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Prairie Island Nuclear Generating Plant
Units 1 and 2
Dockets 50-282 and 50-306 and 72-10
License Nos. DPR-42 and DPR-60 and SNM-2506

Prairie Island Independent Spent
Fuel Storage Installation
Docket 72-10
Materials License No. SNM-2506

2009 Annual Radiological Environmental Monitoring Program (REMP) Report

Pursuant to Prairie Island Nuclear Generating Plant (PINGP) Technical Specification (TS) 5.6.2, Appendix A to Operating Licenses DPR-42 and DPR-60, and Prairie Island Independent Spent Fuel Storage Installation Technical Specification (ISFSI TS) 6.2, Appendix A to Materials License SNM-2506, the Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, submits one copy of the Annual Radiological Environmental Monitoring Program report for the period January 1, 2009 through December 31, 2009 as Enclosure 1.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

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Enclosure

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ENCLOSURE 1

Annual Report to the United States Nuclear Regulatory Commission

Radiological Environmental Monitoring Program

January 1, 2009 through December 31, 2009

73 pages follow

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XCEL ENERGY CORPORATION

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

ANNUAL REPORT
to the
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiological Environmental Monitoring Program

January 1 to December 31, 2009

Docket No.	50-282	License No.	DPR-42
	50-306		DPR-60
ISFSI			
Docket No.72-10			SNM-2506

Prepared under Contract by

ENVIRONMENTAL, Inc.
MIDWEST LABORATORY

Project No. 8010

Approved: _____

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PREFACE

The staff of Environmental, Inc., Midwest Laboratory was responsible for the acquisition of data presented in this report. Samples were collected by members of the staff of the Prairie Island Nuclear Generating Plant, operated by Northern States Power Co. –Minnesota, for XCEL Energy Corporation. The report was prepared by Environmental, Inc., Midwest Laboratory.

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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 Prairie Island Nuclear Generating Plant, Red Wing, Minnesota, during the period January - December, 2009. 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.

Tabulations of the individual analyses made during the year are not included in this report. These data are included in a reference document (Environmental, Inc., Midwest Laboratory, 2010b) available at Prairie Island Nuclear Generating Plant.

Prairie Island Nuclear Generating Plant is located on the Mississippi River in Goodhue County, Minnesota, owned by Xcel Energy Corporation and operated by Northern States Power Co.-Minnesota. The plant has two 575 MWe pressurized water reactors. Unit 1 achieved initial criticality on 1 December 1973. Commercial operation at full power began on 16 December 1973. Unit 2 achieved initial criticality on 17 December 1974. Commercial operation at full power began on 21 December 1974.

2.0 SUMMARY

The Radiological Environmental Monitoring Program (REMP) required by the U.S. Nuclear Regulatory Commission (NRC) Offsite Dose Calculation Manual for the Prairie Island Nuclear Generating Plant and the Independent Spent Fuel Storage Installation (ISFSI) is described. Results for 2009 are summarized and discussed.

Program findings show background levels of radioactivity in the environmental samples collected in the vicinity of the Prairie Island Nuclear Generating Plant.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.1 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program (REMP) at the Prairie Island Nuclear Generating Plant 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;

(4) Industrial and medical radioactive waste; and

(5) Fallout from nuclear accidents.

In interpreting the data, effects due to the plant 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 Prairie Island Plant 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 plant 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 plant site. The plant's monitoring program includes analyses for tritium and iodine-131. Most samples are analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, cerium-144, beryllium-7, and potassium-40. The first 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 10 days after reactor shutdown. On the other hand, 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). Beryllium-7 is of cosmogenic origin and potassium-40 is a naturally-occurring isotope. They were chosen as calibration monitors and should not be considered radiological impact indicators.

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 final group, manganese-54, iron-59, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of a nuclear power plant's effluents, but are not produced in significant quantities by nuclear detonations.

3.1 Program Design and Data Interpretation (continued)

Other means of distinguishing sources of environmental radiation are employed in interpreting the data. Current radiation levels are compared with previous levels, including those measured before the Plant became operational. Results of the plant's monitoring program can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.2 Program Description

The sampling and analysis schedule for the radiological environmental monitoring program at Prairie Island is summarized in Table 5.1 and briefly reviewed below. Table 5.2 defines the sampling location codes used in Table 5.1 and specifies for each location its type (indicator or control) and its distance, direction, and sector relative to the reactor site or ISFSI facility, as appropriate. To assure that sampling is carried out in a reproducible manner, detailed sampling procedures have been prescribed (Prairie Island Nuclear Generating Plant, 2009). Maps of fixed sampling locations are included in Appendix D.

To monitor the air environment, airborne particulates are collected on membrane filters by continuous pumping at five locations. Airborne iodine is collected by continuous pumping through charcoal filters at these same locations. Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. Quarterly composites of particulate filters from each location are determined by gamma spectroscopy. One of the five locations is a control (P-1), and four are indicators (P-2, P-3, P-4, and P-6).

Offsite ambient gamma radiation is monitored at thirty-four locations, using $CaSO_4$:Dy dosimeters with four sensitive areas at each location: ten in an inner ring in the general area of the site boundary, fifteen in the outer ring within a 4-5 mile radius, eight at special interest locations, and one control location, 11.1 miles distant from the plant. They are replaced and measured quarterly.

Ambient gamma radiation is monitored at the Independent Spent Fuel Storage Installation (ISFSI) Facility by twenty $CaSO_4$:Dy dosimeters. Twelve dosimeters are located inside of the earthen berm in direct line of sight from the storage casks and eight dosimeters are located outside of the earthen berm. They are replaced and measured quarterly.

Milk samples are collected monthly from four farms (three indicators and one control) and analyzed for iodine-131 and gamma-emitting isotopes. The milk is collected biweekly during the growing season (May - October), because the milk animals may be on pasture.

For additional monitoring of the terrestrial environment, green leafy vegetables (cabbage) are collected annually from the highest D/Q garden and a control location (P-38), and analyzed for gamma-emitting isotopes, including iodine-131. Corn is collected annually only if fields are irrigated with river water and analyzed for gamma-emitting isotopes. Well water and ground water are collected quarterly from four locations near the plant and analyzed for tritium and gamma-emitting isotopes.

River water is collected weekly at two locations, one upstream of the plant (P-5) and one downstream (P-6, Lock and Dam No.3). Monthly composites are analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

3.2 Program Description (continued)

Drinking water is collected weekly from the City of Red Wing well. Monthly composites are analyzed for gross beta, iodine-131, and gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

The aquatic environment is also monitored by semi-annual upstream and downstream collections of fish, periphyton or invertebrates, and bottom sediments. Shoreline sediment is collected semi-annually from one location. All samples are analyzed for gamma-emitting isotopes.

3.3 Program Execution

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

(1) Air Particulates / Air Iodine :

A partial sample was collected from location P-4 for the week ending 10/20/09. Power was down approximately 32 hours due to switching operations at the plant.

Deviations from the program are summarized in Table 5.3.

3.4 Laboratory Procedures

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

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. Levels of iodine-131 in cabbage and natural vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Tritium concentrations are determined by liquid scintillation.

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

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (Environmental, Inc., Midwest Laboratory, 2009). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in the crosscheck programs are presented in Appendix A.

3.5 Program Modifications

There were no modifications to the REMP in 2009.

3.6 Land Use Census

In accordance with the Prairie Island Nuclear Generating Plant Offsite Dose Calculation Manual, H4, (ODCM) a land use census is conducted in order to identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 ft^2 producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of 5 miles. This census is conducted at least once per 12 months between the dates of May 1 and October 31. If new locations yield a calculated dose or dose equivalent (via the same exposure pathway) twenty percent greater than the required locations per the ODCM, then the new locations are added to the radiological environmental monitoring program within 30 days, and sampling locations having lower calculated doses or a lower dose commitment may be deleted from this monitoring program after October 31 of the year in which the land use census was conducted.

This land use census insures the updating of the radiological environmental monitoring program should sampling locations change within the 5 mile radius from the plant.

The Land Use Census was completed in September, 2009. There were no changes to any of the highest D/Q locations for nearest residence, milk animal or garden sites.

No downstream irrigation of corn was discovered within 5 miles of the Prairie Island Plant. Therefore, no corn samples were collected for analysis.

4.0 RESULTS AND DISCUSSION

All scheduled collections and analyses were made except those listed in Table 5.3.

The results are summarized in Table 5.4 in a format recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.8. For each type of analysis of each sampled medium, this table lists the mean and range for all indicator locations and for all control locations. The locations with the highest mean and range are also shown.

4.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported atmospheric nuclear tests in 2009. The last reported test was conducted on October 16, 1980 by the People's Republic of China. There were no reported accidents involving any significant release to the environment at nuclear reactor facilities in 2009.

4.2 Summary of Preoperational Data

The following constitutes a summary of preoperational studies conducted at the Prairie Island Nuclear Power Plant during the years 1970 to 1973, to determine background levels expected in the environment, and provided, where applicable, as a means for comparison with present day levels. Strict comparisons, however, are difficult, since background levels of radiation were much higher in these years due to radioactive fallout from the atmosphere. Gross beta measurements in fallout declined yearly from a level of 12,167 pCi/m^2 to 1,020 pCi/m^2, and these declining values are reflected throughout the various media tested.

In the air environment, ambient gamma radiation (TLDs) averaged 9.4 mR/4 weeks during pre-operational studies. Gross beta in air particulates declined from levels of 0.38 to 0.037 pCi/m^3. Average present day levels have stabilized at around 0.025 pCi/m^3. Airborne radioiodine remained below detection levels.

In the terrestrial environment of 1970 to 1973, milk, agricultural crops, and soil were monitored. In milk samples, low levels of Cs-137, I-131, and Sr-90 were detected. Cs-137 levels declined from 16.5 to 8.6 pCi/L. Present day measurements for both Cs-137 and I-131 are below detection levels. Agricultural crop measurements averaged 57.7 pCi/g for gross beta and 0.47 pCi/g for Cs-137. Gross beta measured in soil averaged 52 pCi/g.

The aqueous environment was monitored by testing of river, well and lake waters, bottom sediments, fish, aquatic vegetation and periphyton. Specific location comparison of drinking, river and well water concentrations for tritium and gross beta are not possible. However, tritium background levels, measured at eight separate locations, declined steadily from an average concentration of 1020 pCi/L to 490 pCi/L. Present day environmental levels of tritium measure below a detection limit of approximately 160 pCi/L. Values for gross beta, measured from 1970 to 1973, averaged 9.9 pCi/L in downstream Mississippi River water, 8.2 pCi/L for well water, and 11.0 pCi/L for lake water. Gamma emitters were below the lower limit of detection (LLD). In bottom sediments, gross beta background levels were determined at 51.0 pCi/g. Cs-137 activity during preoperational studies in 1973 measured 0.25 pCi/g upstream and 0.21 pCi/g downstream. The lower levels occasionally observed today can still be attributed to residual activity from atmospheric fallout. Gross beta in fish, measured in both flesh and skeletal samples, averaged 7.3 and 11.7 pCi/g, respectively. Gross beta background levels in aquatic vegetation, algae and periphyton samples measured 76.0 pCi/g , 46.0 pCi/g, and 13.6 pCi/g, respectively.

4.3 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in the vicinity of the Prairie Island Nuclear Generating Plant.

Ambient Radiation (TLDs)

Ambient radiation was measured in the general area of the site boundary, at the outer ring 4 - 5 mi. distant from the Plant, at special interest areas and at one control location. The means ranged from 15.5 mR/91 days at inner ring locations to 16.2 mR/91 days at outer ring locations. The mean at special interest locations was 15.8 mR/91 days and 16.3 mR/91 days at the control location. Dose rates measured at the inner and outer ring and the control locations were similar to those observed from 1994 through 2008. The results are tabulated below. No plant effect on ambient gamma radiation measurements was indicated (Figure 5-1).

Year	Average (Inner and Outer Rings)	Control		Year	Average (Inner and Outer Rings)	Control
1994	15.2	16.0		2002	17.4	16.9
1995	15.6	16.6		2003	16.2	16.0
1996	14.8	16.4		2004	17.6	17.6
1997	15.1	16.0		2005	16.8	16.3
1998	16.7	17.3		2006	16.6	16.6
1999	16.6	17.5		2007	17.5	17.7
2000	17.0	17.1		2008	16.9	17.1
2001	16.8	17.2		2009	15.9	16.3

Ambient gamma radiation as measured by thermoluminescent dosimetry.
Average quarterly dose rates (mR/91 days).

ISFSI Facility Operations Monitoring

Ambient radiation was measured inside the ISFSI earth berm, outside the ISFSI earth berm and at two special locations between the plant ISFSI and the Prairie Island Indian Community. The mean dose rates averaged 99.5 mR/91 days inside the ISFSI earth berm and 20.4 mR/91 days outside the ISFSI earth berm. One additional cask was placed on the ISFSI pad in 2009, a total of twenty-five loaded casks remain. The higher levels inside the earth berm are expected, due to the loaded spent fuel casks being in direct line-of-sight of the TLDs.

Ambient radiation levels measured outside the earth berm show a slight increase as compared to other offsite dose rates around the plant. If the dose rates outside the earth berm are an indication of gamma skyshine from the casks, they are consistent with predictions given in the ISFSI Safety Analysis Report, Table 7A-7, "Total Skyshine Dose Rate". The cumulative average of the two special Prairie Island Indian Community TLDs measured 15.1 and 15.0 mR/91 days. Although the skyshine neutron dose rates are not directly measured, the neutron levels measured next to the casks are below the levels predicted in the ISFSI SAR Report, Table 7A-4, "TN-40 Dose Rates at Short Distances". Therefore, the skyshine dose rates at farther distances from the casks should be at or below the calculated dose rates. No spent fuel storage effect on offsite ambient gamma radiation was indicated (Fig. 5-1).

Airborne Particulates

Typically, the highest averages for gross beta occur during the months of January and December, and the first and fourth quarters, as in 1993 through 2006, and also in 2008. The elevated activity observed in 2007 was attributed to construction activity in the area, an increase in dust and consequent heavier particulate filter loading.

Average annual gross beta concentrations in airborne particulates were identical at the indicators versus control locations (0.029 pCi/m^3) and similar to levels observed from 1994 through 2006 and 2008. The results are tabulated below.

Year	Average of Indicators	Control
	Concentration (pCi/m^3)	
1994	0.022	0.022
1995	0.022	0.022
1996	0.023	0.020
1997	0.021	0.021
1998	0.022	0.018
1999	0.024	0.022
2000	0.025	0.025
2001	0.023	0.023
2002	0.028	0.023
2003	0.027	0.025
2004	0.025	0.026
2005	0.027	0.025
2006	0.026	0.025
2007	0.037	0.031
2008	0.028	0.027
2009	0.029	0.029

Average annual gross beta concentrations in airborne particulates.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average activity of 0.087 pCi/m^3 for all locations. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.03 pCi/m^3 in all samples. There was no indication of a plant effect.

Milk

Iodine-131 results were below the detection limit of 0.5 pCi/L in all samples. Cs-137 results were below the LLD level of 5 pCi/L in all samples. No other gamma-emitting isotopes, except naturally-occurring potassium-40, were detected in any milk samples. This is consistent with the findings of the National Center for Radiological Health that most radiocontaminants in feed do not find their way into milk due to the selective metabolism of the cow. The common exceptions are radioisotopes of potassium, cesium, strontium, barium, and iodine (National Center for Radiological Health, 1968).

In summary, the milk data for 2009 show no radiological effects of the plant operation.

Drinking Water

In drinking water from the City of Red Wing well, tritium activity measured below the LLD level of 159 pCi/L in all samples.

Gross beta concentrations averaged 11.4 pCi/L throughout the year, ranging from 6.8–15.2 pCi/L. These concentrations are consistent with levels observed from 1994 through 2008. The most likely contribution is the relatively high levels of naturally-occurring radium. Gamma spectroscopy indicates the presence of lead and bismuth isotopes, which are daughters of the radium decay chain. There is no indication from the 2009 data of any effect of plant operation.

Year		Gross Beta (pCi/L)
1994		5.8
1995		3.9
1996		6.3
1997		5.1
1998		5.4
1999		5.3
2000		10.1
2001		8.3
2002		8.7
2003		9.9
2004		9.8
2005		11.5
2006		13.4
2007		11.6
2008		11.6
2009		11.4

Average annual concentrations; Gross beta in drinking water.

River Water

For 2009, no measurable tritium activity was detected in river water composites, above the concentration level of 159 pCi/L.

Gamma-emitting isotopes were below detection limits in all samples.

Well Water

At control well, P-43 (Peterson Farm) and the four indicator wells (P-8, Community Center, P-6, Lock and Dam No. 3, P-9, Plant Well No. 2 and P-24, Suter Farm) no tritium was detected above a concentration level of 161 pCi/L.

Gamma-emitting isotopes were below detection limits in all samples.

In summary, well water data for 2009 show no radiological effects of the plant operation.

Crops

Three samples of broadleaf vegetation, cabbage leaves, were collected in August and analyzed for gamma-emitting isotopes, including iodine-131. The I-131 level was below 0.029 pCi/g wet weight in all samples. With the exception of naturally-occurring potassium-40, all other gamma-emitting isotopes were below their respective detection limits. There was no indication of a plant effect.

Field sampling personnel conducted an annual land use survey and found no river water taken for irrigation into fields within 5 miles downstream from the Prairie Island Plant. The collection and analysis of corn samples was not required.

Fish

Fish were collected in May and September, 2009 and analyzed for gamma emitting isotopes. Only naturally-occurring potassium-40 was detected, and there was no significant difference between upstream and downstream results. There was no indication of a plant effect.

Aquatic Insects or Periphyton

Aquatic insects (invertebrates) or periphyton were collected in May and September, 2009 and analyzed for gamma-emitting isotopes. All gamma-emitting isotopes were below detection limits. There was no indication of a plant effect.

