 ± 0.010
04-05-13	287	0.026 ± 0.004	10-11-13	325	0.029 ± 0.004
04-12-13	294	0.016 ± 0.003	10-17-13	244	0.023 ± 0.004
04-18-13	250	0.012 ± 0.003	10-23-13	240	0.020 ± 0.004
04-26-13	334	0.019 ± 0.003	10-31-13	321	0.023 ± 0.003
05-03-13	287	0.025 ± 0.004			
			11-08-13	327	0.038 ± 0.004
05-10-13	293	0.019 ± 0.003	11-14-13	240	0.025 ± 0.004
05-17-13	291	0.021 ± 0.004	11-22-13	325	0.027 ± 0.004
05-23-13	249	0.019 ± 0.004	11-27-13	199	0.028 ± 0.005
05-30-13	290	0.012 ± 0.003			
			12-05-13	326	0.062 ± 0.005
06-07-13	333	0.013 ± 0.003	12-13-13	320	0.055 ± 0.004
06-14-13	291	0.025 ± 0.004	12-20-13	284	0.041 ± 0.004
06-21-13	294	0.023 ± 0.004	12-26-13	243	0.041 ± 0.005
06-28-13	292	0.023 ± 0.004	01-03-14	326	0.043 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.035 ± 0.013
			Cumulative Average		0.029

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Low volume possibly due to timer problem.

Table 3. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-6 (Center Point)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-10-13	271	0.053 ± 0.005	07-05-13	277	0.022 ± 0.004
01-18-13	309	0.027 ± 0.004	07-12-13	280	0.037 ± 0.004
01-24-13	231	0.025 ± 0.004	07-19-13	280	0.022 ± 0.004
02-01-13	346	0.041 ± 0.004	07-26-13	279	0.024 ± 0.004
			08-02-13	280	0.020 ± 0.004
02-07-13	262	0.029 ± 0.004			
02-14-13	303	0.023 ± 0.004	08-09-13	279	0.030 ± 0.004
02-22-13	344	0.018 ± 0.003	08-16-13	279	0.030 ± 0.004
03-01-13	305	0.011 ± 0.003	08-23-13	280	0.046 ± 0.005
			08-30-13	281	0.045 ± 0.005
03-08-13	302	0.022 ± 0.003			
03-15-13	304	0.031 ± 0.004	09-05-13	240	0.027 ± 0.005
03-22-13	300	0.035 ± 0.004	09-13-13	318	0.043 ± 0.004
03-29-13	305	0.012 ± 0.003	09-20-13	278	0.025 ± 0.004
			09-27-13	283	0.025 ± 0.004
			10-03-13	238	0.027 ± 0.005
1st Quarter Mean ± s.d.		0.027 ± 0.012	3rd Quarter Mean ± s.d.		0.030 ± 0.009
04-05-13	298	0.010 ± 0.003	10-11-13	321	0.025 ± 0.004
04-12-13	305	0.009 ± 0.003	10-17-13	241	0.017 ± 0.004
04-18-13	256	0.010 ± 0.003	10-23-13	238	0.020 ± 0.004
04-26-13	347	0.022 ± 0.003	10-31-13	314	0.024 ± 0.004
05-03-13	277	0.026 ± 0.004			
			11-08-13	320	0.036 ± 0.004
05-10-13	280	0.022 ± 0.004	11-14-13	239	0.023 ± 0.004
05-17-13	281	0.023 ± 0.004	11-22-13	331	0.026 ± 0.003
05-23-13	235	0.025 ± 0.004	11-27-13	195	0.030 ± 0.005
05-30-13	279	0.015 ± 0.004			
			12-05-13	320	0.059 ± 0.005
06-07-13	321	0.016 ± 0.003	12-13-13	313	0.046 ± 0.004
06-14-13	280	0.025 ± 0.004	12-20-13	279	0.039 ± 0.004
06-21-13	281	0.025 ± 0.004	12-26-13	238	0.043 ± 0.005
06-28-13	277	0.020 ± 0.004	01-03-14	316	0.044 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.006	4th Quarter Mean ± s.d.		0.033 ± 0.012
			Cumulative Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

Table 4. 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>
01-10-13	288	0.047 ± 0.004	07-05-13	284	0.020 ± 0.004
01-18-13	328	0.024 ± 0.003	07-12-13	285	0.033 ± 0.004
01-24-13	246	0.026 ± 0.004	07-19-13	285	0.025 ± 0.004
02-01-13	329	0.047 ± 0.004	07-26-13	285	0.023 ± 0.004
			08-02-13	286	0.021 ± 0.004
02-07-13	250	0.025 ± 0.004			
02-14-13	291	0.023 ± 0.004	08-09-13	284	0.028 ± 0.004
02-22-13	323	0.020 ± 0.003	08-16-13	286	0.028 ± 0.004
03-01-13	290	0.029 ± 0.004	08-23-13	286	0.043 ± 0.005
			08-30-13	286	0.038 ± 0.004
03-08-13	287	0.016 ± 0.003			
03-15-13	290	0.020 ± 0.003	09-05-13	244	0.027 ± 0.004
03-22-13	286	0.036 ± 0.004	09-13-13	325	0.043 ± 0.004
03-29-13	291	0.015 ± 0.003	09-20-13	284	0.031 ± 0.004
			09-27-13	289	0.027 ± 0.004
			10-03-13	244	0.032 ± 0.005
1st Quarter Mean ± s.d.		0.027 ± 0.011	3rd Quarter Mean ± s.d.		0.030 ± 0.007
04-05-13	270	0.025 ± 0.004	10-11-13	343	0.022 ± 0.003
04-12-13	276	0.015 ± 0.003	10-17-13	269	0.014 ± 0.003
04-18-13	235	0.013 ± 0.004	10-23-13	275	0.020 ± 0.004
04-26-13	315	0.021 ± 0.003	10-31-13	382	0.021 ± 0.003
05-03-13	270	0.025 ± 0.004			
			11-08-13	403	0.034 ± 0.003
05-10-13	275	0.021 ± 0.004	11-14-13	311	0.026 ± 0.004
05-17-13	275	0.022 ± 0.004	11-22-13	423	0.030 ± 0.003
05-23-13	233	0.022 ± 0.004	11-27-13	271	0.028 ± 0.004
05-30-13	269	0.016 ± 0.004			
			12-05-13	459	0.061 ± 0.004
06-07-13	313	0.013 ± 0.003	12-13-13	464	0.050 ± 0.003
06-14-13	274	0.011 ± 0.003	12-20-13	425	0.040 ± 0.003
06-21-13	276	0.022 ± 0.004	12-26-13	373	0.042 ± 0.004
06-28-13	274	0.026 ± 0.004	01-03-14	326	0.033 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.005	4th Quarter Mean ± s.d.		0.032 ± 0.013
			Cumulative Average		0.027

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

Table 5. 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>
01-10-13	282	0.054 ± 0.005	07-05-13	283	0.020 ± 0.004 ^c
01-18-13	320	0.030 ± 0.004	07-12-13	283	0.023 ± 0.004
01-24-13	240	0.027 ± 0.004	07-19-13	283	0.028 ± 0.004
02-01-13	324	0.039 ± 0.004	07-26-13	279	0.025 ± 0.004
			08-02-13	283	0.020 ± 0.004
02-07-13	241	0.048 ± 0.005			
02-14-13	280	0.022 ± 0.004	08-09-13	282	0.015 ± 0.003
02-22-13	319	0.022 ± 0.003	08-16-13	282	0.013 ± 0.003
03-01-13	282	0.027 ± 0.004	08-23-13	284	0.037 ± 0.004
			08-30-13	288	0.039 ± 0.004
03-08-13	279	0.021 ± 0.003			
03-15-13	281	0.027 ± 0.004	09-05-13	246	0.025 ± 0.004
03-22-13	277	0.033 ± 0.004	09-13-13	326	0.041 ± 0.004
03-29-13	283	0.016 ± 0.003	09-20-13	271	0.020 ± 0.004
			09-27-13	278	0.027 ± 0.004
			10-03-13	230	0.038 ± 0.005
1st Quarter Mean ± s.d.		0.030 ± 0.011	3rd Quarter Mean ± s.d.		0.027 ± 0.009
04-05-13	278	0.030 ± 0.004	10-11-13	253	0.035 ± 0.005
04-12-13	278	0.017 ± 0.003	10-17-13	178	0.030 ± 0.006 ^d
04-18-13	242	0.011 ± 0.003	10-23-13	229	0.020 ± 0.004
04-26-13	320	0.022 ± 0.003	10-31-13	327	0.019 ± 0.003
05-03-13	265	0.017 ± 0.004			
			11-08-13	334	0.038 ± 0.004
05-10-13	269	0.020 ± 0.004	11-14-13	249	0.022 ± 0.004
05-17-13	269	0.022 ± 0.004	11-22-13	327	0.031 ± 0.004
05-23-13	112	0.022 ± 0.007 ^b	11-27-13	194	0.033 ± 0.005
05-30-13	240	0.014 ± 0.004			
			12-05-13	320	0.061 ± 0.005
06-07-13	324	0.017 ± 0.003	12-13-13	314	0.046 ± 0.004
06-14-13	283	0.026 ± 0.004 ^c	12-20-13	279	0.035 ± 0.004
06-21-13	283	0.022 ± 0.004 ^c	12-26-13	237	0.037 ± 0.005
06-28-13	283	0.025 ± 0.004 ^c	01-03-14	317	0.032 ± 0.004
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.034 ± 0.011
			Cumulative Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Low volume, breaker tripped during lightning storm.

^c Timer reading suspect, volume estimate based on a 7 day run-time.

^d Low volume may have been due to a timer failure; I-131 = < 0.035 pCi/m³.

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

Location: D-13 (Alburnett)

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>
01-10-13	274	0.055 ± 0.005	07-05-13	353	0.013 ± 0.003
01-18-13	312	0.026 ± 0.003	07-12-13	363	0.029 ± 0.003
01-24-13	234	0.033 ± 0.005	07-19-13	371	0.019 ± 0.003
02-01-13	313	0.037 ± 0.004	07-26-13	379	0.019 ± 0.003
			08-02-13	389	0.019 ± 0.003
02-07-13	237	0.046 ± 0.005			
02-14-13	273	0.021 ± 0.004	08-09-13	395	0.024 ± 0.003
02-22-13	332	0.017 ± 0.003	08-16-13	404	0.022 ± 0.003
03-01-13	293	0.023 ± 0.003	08-23-13	284	0.035 ± 0.004
			08-30-13	286	0.034 ± 0.004
03-08-13	290	0.012 ± 0.003			
03-15-13	293	0.023 ± 0.003	09-05-13	245	0.026 ± 0.004
03-22-13	288	0.033 ± 0.004	09-13-13	337	0.033 ± 0.004
03-29-13	294	0.013 ± 0.003	09-20-13	299	0.026 ± 0.004
			09-27-13	269	0.026 ± 0.004
			10-03-13	181	0.041 ± 0.006
1st Quarter Mean ± s.d.		0.028 ± 0.013	3rd Quarter Mean ± s.d.		0.026 ± 0.008
04-05-13	287	0.025 ± 0.004	10-11-13	360	0.008 ± 0.003
04-12-13	293	0.015 ± 0.003	10-17-13	275	0.016 ± 0.004
04-18-13	248	0.013 ± 0.003	10-23-13	276	0.016 ± 0.004
04-26-13	335	0.019 ± 0.003	10-31-13	373	0.022 ± 0.003
05-03-13	288	0.014 ± 0.003			
			11-08-13	386	0.036 ± 0.003
05-10-13	292	0.014 ± 0.003	11-14-13	292	0.024 ± 0.004
05-17-13	292	0.013 ± 0.003	11-22-13	331	0.026 ± 0.003
05-23-13	256	0.019 ± 0.004	11-27-13	205	0.024 ± 0.004
05-30-13	311	0.013 ± 0.003			
			12-05-13	336	0.047 ± 0.004
06-07-13	368	0.013 ± 0.003	12-13-13	329	0.041 ± 0.004
06-14-13	330	0.019 ± 0.003	12-20-13	294	0.034 ± 0.004
06-21-13	377	0.016 ± 0.003	12-26-13	250	0.040 ± 0.005
06-28-13	309	0.024 ± 0.004	01-03-14	333	0.038 ± 0.004
2nd Quarter Mean ± s.d.		0.017 ± 0.004	4th Quarter Mean ± s.d.		0.029 ± 0.012
			Cumulative Average		0.025

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

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

Location: D-15 (On-site, north)

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>
01-10-13	297	0.050 ± 0.004	07-05-13	285	0.019 ± 0.004 ^c
01-18-13	331	0.024 ± 0.003	07-12-13	285	0.031 ± 0.004
01-24-13	252	0.030 ± 0.004	07-19-13	285	0.025 ± 0.004
02-01-13	327	0.041 ± 0.004	07-26-13	285	0.021 ± 0.004
			08-02-13	286	0.018 ± 0.004
02-07-13	250	0.062 ± 0.005			
02-14-13	290	0.021 ± 0.004	08-09-13	284	0.014 ± 0.003
02-22-13	332	0.027 ± 0.003	08-16-13	286	0.024 ± 0.004
03-01-13	276	0.028 ± 0.004	08-23-13	286	0.043 ± 0.005
			08-30-13	274	0.040 ± 0.004
03-08-13	273	0.024 ± 0.004			
03-15-13	275	0.023 ± 0.003	09-05-13	42	0.033 ± 0.020 ^d
03-22-13	272	0.032 ± 0.004	09-13-13	312	0.043 ± 0.004
03-29-13	276	0.017 ± 0.003	09-20-13	280	0.030 ± 0.004
			09-27-13	270	0.027 ± 0.004
			10-03-13	234	0.026 ± 0.005
1st Quarter Mean ± s.d.		0.032 ± 0.013	3rd Quarter Mean ± s.d.		0.028 ± 0.009
04-05-13	270	0.026 ± 0.004	10-11-13	311	0.022 ± 0.004
04-12-13	276	0.019 ± 0.004	10-17-13	154	0.023 ± 0.006 ^e
04-18-13	235	0.008 ± 0.003	10-23-13	232	0.022 ± 0.004
04-26-13	315	0.023 ± 0.004	10-31-13	84	0.018 ± 0.010 ^f
05-03-13	270	0.021 ± 0.004			
			11-08-13	317	0.039 ± 0.004
05-10-13	275	0.016 ± 0.003	11-14-13	235	0.030 ± 0.004
05-17-13	275	0.020 ± 0.004	11-22-13	312	0.037 ± 0.004
05-23-13	234	0.020 ± 0.004	11-27-13	195	0.028 ± 0.005
05-30-13		ND ^b			
			12-05-13	309	0.053 ± 0.005
06-07-13	326	0.016 ± 0.003	12-13-13	311	0.046 ± 0.004
06-14-13	285	0.025 ± 0.004	12-20-13	269	0.038 ± 0.004
06-21-13	293	0.021 ± 0.004	12-26-13	232	0.050 ± 0.005
06-28-13	280	0.020 ± 0.004	01-03-14	311	0.034 ± 0.004
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.034 ± 0.011
			Cumulative Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b ND = No data; see Table 2.0, Listing of Missed Samples.

^c Timer reading suspect, volume based on sampler run time.

^d Low volume due to tripped breaker; I-131 result = < 0.069 pCi/m³.

^e Low volume due to power outage; I-131 = < 0.041 pCi/m³.

^f Low volume due to power outage; I-131 = < 0.044 pCi/m³.

Table 8. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.
 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>
01-10-13	277	0.051 ± 0.005	07-05-13	276	0.022 ± 0.004
01-18-13	307	0.027 ± 0.004	07-12-13	283	0.034 ± 0.004
01-24-13	236	0.036 ± 0.005	07-19-13	279	0.028 ± 0.004
02-01-13	304	0.048 ± 0.004	07-26-13	279	0.024 ± 0.004
			08-02-13	280	0.022 ± 0.004
02-07-13	230	0.054 ± 0.005			
02-14-13	268	0.021 ± 0.004	08-09-13	278	0.034 ± 0.004
02-22-13	306	0.024 ± 0.003	08-16-13	280	0.028 ± 0.004
03-01-13	270	0.032 ± 0.004	08-23-13	280	0.043 ± 0.005
			08-30-13	280	0.045 ± 0.005
03-08-13	268	0.024 ± 0.004			
03-15-13	269	0.021 ± 0.003	09-05-13	238	0.030 ± 0.005
03-22-13	267	0.036 ± 0.004	09-13-13	317	0.046 ± 0.004
03-29-13	270	0.011 ± 0.003	09-20-13	278	0.026 ± 0.004
			09-27-13	272	0.028 ± 0.004
			10-03-13	241	0.029 ± 0.005
1st Quarter Mean ± s.d.		0.032 ± 0.013	3rd Quarter Mean ± s.d.		0.031 ± 0.008
04-05-13	265	0.033 ± 0.004	10-11-13	317	0.026 ± 0.004
04-12-13	271	0.020 ± 0.004	10-17-13	242	0.021 ± 0.004
04-18-13	230	0.010 ± 0.003	10-23-13	237	0.020 ± 0.004
04-26-13	308	0.026 ± 0.004	10-31-13	311	0.025 ± 0.004
05-03-13	276	0.023 ± 0.004			
			11-08-13	317	0.011 ± 0.003 ^b
05-10-13	282	0.017 ± 0.003	11-14-13	235	0.026 ± 0.004
05-17-13	280	0.026 ± 0.004	11-22-13	312	0.035 ± 0.004
05-23-13	239	0.020 ± 0.004	11-27-13	197	0.033 ± 0.005
05-30-13	279	0.013 ± 0.004			
			12-05-13	312	0.038 ± 0.004
06-07-13	320	0.013 ± 0.003	12-13-13	315	0.062 ± 0.005
06-14-13	279	0.026 ± 0.004	12-20-13	271	0.046 ± 0.005
06-21-13	288	0.025 ± 0.004	12-26-13	234	0.049 ± 0.005
06-28-13	275	0.023 ± 0.004	01-03-14	313	0.046 ± 0.004
2nd Quarter Mean ± s.d.		0.021 ± 0.006	4th Quarter Mean ± s.d.		0.034 ± 0.014
			Cumulative Average		0.030

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Sample recounted; 0.010 ± 0.003 pCi/m³.

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

Location: D-40

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>
01-10-13	293	0.058 ± 0.005	07-05-13	289	0.020 ± 0.004
01-18-13	282	0.034 ± 0.004	07-12-13	292	0.030 ± 0.004
01-24-13	238	0.030 ± 0.004	07-19-13	288	0.024 ± 0.004
02-01-13	332	0.039 ± 0.004	07-26-13	287	0.020 ± 0.004
			08-02-13	289	0.024 ± 0.004
02-07-13	247	0.039 ± 0.005			
02-14-13	288	0.032 ± 0.004	08-09-13	288	0.028 ± 0.004
02-22-13	328	0.021 ± 0.003	08-16-13	288	0.024 ± 0.004
03-01-13	293	0.029 ± 0.004	08-23-13	289	0.040 ± 0.004
			08-30-13	180	0.023 ± 0.005
03-08-13	288	0.020 ± 0.003			
03-15-13	288	0.024 ± 0.003	09-05-13	247	0.025 ± 0.004
03-22-13	286	0.032 ± 0.004	09-13-13	328	0.047 ± 0.004
03-29-13	291	0.007 ± 0.003	09-20-13	284	0.031 ± 0.004
			09-27-13	294	0.011 ± 0.003 ^b
			10-03-13	247	0.030 ± 0.005
1st Quarter Mean ± s.d.		0.030 ± 0.012	3rd Quarter Mean ± s.d.		0.027 ± 0.009
04-05-13	287	0.026 ± 0.004	10-11-13	330	0.024 ± 0.003
04-12-13	285	0.017 ± 0.003	10-17-13	232	0.024 ± 0.004
04-18-13	250	0.013 ± 0.003	10-23-13	232	0.018 ± 0.004
04-26-13	333	0.020 ± 0.003	10-31-13	307	0.025 ± 0.004
05-03-13	286	0.011 ± 0.003			
			11-08-13	315	0.039 ± 0.004
05-10-13	293	0.019 ± 0.003	11-14-13	234	0.030 ± 0.005
05-17-13	294	0.022 ± 0.004	11-22-13	308	0.028 ± 0.004
05-23-13	249	0.023 ± 0.004	11-27-13	189	0.032 ± 0.005
05-30-13	290	0.016 ± 0.004			
			12-05-13	314	0.049 ± 0.004
06-07-13	333	0.014 ± 0.003	12-13-13	306	0.051 ± 0.004
06-14-13	288	0.025 ± 0.004	12-20-13	274	0.039 ± 0.004
06-21-13	294	0.022 ± 0.004	12-26-13	228	0.039 ± 0.005
06-28-13	292	0.019 ± 0.004	01-03-14	315	0.046 ± 0.004
2nd Quarter Mean ± s.d.		0.019 ± 0.004	4th Quarter Mean ± s.d.		0.034 ± 0.010
			Cumulative Average		0.027

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Sample recounted; 0.015 ± 0.003 pCi/m³.