Bottom and Shoreline Sediments

Upstream, downstream and downstream recreational area shoreline sediments were sampled in May, June and September, 2009 and analyzed for gamma-emitting isotopes. The only gamma-emitting isotopes detected were naturally-occurring beryllium-7 and potassium-40. There was no indication of a plant effect.

5.0 FIGURES AND TABLES

Figure 5-1. Offsite Ambient Radiation (TLDs); average of inner and outer ring indicator locations versus control location.

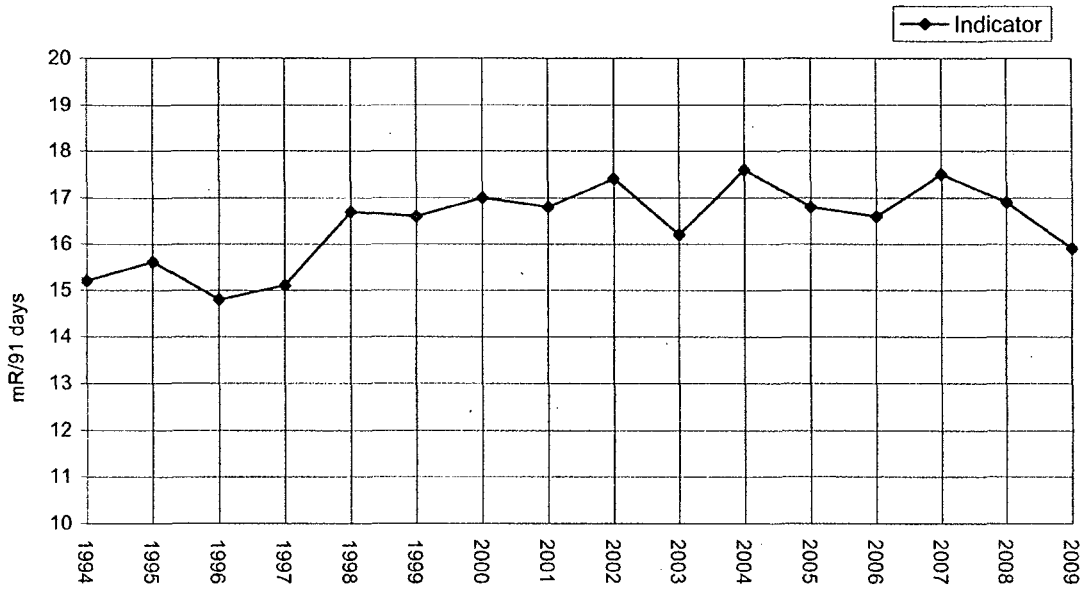
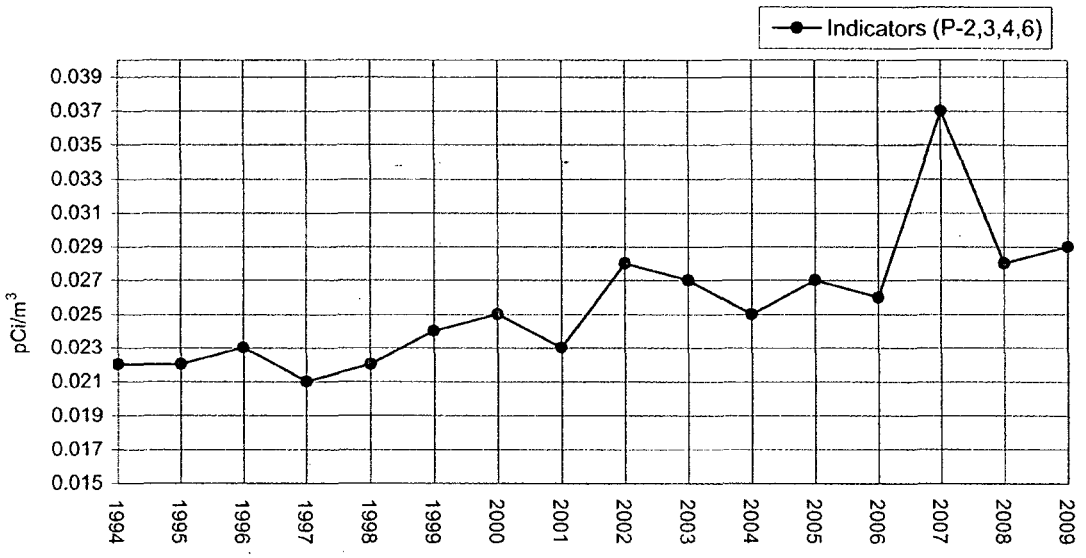
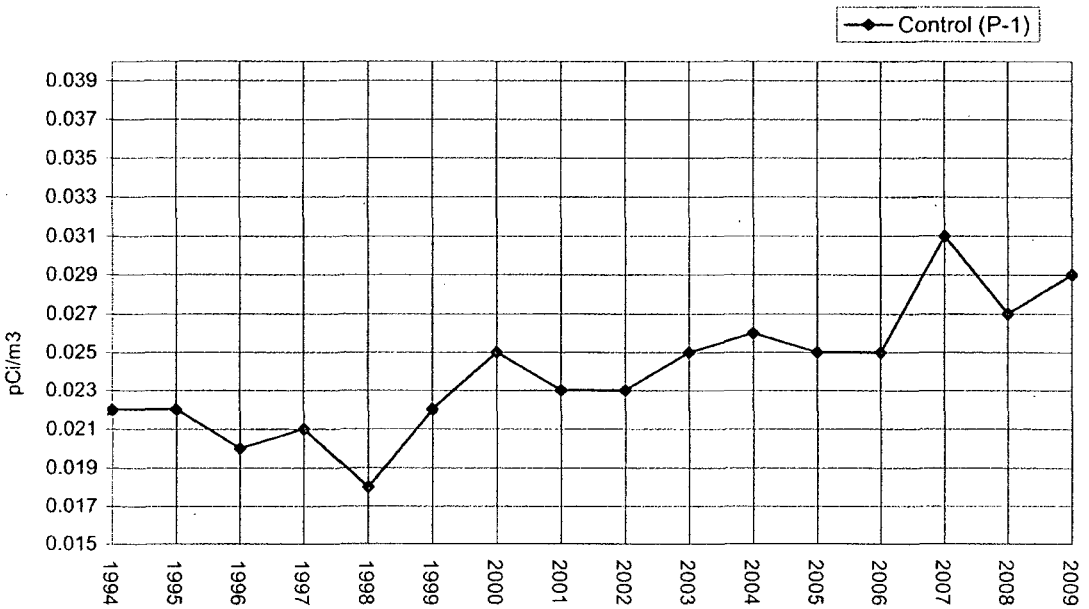


Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.





PRAIRIE ISLAND

Table 5.1. Sample collection and analysis program, Prairie Island Nuclear Generating Plant.

Medium	Location No.	Location Codes (and Type)[a]	Collection Type and Frequency[b]	Analysis Type and Frequency[c]
Ambient radiation (TLD's)	54	P-01A - P-10A P-01B - P-15B P-01S - P-08S P-01IA - P-08IA P-01IB - P-08IB P-01IX- P-04IX, P-01C	C/Q	Ambient gamma
Airborne Particulates	5	P-1(C), P-2, P-3, P-4, P-6	C/W	GB, GS (QC of each location)
Airborne Iodine	5	P-1(C), P-2, P-3, P-4, P-6	C/W	I-131
Milk	4	P-18, P-37, P-42, P-43 (C)	G/M[d]	I-131, GS
River water	2	P-5(C), P-6	G/W	GS(MC), H-3(QC)
Drinking water	1	P-11	G/W	GB(MC), I-131(MC) GS (MC), H-3 (QC)
Well water	5	P-6, P-8, P-9, P-24, P-43 (C)	G/Q	H-3, GS
Edible cultivated crops - leafy green vegetables	3	P-28, P-38(C), P-45	G/A	GS (I-131)
Fish (one species, edible portion)	2	P-19(C), P-13	G/SA	GS
Periphyton or invertebrates	2	P-40(C), P-6	G/SA	GS
Bottom sediment	2	P-20(C), P-6	G/SA	GS
Shoreline sediment	1	P-12	G/SA	GS

[a] Location codes are defined in Table D-2. Control stations are indicated by (C). All other stations are indicators.

[b] Collection type is coded as follows: C/ = continuous, G/ = grab. Collection frequency is coded as follows: W= weekly, M = monthly, Q = quarterly, SA = semiannually, A = annually.

[c] Analysis type is coded as follows: GB = gross beta, GS = gamma spectroscopy, H-3 = tritium, I-131 = iodine-131. Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

[d] Milk is collected biweekly during the grazing season (May - October).

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
P-1	C	Air Station P-1	AP, AI	11.8 mi @ 316°/NNW
P-2		Air Station P-2	AP, AI	0.5 mi @ 294°/WNW
P-3		Air Station P-3	AP, AI	0.8 mi @ 313°/NW
P-4		Air Station P-4	AP, AI	0.4 mi @ 359°/N
P-5	C	Upstream of Plant	RW	1.8 mi @ 11°/N
P-6		Lock and Dam #3 & Air Station P-6	AP, AI, RW WW, BS, BO[c]	1.6 mi @ 129°/SE
P-8		Community Center	WW	1.0 mi @ 321°/WNW
P-9		Plant Well #2	WW	0.3 mi @ 306°/NW
P-11		Red Wing Service Center	DW	3.3 mi @ 158°/SSE
P-12		Downstream of Plant	SS	3.0 mi @ 116°/ESE
P-13		Downstream of Plant	F[c]	3.5 mi @ 113°/ESE
P-18		Christiansen Farm	M	3.8 mi @ 88°/E
P-19	C	Upstream of Plant	F[c]	1.3 mi @ 0°/N
P-20	C	Upstream of Plant	BS	0.9 mi @ 45°/NE
P-24		Suter Residence	WW	0.6 mi @ 158°/SSE
P-28		Allyn Residence	VE	1.0 mi @ 152°/SSE
P-37		Welsch Farm	M	4.1 mi @ 87°/E
P-38	C	Cain Residence	VE	14.2 mi @ 359°/N
P-40	C	Upstream of Plant	BO[c]	0.4 mi @ 0°/N
P-42		Rother Farm	M	4.3 mi. @ 264°/W
P-43	C	Peterson Farm	M, WW	13.9 mi. @ 355°/N
P-45		Glazier Residence	VE	0.6 mi. @ 341°/NNW
General Area of the Site Boundary				
P-01A		Property Line	TLD	0.4 mi @ 359°/N
P-02A		Property Line	TLD	0.3 mi @ 10°/N
P-03A		Property Line	TLD	0.5 mi @ 183°/S
P-04A		Property Line	TLD	0.4 mi @ 204°/SWW
P-05A		Property Line	TLD	0.4 mi @ 225°/SW
P-06A		Property Line	TLD	0.4 mi @ 249°/WSW
P-07A		Property Line	TLD	0.4 mi @ 268°/W
P-08A		Property Line	TLD	0.4 mi @ 291°/WNW
P-09A		Property Line	TLD	0.7 mi @ 317°/NW
P-10A		Property Line	TLD	0.5 mi @ 333°/NNW

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant (continued).

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
Approximately 4 to 5 miles Distant from the Plant				
P-01B		Thomas Killian Residence	TLD	4.7 mi @ 355°/N
P-02B		Roy Kinneman Residence	TLD	4.8 mi @ 17°/NNE
P-03B		Wayne Anderson Farm	TLD	4.9 mi @ 46°/NE
P-04B		Nelson Drive (Road)	TLD	4.2 mi @ 61°/ENE
P-05B		County Road E and Coulee	TLD	4.2 mi @ 102°/ESE
P-06B		William Hauschiblt Residence	TLD	4.4 mi @ 112°/ESE
P-07B		Red Wing Public Works	TLD	4.7 mi @ 140°/SE
P-08B		David Wnuk Residence	TLD	4.1 mi @ 165°/SSE
P-09B		Highway 19 South	TLD	4.2 mi @ 187°/S
P-10B		Cannondale Farm	TLD	4.9 mi @ 200°/SSW
P-11B		Wallace Weberg Farm	TLD	4.5 mi @ 221°/SW
P-12B		Ray Gergen Farm	TLD	4.6 mi @ 251°/WSW
P-13B		Thomas O'Rourke Farm	TLD	4.4 mi @ 270°/W
P-14B		David J. Anderson Farm	TLD	4.9 mi @ 306°/NW
P-15B		Holst Farms	TLD	3.8 mi @ 345°/NNW
Special Interest Locations				
P-01S		Federal Lock & Dam #3	TLD	1.6 mi @ 129°/SE
P-02S		Charles Suter Residence	TLD	0.5 mi @ 155°/SSE
P-03S		Carl Gustafson Farm	TLD	2.2 mi @ 173°/S
P-04S		Richard Burt Residence	TLD	2.0 mi @ 202°/SSW
P-05S		Kinney Store	TLD	2.0 mi @ 270°/W
P-06S		Earl Flynn Farm	TLD	2.5 mi @ 299°/WNW
P-07S		Indian Community	TLD	0.7 mi @ 271°/W
P-08S		Indian Community	TLD	0.7 mi @ 287°/NWW
P-01C	C	Robert Kinneman Farm	TLD	11.1 mi @ 331°/NNW

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant (continued).

Code	Type[a]	Collection Site	Type of Sample[b]	Distance and Direction from ISFSI Center.
ISFSI Area Inside Earth Berm				
P-01IA		ISFSI Nuisance Fence	TLD	190' @ 45°/NE
P-02IA		ISFSI Nuisance Fence	TLD	360' @ 82°/E
P-03IA		ISFSI Nuisance Fence	TLD	370' @ 100°/E
P-04IA		ISFSI Nuisance Fence	TLD	200' @ 134°/SE
P-05IA		ISFSI Nuisance Fence	TLD	180' @ 219°/SW
P-06IA		ISFSI Nuisance Fence	TLD	320' @ 258°/WSW
P-07IA		ISFSI Nuisance Fence	TLD	320' @ 281°/WNW
P-08IA		ISFSI Nuisance Fence	TLD	190' @ 318°/NW
P-01IX		ISFSI Nuisance Fence	TLD	140' @ 180°/S
P-02IX		ISFSI Nuisance Fence	TLD	310' @ 270°/W
P-03IX		ISFSI Nuisance Fence	TLD	140' @ 0°/N
P-04IX		ISFSI Nuisance Fence	TLD	360' @ 90°/E
ISFSI Area Outside Earth Berm				
P-01IB		ISFSI Berm Area	TLD	340' @ 3°/N
P-02IB		ISFSI Berm Area	TLD	380' @ 28°/NNE
P-03IB		ISFSI Berm Area	TLD	560' @ 85°/E
P-04IB		ISFSI Berm Area	TLD	590' @ 165°/SSE
P-05IB		ISFSI Berm Area	TLD	690' @ 186°/S
P-06IB		ISFSI Berm Area	TLD	720' @ 201°/SSW
P-07IB		ISFSI Berm Area	TLD	610' @ 271°/W
P-08IB		ISFSI Berm Area	TLD	360' @ 332°/NNW

[a] "C" denotes control location. All other locations are indicators.

[b] Sample Codes:

AP	Airborne particulates	F	Fish
AI	Airborne Iodine	M	Milk
BS	Bottom (river) sediments	SS	Shoreline Sediments
BO	Bottom organisms (periphyton or macroinvertebrates)	SW	Surface Water
		VE	Vegetation/vegetables
DW	Drinking water	WW	Well water

[c] Distance and direction data for fish and bottom organisms are approximate since availability of sample specimen may vary at any one location.

Table 5.3. Missed collections and analyses at the Prairie Island Nuclear Generating Plant.