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite

Units: pCi/m³

Location D-3				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 2021	DAP- 4090	DAP- 6403	DAP- 7865
Volume (m ³)	3309	3498	3861	3131
Be-7	0.076 ± 0.022	0.059 ± 0.015	0.077 ± 0.014	0.060 ± 0.017
Mn-54	< 0.0009	< 0.0010	< 0.0009	< 0.0008
Fe-59	< 0.0017	< 0.0011	< 0.0013	< 0.0016
Co-58	< 0.0010	< 0.0010	< 0.0008	< 0.0010
Co-60	< 0.0008	< 0.0007	< 0.0010	< 0.0005
Zn-65	< 0.0016	< 0.0012	< 0.0008	< 0.0015
Nb-95	< 0.0018	< 0.0012	< 0.0008	< 0.0007
Zr-95	< 0.0019	< 0.0022	< 0.0011	< 0.0010
Ru-103	< 0.0014	< 0.0010	< 0.0010	< 0.0014
Ru-106	< 0.0079	< 0.0075	< 0.0073	< 0.0085
Cs-134	< 0.0010	< 0.0005	< 0.0008	< 0.0013
Cs-137	< 0.0010	< 0.0008	< 0.0009	< 0.0009
Ce-141	< 0.0020	< 0.0015	< 0.0016	< 0.0017
Ce-144	< 0.0054	< 0.0032	< 0.0033	< 0.0045

Location D-5				
Lab Code	DAP- 2022	DAP- 4091	DAP- 6404	DAP- 7866
Volume (m ³)	3501	3785	3751	3720
Be-7	0.062 ± 0.015	0.070 ± 0.015	0.081 ± 0.016	0.048 ± 0.016
Mn-54	< 0.0007	< 0.0011	< 0.0011	< 0.0007
Fe-59	< 0.0017	< 0.0028	< 0.0015	< 0.0019
Co-58	< 0.0008	< 0.0010	< 0.0009	< 0.0010
Co-60	< 0.0008	< 0.0005	< 0.0010	< 0.0007
Zn-65	< 0.0018	< 0.0011	< 0.0014	< 0.0019
Nb-95	< 0.0010	< 0.0013	< 0.0012	< 0.0009
Zr-95	< 0.0012	< 0.0019	< 0.0012	< 0.0019
Ru-103	< 0.0009	< 0.0013	< 0.0014	< 0.0009
Ru-106	< 0.0077	< 0.0084	< 0.0088	< 0.0070
Cs-134	< 0.0006	< 0.0005	< 0.0010	< 0.0011
Cs-137	< 0.0008	< 0.0011	< 0.0007	< 0.0009
Ce-141	< 0.0015	< 0.0022	< 0.0020	< 0.0017
Ce-144	< 0.0030	< 0.0052	< 0.0035	< 0.0049

Location D-6				
Lab Code	DAP- 2023	DAP- 4092	DAP- 6405	DAP- 7867
Volume (m ³)	3581	3715	3873	3667
Be-7	0.061 ± 0.015	0.078 ± 0.015	0.093 ± 0.018	0.057 ± 0.014
Mn-54	< 0.0010	< 0.0008	< 0.0008	< 0.0011
Fe-59	< 0.0022	< 0.0019	< 0.0013	< 0.0017
Co-58	< 0.0004	< 0.0008	< 0.0011	< 0.0011
Co-60	< 0.0005	< 0.0009	< 0.0008	< 0.0004
Zn-65	< 0.0019	< 0.0013	< 0.0008	< 0.0008
Nb-95	< 0.0009	< 0.0013	< 0.0011	< 0.0010
Zr-95	< 0.0022	< 0.0013	< 0.0011	< 0.0019
Ru-103	< 0.0013	< 0.0013	< 0.0012	< 0.0011
Ru-106	< 0.0037	< 0.0066	< 0.0073	< 0.0074
Cs-134	< 0.0007	< 0.0008	< 0.0008	< 0.0010
Cs-137	< 0.0008	< 0.0008	< 0.0003	< 0.0008
Ce-141	< 0.0019	< 0.0022	< 0.0012	< 0.0016
Ce-144	< 0.0056	< 0.0040	< 0.0029	< 0.0043

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite

Units: pCi/m³

Location D-7				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 2024	DAP- 4094	DAP- 6406	DAP- 7868
Volume (m ³)	3499	3556	3952	4724
Be-7	0.050 ± 0.015	0.080 ± 0.019	0.092 ± 0.016	0.061 ± 0.015
Mn-54	< 0.0008	< 0.0009	< 0.0007	< 0.0006
Fe-59	< 0.0018	< 0.0030	< 0.0013	< 0.0008
Co-58	< 0.0007	< 0.0010	< 0.0005	< 0.0003
Co-60	< 0.0004	< 0.0010	< 0.0007	< 0.0004
Zn-65	< 0.0008	< 0.0012	< 0.0021	< 0.0007
Nb-95	< 0.0010	< 0.0017	< 0.0008	< 0.0008
Zr-95	< 0.0013	< 0.0026	< 0.0014	< 0.0015
Ru-103	< 0.0011	< 0.0015	< 0.0013	< 0.0005
Ru-106	< 0.0050	< 0.0093	< 0.0068	< 0.0063
Cs-134	< 0.0004	< 0.0010	< 0.0010	< 0.0009
Cs-137	< 0.0004	< 0.0009	< 0.0006	< 0.0003
Ce-141	< 0.0012	< 0.0024	< 0.0018	< 0.0008
Ce-144	< 0.0043	< 0.0061	< 0.0042	< 0.0054

Location D-11				
Lab Code	DAP- 2025	DAP- 4095	DAP- 6407	DAP- 7869
Volume (m ³)	3408	3444	3898	3558
Be-7	0.075 ± 0.015	0.090 ± 0.021	0.066 ± 0.014	0.048 ± 0.012
Mn-54	< 0.0009	< 0.0011	< 0.0009	< 0.0006
Fe-59	< 0.0021	< 0.0023	< 0.0025	< 0.0009
Co-58	< 0.0004	< 0.0012	< 0.0006	< 0.0004
Co-60	< 0.0004	< 0.0008	< 0.0007	< 0.0005
Zn-65	< 0.0008	< 0.0017	< 0.0016	< 0.0007
Nb-95	< 0.0008	< 0.0010	< 0.0009	< 0.0007
Zr-95	< 0.0013	< 0.0014	< 0.0010	< 0.0010
Ru-103	< 0.0011	< 0.0017	< 0.0012	< 0.0005
Ru-106	< 0.0047	< 0.0125	< 0.0055	< 0.0063
Cs-134	< 0.0007	< 0.0009	< 0.0009	< 0.0009
Cs-137	< 0.0008	< 0.0008	< 0.0005	< 0.0003
Ce-141	< 0.0023	< 0.0024	< 0.0012	< 0.0017
Ce-144	< 0.0048	< 0.0043	< 0.0040	< 0.0033

Location D-13				
Lab Code	DAP- 2026	DAP- 4096	DAP- 6408	DAP- 7870
Volume (m ³)	3433	3986	4555	4039
Be-7	0.059 ± 0.014	0.063 ± 0.012	0.072 ± 0.015	0.042 ± 0.013
Mn-54	< 0.0006	< 0.0006	< 0.0008	< 0.0009
Fe-59	< 0.0016	< 0.0009	< 0.0018	< 0.0023
Co-58	< 0.0006	< 0.0004	< 0.0006	< 0.0006
Co-60	< 0.0006	< 0.0003	< 0.0006	< 0.0008
Zn-65	< 0.0012	< 0.0008	< 0.0007	< 0.0024
Nb-95	< 0.0009	< 0.0010	< 0.0014	< 0.0017
Zr-95	< 0.0013	< 0.0015	< 0.0010	< 0.0016
Ru-103	< 0.0010	< 0.0011	< 0.0011	< 0.0013
Ru-106	< 0.0032	< 0.0055	< 0.0044	< 0.0060
Cs-134	< 0.0006	< 0.0004	< 0.0007	< 0.0010
Cs-137	< 0.0007	< 0.0004	< 0.0006	< 0.0007
Ce-141	< 0.0010	< 0.0010	< 0.0016	< 0.0013
Ce-144	< 0.0032	< 0.0032	< 0.0040	< 0.0030