All required samples were collected and analyzed as scheduled with the following exceptions:

Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AP/AI	Gross Beta, I-131	P-4	10/20/2009	Approx. 32 hrs run-time lost. Inadvertant loss of power.	none

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Prairie Island Nuclear Power Station	Docket No.	50-282, 50-306
Location of Facility	Goodhue, Minnesota (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
TLD (Inner Ring, Area at Site Boundary) mR/91 days)	Gamma 40	3.0	15.5 (40/40) (10.8-17.9)	P-06A 0.4 mi @ 249° /WSW	16.9 (4/4) (15.5-17.9)	(See Control below.)	0
TLD (Outer Ring, 4-5 mi. distant) mR/91 days)	Gamma 60	3.0	16.2 (60/60) (12.9-19.0)	P-12B, R. Gergen Farm, 4.6 mi @ 251° /WSW	17.7 (4/4) (16.5-18.4)	(See Control below.)	0
TLD (Special Interest Areas) mR/91 days)	Gamma 32	3.0	15.8 (32/32) (13.3-19.4)	P-03S, Gustafson Farm, 2.2 mi @ 173° /S	18.3 (4/4) (17.4-19.4)	(See Control below.)	0
TLD (Control) mR/91 days)	Gamma 4	3.0	None	P-01C, Robert Kinneman 11.1 mi @ 331° /NNW	16.3 (4/4) (15.7-17.0)	16.3 (4/4) (15.7-17.0)	0
Airborne Particulates (pCi/m^3)	GB 260	0.005	0.029 (208/208) (0.007-0.075)	P-06, Air Station 1.6 mi @ 129° /SE	0.029 (52 /52) (0.007-0.075)	0.029 (52/52) (0.008-0.064)	0
	GS 20						
	Be-7	0.015	0.087 (16/16) (0.051-0.112)	P-02, Air Station 0.5 mi @ 294° /WNW	0.089 (4/4) (0.057-0.102)	0.088 (4/4) (0.057-0.102)	0
	Mn-54	0.0007	< LLD	-	-	< LLD	0
	Co-58	0.0006	< LLD	-	-	< LLD	0
	Co-60	0.0007	< LLD	-	-	< LLD	0
	Zn-65	0.0010	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.0010	< LLD	-	-	< LLD	0
	Ru-103	0.0008	< LLD	-	-	< LLD	0
	Ru-106	0.0057	< LLD	-	-	< LLD	0
	Cs-134	0.0007	< LLD	-	-	< LLD	0
	Cs-137	0.0006	< LLD	-	-	< LLD	0
	Ba-La-140	0.0024	< LLD	-	-	< LLD	0
	Ce-141	0.0016	< LLD	-	-	< LLD	0
	Ce-144	0.0035	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m^3)	I-131 260	0.03	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Prairie Island Nuclear Power Station	Docket No.	50-282, 50-306
Location of Facility	Goodhue, Minnesota (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Milk (pCi/L)	I-131 72	0.5	< LLD	-	-	< LLD	0
	GS 72						
	K-40	200	1386 (54/54) (1303-1540)	P-37, Welsch Farm 4.1 mi @ 87° /E	1416 (18 /18) (1356-1540)	1404 (18/18) (1299-1517)	0
	Cs-134	5	< LLD	-	-	< LLD	0
	Cs-137	5	< LLD	-	-	< LLD	0
	Ba-La-140	5	< LLD	-	-	< LLD	0
River Water (pCi/L)	H-3 8	159	< LLD	-	-	< LLD	0
	GS 24						
	Mn-54	10	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	10	< LLD	-	-	< LLD	0
	Co-60	10	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	30	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Prairie Island Nuclear Power Station	Docket No.	50-282, 50-306
Location of Facility	Goodhue, Minnesota (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Drinking Water (pCi/L)	GB 12	1.0	11.4 (12/12) (6.8-15.2)	P-11, Red Wing S.C. 3.3 mi @ 158° /SSE	11.4 (12/12) (6.8-15.2)	None	0
	I-131 12	1.0	< LLD		-	None	0
	H-3 4	159	< LLD	-	-	None	0
	GS 12						
	Mn-54	10	< LLD	-	-	None	0
	Fe-59	30	< LLD	-	-	None	0
	Co-58	10	< LLD	-	-	None	0
	Co-60	10	< LLD	-	-	None	0
	Zn-65	30	< LLD	-	-	None	0
	Zr-Nb-95	15	< LLD	-	-	None	0
	Cs-134	10	< LLD	-	-	None	0
	Cs-137	10	< LLD	-	-	None	0
	Ba-La-140	15	< LLD	-	-	None	0
	Ce-144	38	< LLD	-	-	None	0
Well Water (pCi/L)	H-3 20	161	< LLD	-	-	< LLD	0
	GS 20						
	Mn-54	10	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	10	< LLD	-	-	< LLD	0
	Co-60	10	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	46	< LLD	-	-	< LLD	0
Crops - Cabbage (pCi/gwet)	I-131 3	0.029	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Prairie Island Nuclear Power Station	Docket No.	50-282, 50-306
Location of Facility	Goodhue, Minnesota (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Fish	GS 4						
(pCi/g wet)	K-40	0.10	2.52 (2/2) (2.45-2.58)	P-19, Upstream 1.3 mi @ 0°/N	3.02 (2/2) (2.92-3.13)	3.02 (2/2) (2.92-3.13)	0
	Mn-54	0.018	< LLD	-	-	< LLD	0
	Fe-59	0.036	< LLD	-	-	< LLD	0
	Co-58	0.018	< LLD	-	-	< LLD	0
	Co-60	0.017	< LLD	-	-	< LLD	0
	Zn-65	0.018	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.029	< LLD	-	-	< LLD	0
	Cs-134	0.013	< LLD	-	-	< LLD	0
	Cs-137	0.016	< LLD	-	-	< LLD	0
	Ba-La-140	0.034	< LLD	-	-	< LLD	0
Invertebrates	GS 4						
(pCi/g wet)	Be-7	1.15	< LLD	-	-	< LLD	0
	K-40	1.65	< LLD	-	-	< LLD	0
						-	
	Mn-54	0.084	< LLD	-	-	< LLD	0
	Co-58	0.091	< LLD	-	-	< LLD	0
	Co-60	0.073	< LLD	-	-	< LLD	0
	Zn-65	0.16	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.12	< LLD	-	-	< LLD	0
	Ru-103	0.15	< LLD	-	-	< LLD	0
	Ru-106	0.54	< LLD	-	-	< LLD	0
	Cs-134	0.068	< LLD	-	-	< LLD	0
	Cs-137	0.066	< LLD	-	-	< LLD	0
	Ba-La-140	0.46	< LLD	-	-	< LLD	0
	Ce-141	0.25	< LLD	-	-	< LLD	0
	Ce-144	0.46	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Prairie Island Nuclear Power Station	Docket No.	50-282, 50-306
Location of Facility	Goodhue, Minnesota (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Bottom and Shoreline Sediments (pCi/g dry)	GS 6						
	Be-7	0.23	< LLD	P-20, Upstream 0.9 mi. @ 45° /NE	0.23 (1/2)	0.23 (1/2)	0
	K-40	0.10	8.93 (4/4) (8.00-10.38)	P-6, Lock and Dam #3 1.6 mi @ 129°/SE	9.84 (2/2) (9.29-10.38)	9.46 (2/2) (8.46-10.45)	0
	Mn-54	0.025	< LLD	-	-	< LLD	0
	Co-58	0.027	< LLD	-	-	< LLD	0
	Co-60	0.023	< LLD	-	-	< LLD	0
	Zn-65	0.062	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.031	< LLD	-	-	< LLD	0
	Ru-103	0.020	< LLD	-	-	< LLD	0
	Ru-106	0.21	< LLD	-	-	< LLD	0
	Cs-134	0.018	< LLD	-	-	< LLD	0
	Cs-137	0.026	< LLD	-	-	< LLD	0
				-	-		
	Ba-La-140	0.029	< LLD	-	-	< LLD	0
	Ce-141	0.044	< LLD	-	-	< LLD	0
	Ce-144	0.14	< LLD	-	-	< LLD	0

[a] GB = gross beta, GS = gamma scan.

[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified: (1) by name, and/or station code (Table 2) and (2) by distance (miles) and direction relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten time the typical preoperational value for the medium or location.

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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, 2009 through December, 2009

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's 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	5.0 pCi/liter
	> 100 pCi/liter or kg	5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg	5.0 pCi/liter
	> 50 pCi/liter or kg	10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg	5.0 pCi/liter
	> 30 pCi/liter or kg	10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter	5.0 pCi/liter
	> 20 pCi/liter	25% of known value
Gross beta	≤ 100 pCi/liter	5.0 pCi/liter
	> 100 pCi/liter	5% of known value
Tritium	≤ 4,000 pCi/liter	$\pm 1\sigma = 169.85 \times (\text{known})^{0.0933}$
	> 4,000 pCi/liter	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	6 pCi/liter
	> 55 pCi/liter	10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤ 35 pCi/liter	6 pCi/liter
	> 35 pCi/liter	15% of known value
Iron-55[b]	50 to 100 pCi/liter	10 pCi/liter
	> 100 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	Concentration (pCi/L) Analysis	aboratory Result[b]	ERA Result[c]	Control Limits	Acceptance
STW-1181	04/06/09	Sr-89	41.0 ± 5.8	48.3	37.8 - 55.7	Pass
STW-1181	04/06/09	Sr-90	32.4 ± 2.4	31.4	22.9 - 36.4	Pass
STW-1182	04/06/09	Ba-133	44.6 ± 3.1	52.7	43.4 - 58.3	Pass
STW-1182	04/06/09	Co-60	81.0 ± 3.1	88.9	80.0 - 100.0	Pass
STW-1182	04/06/09	Cs-134	65.6 ± 5.2	72.9	59.5 - 80.2	Pass
STW-1182 [d]	04/06/09	Cs-137	147.7 ± 5.3	168.0	151.0 - 187.0	Fail
STW-1182	04/06/09	Zn-65	79.8 ± 7.5	84.4	76.0 - 101.0	Pass
STW-1183	04/06/09	Gr. Alpha	47.6 ± 2.1	54.2	28.3 - 67.7	Pass
STW-1183	04/06/09	Gr. Beta	38.5 ± 1.3	43.5	29.1 - 50.8	Pass
STW-1184	04/06/09	I-131	24.4 ± 2.5	26.1	21.7 - 30.8	Pass
STW-1185	04/06/09	Ra-226	14.0 ± 0.7	15.1	11.2 - 17.3	Pass
STW-1185	04/06/09	Ra-228	14.3 ± 2.1	13.6	9.0 - 16.6	Pass
STW-1185	04/06/09	Uranium	25.0 ± 0.2	25.7	20.6 - 28.8	Pass
STW-1186 [e]	04/06/09	H-3	22819.0 ± 453.0	20300.0	17800.0 - 22300.0	Fail
STW-1193	10/05/09	Sr-89	53.0 ± 6.0	62.2	50.2 - 70.1	Pass
STW-1193	10/05/09	Sr-90	31.1 ± 2.2	30.7	22.4 - 35.6	Pass
STW-1194	10/05/09	Ba-133	82.5 ± 3.5	92.9	78.3 - 102.0	Pass
STW-1194	10/05/09	Co-60	116.8 ± 3.3	117.0	105.0 - 131.0	Pass
STW-1194	10/05/09	Cs-134	78.8 ± 5.7	78.8	65.0 - 87.3	Pass
STW-1194	10/05/09	Cs-137	54.2 ± 3.7	54.6	49.1 - 62.9	Pass
STW-1194	10/05/09	Zn-65	102.5 ± 6.2	99.5	89.6 - 119.0	Pass
STW-1195	10/05/09	Gr. Alpha	20.3 ± 2.0	23.2	11.6 - 31.1	Pass
STW-1195	10/05/09	Gr. Beta	23.7 ± 1.4	26.0	16.2 - 33.9	Pass
STW-1196	10/05/09	I-131	22.4 ± 1.4	22.2	18.4 - 26.5	Pass
STW-1197	10/05/09	Ra-226	15.0 ± 0.7	13.9	10.4 - 16.0	Pass
STW-1197	10/05/09	Ra-228	17.4 ± 2.0	14.9	10.0 - 18.0	Pass
STW-1197	10/05/09	Uranium	32.5 ± 0.4	33.8	27.3 - 37.8	Pass
STW-1198	10/05/09	H-3	17228.0 ± 694.0	16400.0	14300.0 - 18000.0	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] All gamma -emitters showed a low bias. A large plastic burr found on the base of the Marinelli kept the beaker from sitting directly on the detector. Result of recount in a different beaker, Cs-137, 155.33 ± 14.55 pCi/L.

[e] Samples were recounted and also reanalyzed. A recount of the original vials averaged 23,009 pCi/L. Reanalysis results were acceptable, 19,170 pCi/L.

TABLE A-2. Crosscheck program results; Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).

Lab Code	Date	Description	Known Value (mR)	Lab Result ± 2 sigma (mR)	Control Limits (mR)	Acceptance
Environmental, Inc.						
2009-1	7/6/2009	40 cm.	41.82	45.43 ± 3.66	29.27 - 54.37	Pass
2009-1	7/6/2009	50 cm.	26.76	32.17 ± 1.52	18.73 - 34.79	Pass
2009-1	7/6/2009	60 cm.	18.58	20.23 ± 1.60	13.01 - 24.15	Pass
2009-1	7/6/2009	70 cm.	13.65	15.28 ± 0.79	9.56 - 17.75	Pass
2009-1	7/6/2009	90 cm.	8.26	7.97 ± 0.40	5.78 - 10.74	Pass
2009-1	7/6/2009	90 cm.	8.26	7.37 ± 0.49	5.78 - 10.74	Pass
2009-1	7/6/2009	100 cm.	6.69	6.16 ± 0.64	4.68 - 8.70	Pass
2009-1	7/6/2009	110 cm.	5.53	4.38 ± 0.24	3.87 - 7.19	Pass
2009-1	7/6/2009	120 cm.	4.65	4.34 ± 0.23	3.26 - 6.05	Pass
2009-1	7/6/2009	150 cm.	2.97	2.92 ± 0.25	2.08 - 3.86	Pass
Environmental, Inc.						
2009-2	12/27/2009	40 cm.	44.83	51.38 ± 2.69	31.38 - 58.28	Pass
2009-2	12/27/2009	50 cm.	28.69	31.65 ± 2.81	20.08 - 37.30	Pass
2009-2	12/27/2009	60 cm.	19.92	21.38 ± 1.19	13.94 - 25.90	Pass
2009-2	12/27/2009	60 cm.	19.92	22.30 ± 0.50	13.94 - 25.90	Pass
2009-2	12/27/2009	75 cm.	12.75	13.48 ± 1.02	8.93 - 16.58	Pass
2009-2	12/27/2009	90 cm.	8.85	9.62 ± 0.74	6.20 - 11.51	Pass
2009-2	12/27/2009	90 cm.	8.85	8.39 ± 0.86	6.20 - 11.51	Pass
2009-2	12/27/2009	100 cm.	7.17	6.65 ± 0.96	5.02 - 9.32	Pass
2009-2	12/27/2009	120 cm.	4.98	4.89 ± 0.53	3.49 - 6.47	Pass
2009-2	12/27/2009	120 cm.	4.98	4.92 ± 0.58	3.49 - 6.47	Pass
2009-2	12/27/2009	150 cm.	3.19	2.74 ± 0.39	2.23 - 4.15	Pass
2009-2	12/27/2009	180 cm.	2.21	1.65 ± 0.33	1.55 - 2.87	Pass
2009-2	12/27/2009	180 cm.	2.21	2.12 ± 0.69	1.55 - 2.87	Pass

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
W-12009	1/20/2009	Ra-226	12.88 ± 0.41	12.69	8.88 - 16.50	Pass
W-12009	1/27/2009	Gr. Alpha	20.20 ± 0.40	20.08	10.04 - 30.12	Pass
W-12709	1/27/2009	Gr. Beta	46.26 ± 0.42	45.60	35.60 - 55.60	Pass
SPW-5553	1/27/2009	Ra-228	29.11 ± 2.53	28.66	20.06 - 37.26	Pass
SPW-217	1/29/2009	U-238	44.98 ± 2.30	41.70	29.19 - 54.21	Pass
SPW-539	2/24/2009	Ni-63	167.93 ± 3.79	211.00	147.70 - 274.30	Pass
SPW-718	3/6/2009	C-14	4893.50 ± 21.69	4740.20	2844.12 - 6636.28	Pass
SPMI-814	3/16/2009	Cs-134	34.91 ± 3.85	35.70	25.70 - 45.70	Pass
SPMI-814	3/16/2009	Cs-137	59.17 ± 6.70	55.60	45.60 - 65.60	Pass
SPMI-814	3/16/2009	Sr-90	40.82 ± 1.59	44.07	35.26 - 52.88	Pass
SPMI-815	3/16/2009	I-131	70.99 ± 0.62	69.60	55.68 - 83.52	Pass
SPMI-815	3/16/2009	I-131(G)	63.08 ± 7.12	69.60	59.60 - 79.60	Pass
SPW-817	3/16/2009	I-131	62.11 ± 0.59	69.60	55.68 - 83.52	Pass
SPW-817	3/16/2009	I-131(G)	64.55 ± 8.32	69.60	59.60 - 79.60	Pass
SPW-818	3/16/2009	Co-60	50.84 ± 4.70	51.99	41.99 - 61.99	Pass
SPW-818	3/16/2009	Cs-134	33.78 ± 3.42	35.70	25.70 - 45.70	Pass
SPW-818	3/16/2009	Cs-137	61.27 ± 7.18	55.64	45.64 - 65.64	Pass
SPW-818	3/16/2009	Sr-90	47.26 ± 1.89	44.07	35.26 - 52.88	Pass
SPAP-903	3/23/2009	Cs-134	13.29 ± 2.89	14.19	4.19 - 24.19	Pass
SPAP-903	3/23/2009	Cs-137	103.24 ± 7.54	111.23	100.11 - 122.35	Pass
SPCH-916	3/24/2009	I-131(G)	0.22 ± 0.02	0.22	0.13 - 0.31	Pass
SPVE-888	4/1/2009	I-131(G)	0.40 ± 0.08	0.35	0.21 - 0.49	Pass
SPF-820	4/7/2009	Cs-134	0.58 ± 0.02	0.56	0.34 - 0.78	Pass
W-40909	4/9/2009	Gr. Alpha	19.26 ± 0.40	20.08	10.04 - 30.12	Pass
W-40909	4/9/2009	Gr. Beta	48.04 ± 0.42	45.60	35.60 - 55.60	Pass
SPW-12641	4/10/2009	Ra-228	40.06 ± 2.79	40.54	28.38 - 52.70	Pass
SPW-1267	4/10/2009	U-238	41.71 ± 2.25	41.70	29.19 - 54.21	Pass
TWW-2124	4/21/2009	H-3	7932.00 ± 279.00	7063.00	5650.40 - 8475.60	Pass
W-42809	4/28/2009	Ra-226	14.49 ± 0.53	16.78	11.75 - 21.81	Pass
SPMI-2186	5/12/2009	Cs-134	32.55 ± 1.26	33.89	23.89 - 43.89	Pass
SPMI-2186	5/12/2009	Cs-137	54.27 ± 2.60	55.60	45.60 - 65.60	Pass
SPMI-2186	5/12/2009	I-131	60.81 ± 0.63	52.40	40.40 - 64.40	Pass
SPMI-2186	5/12/2009	I-131(G)	56.89 ± 2.56	52.40	42.40 - 62.40	Pass
SPMI-2186	5/12/2009	Sr-90	43.88 ± 1.68	52.40	41.92 - 62.88	Pass
SPW-2497	5/27/2009	Fe-55	2472.37 ± 10.76	2106.35	1685.08 - 2527.62	Pass
SPW-3448	7/14/2009	Cs-137	171.06 ± 9.21	166.10	149.49 - 182.71	Pass
SPW-3497	7/15/2009	Ni-63	179.99 ± 3.06	210.40	147.28 - 273.52	Pass
SPW-3499	7/15/2009	Tc-99	29.61 ± 0.81	32.34	20.34 - 44.34	Pass
SPMI-3582	7/17/2009	Cs-134	32.86 ± 3.72	31.89	21.89 - 41.89	Pass
SPMI-3582	7/17/2009	Cs-137	182.49 ± 10.54	166.10	149.49 - 182.71	Pass
SPAP-3595	7/17/2009	Cs-134	13.01 ± 3.00	12.75	2.75 - 22.75	Pass
SPAP-3595	7/17/2009	Cs-137	110.63 ± 6.58	110.73	99.66 - 121.80	Pass

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1	Known Activity	Control Limits[c]	Acceptance
SPF-3597	7/17/2009	Cs-134	0.53 ± 0.03	0.51	0.31 - 0.71	Pass
SPF-3597	7/17/2009	Cs-137	2.43 ± 0.05	2.22	1.33 - 3.10	Pass
SPW-3599	7/17/2009	H-3	63246.00 ± 725.00	62495.00	49996.00 - 74994.00	Pass
SPW-12643	8/3/2009	Ra-228	38.18 ± 2.72	40.54	28.38 - 52.70	Pass
W-80709	8/7/2009	Ra-226	16.28 ± 0.41	16.77	11.74 - 21.80	Pass
W-81009	8/10/2009	Gr. Alpha	20.58 ± 0.44	20.08	10.04 - 30.12	Pass
W-81009	8/10/2009	Gr. Beta	44.44 ± 0.40	45.60	35.60 - 55.60	Pass
W-100109	10/1/2009	Ra-226	15.68 ± 0.41	16.77	11.74 - 21.80	Pass
W-102709	10/27/2009	Gr. Alpha	21.50 ± 0.43	20.08	10.04 - 30.12	Pass
W-102709	10/27/2009	Gr. Beta	44.83 ± 0.40	45.60	35.60 - 55.60	Pass
SPW-5964	10/28/2009	U-238	40.20 ± 1.87	41.70	29.19 - 54.21	Pass
SPW-12647	11/6/2009	Ra-228	44.49 ± 3.33	40.54	28.38 - 52.70	Pass
SPAP-6769	12/14/2009	Gr. Beta	45.43 ± 0.11	49.48	29.69 - 69.27	Pass
SPAP-6774	12/14/2009	Cs-134	10.32 ± 0.83	11.11	1.11 - 21.11	Pass
SPAP-6774	12/14/2009	Cs-137	106.58 ± 2.51	109.70	98.73 - 120.67	Pass
SPF-6776	12/14/2009	Cs-134	0.43 ± 0.02	0.44	0.26 - 0.62	Pass
SPF-6776	12/14/2009	Cs-137	2.33 ± 0.05	2.19	1.31 - 3.07	Pass
SPW-6780	12/14/2009	Tc-99	30.71 ± 1.09	32.34	20.34 - 44.34	Pass
SPMI-6782	12/14/2009	Co-60	74.30 ± 5.41	72.81	62.81 - 82.81	Pass
SPMI-6782	12/14/2009	Cs-134	58.82 ± 3.75	55.54	45.54 - 65.54	Pass
SPMI-6782	12/14/2009	Cs-137	178.18 ± 9.68	164.55	148.10 - 181.01	Pass
SPW-6784	12/14/2009	Co-60	74.03 ± 4.64	72.81	62.81 - 82.81	Pass
SPW-6784	12/14/2009	Cs-134	54.84 ± 3.83	55.54	45.54 - 65.54	Pass
SPW-6784	12/14/2009	Cs-137	180.06 ± 8.81	164.55	148.10 - 181.01	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/m^3), and solid samples (pCi/g).

[b] Laboratory codes as follows: W (water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish).

[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 ± 2σ.

[e] Control limits based on the laboratory limit, Attachment A ("Other Analyses").

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 (4.66σ) LLD	Activity[c]	Acceptance Criteria (4.66 σ)
W-12009	Water	1/20/2009	Ra-226	0.05	0.06 ± 0.04	1
SPW-5554	Water	1/27/2009	Ra-228	0.08	0.17 ± 0.40	2
W-12709	Water	1/27/2009	Gr. Alpha	0.35	0.22 ± 0.27	1
W-12709	Water	1/27/2009	Gr. Beta	0.74	-0.08 ± 0.51	3.2
SPW-218	Water	1/29/2009	U-238	0.19	-0.06 ± 0.09	1
SPW-538	Water	2/24/2009	Ni-63	7.91	4.96 ± 4.93	20
SPW-717	Water	3/6/2009	C-14	7.66	3.03 ± 4.71	200
SPMI-816	Milk	3/16/2009	Cs-134	3.24	-	10
SPMI-816	Milk	3/16/2009	Cs-137	3.38	-	10
SPMI-816	Milk	3/16/2009	I-131	0.31	0.04 ± 0.17	0.5
SPMI-816	Milk	3/16/2009	I-131(G)	3.65	-	20
SPMI-816	Milk	3/16/2009	Sr-90	0.48	0.41 ± 0.27	1
SPW-819	Water	3/16/2009	Co-60	3.02	-	10
SPW-819	Water	3/16/2009	Cs-134	2.25	-	10
SPW-819	Water	3/16/2009	Cs-137	2.03	-	10
SPW-819	Water	3/16/2009	I-131	0.42	-0.06 ± 0.19	0.5
SPW-819	Water	3/16/2009	I-131(G)	3.02	-	20
SPW-819	Water	3/16/2009	Sr-90	1.10	-0.63 ± 0.44	1
SPAP-902	Air Filter	3/23/2009	Gr. Beta	0.003	0.006 ± 0.002	3.2
SPAP-904	Air Filter	3/23/2009	Cs-134	1.68	-	100
SPAP-904	Air Filter	3/23/2009	Cs-137	2.62	-	100
SPW-32709	Water	3/23/2009	Ni-63	2.84	1.37 ± 1.75	20
SPF-821	Fish	4/7/2009	Cs-134	3.12	-	100
SPF-821	Fish	4/7/2009	Cs-137	3.93	-	100
W-40909	Water	4/9/2009	Gr. Alpha	0.40	-0.25 ± 0.26	1
W-40909	Water	4/9/2009	Gr. Beta	0.77	-0.30 ± 0.53	3.2
SPW-12651	Water	4/10/2009	Ra-228	0.77	0.77 ± 0.45	2
SPW-1268	Water	4/10/2009	U-238	0.11	0.24 ± 0.17	1
W-42809	Water	4/28/2009	Ra-226	0.04	0.09 ± 0.04	—1
SPMI-2186	Milk	5/12/2009	Sr-90	0.43	0.52 ± 0.26	1
SPMI-2187	Milk	5/12/2009	Cs-134	3.61	-	10
SPMI-2187	Milk	5/12/2009	Cs-137	3.13	-	10
SPMI-2187	Milk	5/12/2009	I-131	0.15	-0.02 ± 0.10	0.5
SPMI-2187	Milk	5/12/2009	I-131(G)	3.77	-	20
SPW-2498	Water	5/27/2009	Ni-63	1.60	0.00 ± 0.97	20

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

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[c]	Acceptance Criteria (4.66 σ)
SPW-3497	Water	7/15/2009	Ni-63	1.55	-0.24 ± 0.94	20
SPW-3500	Water	7/15/2009	Tc-99	0.90	-1.71 ± 0.53	10
SPMI-3589	Milk	7/17/2009	I-131(G)	5.75	-	20
SPAP-3594	Air Filter	7/17/2009	Cs-134	1.14	-	100
SPAP-3594	Air Filter	7/17/2009	Cs-137	2.47	-	100
SPF-3596	Fish	7/17/2009	Co-60	5.00	-	100
SPF-3596	Fish	7/17/2009	Cs-134	8.00	-	100
SPF-3596	Fish	7/17/2009	Cs-137	11.50	-	100
SPW-3598	Water	7/17/2009	H-3	148.40	0.69 ± 73.60	200
SPW-12653	Water	8/3/2009	Ra-228	0.76	1.46 ± 0.51	2
W-80709	Water	8/7/2009	Ra-226	0.04	0.08 ± 0.03	1
W-81009	Water	8/10/2009	Gr. Alpha	0.44	0.08 ± 0.31	1
W-81009	Water	8/10/2009	Gr. Beta	0.75	-0.31 ± 0.52	3.2
W-100109	Water	10/1/2009	Ra-226	0.04	0.09 ± 0.03	1
W-102709	Water	10/27/2009	Gr. Alpha	0.38	0.33 ± 0.30	1
W-102709	Water	10/27/2009	Gr. Beta	0.81	-0.59 ± 0.55	3.2
SPW-5965	Water	10/28/2009	U-238	0.15	0.09 ± 0.13	1
SPW-12657	Water	11/6/2009	Ra-228	0.86	0.80 ± 0.50	2
SPAP-6769	Air Filter	12/14/2009	Gr. Beta	0.003	0.010 ± 0.002	3.2
SPAP-6773	Air Filter	12/14/2009	Cs-137	1.31	-	100
SPF-6775	Fish	12/14/2009	Cs-134	5.70	-	100
SPF-6775	Fish	12/14/2009	Cs-137	4.18	-	100
SPW-6777	Water	12/14/2009	Ni-63	2.29	0.25 ± 1.38	20
SPW-6779	Water	12/14/2009	Tc-99	1.16	-0.98 ± 0.69	10
SPMI-6781	Milk	12/14/2009	Cs-134	2.62	-	10
SPMI-6781	Milk	12/14/2009	Cs-137	3.29	-	10
SPMI-6781	Milk	12/14/2009	I-131(G)	2.65	-	20
SPW-6783	Water	12/14/2009	Cs-134	2.18	-	10
SPW-6783	Water	12/14/2009	Cs-137	2.90	-	10
SPW-6783	Water	12/14/2009	I-131(G)	2.30	-	20

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), 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. For gamma spectroscopic analysis, activity detected below the LLD value is not reported.

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
AP-7464, 7465	1/1/2009	Be-7	0.063 ± 0.012	0.065 ± 0.010	0.064 ± 0.008	Pass
E-20, 21	1/5/2009	K-40	1.34 ± 0.21	1.13 ± 0.13	1.24 ± 0.12	Pass
CF-67, 68	1/5/2009	Be-7	0.34 ± 0.12	0.39 ± 0.08	0.37 ± 0.07	Pass
CF-67, 68	1/5/2009	Gr. Beta	4.34 ± 0.11	4.38 ± 0.12	4.36 ± 0.08	Pass
CF-67, 68	1/5/2009	K-40	3.16 ± 0.26	3.00 ± 0.16	3.08 ± 0.15	Pass
DW-90010, 90011	1/9/2009	Ra-226	2.97 ± 0.22	2.76 ± 0.21	2.87 ± 0.15	Pass
DW-90010, 90011	1/9/2009	Ra-228	3.13 ± 0.71	3.55 ± 0.81	3.34 ± 0.54	Pass
SG-198, 199	1/23/2009	Gr. Alpha	101.90 ± 6.50	101.70 ± 6.10	101.80 ± 4.46	Pass
SG-198, 199	1/23/2009	Gr. Beta	97.80 ± 3.50	94.00 ± 3.20	95.90 ± 2.37	Pass
SW-308, 309	1/27/2009	Gr. Beta	1.43 ± 0.58	1.41 ± 0.54	1.42 ± 0.40	Pass
LW-330, 331	1/27/2009	Gr. Beta	2.09 ± 0.58	2.33 ± 0.63	2.21 ± 0.43	Pass
SW-308, 309	1/29/2009	Gr. Beta	1.51 ± 0.56	1.61 ± 0.57	1.56 ± 0.40	Pass
DW-375, 376	2/4/2009	Gr. Beta	2.72 ± 0.65	3.06 ± 0.69	2.89 ± 0.47	Pass
SWU-606, 607	2/24/2009	Gr. Beta	2.66 ± 0.68	2.16 ± 0.67	2.41 ± 0.48	Pass
U-651, 652	2/27/2009	Beta-K40	3.90 ± 2.30	1.70 ± 2.50	2.80 ± 1.70	Pass
U-651, 652	2/27/2009	H-3	597.00 ± 292.00	507.00 ± 288.00	552.00 ± 205.07	Pass
SG-739, 740	3/2/2009	Ra-226	8.20 ± 0.20	8.30 ± 0.20	8.25 ± 0.14	Pass
MI-875, 876	3/17/2009	K-40	1286.50 ± 111.60	1471.70 ± 111.50	1379.10 ± 78.88	Pass
MI-875, 876	3/17/2009	Sr-90	0.67 ± 0.31	0.36 ± 0.36	0.52 ± 0.24	Pass
WW-970, 971	3/24/2009	Gr. Beta	13.59 ± 2.32	17.33 ± 2.69	15.46 ± 1.78	Pass
XWW-980, 981	3/24/2009	H-3	7143.00 ± 262.00	7262.00 ± 264.00	7202.50 ± 185.97	Pass
AP-1441, 1442	3/30/2009	Be-7	0.076 ± 0.012	0.075 ± 0.014	0.076 ± 0.009	Pass
SWT-1123, 1124	3/31/2009	Gr. Beta	1.40 ± 0.55	1.86 ± 0.62	1.63 ± 0.41	Pass
WW-1102, 1103	4/1/2009	Gr. Beta	2.13 ± 1.34	2.30 ± 1.32	2.22 ± 0.94	Pass
XWW-1174, 1175	4/1/2009	H-3	2814 ± 176	2787 ± 176	2801 ± 124	Pass
AP-1462, 1463	4/2/2009	Be-7	0.085 ± 0.014	0.10 ± 0.016	0.091 ± 0.011	Pass
SL-2024, 2025	5/4/2009	Be-7	0.80 ± 0.18	0.82 ± 0.13	0.81 ± 0.11	Pass
SL-2024, 2025	5/4/2009	Gr. Beta	2.41 ± 0.19	2.68 ± 0.21	2.55 ± 0.14	Pass
SL-2024, 2025	5/4/2009	K-40	1.20 ± 0.21	1.30 ± 0.15	1.25 ± 0.13	Pass
SO-2045, 2046	5/4/2009	Gr. Alpha	6.22 ± 2.87	6.50 ± 3.26	6.36 ± 2.17	Pass
SO-2045, 2046	5/4/2009	Gr. Beta	28.85 ± 3.15	30.39 ± 3.34	29.62 ± 2.30	Pass
SO-2045, 2046	5/4/2009	Sr-90	0.036 ± 0.010	0.024 ± 0.010	0.030 ± 0.007	Pass
mi-2251, 2252	5/14/2009	K-40	1220.60 ± 155.10	1455.50 ± 118.20	1338.05 ± 97.50	Pass
mi-2381, 2382	5/19/2009	K-40	1472.50 ± 122.90	1412.80 ± 117.40	1442.65 ± 84.98	Pass
SWT-2534, 2535	5/26/2009	Gr. Beta	1.12 ± 0.57	1.66 ± 0.58	1.39 ± 0.41	Pass
G-2626, 2627	5/28/2009	Gr. Beta	6.32 ± 0.19	6.18 ± 0.19	6.25 ± 0.13	Pass
G-2626, 2627	5/28/2009	K-40	4.13 ± 0.35	4.05 ± 0.34	4.09 ± 0.24	Pass
WW-2732, 2733	6/1/2009	H-3	240.73 ± 93.21	190.39 ± 90.81	215.56 ± 65.07	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
SO-3141, 3142	6/22/2009	Ac-228	1.07 ± 0.06	1.06 ± 0.05	1.07 ± 0.04	Pass
SO-3141, 3142	6/22/2009	Be-7	0.55 ± 0.14	0.62 ± 0.08	0.59 ± 0.08	Pass
SO-3141, 3142	6/22/2009	Bi-212	1.16 ± 0.17	1.14 ± 0.16	1.15 ± 0.12	Pass
SO-3141, 3142	6/22/2009	Bi-214	0.96 ± 0.03	1.01 ± 0.03	0.99 ± 0.02	Pass
SO-3141, 3142	6/22/2009	Cs-137	0.72 ± 0.07	0.76 ± 0.08	0.74 ± 0.05	Pass
SO-3141, 3142	6/22/2009	Pb-212	1.00 ± 0.02	1.03 ± 0.02	1.02 ± 0.01	Pass
SO-3141, 3142	6/22/2009	Pb-214	1.01 ± 0.03	1.04 ± 0.03	1.03 ± 0.02	Pass
SO-3141, 3142	6/22/2009	Pu-239/40	0.022 ± 0.008	0.030 ± 0.009	0.026 ± 0.006	Pass
SO-3141, 3142	6/22/2009	Th-232	0.51 ± 0.04	0.48 ± 0.05	0.50 ± 0.03	Pass
SO-3141, 3142	6/22/2009	Tl-208	0.35 ± 0.02	0.36 ± 0.02	0.36 ± 0.01	Pass
SO-3141, 3142	6/22/2009	U-233/4	0.16 ± 0.02	0.18 ± 0.02	0.17 ± 0.01	Pass
SO-3141, 3142	6/22/2009	U-238	0.14 ± 0.02	0.18 ± 0.03	0.16 ± 0.02	Pass
SG-3187, 3188	6/25/2009	Ac-228	11.07 ± 0.33	10.88 ± 0.33	10.97 ± 0.24	Pass
SG-3187, 3188	6/25/2009	Pb-214	26.54 ± 0.23	26.17 ± 0.25	26.36 ± 0.17	Pass
SL-3297, 3298	7/1/2009	Be-7	1.15 ± 0.13	1.15 ± 0.12	1.15 ± 0.09	Pass
SL-3297, 3298	7/1/2009	Gr. Beta	3.38 ± 0.23	3.37 ± 0.12	3.38 ± 0.13	Pass
SL-3297, 3298	7/1/2009	K-40	1.43 ± 0.18	1.50 ± 0.19	1.47 ± 0.13	Pass
AP-3944, 3945	7/1/2009	Be-7	0.064 ± 0.009	0.068 ± 0.010	0.066 ± 0.007	Pass
DW-90222, 90223	7/15/2009	Ra-226	5.36 ± 0.60	4.62 ± 0.51	4.99 ± 0.39	Pass
DW-90222, 90223	7/15/2009	Ra-228	2.91 ± 0.73	2.80 ± 0.70	2.86 ± 0.51	Pass
DW-90237, 90238	7/17/2009	Gr. Alpha	3.54 ± 0.99	4.22 ± 1.09	3.88 ± 0.74	Pass
F-3790, 3791	7/21/2009	K-40	1.10 ± 0.35	1.41 ± 0.44	1.26 ± 0.28	Pass
DW-90250, 90251	7/22/2009	Ra-226	14.58 ± 0.39	15.13 ± 0.40	14.86 ± 0.28	Pass
DW-90250, 90251	7/22/2009	Ra-228	6.71 ± 1.05	6.10 ± 1.01	6.41 ± 0.73	Pass
VE-3965, 3966	7/28/2009	K-40	1.48 ± 0.16	1.56 ± 0.19	1.52 ± 0.13	Pass
VE-4098, 4099	8/3/2009	Be-7	0.54 ± 0.16	0.58 ± 0.16	0.56 ± 0.11	Pass
VE-4098, 4099	8/3/2009	Gr. Beta	5.15 ± 0.17	5.07 ± 0.18	5.11 ± 0.12	Pass
VE-4098, 4099	8/3/2009	K-40	4.91 ± 0.49	5.17 ± 0.15	5.04 ± 0.26	Pass
SO-4325, 4326	8/14/2009	Be-7	0.59 ± 0.21	0.68 ± 0.28	0.64 ± 0.18	Pass
SO-4325, 4326	8/14/2009	Cs-137	0.29 ± 0.05	0.28 ± 0.05	0.28 ± 0.03	Pass
SO-4325, 4326	8/14/2009	K-40	13.41 ± 0.77	13.46 ± 0.80	13.43 ± 0.56	Pass
SG-4283, 4284	8/17/2009	Ac-228	7.16 ± 0.28	7.10 ± 0.26	7.13 ± 0.19	Pass
SG-4283, 4284	8/17/2009	Pb-214	6.27 ± 0.13	6.21 ± 0.13	6.24 ± 0.09	Pass
VE-4436, 4437	8/25/2009	K-40	2.28 ± 0.28	2.67 ± 0.26	2.48 ± 0.19	Pass
SL-4589, 4590	9/1/2009	Be-7	1.25 ± 0.22	1.25 ± 0.16	1.25 ± 0.14	Pass
SL-4589, 4590	9/1/2009	K-40	2.96 ± 0.30	2.70 ± 0.27	2.83 ± 0.20	Pass
AV-4882, 4883	9/8/2009	Be-7	0.93 ± 0.18	0.95 ± 0.17	0.94 ± 0.12	Pass
AV-4882, 4883	9/8/2009	K-40	2.50 ± 0.26	2.47 ± 0.29	2.49 ± 0.20	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
WW-4721, 4722	9/9/2009	H-3	19191.00 ± 404.00	18677.00 ± 399.00	18934.00 ± 283.91	Pass
WW-4903, 4904	9/11/2009	H-3	1075.00 ± 130.00	1281.00 ± 136.00	1178.00 ± 94.07	Pass
BS-5119, 5120	9/16/2009	Be-7	2067.50 ± 327.90	2225.40 ± 371.10	2146.45 ± 247.61	Pass
BS-5119, 5120	9/16/2009	Cs-137	86.24 ± 35.40	145.10 ± 31.54	115.67 ± 23.71	Pass
BS-5119, 5120	9/16/2009	K-40	16.85 ± 0.90	17.27 ± 0.79	17.06 ± 0.60	Pass
SS-5188, 5189	9/23/2009	Be-7	1.02 ± 0.31	1.04 ± 0.43	1.03 ± 0.26	Pass
SS-5188, 5189	9/23/2009	K-40	10.21 ± 0.65	9.94 ± 0.93	10.07 ± 0.57	Pass
AP-3944, 3945	9/29/2009	Be-7	0.09 ± 0.02	0.09 ± 0.02	0.09 ± 0.01	Pass
E-5251, 5252	10/1/2009	Gr. Beta	2.30 ± 0.10	2.10 ± 0.10	2.20 ± 0.07	Pass
E-5251, 5252	10/1/2009	K-40	1.18 ± 0.24	1.15 ± 0.18	1.17 ± 0.15	Pass
G-5272, 5273	10/1/2009	Be-7	3.31 ± 0.29	3.60 ± 0.26	3.46 ± 0.19	Pass
G-5272, 5273	10/1/2009	Gr. Alpha	19.81 ± 0.80	21.10 ± 0.74	20.46 ± 0.54	Pass
G-5272, 5273	10/1/2009	K-40	16.47 ± 0.75	17.00 ± 0.74	16.74 ± 0.53	Pass
F-5690, 5691	10/15/2009	H-3	8895.00 ± 250.00	9051.00 ± 252.00	8973.00 ± 177.49	Pass
F-5690, 5691	10/15/2009	K-40	3.62 ± 0.40	3.09 ± 0.48	3.36 ± 0.31	Pass
DW-90396, 90397	10/16/2009	Ra-226	0.54 ± 0.09	0.42 ± 0.08	0.48 ± 0.06	Pass
DW-90396, 90397	10/16/2009	Ra-228	1.44 ± 0.56	0.94 ± 0.51	1.19 ± 0.38	Pass
DW-90408, 90409	10/19/2009	Ra-226	0.99 ± 0.12	1.10 ± 0.14	1.05 ± 0.09	Pass
DW-90408, 90409	10/19/2009	Ra-228	2.76 ± 0.66	1.38 ± 0.92	2.07 ± 0.57	Pass
DW-90420, 90421	10/21/2009	Ra-226	1.95 ± 0.17	1.77 ± 0.15	1.86 ± 0.11	Pass
DW-90420, 90421	10/21/2009	Ra-228	3.10 ± 0.73	3.32 ± 0.80	3.21 ± 0.54	Pass
SG-5962, 5963	10/22/2009	Ac-228	16.39 ± 0.79	16.51 ± 0.63	16.45 ± 0.51	Pass
SG-5962, 5963	10/22/2009	Pb-214	18.03 ± 0.41	17.74 ± 0.42	17.89 ± 0.29	Pass
DW-90423, 90424	10/27/2009	Gr. Alpha	12.04 ± 1.68	15.28 ± 1.97	13.66 ± 1.29	Pass
ME-6116, 6117	11/3/2009	Gr. Beta	0.86 ± 0.03	0.83 ± 0.03	0.85 ± 0.02	Pass
ME-6116, 6117	11/3/2009	K-40	2.57 ± 0.08	2.65 ± 0.08	2.61 ± 0.06	Pass
F-6567, 6568	11/6/2009	Gr. Beta	2.72 ± 1.05	3.04 ± 0.92	2.88 ± 0.70	Pass
F-6567, 6568	11/6/2009	Sr-90	0.09 ± 0.03	0.12 ± 0.04	0.11 ± 0.02	Pass
W-6495, 6496	11/8/2009	H-3	2638.00 ± 173.00	2451.00 ± 168.00	2544.50 ± 120.57	Pass
WW-6313, 6314	11/9/2009	H-3	1514.00 ± 137.00	1483.00 ± 136.00	1498.50 ± 96.52	Pass
SWU-6611, 6612	11/24/2009	Gr. Beta	1.88 ± 0.60	1.67 ± 0.59	1.78 ± 0.42	Pass
DW-90446, 90447	12/30/2009	Ra-226	0.30 ± 0.10	0.54 ± 0.14	0.42 ± 0.09	Pass
DW-90446, 90447	12/30/2009	Ra-228	2.60 ± 0.64	2.65 ± 0.65	2.63 ± 0.46	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)[a].