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite

Units: pCi/m³

Location					D-15				
Quarter	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter		
Lab Code	DAP- 2027		DAP- 4097		DAP- 6410		DAP- 7871		
Volume (m ³)	3452		3336		3695		3272		
Be-7	0.074 ± 0.018		0.071 ± 0.015		0.075 ± 0.017		0.051 ± 0.016		
Mn-54	< 0.0011		< 0.0013		< 0.0009		< 0.0006		
Fe-59	< 0.0017		< 0.0021		< 0.0020		< 0.0014		
Co-58	< 0.0010		< 0.0008		< 0.0008		< 0.0009		
Co-60	< 0.0008		< 0.0011		< 0.0007		< 0.0009		
Zn-65	< 0.0008		< 0.0012		< 0.0014		< 0.0008		
Nb-95	< 0.0016		< 0.0013		< 0.0018		< 0.0008		
Zr-95	< 0.0011		< 0.0017		< 0.0017		< 0.0012		
Ru-103	< 0.0011		< 0.0012		< 0.0016		< 0.0006		
Ru-106	< 0.0078		< 0.0094		< 0.0080		< 0.0102		
Cs-134	< 0.0010		< 0.0010		< 0.0009		< 0.0010		
Cs-137	< 0.0008		< 0.0010		< 0.0007		< 0.0006		
Ce-141	< 0.0024		< 0.0027		< 0.0015		< 0.0023		
Ce-144	< 0.0049		< 0.0063		< 0.0047		< 0.0043		

Location					D-16				
Lab Code	DAP- 2028		DAP- 4098		DAP- 6411		DAP- 7873		
Volume (m ³)	3272		3591		3862		3614		
Be-7	0.061 ± 0.017		0.075 ± 0.014		0.077 ± 0.014		0.053 ± 0.014		
Mn-54	< 0.0012		< 0.0013		< 0.0011		< 0.0006		
Fe-59	< 0.0020		< 0.0019		< 0.0009		< 0.0008		
Co-58	< 0.0010		< 0.0008		< 0.0006		< 0.0006		
Co-60	< 0.0007		< 0.0007		< 0.0006		< 0.0005		
Zn-65	< 0.0017		< 0.0008		< 0.0012		< 0.0007		
Nb-95	< 0.0018		< 0.0012		< 0.0006		< 0.0009		
Zr-95	< 0.0013		< 0.0008		< 0.0018		< 0.0008		
Ru-103	< 0.0014		< 0.0015		< 0.0008		< 0.0004		
Ru-106	< 0.0075		< 0.0096		< 0.0064		< 0.0070		
Cs-134	< 0.0007		< 0.0008		< 0.0010		< 0.0007		
Cs-137	< 0.0011		< 0.0006		< 0.0010		< 0.0007		
Ce-141	< 0.0027		< 0.0023		< 0.0012		< 0.0016		
Ce-144	< 0.0065		< 0.0047		< 0.0047		< 0.0027		

Location					D-40				
Lab Code	DAP- 2029		DAP- 4099		DAP- 6412		DAP- 7874		
Volume (m ³)	3454		3776		3891		3584		
Be-7	0.053 ± 0.014		0.076 ± 0.014		0.068 ± 0.015		0.048 ± 0.011		
Mn-54	< 0.0005		< 0.0009		< 0.0007		< 0.0006		
Fe-59	< 0.0012		< 0.0019		< 0.0021		< 0.0011		
Co-58	< 0.0010		< 0.0007		< 0.0009		< 0.0006		
Co-60	< 0.0004		< 0.0006		< 0.0007		< 0.0006		
Zn-65	< 0.0009		< 0.0010		< 0.0012		< 0.0011		
Nb-95	< 0.0009		< 0.0009		< 0.0017		< 0.0009		
Zr-95	< 0.0012		< 0.0018		< 0.0023		< 0.0012		
Ru-103	< 0.0012		< 0.0015		< 0.0009		< 0.0007		
Ru-106	< 0.0040		< 0.0074		< 0.0060		< 0.0049		
Cs-134	< 0.0006		< 0.0009		< 0.0009		< 0.0007		
Cs-137	< 0.0008		< 0.0008		< 0.0006		< 0.0007		
Ce-141	< 0.0020		< 0.0019		< 0.0018		< 0.0008		
Ce-144	< 0.0030		< 0.0056		< 0.0052		< 0.0023		

Table 11. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD).
 Quarterly collection. Units: mR/91 days

<u>Control Locations</u>	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
D-1	24.1 ± 1.2	13.3 ± 1.8	ND ^a	9.3 ± 1.1
D-2	18.9 ± 1.3	11.9 ± 1.5	12.2 ± 2.0	13.1 ± 1.2
D-3	22.5 ± 1.3	11.2 ± 1.2	14.2 ± 2.0	13.6 ± 1.5
D-5	19.7 ± 1.5	14.2 ± 1.2	13.9 ± 1.9	17.6 ± 1.3
D-6	21.1 ± 1.1	16.8 ± 1.3	13.2 ± 1.8	16.8 ± 1.0
D-7	20.2 ± 1.7	13.1 ± 1.5	13.7 ± 2.0	15.3 ± 1.1
D-8	24.8 ± 0.9	14.8 ± 1.5	18.9 ± 1.7	16.4 ± 1.2
D-10	23.9 ± 1.6	11.7 ± 1.2	18.2 ± 1.6	14.8 ± 1.1
D-11	18.2 ± 1.0	11.8 ± 2.0	12.9 ± 1.9	13.2 ± 1.5
D-13	19.0 ± 0.9	14.6 ± 1.6	10.9 ± 1.6	17.0 ± 1.2
Mean ± s.d.	21.2 ± 2.4	13.3 ± 1.8	14.2 ± 2.6	14.7 ± 2.5
<u>Within 0.5 mi. of Stack</u>				
D-15	20.2 ± 1.2	12.7 ± 1.2	12.8 ± 1.5	15.2 ± 0.9
D-16	18.3 ± 1.1	14.1 ± 1.7	12.4 ± 2.0	16.3 ± 1.6
D-17	21.5 ± 1.3	17.0 ± 1.3	21.4 ± 1.7	ND ^a
D-18	24.1 ± 2.2	19.2 ± 1.2	15.0 ± 1.9	20.8 ± 0.9
D-19	21.9 ± 1.3	12.8 ± 1.4	14.9 ± 1.9	15.0 ± 1.3
D-20	21.9 ± 1.2	20.2 ± 2.1	14.9 ± 1.9	19.4 ± 1.3
D-21	27.9 ± 1.4	15.8 ± 2.1	20.8 ± 1.6	17.3 ± 1.1
D-22	23.3 ± 1.6	12.9 ± 1.4	14.9 ± 1.9	15.3 ± 1.1
D-23	19.2 ± 1.1	8.6 ± 1.2	10.6 ± 1.7	11.4 ± 1.0
D-28	24.6 ± 1.6	13.8 ± 1.2	18.0 ± 2.0	18.0 ± 1.4
D-29	21.5 ± 1.1	14.9 ± 1.2	14.7 ± 1.6	18.1 ± 1.1
D-30	26.4 ± 1.2	13.9 ± 1.9	16.4 ± 1.7	16.9 ± 1.7
D-31	28.1 ± 1.7	16.0 ± 1.8	18.2 ± 2.6	17.7 ± 1.3
D-32	26.9 ± 0.9	12.7 ± 1.3	18.4 ± 1.5	16.6 ± 1.1
D-82	21.0 ± 1.1	16.9 ± 1.1	ND ^a	19.9 ± 0.9
D-83	24.0 ± 1.1	12.1 ± 1.1	13.9 ± 1.6	15.3 ± 0.9
D-84	23.0 ± 1.3	15.1 ± 1.2	14.6 ± 1.6	14.2 ± 1.0
D-85	24.1 ± 1.2	15.5 ± 1.4	17.4 ± 1.6	18.4 ± 1.1
D-86	22.3 ± 1.8	16.9 ± 1.4	15.5 ± 2.6	18.4 ± 1.3
D-91	24.4 ± 1.2	13.4 ± 1.5	16.0 ± 1.9	16.0 ± 1.5
Mean ± s.d.	23.2 ± 2.7	14.7 ± 2.6	15.8 ± 2.7	16.8 ± 2.2

^a ND = No data; see Table 2.0, Listing of Missed Samples.

Table 11. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD).
 Quarterly collection. 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	22.5 ± 1.1	11.2 ± 1.4	14.8 ± 2.0	14.9 ± 1.6
D-44	25.7 ± 1.1	15.7 ± 1.1	17.7 ± 1.6	19.0 ± 0.9
D-45	24.6 ± 1.0	11.7 ± 1.3	15.7 ± 1.7	14.6 ± 1.2
D-46	27.2 ± 1.3	16.0 ± 1.4	19.0 ± 1.9	18.2 ± 1.1
D-47	23.1 ± 1.1	17.3 ± 1.4	14.3 ± 1.8	20.4 ± 1.3
D-48	<u>27.4 ± 1.0</u>	<u>15.0 ± 1.2</u>	<u>20.5 ± 1.8</u>	<u>19.1 ± 1.0</u>
Mean ± s.d.	25.1 ± 2.1	14.5 ± 2.5	17.0 ± 2.5	17.7 ± 2.4
<u>Within 3.0 mi. of Stack</u>				
D-33	17.5 ± 1.1	10.6 ± 1.2	9.7 ± 1.5	13.4 ± 0.9
D-34	22.2 ± 1.0	11.2 ± 1.6	13.2 ± 1.5	13.8 ± 1.1
D-35	23.9 ± 1.0	11.8 ± 1.4	14.0 ± 1.7	13.2 ± 1.0
D-36	22.8 ± 1.4	12.1 ± 1.3	13.8 ± 1.8	16.3 ± 1.1
D-37	24.8 ± 1.5	13.7 ± 1.1	17.2 ± 1.9	18.3 ± 1.1
D-38	22.8 ± 1.3	13.4 ± 1.3	18.9 ± 1.9	15.1 ± 1.3
D-39	24.4 ± 1.3	14.8 ± 1.7	16.7 ± 1.8	17.0 ± 1.4
D-40	21.1 ± 0.9	12.3 ± 1.5	11.0 ± 1.8	13.9 ± 1.1
D-41	25.2 ± 1.0	16.3 ± 1.5	ND ^a	21.1 ± 1.1
D-42	<u>18.5 ± 1.1</u>	<u>11.0 ± 1.5</u>	<u>11.1 ± 1.5</u>	<u>15.7 ± 1.1</u>
Mean ± s.d.	22.3 ± 2.6	12.7 ± 1.8	13.9 ± 3.1	15.8 ± 2.5
<u>ISFSI Fenceline</u>				
D-161	63.8 ± 2.5	50.9 ± 3.6	48.3 ± 3.2	53.8 ± 4.1
D-162	22.1 ± 1.0	13.9 ± 1.3	14.0 ± 1.6	16.2 ± 1.4
D-163	60.3 ± 1.8	44.2 ± 2.6	49.7 ± 2.0	48.4 ± 3.0
D-164	<u>22.5 ± 1.0</u>	<u>11.0 ± 1.2</u>	<u>14.1 ± 1.6</u>	<u>13.7 ± 1.0</u>
Mean ± s.d.	42.2 ± 23.0	30.0 ± 20.5	31.5 ± 20.2	33.0 ± 21.0

^a ND = No data; see Table 2.0, Listing of Missed Samples.

Table 12. 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-110					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-08-13	DMI- 90	< 0.3	1528 ± 119	< 2.5	< 2.4	< 13.1	< 1.5
02-05-13	DMI- 488	< 0.5	1351 ± 118	< 3.2	< 4.5	< 15.0	< 1.5
03-05-13	DMI- 939	< 0.3	1413 ± 105	< 2.7	< 3.8	< 9.7	< 1.7
04-09-13	DMI- 1622	< 0.4	1435 ± 124	< 3.6	< 3.2	< 15.9	< 1.8
05-10-13	DMI- 2489	< 0.3	1504 ± 110	< 3.2	< 3.7	< 15.9	< 1.4
05-22-13	DMI- 2708	< 0.3	1490 ± 113	< 3.8	< 3.6	< 20.3	< 3.9
06-04-13	DMI- 2950	< 0.3	1477 ± 105	< 3.4	< 3.3	< 12.5	< 2.2
06-18-13	DMI- 3389	< 0.4	1530 ± 104	< 2.4	< 3.3	< 9.3	< 2.8
07-03-13	DMI- 3658	< 0.4	1516 ± 122	< 2.7	< 4.1	< 16.1	< 1.7
07-16-13	DMI- 3979	< 0.4	1464 ± 97	< 3.2	< 3.2	< 12.8	< 3.1
07-30-13	DMI- 4379	< 0.3	1485 ± 125	< 1.9	< 4.1	< 9.7	< 2.8
08-13-13	DMI- 4761	< 0.2	1406 ± 105	< 3.3	< 3.5	< 9.7	< 1.5
08-27-13	DMI- 5075	< 0.2	1436 ± 93	< 2.2	< 2.2	< 10.0	< 0.7
09-10-13	DMI- 5373	< 0.3	1297 ± 116	< 3.3	< 2.5	< 16.0	< 1.4
09-24-13	DMI- 5636	< 0.2	1483 ± 99	< 3.1	< 3.2	< 12.3	< 3.0
10-16-13	DMI- 6333	< 0.4	1432 ± 115	< 3.5	< 4.6	< 11.5	< 1.3
11-15-13	DMI- 7058	< 0.4	1391 ± 114	< 4.0	< 2.7	< 19.3	< 1.3
12-17-13	DMI- 7569	< 0.3	1420 ± 95	< 3.3	< 3.6	< 8.7	< 1.6

Location		D-138					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-08-13	DMI- 91	< 0.3	1405 ± 105	< 3.7	< 2.7	< 13.6	< 2.2
02-05-13	DMI- 489	< 0.3	1351 ± 104	< 2.9	< 4.0	< 10.1	< 2.0
03-05-13	DMI- 940	< 0.3	1264 ± 101	< 2.0	< 2.3	< 10.0	< 1.1
04-09-13	DMI- 1623	< 0.3	1440 ± 106	< 2.7	< 3.0	< 14.0	< 1.5
05-10-13	DMI- 2490	< 0.3	1423 ± 107	< 2.6	< 3.7	< 16.4	< 2.5
05-22-13	DMI- 2709	< 0.3	1392 ± 108	< 2.3	< 3.3	< 17.4	< 2.4
06-04-13	DMI- 2951	< 0.4	1307 ± 115	< 3.8	< 3.9	< 14.7	< 1.4
06-18-13	DMI- 3390	< 0.5	1583 ± 113	< 2.8	< 3.1	< 12.9	< 1.2
07-03-13	DMI- 3659	< 0.4	1416 ± 116	< 3.5	< 4.4	< 18.9	< 3.8
07-16-13	DMI- 3980	< 0.3	1495 ± 100	< 2.2	< 1.6	< 7.5	< 2.1
07-30-13	DMI- 4380	< 0.4	1543 ± 114	< 2.7	< 3.6	< 8.0	< 1.8
08-13-13	DMI- 4762	< 0.2	1445 ± 109	< 2.2	< 4.0	< 17.4	< 2.4
08-27-13	DMI- 5076	< 0.2	1334 ± 100	< 3.1	< 3.3	< 7.9	< 1.9
09-10-13	DMI- 5374	< 0.4	1238 ± 104	< 3.2	< 4.0	< 17.8	< 2.1
09-24-13	DMI- 5637	< 0.2	1534 ± 106	< 2.8	< 3.4	< 14.7	< 2.0
10-16-13	DMI- 6334	< 0.3	1226 ± 105	< 3.8	< 4.2	< 10.0	< 1.4
11-15-13	DMI- 7059	< 0.4	1412 ± 114	< 2.9	< 3.5	< 15.8	< 1.3
12-17-13	DMI- 7570	< 0.3	1525 ± 96	< 2.9	< 3.2	< 5.9	< 1.7

Table 13. Well water samples, analyses for gross beta, gamma emitting isotopes and tritium.

Collection: Quarterly

Units: pCi/L

Location		D-53 Treated Municipal Water			
Lab Code	DWW- 769	DWW- 3094	DWW- 5034	DWW- 7183	
Date Collected	02-25-13	06-05-13	08-22-13	11-21-13	
Gross Beta	1.2 ± 0.3	-	-	-	
H-3	< 141	< 138	< 150	< 158	
Mn-54	< 1.9	< 2.0	< 2.7	< 2.9	
Fe-59	< 3.5	< 4.3	< 6.2	< 3.3	
Co-58	< 3.3	< 3.4	< 2.0	< 3.5	
Co-60	< 2.9	< 1.9	< 2.5	< 2.2	
Zn-65	< 4.9	< 3.8	< 2.8	< 3.3	
Nb-95	< 3.4	< 4.2	< 2.6	< 3.5	
Zr-95	< 4.7	< 3.1	< 3.5	< 6.0	
I-131	< 5.9	< 8.5	< 9.1	< 9.1	
Cs-134	< 2.5	< 2.6	< 2.3	< 3.7	
Cs-137	< 2.5	< 2.5	< 3.2	< 3.5	
Ba-140	< 18.5	< 23.8	< 20.6	< 17.6	
La-140	< 2.9	< 6.2	< 5.2	< 3.0	

Location		D-54 Inlet to Municipal Water			
Lab Code	DWW- 771	DWW- 3095	DWW- 5035	DWW- 7184	
Date Collected	02-25-13	06-05-13	08-22-13	11-21-13	
Gross Beta	1.8 ± 0.4	-	-	-	
H-3	< 141	< 138	< 150	< 158	
Mn-54	< 1.8	< 3.1	< 2.6	< 2.3	
Fe-59	< 2.4	< 7.1	< 5.9	< 4.1	
Co-58	< 2.4	< 2.6	< 2.5	< 2.6	
Co-60	< 2.4	< 1.9	< 1.8	< 2.1	
Zn-65	< 3.0	< 4.4	< 1.7	< 5.2	
Nb-95	< 2.2	< 4.2	< 3.7	< 3.1	
Zr-95	< 3.9	< 3.1	< 3.7	< 6.0	
I-131	< 7.2	< 6.6	< 7.4	< 8.1	
Cs-134	< 2.9	< 3.5	< 2.0	< 2.7	
Cs-137	< 2.8	< 3.0	< 2.3	< 2.2	
Ba-140	< 10.7	< 21.3	< 13.4	< 13.7	
La-140	< 4.0	< 4.5	< 4.1	< 3.3	

Table 13. Well water samples, analyses for gross beta, gamma emitting isotopes and tritium.

Collection: Quarterly

Units: pCi/L

Location		D-55 On-site Well			
Lab Code	DWW- 772	DWW- 3096	DWW- 5036	DWW- 7185	
Date Collected	02-25-13	06-05-13	08-22-13	11-21-13	
Gross Beta	-0.1 ± 0.3	-	-	-	
H-3	< 141	< 138	< 150	< 158	
Mn-54	< 1.9	< 2.3	< 2.1	< 2.9	
Fe-59	< 3.4	< 3.6	< 6.1	< 4.6	
Co-58	< 2.8	< 1.6	< 1.7	< 2.5	
Co-60	< 2.3	< 1.7	< 1.7	< 3.8	
Zn-65	< 2.8	< 2.5	< 4.2	< 4.6	
Nb-95	< 1.5	< 2.5	< 4.3	< 3.1	
Zr-95	< 5.2	< 5.5	< 3.3	< 6.3	
I-131	< 6.2	< 10.3	< 9.1	< 6.3	
Cs-134	< 2.6	< 2.1	< 2.4	< 3.4	
Cs-137	< 2.3	< 2.6	< 3.1	< 2.5	
Ba-140	< 6.9	< 18.3	< 15.4	< 12.0	
La-140	< 2.6	< 2.2	< 2.6	< 3.9	

Location		D-57 Bull Farm			
Lab Code	DWW- 773	DWW- 3097	DWW- 5037	DWW- 7187	
Date Collected	02-25-13	06-05-13	08-22-13	11-21-13	
Gross Beta	0.6 ± 0.3	-	-	-	
H-3	< 141	< 138	< 150	< 156	
Mn-54	< 2.6	< 1.2	< 2.7	< 2.7	
Fe-59	< 4.3	< 3.4	< 3.1	< 3.3	
Co-58	< 3.0	< 2.9	< 2.9	< 2.0	
Co-60	< 2.7	< 2.6	< 2.5	< 2.9	
Zn-65	< 4.4	< 2.7	< 3.6	< 7.8	
Nb-95	< 2.2	< 1.9	< 3.0	< 4.2	
Zr-95	< 2.9	< 4.7	< 4.9	< 6.9	
I-131	< 7.4	< 9.0	< 8.1	< 9.5	
Cs-134	< 2.8	< 1.6	< 2.0	< 3.7	
Cs-137	< 2.9	< 2.5	< 2.0	< 2.1	
Ba-140	< 13.5	< 25.6	< 14.3	< 14.9	
La-140	< 3.0	< 3.0	< 4.9	< 4.8	

Table 13. Well water samples, analyses for gross beta, gamma emitting isotopes and tritium.