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STW-1170 [f]	01/01/09	Am-241	1.15 ± 0.06	0.64	0.45 - 0.83	Fail
STW-1170	01/01/09	Co-57	19.60 ± 0.40	18.90	13.20 - 24.60	Pass
STW-1170	01/01/09	Co-60	16.60 ± 0.30	17.21	12.05 - 22.37	Pass
STW-1170	01/01/09	Cs-134	20.40 ± 0.50	22.50	15.80 - 29.30	Pass
STW-1170 [e]	01/01/09	Cs-137	0.10 ± 0.20	0.00	0.00 - 1.00	Pass
STW-1170	01/01/09	Fe-55	51.60 ± 20.60	48.20	33.70 - 62.70	Pass
STW-1170	01/01/09	H-3	359.90 ± 33.90	330.90	231.60 - 430.20	Pass
STW-1170	01/01/09	Mn-54	15.00 ± 0.40	14.66	10.26 - 19.06	Pass
STW-1170	01/01/09	Ni-63	50.50 ± 3.25	53.50	37.45 - 69.55	Pass
STW-1170	01/01/09	Pu-238	1.17 ± 0.04	1.18	0.83 - 1.53	Pass
STW-1170	01/01/09	Pu-239/40	0.74 ± 0.03	0.85	0.60 - 1.11	Pass
STW-1170	01/01/09	Sr-90	7.87 ± 1.39	7.21	5.05 - 9.37	Pass
STW-1170	01/01/09	Tc-99	12.70 ± 0.80	14.46	10.12 - 18.80	Pass
STW-1170	01/01/09	U-233/4	2.78 ± 0.07	2.77	1.94 - 3.60	Pass
STW-1170	01/01/09	U-238	2.87 ± 0.07	2.88	2.02 - 3.74	Pass
STW-1170	01/01/09	Zn-65	14.00 ± 0.70	13.60	9.50 - 17.70	Pass
STW-1171	01/01/09	Gr. Alpha	0.56 ± 0.06	0.64	0.00 - 1.27	Pass
STW-1171	01/01/09	Gr. Beta	1.29 ± 0.05	1.27	0.64 - 1.91	Pass
STSO-1172 [e]	01/01/09	Co-57	0.00 ± 0.00	0.00	0.00 - 1.00	Pass
STSO-1172	01/01/09	Cs-134	458.60 ± 7.40	467.00	327.00 - 607.00	Pass
STSO-1172	01/01/09	Cs-137	652.30 ± 3.50	605.00	424.00 - 787.00	Pass
STSO-1172	01/01/09	K-40	636.40 ± 9.50	570.00	360.40 - 669.40	Pass
STSO-1172	01/01/09	Mn-54	346.40 ± 3.10	307.00	215.00 - 399.00	Pass
STSO-1172	01/01/09	Pu-238	28.60 ± 2.20	25.30	17.70 - 32.90	Pass
STSO-1172 [e]	01/01/09	Pu-239/40	0.50 ± 0.40	0.00	0.00 - 1.00	Pass
STSO-1172	01/01/09	Sr-90	180.60 ± 12.10	257.00	180.00 - 334.00	Pass
STSO-1172	01/01/09	U-233/4	152.20 ± 4.30	149.00	104.00 - 194.00	Pass
STSO-1172	01/01/09	U-238	154.90 ± 4.40	155.00	109.00 - 202.00	Pass
STSO-1172	01/01/09	Zn-65	268.30 ± 4.00	242.00	169.00 - 315.00	Pass
STVE-1173	01/01/09	Co-57	2.75 ± 0.11	2.36	1.65 - 3.07	Pass
STVE-1173 [e]	01/01/09	Co-60	0.06 ± 0.09	0.00	0.00 - 1.00	Pass
STVE-1173	01/01/09	Cs-134	3.49 ± 0.22	3.40	2.38 - 4.42	Pass
STVE-1173	01/01/09	Cs-137	1.01 ± 0.11	0.93	0.65 - 1.21	Pass
STVE-1173	01/01/09	Mn-54	2.52 ± 0.14	2.30	1.61 - 2.99	Pass
STVE-1173	01/01/09	Zn-65	1.52 ± 0.18	1.35	0.95 - 1.76	Pass

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

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STAP-1174 [g]	01/01/09	Am-241	0.29 ± 0.03	0.21	0.14 - 0.27	Fail
STAP-1174	01/01/09	Co-57	1.25 ± 0.05	1.30	0.91 - 1.69	Pass
STAP-1174	01/01/09	Co-60	1.17 ± 0.06	1.22	0.85 - 1.59	Pass
STAP-1174	01/01/09	Cs-134	2.67 ± 0.14	2.93	2.05 - 3.81	Pass
STAP-1174	01/01/09	Cs-137	1.53 ± 0.08	1.52	1.06 - 1.98	Pass
STAP-1174	01/01/09	Mn-54	2.34 ± 0.09	2.27	1.59 - 2.95	Pass
STAP-1174 [h]	01/01/09	Sr-90	0.93 ± 0.14	0.64	0.45 - 0.83	Fail
STAP-1174	01/01/09	Zn-65	1.44 ± 0.14	1.36	0.95 - 1.77	Pass
STAP-1175	01/01/09	Gr. Alpha	0.22 ± 0.03	0.35	0.00 - 0.70	Pass
STAP-1175	01/01/09	Gr. Beta	0.36 ± 0.04	0.28	0.14 - 0.42	Pass
STSO-1188	07/01/09	Co-57	674.60 ± 9.00	586.00	410.00 - 762.00	Pass
STSO-1188	07/01/09	Co-60	356.40 ± 6.30	327.00	229.00 - 425.00	Pass
STSO-1188	07/01/09	Cs-134	0.20 ± 1.90	0.00	0.00 - 1.00	Pass
STSO-1188	07/01/09	Cs-137	767.50 ± 12.00	669.00	468.00 - 870.00	Pass
STSO-1188	07/01/09	K-40	433.00 ± 37.20	375.00	263.00 - 488.00	Pass
STSO-1188	07/01/09	Mn-54	931.60 ± 14.10	796.00	557.00 - 1035.00	Pass
STSO-1188	07/01/09	Pu-238	53.10 ± 9.00	63.20	44.20 - 82.20	Pass
STSO-1188	07/01/09	Pu-239/40	107.10 ± 12.60	116.30	81.40 - 151.20	Pass
STSO-1188 [i]	07/01/09	Sr-90	310.50 ± 12.20	455.00	319.00 - 592.00	Fail
STSO-1188	07/01/09	U-233/4	188.20 ± 11.90	209.00	146.00 - 272.00	Pass
STSO-1188	07/01/09	U-238	197.40 ± 12.20	217.00	152.00 - 282.00	Pass
STSO-1188	07/01/09	Zn-65	1433.90 ± 25.20	1178.00	825.00 - 1531.00	Pass
STAP-1189	07/01/09	Gr. Alpha	0.33 ± 0.04	0.66	0.00 - 1.32	Pass
STAP-1189	07/01/09	Gr. Beta	1.57 ± 0.07	1.32	0.66 - 1.98	Pass
STAP-1190	07/01/09	Am-241	0.01 ± 0.02	0.00	0.01 - 0.05	Pass
STAP-1190	07/01/09	Co-57	6.78 ± 0.27	6.48	4.54 - 8.42	Pass
STAP-1190	07/01/09	Co-60	1.06 ± 0.18	1.03	0.72 - 1.34	Pass
STAP-1190	07/01/09	Cs-134	0.01 ± 0.06	0.00	0.01 - 0.05	Pass
STAP-1190	07/01/09	Cs-137	1.49 ± 0.27	1.40	0.98 - 1.82	Pass
STAP-1190	07/01/09	Mn-54	6.00 ± 0.45	5.49	3.84 - 7.14	Pass
STAP-1190	07/01/09	Sr-90	0.79 ± 0.13	0.84	0.59 - 1.09	Pass
STAP-1190	07/01/09	Zn-65	4.55 ± 0.66	3.93	2.75 - 5.11	Pass
STVE-1190	07/01/09	Co-57	8.90 ± 0.60	8.00	5.60 - 10.40	Pass
STVE-1190	07/01/09	Co-60	2.50 ± 0.36	2.57	1.80 - 3.34	Pass
STVE-1190	07/01/09	Cs-134	0.01 ± 0.11	0.00	0.00 - 0.10	Pass
STVE-1190	07/01/09	Cs-137	2.42 ± 0.16	2.43	1.70 - 3.16	Pass
STVE-1190	07/01/09	Mn-54	8.35 ± 0.70	7.90	5.50 - 10.30	Pass
STVE-1190	07/01/09	Zn-65	0.01 ± 0.26	0.00	0.00 - 0.10	Pass

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

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STW-1191	07/01/09	Gr. Alpha	0.88 ± 0.07	1.05	0.00 - 2.09	Pass
STW-1191	07/01/09	Gr. Beta	7.29 ± 0.10	7.53	3.77 - 11.30	Pass
STW-1192	07/01/09	Am-241	0.88 ± 0.08	1.04	0.73 - 1.35	Pass
STW-1192	07/01/09	Co-57	37.20 ± 1.50	36.60	25.60 - 47.60	Pass
STW-1192	07/01/09	Co-60	15.10 ± 0.90	15.40	10.80 - 20.00	Pass
STW-1192	07/01/09	Cs-134	30.30 ± 2.10	32.20	22.50 - 41.90	Pass
STW-1192	07/01/09	Cs-137	41.90 ± 1.80	41.20	28.80 - 53.60	Pass
STW-1192	07/01/09	Fe-55	54.50 ± 15.50	60.80	42.60 - 79.00	Pass
STW-1192	07/01/09	H-3	680.30 ± 33.60	634.10	443.90 - 824.30	Pass
STW-1192 [e]	07/01/09	Mn-54	0.01 ± 0.26	0.00	0.00 - 1.00	Pass
STW-1192	07/01/09	Ni-63	38.70 ± 2.60	44.20	30.90 - 57.50	Pass
STW-1192	07/01/09	Pu-238	0.02 ± 0.01	0.02	0.00 - 0.05	Pass
STW-1192	07/01/09	Pu-239/40	1.70 ± 0.10	1.64	1.15 - 2.13	Pass
STW-1192	07/01/09	Sr-90	12.90 ± 1.70	12.99	9.09 - 16.89	Pass
STW-1192	07/01/09	Tc-99	7.60 ± 0.40	10.00	7.00 - 13.00	Pass
STW-1192	07/01/09	Tc-99	7.60 ± 0.40	10.00	7.00 - 13.00	Pass
STW-1192	07/01/09	U-233/4	2.90 ± 0.10	2.96	2.07 - 3.85	Pass
STW-1192	07/01/09	U-238	3.00 ± 0.10	3.03	2.12 - 3.94	Pass
STW-1192	07/01/09	Zn-65	28.50 ± 2.40	26.90	18.80 - 35.00	Pass

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

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

[c] Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation).