Collection: Quarterly

Units: pCi/L

Location				
D-58 Franz Farm				
Lab Code	DWW- 774	DWW- 3098	DWW- 5038	DWW- 7188
Date Collected	02-25-13	06-05-13	08-22-13	11-21-13
Gross Beta	4.2 ± 0.5	-	-	-
H-3	< 141	< 138	< 150	< 156
Mn-54	< 2.1	< 2.1	< 3.2	< 3.0
Fe-59	< 3.6	< 4.0	< 4.4	< 6.1
Co-58	< 2.6	< 2.1	< 3.3	< 2.7
Co-60	< 2.1	< 1.9	< 2.0	< 2.7
Zn-65	< 5.5	< 3.5	< 3.1	< 6.1
Nb-95	< 3.1	< 2.8	< 3.6	< 3.9
Zr-95	< 3.6	< 3.7	< 4.3	< 5.5
I-131	< 6.4	< 11.4	< 9.8	< 7.5
Cs-134	< 2.2	< 2.1	< 2.8	< 3.5
Cs-137	< 1.7	< 3.3	< 2.9	< 3.1
Ba-140	< 17.1	< 21.5	< 18.8	< 15.9
La-140	< 2.2	< 3.8	< 5.7	< 3.6

Location				
D-72(C) Van Note Farm				
Lab Code	DWW- 775	DWW- 3099	DWW- 5039	DWW- 7189
Date Collected	02-25-13	06-05-13	08-22-13	11-21-13
Gross Beta	0.1 ± 0.3	-	-	-
H-3	< 141	< 138	< 150	< 156
Mn-54	< 3.7	< 2.5	< 3.3	< 2.1
Fe-59	< 4.8	< 3.8	< 2.8	< 5.1
Co-58	< 1.6	< 1.9	< 2.0	< 1.5
Co-60	< 1.8	< 2.3	< 2.8	< 1.5
Zn-65	< 3.3	< 4.6	< 5.4	< 2.3
Nb-95	< 2.2	< 2.9	< 3.7	< 2.4
Zr-95	< 5.9	< 3.5	< 2.4	< 3.0
I-131	< 6.3	< 9.3	< 10.3	< 8.6
Cs-134	< 2.2	< 1.9	< 2.8	< 2.7
Cs-137	< 2.5	< 2.5	< 2.8	< 3.0
Ba-140	< 12.9	< 16.0	< 25.2	< 20.6
La-140	< 4.3	< 5.3	< 3.9	< 3.3

Table 14. Vegetation (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.
 Collection: Annually
 Units: pCi/g wet

Location	D-40	D-118	D-118
Lab Code	DVE- 4498	DVE- 4952	DVE- 6600
Date Collected	08-02-13	08-20-13	10-22-13
Sample Type	Broadleaf	Cabbage	Cabbage
K-40	4.95 ± 0.44	2.09 ± 0.18	2.07 ± 0.21
Mn-54	< 0.014	< 0.005	< 0.005
Fe-59	< 0.027	< 0.018	< 0.012
Co-58	< 0.011	< 0.007	< 0.007
Co-60	< 0.013	< 0.007	< 0.005
Zn-65	< 0.033	< 0.009	< 0.010
Nb-95	< 0.018	< 0.005	< 0.009
Zr-95	< 0.028	< 0.008	< 0.009
Ru-103	< 0.021	< 0.005	< 0.009
Ru-106	< 0.14	< 0.044	< 0.052
I-131	< 0.030	< 0.014	< 0.013
Cs-134	< 0.017	< 0.007	< 0.007
Cs-137	< 0.013	< 0.007	< 0.004
Ce-141	< 0.031	< 0.013	< 0.012
Ce-144	< 0.095	< 0.058	< 0.061

Table 15. Vegetation (hay and grain), analyses for gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-16	D-57	D-57	D-57	D-109
Lab Code	DVE- 3936	DVE- 3937	DVE- 5638	DVE- 6599	DVE- 6601
Date Collected	07-10-13	07-10-13	09-23-13	10-22-13	10-22-13
Sample Type	Wheat	Wheat	Hay	Corn	Corn
K-40	4.81 ± 0.47	7.28 ± 0.74	4.15 ± 0.33	2.60 ± 0.21	2.11 ± 0.29
Mn-54	< 0.018	< 0.032	< 0.011	< 0.006	< 0.009
Fe-59	< 0.023	< 0.063	< 0.016	< 0.015	< 0.009
Co-58	< 0.018	< 0.017	< 0.008	< 0.006	< 0.008
Co-60	< 0.013	< 0.023	< 0.010	< 0.006	< 0.003
Zn-65	< 0.035	< 0.031	< 0.021	< 0.009	< 0.006
Nb-95	< 0.015	< 0.019	< 0.017	< 0.006	< 0.007
Zr-95	< 0.022	< 0.051	< 0.018	< 0.011	< 0.019
Ru-103	< 0.020	< 0.033	< 0.013	< 0.007	< 0.005
Ru-106	< 0.19	< 0.20	< 0.12	< 0.038	< 0.13
I-131	< 0.042	< 0.053	< 0.019	< 0.014	< 0.014
Cs-134	< 0.012	< 0.021	< 0.009	< 0.008	< 0.010
Cs-137	< 0.020	< 0.031	< 0.015	< 0.006	< 0.011
Ce-141	< 0.036	< 0.053	< 0.015	< 0.017	< 0.018
Ce-144	< 0.15	< 0.19	< 0.10	< 0.057	< 0.078

Location	Control			
	D-110	D-110	D-138	D-138
Lab Code	DVE- 6595	DVE- 6596	DVE- 5640	DVE- 6597
Date Collected	10-22-13	10-22-13	09-23-13	10-22-13
Sample Type	Corn	Beans	Hay	Corn
K-40	3.02 ± 0.29	16.31 ± 0.60	11.35 ± 0.53	2.46 ± 0.22
Mn-54	< 0.008	< 0.008	< 0.010	< 0.009
Fe-59	< 0.011	< 0.018	< 0.026	< 0.018
Co-58	< 0.007	< 0.013	< 0.008	< 0.008
Co-60	< 0.009	< 0.008	< 0.014	< 0.007
Zn-65	< 0.009	< 0.026	< 0.031	< 0.008
Nb-95	< 0.013	< 0.014	< 0.014	< 0.006
Zr-95	< 0.015	< 0.026	< 0.024	< 0.008
Ru-103	< 0.011	< 0.013	< 0.012	< 0.009
Ru-106	< 0.089	< 0.064	< 0.12	< 0.066
I-131	< 0.018	< 0.018	< 0.019	< 0.013
Cs-134	< 0.010	< 0.013	< 0.012	< 0.008
Cs-137	< 0.010	< 0.009	< 0.012	< 0.007
Ce-141	< 0.011	< 0.026	< 0.018	< 0.011
Ce-144	< 0.067	< 0.093	< 0.089	< 0.042

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-49

Lab Code	DSW- 168	DSW- 500	DSW- 1258	DSW- 1913	DSW- 2762	DSW- 3461
Date Collected	01-14-13	02-05-13	03-21-13	04-19-13	05-24-13	06-20-13
H-3	< 138	< 136	< 146	< 183	< 188	< 197
I-131(Chemistry)	< 0.6	< 0.5	< 0.4	< 0.3	< 0.4	< 0.3
Mn-54	< 3.0	< 3.8	< 2.3	< 3.8	< 2.1	< 2.7
Fe-59	< 3.5	< 4.2	< 3.9	< 6.8	< 5.0	< 3.5
Co-58	< 2.4	< 4.7	< 3.4	< 3.9	< 1.7	< 1.3
Co-60	< 2.6	< 2.2	< 3.2	< 3.9	< 2.4	< 3.1
Zn-65	< 5.8	< 4.8	< 4.2	< 6.4	< 3.4	< 1.9
Nb-95	< 1.8	< 4.4	< 2.7	< 2.7	< 2.1	< 2.1
Zr-95	< 4.0	< 6.6	< 4.2	< 6.5	< 3.8	< 5.0
I-131	< 5.9	< 3.6	< 6.8	< 6.4	< 6.8	< 3.9
Cs-134	< 3.3	< 4.0	< 2.8	< 4.7	< 2.6	< 3.2
Cs-137	< 4.4	< 4.3	< 3.1	< 4.5	< 2.9	< 4.2
Ba-140	< 12.0	< 10.7	< 14.6	< 24.5	< 14.3	< 11.5
La-140	< 2.2	< 2.6	< 3.4	< 4.4	< 3.1	< 1.7

Lab Code	DSW- 4139	DSW- 4947	DSW- 5513	DSW- 6322	DSW- 7127	DSW- 7600
Date Collected	07-17-13	08-20-13	09-17-13	10-16-13	11-19-13	12-19-13
H-3	< 156	< 153	< 151	< 147	< 149	< 158
I-131(Chemistry)	< 0.2	< 0.3	< 0.3	< 0.2	< 0.2	< 0.4
Mn-54	< 2.9	< 2.0	< 3.2	< 3.8	< 2.8	< 2.4
Fe-59	< 2.5	< 3.7	< 6.9	< 4.3	< 3.1	< 5.9
Co-58	< 2.3	< 1.7	< 1.6	< 2.6	< 2.4	< 2.9
Co-60	< 1.7	< 2.3	< 3.3	< 3.1	< 2.3	< 2.5
Zn-65	< 2.8	< 1.5	< 3.6	< 7.3	< 4.1	< 4.8
Nb-95	< 3.3	< 2.5	< 2.2	< 6.2	< 3.2	< 3.4
Zr-95	< 3.5	< 2.9	< 6.4	< 6.6	< 4.0	< 4.4
I-131	< 4.7	< 3.6	< 4.8	< 4.7	< 5.1	< 6.8
Cs-134	< 2.7	< 2.4	< 3.3	< 4.8	< 3.8	< 3.4
Cs-137	< 3.1	< 2.8	< 4.2	< 2.2	< 3.4	< 2.3
Ba-140	< 9.2	< 10.7	< 12.6	< 21.3	< 8.8	< 15.3
La-140	< 1.5	< 1.2	< 3.0	< 2.9	< 1.8	< 2.8

Table 16. Surface water samples, analyses for tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-50

Lab Code	DSW- 169	DSW- 501	DSW- 1259	DSW- 1914	DSW- 2763	DSW- 3462
Date Collected	01-14-13	02-05-13	03-21-13	04-19-13	05-24-13	06-20-13
H-3	< 138	< 136	< 146	< 183	< 188	< 197
Mn-54	< 2.7	< 2.6	< 3.0	< 2.7	< 2.8	< 1.4
Fe-59	< 2.7	< 4.9	< 6.0	< 4.5	< 2.8	< 3.5
Co-58	< 1.8	< 3.0	< 1.7	< 3.3	< 2.9	< 2.0
Co-60	< 2.0	< 2.6	< 2.5	< 3.2	< 2.2	< 3.1
Zn-65	< 5.2	< 3.8	< 5.4	< 2.7	< 2.7	< 4.6
Nb-95	< 1.4	< 2.1	< 4.0	< 1.9	< 1.8	< 2.4
Zr-95	< 4.5	< 4.6	< 4.7	< 5.6	< 3.5	< 4.4
I-131	< 3.4	< 5.8	< 3.6	< 6.1	< 4.2	< 5.7
Cs-134	< 2.6	< 3.7	< 2.2	< 2.1	< 2.3	< 2.0
Cs-137	< 2.6	< 3.8	< 2.1	< 3.5	< 3.2	< 2.9
Ba-140	< 5.8	< 16.3	< 13.9	< 20.3	< 16.1	< 13.0
La-140	< 2.7	< 2.6	< 2.4	< 4.5	< 1.6	< 2.1
Lab Code	DSW- 4140	DSW- 4948	DSW- 5514	DSW- 6323	DSW- 7128	DSW- 7602
Date Collected	07-17-13	08-20-13	09-17-13	10-16-13	11-19-13	12-19-13
H-3	< 156	< 153	< 151	< 147	< 149	< 158
Mn-54	< 2.0	< 2.9	< 1.9	< 2.4	< 2.1	< 2.4
Fe-59	< 3.4	< 2.4	< 4.0	< 4.5	< 4.3	< 5.0
Co-58	< 2.1	< 2.3	< 3.2	< 3.3	< 1.5	< 2.3
Co-60	< 1.8	< 2.0	< 2.0	< 1.8	< 1.8	< 1.4
Zn-65	< 4.7	< 4.0	< 5.1	< 8.1	< 4.8	< 5.0
Nb-95	< 2.4	< 3.4	< 3.9	< 1.8	< 3.0	< 2.0
Zr-95	< 3.2	< 3.3	< 3.6	< 7.5	< 3.8	< 6.1
I-131	< 4.9	< 6.3	< 3.1	< 3.4	< 5.2	< 5.0
Cs-134	< 3.0	< 3.3	< 3.2	< 3.8	< 2.9	< 2.9
Cs-137	< 3.4	< 2.0	< 3.3	< 3.2	< 2.8	< 3.5
Ba-140	< 17.1	< 10.1	< 13.3	< 10.5	< 8.8	< 16.3
La-140	< 2.3	< 2.3	< 1.4	< 2.1	< 2.3	< 3.0

Table 16. Surface water samples, analyses for tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-51

Lab Code	DSW- 170	DSW- 502	DSW- 1260	DSW- 1915	DSW- 2764	DSW- 3463
Date Collected	01-14-13	02-05-13	03-21-13	04-19-13	05-24-13	06-20-13
H-3	< 138	< 136	< 146	< 183	< 188	< 197
Mn-54	< 3.1	< 2.8	< 2.3	< 3.1	< 1.5	< 2.4
Fe-59	< 5.3	< 4.0	< 4.0	< 5.1	< 2.0	< 5.8
Co-58	< 2.4	< 1.9	< 2.3	< 2.0	< 2.1	< 2.4
Co-60	< 3.4	< 2.7	< 2.4	< 2.4	< 1.8	< 1.7
Zn-65	< 5.2	< 3.1	< 3.2	< 2.7	< 4.8	< 3.0
Nb-95	< 2.8	< 2.8	< 2.4	< 3.0	< 2.1	< 3.1
Zr-95	< 7.5	< 3.6	< 5.2	< 4.7	< 2.4	< 2.8
I-131	< 5.9	< 4.0	< 4.4	< 4.9	< 5.0	< 3.6
Cs-134	< 3.3	< 3.1	< 2.8	< 2.7	< 2.9	< 2.6
Cs-137	< 3.7	< 2.0	< 2.9	< 3.2	< 3.5	< 2.5
Ba-140	< 16.3	< 12.6	< 12.0	< 9.1	< 9.7	< 10.2
La-140	< 4.6	< 2.2	< 1.8	< 2.9	< 4.3	< 1.7
Lab Code	DSW- 4141	DSW- 4949	DSW- 5515	DSW- 6324	DSW- 7129	DSW- 7603
Date Collected	07-17-13	08-20-13	09-17-13	10-16-13	11-19-13	12-19-13
H-3	< 156	< 153	< 151	< 147	< 149	< 158
Mn-54	< 2.4	< 2.7	< 3.0	< 2.7	< 2.3	< 2.3
Fe-59	< 3.8	< 3.7	< 5.1	< 4.1	< 3.2	< 4.1
Co-58	< 1.5	< 1.5	< 1.6	< 3.2	< 2.4	< 2.7
Co-60	< 2.0	< 2.7	< 2.0	< 3.4	< 1.1	< 1.8
Zn-65	< 2.6	< 5.0	< 4.3	< 5.0	< 3.3	< 6.3
Nb-95	< 2.6	< 3.4	< 3.4	< 2.0	< 3.2	< 2.3
Zr-95	< 4.7	< 5.2	< 5.1	< 3.3	< 3.9	< 6.5
I-131	< 4.5	< 5.0	< 3.4	< 4.2	< 3.7	< 3.5
Cs-134	< 2.4	< 2.1	< 3.4	< 3.5	< 2.8	< 2.5
Cs-137	< 3.5	< 3.6	< 3.3	< 2.9	< 2.1	< 3.0
Ba-140	< 18.2	< 17.0	< 11.4	< 15.2	< 11.9	< 11.3
La-140	< 2.0	< 3.6	< 3.0	< 3.0	< 3.6	< 4.8

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-61

Lab Code	DSW- 171	DSW- 503	DSW- 1261	DSW- 1916	DSW- 2765	DSW- 3464
Date Collected	01-14-13	02-05-13	03-21-13	04-19-13	05-24-13	06-20-13
H-3	< 138	< 136	< 146	< 183	< 141	< 197
I-131(Chemistry)	< 0.5	< 0.4	< 0.5	< 0.4	< 0.4	< 0.2
Mn-54	< 2.7	< 2.3	< 2.8	< 3.9	< 2.0	< 2.6
Fe-59	< 4.8	< 2.9	< 5.4	< 5.6	< 2.6	< 3.2
Co-58	< 3.2	< 2.4	< 3.0	< 4.0	< 2.3	< 1.9
Co-60	< 2.4	< 3.0	< 2.4	< 3.0	< 2.0	< 2.6
Zn-65	< 4.0	< 4.0	< 4.0	< 3.7	< 2.1	< 4.3
Nb-95	< 2.3	< 3.3	< 2.3	< 3.5	< 1.7	< 2.7
Zr-95	< 3.7	< 4.4	< 3.9	< 8.0	< 5.4	< 4.1
I-131	< 4.6	< 3.2	< 5.8	< 5.7	< 4.2	< 4.9
Cs-134	< 2.3	< 2.6	< 1.7	< 4.1	< 2.0	< 2.3
Cs-137	< 2.9	< 2.9	< 2.9	< 2.9	< 2.8	< 3.1
Ba-140	< 13.8	< 12.2	< 13.0	< 15.1	< 11.5	< 11.1
La-140	< 1.5	< 2.1	< 2.4	< 4.7	< 1.0	< 2.4
Lab Code	DSW- 4142	DSW- 4950	DSW- 5516	DSW- 6326	DSW- 7130	DSW- 7604
Date Collected	07-17-13	08-20-13	09-17-13	10-16-13	11-19-13	12-19-13
H-3	< 156	< 153	< 151	< 147	< 149	< 158
I-131(Chemistry)	< 0.2	< 0.4	< 0.3	< 0.2	< 0.2	< 0.4
Mn-54	< 2.3	< 1.8	< 2.6	< 3.0	< 2.4	< 2.2
Fe-59	< 1.9	< 4.1	< 4.3	< 3.3	< 4.8	< 3.4
Co-58	< 2.0	< 3.5	< 1.3	< 2.7	< 1.5	< 2.0
Co-60	< 2.3	< 2.7	< 1.8	< 2.4	< 2.4	< 1.1
Zn-65	< 3.0	< 6.3	< 3.5	< 2.0	< 3.1	< 3.0
Nb-95	< 2.9	< 2.4	< 2.1	< 3.2	< 2.8	< 2.4
Zr-95	< 3.5	< 6.0	< 3.8	< 5.2	< 5.9	< 4.1
I-131	< 4.5	< 4.3	< 2.6	< 3.1	< 3.2	< 4.3
Cs-134	< 2.3	< 2.9	< 2.9	< 3.0	< 2.7	< 2.5
Cs-137	< 2.8	< 3.9	< 3.2	< 2.7	< 3.3	< 3.1
Ba-140	< 12.2	< 15.1	< 12.6	< 13.1	< 8.4	< 11.9
La-140	< 1.6	< 3.4	< 2.2	< 2.0	< 2.7	< 1.2