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

[e] Included in the testing series as a "false positive".

[f] No errors were found in procedure or calculation. There was not enough sample for a reanalysis. Americium-241 in water was included in the ERA studies (Tbl. A-7) and also in the second round of MAPEP testing. Both analysis results were acceptable.

[g] One determination was eliminated from the average, due to poor recovery. Average of three determinations, 0.25 ± 0.03 pCi/filter.

[h] No reason was determined for the initial high results. The analysis was repeated; result of reanalysis; 0.54 ± 0.12 Bq/filter.

[i] Incomplete separation of strontium from calcium could result in a higher recovery percentage and consequently lower reported activity. The analysis was repeated; result of reanalysis 363.3 ± 28.6 Bq/kg.

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L) Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
STAP-1176	03/23/09	Am-241	47.20 ± 3.10	55.4	32.4 - 76.0	Pass
STAP-1176	03/23/09	Co-60	543.60 ± 8.90	490.0	379.0 - 612.0	Pass
STAP-1176	03/23/09	Cs-134	941.30 ± 30.70	865.0	563.0 - 1070.0	Pass
STAP-1176	03/23/09	Cs-137	850.60 ± 19.40	724.0	544.0 - 951.0	Pass
STAP-1176 [e]	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 0.0	Pass
STAP-1176	03/23/09	Pu-238	64.50 ± 3.60	57.4	39.4 - 75.5	Pass
STAP-1176	03/23/09	Pu-239/40	88.50 ± 4.20	78.2	56.7 - 101.0	Pass
STAP-1176	03/23/09	Sr-90	93.90 ± 10.00	95.3	41.9 - 148.0	Pass
STAP-1176	03/23/09	U-233/4	50.00 ± 2.47	53.5	33.7 - 79.3	Pass
STAP-1176	03/23/09	U-238	50.40 ± 2.48	53.1	34.0 - 75.4	Pass
STAP-1176	03/23/09	Uranium	101.60 ± 5.30	109.0	55.7 - 173.0	Pass
STAP-1176	03/23/09	Zn-65	237.30 ± 23.70	185.0	128.0 - 256.0	Pass
STAP-1177	03/23/09	Gr. Alpha	76.30 ± 3.47	63.8	33.1 - 96.0	Pass
STAP-1177	03/23/09	Gr. Beta	98.50 ± 3.04	80.7	49.7 - 118.0	Pass
STSO-1178	03/23/09	Ac-228	1370.00 ± 121.00	1330.0	860.0 - 1880.0	Pass
STSO-1178	03/23/09	Am-241	1853.00 ± 185.50	1660.0	992.0 - 2130.0	Pass
STSO-1178	03/23/09	Bi-212	1449.00 ± 308.80	1550.0	406.0 - 2310.0	Pass
STSO-1178	03/23/09	Bi-214	1355.00 ± 66.20	1420.0	872.0 - 2050.0	Pass
STSO-1178	03/23/09	Co-60	7475.00 ± 46.40	7520.0	5470.0 - 10100.0	Pass
STSO-1178	03/23/09	Cs-134	5073.00 ± 74.70	5170.0	3330.0 - 6220.0	Pass
STSO-1178	03/23/09	Cs-137	5040.00 ± 49.70	4970.0	3800.0 - 6460.0	Pass
STSO-1178	03/23/09	K-40	10884.00 ± 292.70	11200.0	8060.0 - 15100.0	Pass
STSO-1178	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 20.0	Pass
STSO-1178	03/23/09	Pb-212	1259.00 ± 28.40	1260.0	820.0 - 1780.0	Pass
STSO-1178	03/23/09	Pb-214	1464.00 ± 56.80	1510.0	902.0 - 2260.0	Pass
STSO-1178	03/23/09	Pu-238	1853.00 ± 185.50	1590.0	910.0 - 2240.0	Pass
STSO-1178	03/23/09	Pu-239/40	1516.50 ± 168.30	1360.0	928.0 - 1800.0	Pass
STSO-1178	03/23/09	Sr-90	5270.90 ± 290.20	5750.0	2080.0 - 9380.0	Pass
STSO-1178	03/23/09	U-233/4	1452.30 ± 114.40	1600.0	1010.0 - 1990.0	Pass
STSO-1178	03/23/09	Uranium	3013.70 ± 131.10	3270.0	1860.0 - 4410.0	Pass
STSO-1178	03/23/09	Zn-65	2083.00 ± 59.00	1940.0	1540.0 - 2600.0	Pass

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L) Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
STVE-1179	03/23/09	Am-241	2849.70 ± 237.60	3660.0	2090.0 - 5030.0	Pass
STVE-1179	03/23/09	Cm-244	808.00 ± 85.70	954.0	470.0 - 1480.0	Pass
STVE-1179	03/23/09	Co-60	1546.80 ± 31.60	1710.0	1160.0 - 2460.0	Pass
STVE-1179	03/23/09	Cs-134	1706.00 ± 59.20	1880.0	1080.0 - 2600.0	Pass
STVE-1179	03/23/09	Cs-137	1940.50 ± 44.80	1800.0	1320.0 - 2500.0	Pass
STVE-1179	03/23/09	K-40	30107.30 ± 598.00	30800.0	22300.0 - 43700.0	Pass
STVE-1179	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 0.0	Pass
STVE-1179	03/23/09	Sr-90	6604.80 ± 440.10	8860.0	4950.0 - 11800.0	Pass
STVE-1179	03/23/09	U-233/4	1718.00 ± 128.90	2040.0	1400.0 - 2710.0	Pass
STVE-1179	03/23/09	U-238	1718.30 ± 128.80	2020.0	1420.0 - 2550.0	Pass
STVE-1179	03/23/09	Uranium	3499.40 ± 371.00	4150.0	2850.0 - 5360.0	Pass
STVE-1179	03/23/09	Zn-65	869.40 ± 63.60	878.0	634.0 - 1200.0	Pass
STW-1180	03/23/09	Am-241	127.50 ± 5.10	132.0	90.4 - 178.0	Pass
STW-1180	03/23/09	Co-60	1174.10 ± 11.70	1230.0	1070.0 - 1450.0	Pass
STW-1180	03/23/09	Cs-134	742.20 ± 18.30	790.0	584.0 - 907.0	Pass
STW-1180	03/23/09	Cs-137	887.50 ± 14.00	913.0	776.0 - 1090.0	Pass
STW-1180	03/23/09	Fe-55	323.00 ± 362.00	492.0	286.0 - 657.0	Pass
STW-1180	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 0.0	Pass
STW-1180	03/23/09	Pu-238	96.60 ± 2.20	108.0	81.7 - 134.0	Pass
STW-1180	03/23/09	Pu-239/40	89.50 ± 2.10	86.3	66.8 - 107.0	Pass
STW-1180	03/23/09	Sr-90	763.20 ± 12.90	834.0	530.0 - 1120.0	Pass
STW-1180	03/23/09	U-233/4	95.00 ± 1.80	96.6	72.8 - 124.0	Pass
STW-1180	03/23/09	U-238	97.40 ± 1.80	95.8	73.2 - 119.0	Pass
STW-1180	03/23/09	Uranium	195.50 ± 3.70	197.0	142.0 - 262.0	Pass
STW-1180	03/23/09	Zn-65	653.10 ± 24.10	631.0	535.0 - 786.0	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: STW (water), STAP (air filter), STSO (soil), STVE (vegetation).

[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.

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

[f] The analysis was repeated by leaching and total dissolution methods. Total dissolution yielded results within expected range. Results of the reanalysis: U-233,4, 1655 ± 95 pCi/kg. U-238 1805 ± 97 pCi/kg.

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;

$s = 2\sigma$ 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 $x_1, x_2 \ldots x_n$ 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

Maximum Permissible Concentrations

of Radioactivity in Air and Water

Above Background in Unrestricted Areas

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

	Air (pCi/m^3)		Water (pCi/L)
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-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	1×10^6

[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.

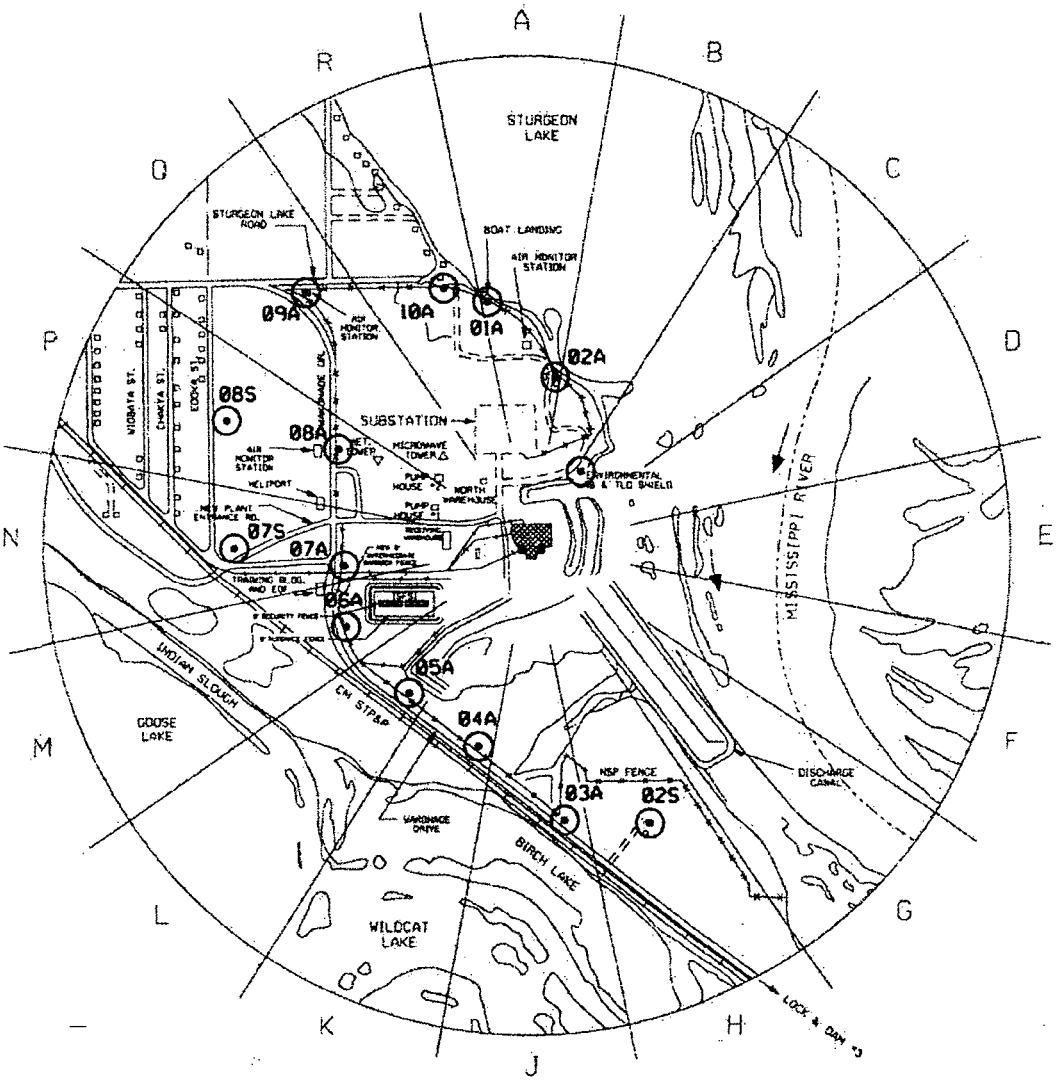
[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

APPENDIX D

Sampling Location Maps

TLD LOCATIONS
ONE MILE RADIUS



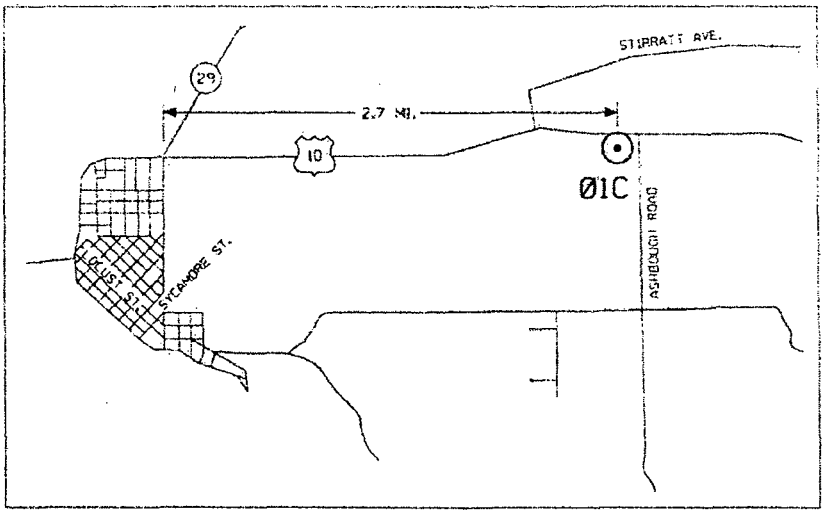
PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]

[NO SCALE]

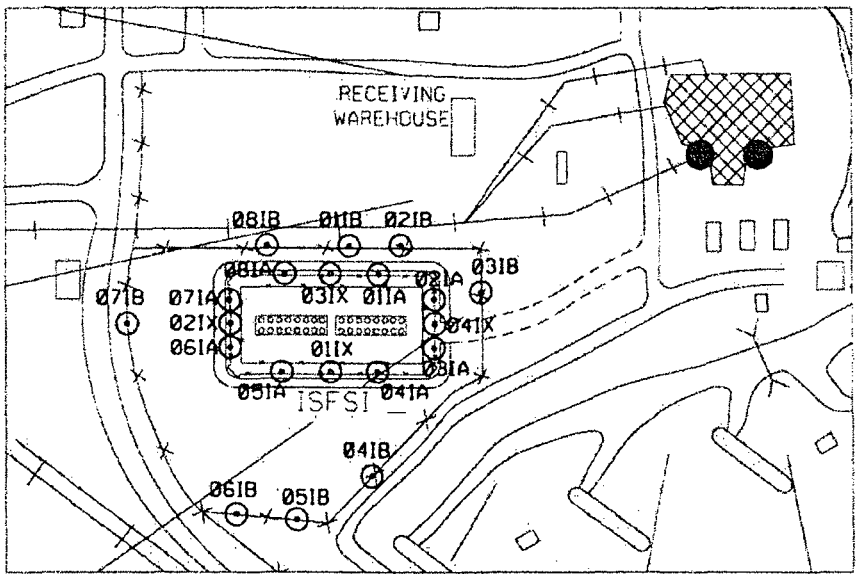
MONITORING LEGEND:

⊙ PRAIRIE ISLAND TLD POINTS

TLD LOCATIONS



CONTROL POINTS
PRESCOTT, WISCONSIN



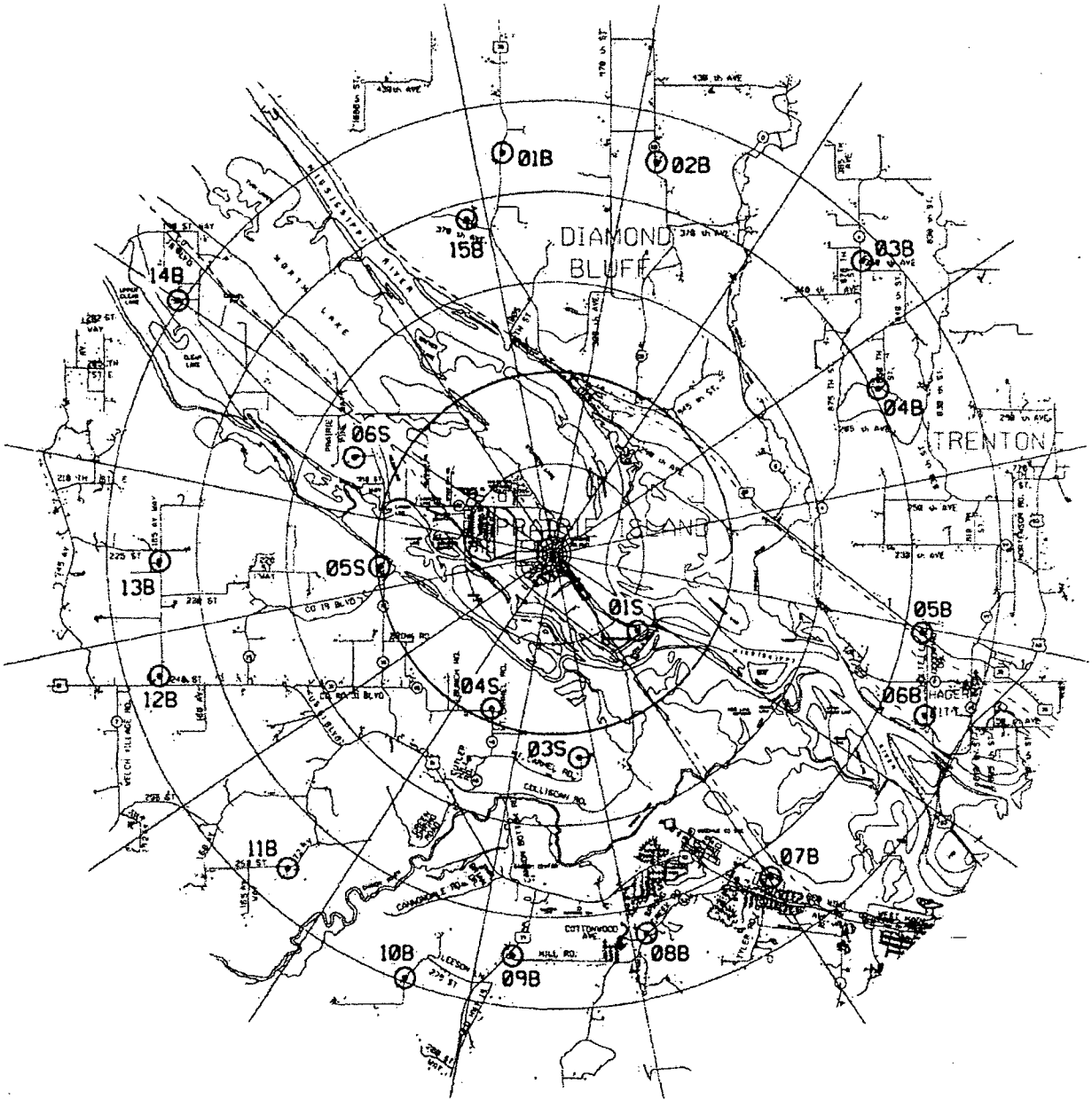
ISFSI AREA TLD LOCATIONS

MONITORING LEGEND:

⊙ PRAIRIE ISLAND TLD POINTS

TLD LOCATIONS

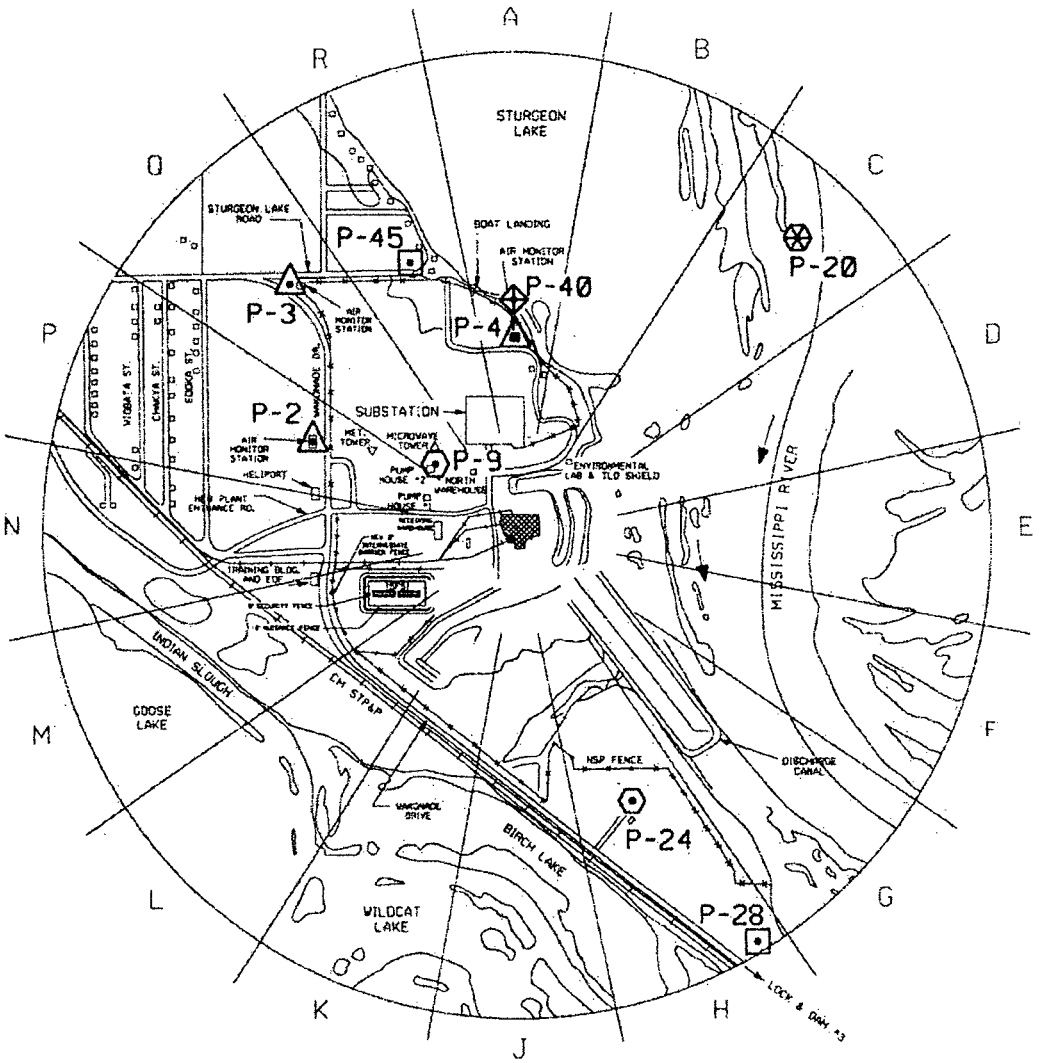
FIVE MILE RADIUS



MONITORING LEGEND:

⊙ PRAIRIE ISLAND TLD POINTS

ENVIRONMENTAL SAMPLING POINTS
ONE MILE RADIUS



PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]

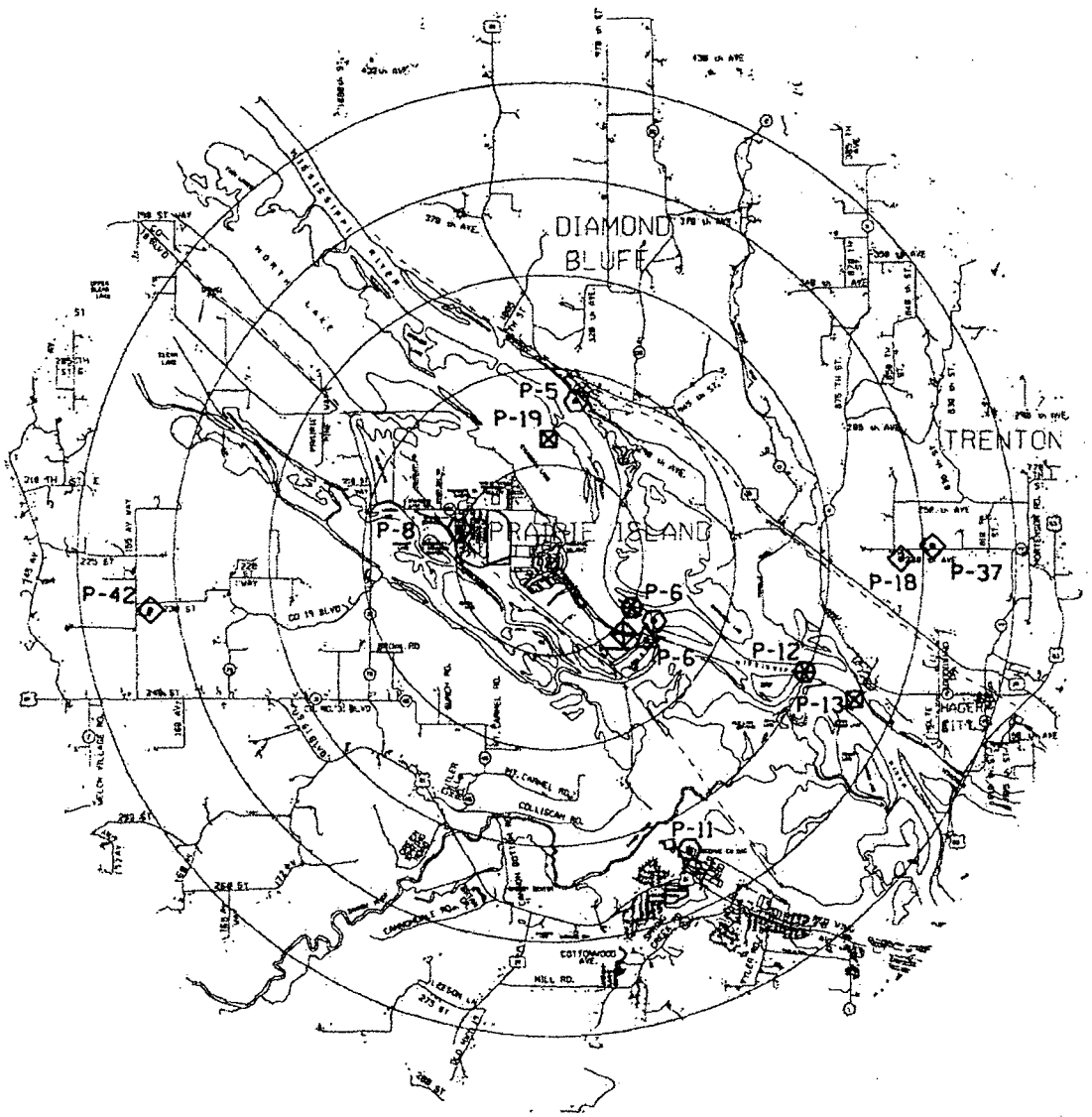
[NO SCALE]

MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS
  P-18, P-37, P-42, P-43
- AIR SAMPLING POINT ID NUMBERS
  P-1, P-2, P-3, P-4, P-6
- WATER SAMPLING POINT ID NUMBERS
  P-5, P-6, P-8, P-9, P-11, P-24, P-43
- VEGETATION / VEGETABLES ID NUMBERS
  P-28, P-38, P-45
- FISH SAMPLING POINT ID NUMBERS
  P-13, P-19
- INVERTEBRATES POINT ID NUMBERS
  P-6, P-40
- SEDIMENT SAMPLING POINT ID NUMBERS
  P-6, P-12, P-20

ENVIRONMENTAL SAMPLING POINTS

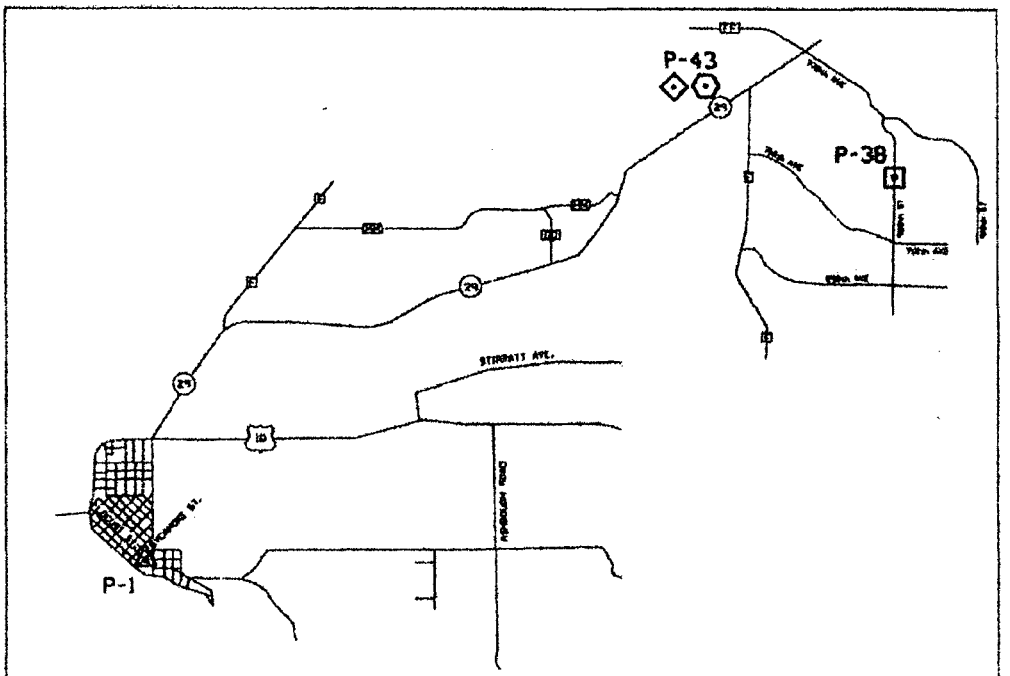
FIVE MILE RADIUS



MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS P-18, P-37, P-42, P-43
- AIR SAMPLING POINT ID NUMBERS P-1, P-2, P-3, P-4, P-6
- WATER SAMPLING POINT ID NUMBERS P-5, P-6, P-8, P-9, P-11, P-24, P-43
- VEGETATION / VEGETABLES ID NUMBERS P-28, P-38, P-45
- FISH SAMPLING POINT ID NUMBERS P-13, P-19
- INVERTEBRATES POINT ID NUMBERS P-6, P-40
- SEDIMENT SAMPLING POINT ID NUMBERS P-6, P-12, P-20

ENVIRONMENTAL SAMPLING POINTS



P-43, Peterson Farm, W10322 St Rd 29, River Falls, WI

P-38, Cain Residence, N7395 950th St, River Falls, WI

CONTROL POINTS

PRESCOTT, WISCONSIN

MONITORING LEGEND

MILK SAMPLING POINT ID NUMBERS
P-18, P-37, P-41, P-42, P-43

AIR SAMPLING POINT ID NUMBERS
P-1, P-2, P-3, P-4, P-6

WATER SAMPLING POINT ID NUMBERS
P-5, P-6, P-8, P-9, P11, P-43

VEGETATION / VEGETABLES ID NUMBERS
P-28, P-38, P-46

APPENDIX E

Special Well and

Surface Water Samples

1.0 INTRODUCTION

This appendix to the Radiological Environmental Monitoring Program Annual Report to the United States Nuclear Regulatory Commission summarizes and interprets results of the special well and surface water samples taken at the Prairie Island Nuclear Generating Plant, Red Wing, Minnesota, during the period January - December, 2009. This supplemental special sampling program was established in December of 1989 when higher than expected levels of tritium were detected in a nearby residence well sample.

Tabulations of the special sampling program individual analyses made during the year are included in this appendix. A summary table of tritium analyses is also included in this appendix.

2.0 SUMMARY

This special sampling program was established following the detection of tritium in a residence well water sample south of the PINGP during 1989. This program is described and the results for 2009 are summarized and discussed.

Program findings for 2009 detect low levels of tritium in nearby residence wells and ground water surface samples at or near the expected natural background levels with the exception of sample wells P-10 and MW-8 and storm water runoff sample S-6. The 2009 sample results (except for P-10, MW-8, and S-6) ranged from <19 pCi/L to 320 pCi/L. Sample well P-10 ranged from 75 pCi/L to 686 pCi/L. Sample well MW-8 ranged from 248 pCi/L to 542 pCi/L. Storm water runoff sample S-6 ranged from 56 pCi/L to 515 pCi/L. All tritium results are far below the Environmental Protection Agency's drinking water standard of 20,000 pCi/L and present no harm to any members of the public.

None of the water samples monitored for gamma-emitting isotopes showed activity greater than the LLD.

The one-time river sediment samples that were monitored for gamma-emitting isotopes showed only natural activity, beryllium-7 and potassium-40 and background levels of cesium-137.

3.0 Special Tritium Sampling Program

3.1 Program Design and Data Interpretation

The purpose of this sampling program is to assess the impact of any tritium leaching into the environment (ground water system) from the PINGP. For this purpose, special water samples are collected and analyzed for tritium content.

3.2 Program Description

The sampling and analysis schedule for the special water sampling program is summarized in Table E-4.1 and briefly reviewed below. Table E-4.2 defines the additional sample locations and codes for the special water sampling program.

Special well, storage tank, and surface water samples were collected quarterly at one location, monthly at six locations, semi-annually at six locations, and annually at thirty-five locations. The Peterson (P-43) and Hanson (SW-1) farm wells are used as control locations for these special samples.

To detect low levels of tritium at or below natural background levels, analyses of the samples have been contracted to a laboratory (University of Waterloo Laboratories) capable of detecting tritium concentrations down to 19 pCi/L. Waterloo Laboratories report tritium analyses results in Tritium Units (1 TU = 3.2 pCi/L). The tritium results in this report are indicated in pCi/L.

3.3 Program Execution

The special water sampling was executed as described in the preceding section.

3.4 Program Modifications

Changes to the program in 2009 include:

- sampling was not performed at station P-4 because it has been capped, it has been deleted as a sample point
- sampling was not performed at the STA house (SW-2) because it was dry
- deleted Unit 2 demineralizer header sample because it comes from the same source as the Unit 1 demineralizer header
- added sampling of the Septic System storage tank, S-7 Parking Lot Storm Water Runoff, and 3 additional Prairie Island Indian Community locations PIIC-20, PIIC-23, and PIIC-28
- samples were taken from monitoring wells P-10 and MW-8 and from storm water runoff from the parking lot and the Old Administration Building Roof, these samples were sent to Environmental Incorporated for analysis for hard-to-detect nuclides in accordance with American Nuclear Insurers recommendations. (Table E-4.5a)

In addition, gamma analyses were conducted using a PI plant spectrometer on 3000 mL samples from the following monitoring wells: P-2, P-3, P-5, P-6, P-7, P-10, P-11, PZ-1, PZ-2, PZ-4, PZ-5, PZ-7, PZ-8, MW-4, MW-5, MW-7, and MW-8.

A special one-time sample of surface water and river sediment was conducted in preparation for dredging near the plant intake (Table E-4.5b).

3.5 Results and Discussion

Results obtained show tritium in well water and ground water samples at or near expected natural background levels except the P-10 and MW-8 sample wells and S-6, Old Admin Building storm water runoff. Table E-4.4 provides the complete data table of results for each period and sampling location.

The tritium level annual averages have shown a downward trend since the special sampling begun in 1989.

Except for sample wells P-10 and MW-8 and runoff sample S-6, the 2009 sample results are within the range of expected background tritium levels in shallow ground water and surface water due to tritium concentrations measured in precipitation. Sampling points in North America have shown tritium concentrations in precipitation ranging from 5 pCi/L to 157 pCi/L (Environmental Isotope Data No. 10; World Survey of Isotope Concentration in Precipitation (1988-1991)).

The higher level results at the Suter residence and Birch Lake in 1989 were possibly due to seepage from the PINGP discharge canal water into the ground water. This is thought to occur due to the elevation difference between the Vermillion River and the discharge canal. The Suter residence is located between the discharge canal and Birch Lake, which connects to the Vermillion River. The PINGP discharge canal piping was lengthened during 1991, so that liquid discharges from the plant are released near the end of the discharge canal, diffused and discharged to the Mississippi River. In 1992, the underground liquid discharge pipe from the plant to the discharge canal piping was replaced with a double walled leak detectable piping system. This year's sample results continue to indicate that these modifications have eliminated the suspected radioactive effluent flow into the local ground water.

The elevated tritium levels in sample wells P-10 and MW-8 in 2009 may be due to prior leakage from the PINGP liquid radwaste discharge pipe or discharge of turbine building sump water into the landlocked area. The liquid radwaste discharge pipe was replaced in 1992 and the discharge to the landlocked area has been terminated, the last discharge took place on 11/14/09.

None of the water samples monitored for gamma-emitting isotopes showed any activity greater than the LLD.

The one-time river sediment samples that were monitored for gamma-emitting isotopes showed only natural activity, beryllium-7 and potassium-40 and background levels of cesium-137.

Table E-4.1. Sample collection and analysis program for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2009.

Medium	No.	Location codes and type [a]	Collection type and frequency [b]	Analysis type [c]
Well Water Annual	30	P-2, P-3, P-5, P-6, P-7, P-8, P-9, P-11, P-26, P-30, P-6 (REMP), PIIC-02, PIIC-20, PIIC-22, PIIC-23, PIIC-26, PIIC-28, PZ-1, PZ-2, PZ-4, PZ-5, PZ-7, PZ-8, MW-4, MW-5, MW-6, SW-2, SW-3, SW-4, SW-5	G/A	H-3
Well Water quarterly	1	P-24D	G/Q	H-3
Well Water monthly	5	P-43(C), SW-1(C), MW-7, MW-8, P-10	G/M	H-3
Surface Water	7	S-1, S-2, S-3, S-4, S-5, S-6, S-7	G/A [d]	H-3
Storage Tank	4	11 CST, 21 CST, 22 CST, U1 demin hdr,	G/S	H-3
Storage Tank	1	Septic Tank	G/M	H-3

[a] Location codes are defined in table D-4.2. Control Stations are indicated by (C). All other stations are indicators.

[b] Collection type is codes as follows: G/ = grab. Collection frequency is coded as follows: M = monthly; Q = quarterly; S= semiannually: A = annually.

[c] Analysis type is coded as follows: H-3 = tritium.

[d] Location S-6 and S-7 are sampled semi-annually.

Table E-4.2. Sampling locations for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2009.

Code	Collection site	Type of sample [a]	Distance and direction from reactor
P-8	PI Community well	WW	1.0 mi. @ 321°/WNW
REMP P-6	Lock & Dam #3 well	WW	1.6 mi. @ 129°/SE
PIIC-02	2077 Other Day Road	WW	1.4 mi. @ 315°/NW
PIIC-20	2158 Holmquist Road	WW	1.6 mi @ 300°/WNW
PIIC-22	1773 Buffalo Slough Rd	WW	1 mi. @ 315°/NW
PIIC-23	2.7 miles NW	WW	2.7 mi @315°/NW
PIIC-26	1771 Buffalo Slough Rd	WW	1 mi. @ 315°/NW
PIIC-28	1960 Larson Lane	WW	1.5 mi @ 288°/WNW
P-24D	Suter residence	WW	0.6 mi. @ 158°/SSE
P-43	Peterson Farm (Control)	WW	13.9 mi. @ 355°/N
SW-1	Hanson Farm (Control)	WW	2.2 mi. @ 315°/NW
P-2	Sample well	WW	See map
P-3	Sample well	WW	See map
P-5	Sample well	WW	See map
P-6	Sample well	WW	See map
P-7	Sample well	WW	See map
P-10	Sample well	WW	See map
P-11	Sample well	WW	See map
PZ-1	Sample well	WW	See map
PZ-2	Sample well	WW	See map
PZ-4	Sample well	WW	See map
PZ-5	Sample well	WW	See map
PZ-7	Sample well	WW	See map
PZ-8	Sample well	WW	See map
MW-4	Sample well	WW	See map
MW-5	Sample well	WW	See map
MW-6	Sample well	WW	See map
MW-7	Sample well	WW	See map
MW-8	Sample well	WW	See map
P-26	PITC well	WW	0.4 mi. @ 258°/WSW
P-30	Environ lab well	WW	0.2 mi. @ 32°/NNE
SW-2	STA House	WW	See map
SW-3	Cooling Tower pump	WW	See map
SW-4	New Admin Bldg	WW	0.05 mi. @ 315°/NW
SW-5	Plant Screenhouse well	WW	0.05 mi. @ 0°/N
P-9	Plant well # 2	WW	0.3 mi. @ 306°/NW
S-1	Upstream Miss. River	SW	See map
S-2	Recirc/Intake canal	SW	See map
S-3	Cooling water canal	SW	See map
S-4	Discharge Canal (end)	SW	See map
S-5	Mid Discharge Canal	SW	See map
S-6	Roof Stormwater Runoff	SW	0.05 mi. @ 0°/N
S-7	Parking Lot Stormwater	SW	0.3 mi @ 306°/NW
11 CST	Storage Tank	ST	Turbine Building
21 CST	Storage Tank	ST	Turbine Building
22 CST	Storage Tank	ST	Turbine Building
Unit 1 demin hdr	Storage Tank	ST	Turbine Building
Septic System	Storage Tank	ST	Outside #1 Warehouse

[a] Sample codes: WW = Well water; SW = Surface Water: ST = Storage Tank.

Table E-4.3 Radiological Environmental Monitoring Program Summary: Special well, storage tank, and surface water samples.

Name of Facility Prairie Island Nuclear Power Station
Location of Facility Goodhue, Minnesota
(County, State)

Docket No. 50-282, 50-306
Reporting Period January - December 2009

Sample Type (Units)	Type and Number of Analyses [a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location [d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range	Number Non-Routine Results[e]
Offsite Well Water (pCi/L)	H-3	13	19	38 (6/13) (24-54)	P-24D	37 (4/5) (24-54)	(See Control Below)	0
Onsite Well Water (pCi/L)	H-3	57	19	236 (43/57) (22-686)	MW-8	407 (12/12) (248-542)	(See Control Below)	14
Onsite Surface Water (pCi/L)	H-3	9	19	117 (8/9) (23-515)	S-6	286 (2/2) (56-515)	(See Control Below)	0
Onsite Storage Tank (pCi/L)	H-3	16	19	107 (11/16) (23-515)	Septic System	135 (8/8) (36-320)	(See Control Below)	0
Control (Offsite Well Water) (pCi/L)	H-3	34	19	None	P-43	35 (6/12) (21-56)	34 (8/24) (21-56)	0

a H-3 = tritium

b LLD = Nominal lower limit of detection based on 4.66 sigma error for background sample. Value shown is lowest for the period.

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

d Locations are specified by code.

e Non-routine results are those which exceed ten times the control station value.

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2009.

	SAMPLE DATES	JAN 2009	FEB 2009	MAR 2009	APR 2009	MAY 2009	JUN 2009	JUL 2009	AUG 2009	SEP 2009	OCT 2009	NOV 2009	DEC 2009
CODE	SAMPLE LOCATIONS	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L
OFFSITE WELLS													
P-8	PI Comm. Well							<19					
P-6 (REMP)	Lock & Dam. #3, Well							<19					
PIIC-02	2077 Other Day Rd.							<19					
PIIC-20	2158 Holmquist Rd.							<19					
PIIC-22	1773 Buffalo Slough Rd.							51					
PIIC-23	2.7 mi. NW of Plant							<19					
PIIC-26	1771 Buffalo Slough Rd.							29					
PIIC-28	1960 Larson Lane							<19					
P-24D	Suter residence	31	54		<19			24			38		
P-43	Peterson Farm (Control)	<19	44	28	<19	27	<19	21	<19	56	36	<19	<19
SW-1	Hanson Farm (Control)	<19	36	<19	<19	24	<19	<19	<19	<19	<19	<19	<19

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2009, continued

	SAMPLE DATES	JAN 2009	FEB 2009	MAR 2009	APR 2009	MAY 2009	JUN 2009	JUL 2009	AUG 2009	SEP 2009	OCT 2009	NOV 2009	DEC 2009
CODE	SAMPLE LOCATIONS	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L
ONSITE WELLS													
P-2*	Sample Well							30					
P-3*	Sample Well							<19					
P-5*	Sample Well							77					
P-6*	Sample Well							<19					
P-7*	Sample Well							59					
P-10*	Sample Well	75	263	267	428	445	544	432	226	455	686	219	178
P-11*	Sample Well							<19					
PZ-1*	Sample Well							<19					
PZ-2*	Sample Well							<19					
PZ-4*	Sample Well							22					
PZ-5*	Sample Well							<19					
PZ-7*	Sample Well							<19					
PZ-8*	Sample Well							<19					
MW-4*	Sample Well							<19					
MW-5*	Sample Well							<19					
MW-6*	Sample Well							47					
MW-7*	Sample Well	79	82	<19	39	49	47	68	68	44	76	84	94
MW-8*	Sample Well	474	501	424	542	476	453	474	438	298	287	264	248
P-26	PITC Well							<19					
P-30	Env. lab Well							22					
SW-3	CT pump							<19					
P-9	Plant Well # 2							23					
SW-4	New Admin							<19					
SW-5	Pln Scrnhs							24					

* Gamma isotopic performed at Prairie Island Plant on 3000 mL sample, no radionuclides above LLD were detected.

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2009, continued

	SAMPLE DATES	JAN 2009	FEB 2009	MAR 2009	APR 2009	MAY 2009	JUN 2009	JUL 2009	AUG 2009	SEP 2009	OCT 2009	NOV 2009	DEC 2009
CODE	SAMPLE LOCATIONS	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L
ONSITE SURFACE WATER													
S-1	Mississippi River upstream							32					
S-2	Recirculation/Intake canal							42					
S-3	Cooling water canal							23					
S-4	Discharge Canal (end)							34					
S-5	Discharge Canal (midway)							<19					
S-6	Stormwater runoff					515				56			
S-7	Parking Lot runoff					48				187			
ONSITE STORAGE TANKS													
11 CST	Storage tank					<19				31			
21 CST	Storage tank					<19				46			
22 CST	Storage tank					<19				20			
U1 Demin Header	Storage tank					<19				<19			
U2 Demin Header	Storage tank												
Septic System	Storage tank				36		156	74	215	320	121	98	61

Table E-4.5a. Results of analyses for iron-55, nickel-63, strontium-90, isotopic plutonium, americium-241 and isotopic curium.

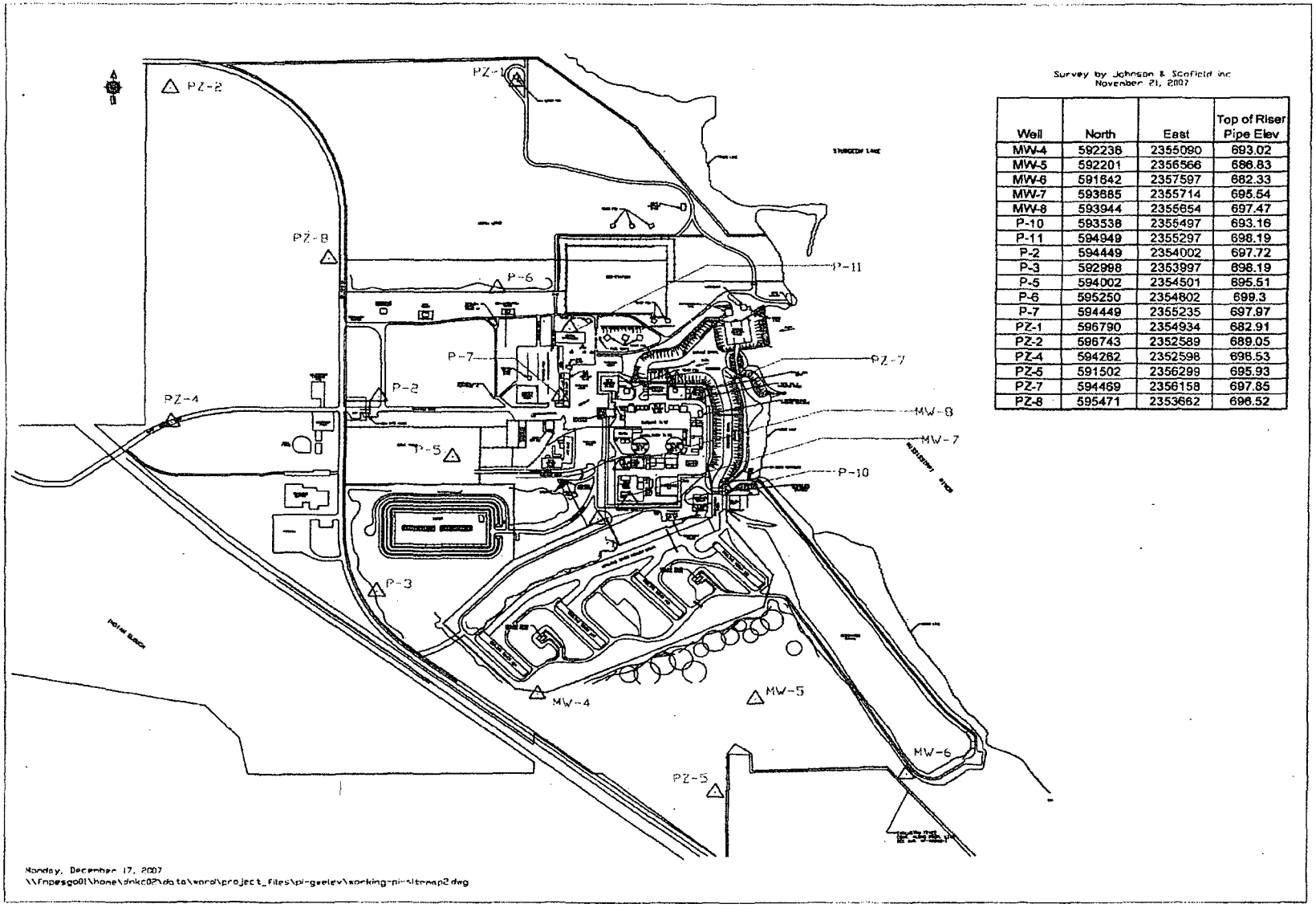
	Groundwater		Stormwater Runoff	
Location	P-10	MW-8	Parking Lot	Old Admin Bldg
Collection Date	5/11/2009	5/11/2009	5/5/2009	5/5/2009
Lab Code	PXW-2665	PXW-2666	PXW-2667	PXW-2668
Isotope	**Concentration (µCi/mL)**			
Fe-55	< 8.0 E-07	< 8.2 E-07	< 8.3 E-07	< 8.1 E-07
Ni-63	< 8.7 E-09	< 8.1 E-09	< 8.0 E-09	< 8.3 E-09
Sr-90	< 2.6 E-09	< 2.7 E-09	< 2.7 E-09	< 2.8 E-09
Pu-238	< 1.1 E-10	< 1.4 E-10	< 2.4 E-10	< 1.1 E-10
Pu-239/240	< 1.1 E-10	< 1.4 E-10	< 1.1 E-10	< 1.1 E-10
Am-241	< 4.5 E-10	< 2.6 E-10	< 4.0 E-10	< 3.0 E-10
Cm-242	< 1.1 E-10	< 6.1 E-11	< 1.7 E-10	< 6.6 E-11
Cm-243/244	< 2.0 E-10	< 6.1 E-11	< 1.2 E-10	< 9.4 E-11

The error given is the probable counting error with a 95% confidence level. Less than (<), value is based on a 4.66 sigma counting error for the background sample.

Table E-4.5b. Mississippi River surface water and bottom sediment, collected 11/19/2009. Analyses prior to dredging.

Sample	Isotope	Activity (uCi/sample)	Activity (uCi/g)	H-3*** Activity (pCi/L)
SLUDGE*				
PI Marina	Be-7 Cs-137 K-40 H-3	9.04E-4 1.69E-4 1.69E-2	4.80E-8	48
Approach Canal #1	K-40 H-3	3.22E-2		91
Approach Canal #2	Be-7 K-40 H-3	1.23E-3 2.39E-2		50
Sturgeon Lake 1	K-40 H-3	2.07E-2		33
Sturgeon Lake 2	Cs-137 K-40 H-3	1.06E-4 2.42E-2	2.52E-8	43
Diamond Bluff	Be-7 K-40 H-3	8.44E-4 3.59E-2		22
WATER**				
PI Marina	H-3			20
Approach Canal	H-3			28
Sturgeon Lake	H-3			42
Diamond Bluff	H-3			27
	—			

* Sludge samples were counted in a 3 liter marinelli for 2000 seconds for gamma emitters at the Prairie Island Plant.
** Water samples were counted in a 1 liter bottle for 2000 seconds for gamma emitters at the Prairie Island Plant.
*** Tritium analyses were performed by the University of Waterloo Laboratory.



Survey by Johnson & Scofield Inc
November 21, 2007

Well	North	East	Top of Riser Pipe Elev
MW-4	592236	2355090	693.02
MW-5	592201	2356566	686.83
MW-6	591642	2357597	682.33
MW-7	593685	2355714	695.54
MW-8	593944	2355654	697.47
P-10	593538	2355497	693.16
P-11	594949	2355297	698.19
P-2	594449	2354002	697.72
P-3	592998	2353997	698.19
P-5	594002	2354501	695.51
P-6	595250	2354802	699.3
P-7	594449	2355235	697.97
PZ-1	596790	2354934	682.91
PZ-2	596743	2352589	689.05
PZ-4	594262	2352598	698.53
PZ-5	591502	2356299	695.93
PZ-7	594469	2356158	697.85
PZ-8	595471	2353662	696.52