Table 16. Surface water samples, analyses for tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-99

Lab Code	DSW- 172	DSW- 504	DSW- 1262	DSW- 1917	DSW- 2766	DSW- 3465
Date Collected	01-14-13	02-05-13	03-21-13	04-19-13	05-24-13	06-20-13
H-3	< 138	< 136	< 146	< 183	< 188	< 197
Mn-54	< 2.3	< 1.5	< 3.3	< 2.8	< 2.2	< 1.9
Fe-59	< 5.6	< 4.5	< 6.0	< 5.6	< 4.5	< 3.6
Co-58	< 2.2	< 1.5	< 3.0	< 3.0	< 1.6	< 1.8
Co-60	< 2.9	< 2.4	< 2.9	< 1.7	< 1.8	< 3.4
Zn-65	< 5.8	< 2.6	< 8.4	< 2.1	< 5.1	< 4.1
Nb-95	< 3.4	< 2.9	< 4.0	< 3.1	< 3.3	< 2.0
Zr-95	< 3.4	< 4.6	< 5.1	< 5.9	< 2.8	< 3.4
I-131	< 6.1	< 3.5	< 7.0	< 5.5	< 4.0	< 5.3
Cs-134	< 2.5	< 1.9	< 3.8	< 2.3	< 2.4	< 3.1
Cs-137	< 3.2	< 2.3	< 3.2	< 3.3	< 3.6	< 3.6
Ba-140	< 14.4	< 9.6	< 19.2	< 11.2	< 11.2	< 14.9
La-140	< 1.9	< 2.0	< 5.3	< 2.8	< 4.0	< 3.2

Lab Code	DSW- 4143	DSW- 4951	DSW- 5517	DSW- 6327	DSW- 7131	DSW- 7605
Date Collected	07-17-13	08-20-13	09-17-13	10-16-13	11-19-13	12-19-13
H-3	< 156	< 153	< 151	< 147	< 149	< 158
Mn-54	< 2.0	< 1.9	< 3.4	< 2.1	< 3.3	< 3.0
Fe-59	< 4.6	< 2.6	< 4.6	< 4.3	< 2.5	< 6.7
Co-58	< 2.9	< 2.6	< 1.8	< 3.7	< 2.1	< 4.3
Co-60	< 2.4	< 1.3	< 3.8	< 3.3	< 1.4	< 5.2
Zn-65	< 4.0	< 4.5	< 5.4	< 3.4	< 5.2	< 6.8
Nb-95	< 2.7	< 3.7	< 2.4	< 2.2	< 2.0	< 2.3
Zr-95	< 3.7	< 4.5	< 5.6	< 5.6	< 3.2	< 4.5
I-131	< 3.7	< 6.1	< 5.1	< 4.9	< 4.0	< 9.0
Cs-134	< 2.7	< 3.3	< 2.4	< 4.3	< 2.6	< 4.1
Cs-137	< 3.4	< 2.2	< 4.1	< 3.7	< 2.7	< 2.0
Ba-140	< 8.6	< 7.6	< 12.4	< 13.3	< 9.1	< 21.0
La-140	< 2.4	< 1.5	< 4.3	< 4.4	< 1.2	< 2.9

Table 17. Surface water, analysis for strontium.
 Collection: Quarterly composites of monthly samples.
 Units: pCi/L

Location				
D-49				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1280	DSW-3490	DSW-5590	DSW-7611
Sr-89	< 0.60	< 0.83	< 0.38	< 0.69
Sr-90	< 0.45	< 0.78	< 0.57	< 0.51

Location				
D-61				
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-1281	DSW-3491	DSW-5591	DSW-7612
Sr-89	< 0.72	< 0.71	< 0.34	< 0.68
Sr-90	< 0.56	< 0.61	< 0.51	< 0.55

Table 18. Fish, analyses of edible portion for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location				
Upstream, D-49				
Lab Code	DF- 4107	DF- 4108	DF- 6027	DF- 6028
Date Collected	06-25-13	06-25-13	09-27-13	09-27-13
Sample Type	Cyprinus Carpio	Carpoides Sp.	Redhorse	Carp sucker
K-40	3.23 ± 0.39	2.87 ± 0.37	3.78 ± 0.40	3.69 ± 0.41
Mn-54	< 0.012	< 0.012	< 0.011	< 0.009
Fe-59	< 0.050	< 0.034	< 0.028	< 0.032
Co-58	< 0.010	< 0.013	< 0.014	< 0.008
Co-60	< 0.011	< 0.008	< 0.004	< 0.012
Zn-65	< 0.018	< 0.024	< 0.026	< 0.021
Nb-95	< 0.029	< 0.020	< 0.027	< 0.019
Zr-95	< 0.029	< 0.020	< 0.033	< 0.012
Ru-103	< 0.030	< 0.024	< 0.015	< 0.011
Ru-106	< 0.14	< 0.14	< 0.099	< 0.11
Cs-134	< 0.011	< 0.011	< 0.015	< 0.016
Cs-137	< 0.018	< 0.014	< 0.013	< 0.008
Ce-141	< 0.035	< 0.023	< 0.045	< 0.042
Ce-144	< 0.13	< 0.071	< 0.083	< 0.082

Location				
Downstream, D-61				
Lab Code	DF- 4109	DF- 4110	DF- 6029	DF- 6030
Date Collected	06-25-13	06-25-13	09-27-13	09-27-13
Sample Type	Ictiobus Sp.	Carpoides Sp.	Carp	Carp sucker
K-40	2.99 ± 0.40	3.18 ± 0.39	2.90 ± 0.36	3.70 ± 0.39
Mn-54	< 0.016	< 0.016	< 0.018	< 0.014
Fe-59	< 0.041	< 0.038	< 0.034	< 0.044
Co-58	< 0.011	< 0.017	< 0.022	< 0.017
Co-60	< 0.012	< 0.011	< 0.010	< 0.010
Zn-65	< 0.034	< 0.017	< 0.018	< 0.020
Nb-95	< 0.028	< 0.025	< 0.031	< 0.030
Zr-95	< 0.020	< 0.016	< 0.022	< 0.034
Ru-103	< 0.020	< 0.015	< 0.028	< 0.019
Ru-106	< 0.14	< 0.10	< 0.13	< 0.10
Cs-134	< 0.015	< 0.012	< 0.016	< 0.015
Cs-137	< 0.019	< 0.013	< 0.010	< 0.011
Ce-141	< 0.058	< 0.043	< 0.040	< 0.045
Ce-144	< 0.14	< 0.078	< 0.11	< 0.13

Table 19. River sediment, analysis for gamma-emitting isotopes.
 Collection: Semiannually
 Units: pCi/g dry

Location		D-50 (Plant Intake, Control)	
Lab Code		DBS- 3378	DBS- 6038
Date Collected		06-17-13	10-07-13
K-40		7.73 ± 0.43	7.21 ± 0.42
Mn-54		< 0.016	< 0.007
Fe-59		< 0.042	< 0.021
Co-58		< 0.015	< 0.012
Co-60		< 0.011	< 0.005
Zn-65		< 0.032	< 0.024
Nb-95		< 0.019	< 0.018
Zr-95		< 0.021	< 0.020
Ru-103		< 0.018	< 0.015
Ru-106		< 0.12	< 0.10
Cs-134		< 0.009	< 0.010
Cs-137		< 0.014	< 0.010
Ce-141		< 0.036	< 0.026
Ce-144		< 0.097	< 0.056

Location		D-51 (Discharge)	
Lab Code		DBS- 3379	DBS- 6039
Date Collected		06-17-13	10-07-13
K-40		8.51 ± 0.46	7.47 ± 0.42
Mn-54		< 0.015	< 0.014
Fe-59		< 0.043	< 0.051
Co-58		< 0.019	< 0.012
Co-60		< 0.013	< 0.008
Zn-65		< 0.030	< 0.030
Nb-95		< 0.015	< 0.013
Zr-95		< 0.036	< 0.032
Ru-103		< 0.017	< 0.015
Ru-106		< 0.066	< 0.073
Cs-134		< 0.012	< 0.009
Cs-137		< 0.016	< 0.006
Ce-141		< 0.044	< 0.041
Ce-144		< 0.075	< 0.073

Table 19. River sediment, analysis for gamma-emitting isotopes.
 Collection: Semiannually
 Units: pCi/g dry

Location	D-107A (On-site, North Drainage Ditch)	
Lab Code	DBS- 3380	DBS- 6040
Date Collected	06-17-13	10-07-13
K-40	4.80 ± 0.40	6.11 ± 0.37
Mn-54	< 0.017	< 0.014
Fe-59	< 0.056	< 0.040
Co-58	< 0.018	< 0.013
Co-60	0.027 ± 0.014	< 0.006
Zn-65	< 0.038	< 0.027
Nb-95	< 0.040	< 0.029
Zr-95	< 0.025	< 0.025
Ru-103	< 0.027	< 0.020
Ru-106	< 0.16	< 0.066
Cs-134	< 0.015	< 0.008
Cs-137	< 0.017	< 0.012
Ce-141	< 0.051	< 0.044
Ce-144	< 0.082	< 0.052