NMC
Committed to Nuclear Excellence

Mano K. Nazar
Site Vice President
Prairie Island Nuclear Generating Plant
Operated by Nuclear Management Company, LLC
1717 Wakonade Dr. East • Welch MN 55089

May 15, 2002

Prairie Island Technical
Specifications 6.6.B

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60
72-10 SNM-2506

2001 Annual Radiological Environmental Monitoring Report

In accordance with the Prairie Island Nuclear Generating Plant Technical Specifications, Appendix A to Operating License DPR-42 and DPR-60, and in accordance with the Prairie Island Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License DNM-2506, we are submitting one copy of the Annual Radiological Environmental Monitoring Report covering the period January 1, 2001 through December 31, 2001.

Please contact us if you have any questions related to the information we have provided.

Mano K. Nazar
Site Vice President
Prairie Island Nuclear Generating Plant

c: Regional Administrator, III, NRC
NRC Region III
Attn: Dr. John House
NRC Project Manager
Director of NMSS
Sr. Resident Inspector, NRC
State of Minnesota
Attn: Tim Donakowski

Attachment: Annual report to the United States Nuclear Regulatory Commission, Radiation Environmental Monitoring Program, January 1, 2001 through December 31, 2001.

IE25

Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.

700 Landwehr Road • Northbrook, IL 60062-2310
ph. (847) 564-0700 • fax (847) 564-4517

XCEL ENERGY CORPORATION

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

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

ANNUAL REPORT TO THE UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiation Environmental Monitoring Program

January 1 to December 31, 2001

Prepared under Contract by

ENVIRONMENTAL, Inc.
MIDWEST LABORATORY

Project No. 8010

Approved: _____

Bronia Grob, M.S.
Laboratory Manager

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 Nuclear Management Company, LLC for XCEL Energy Corporation. The report was prepared by Environmental, Inc., Midwest Laboratory.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This report summarizes and interprets results of the Radiation 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, 2001. 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, 2002b) 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 Nuclear Management Company, LLC. 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 Radiation Environmental Monitoring Program (REMP) required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Prairie Island Nuclear Generating Plant and the Independent Spent Fuel Storage Installation (ISFSI) is described. Results for 2001 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 RADIATION ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.1 Program Design and Data Interpretation

The purpose of the Radiation 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 also 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 radiation 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, 2001). 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. Also, airborne iodine is collected by continuous pumping through charcoal filters at all of these locations. Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. A quarterly composite of the particulate filters from each location is gamma-scanned on an HPGe detector. 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. Also, a complete emergency set of TLDs for the inner ring, outer ring and special interest locations are placed in the field at the same time as regular sets. The emergency set is returned to EIML quarterly for annealing and repackaging.

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 five farms (four indicator 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) No air particulate/air iodine samples were available from location P-1 for the collection date of 09-25-01, due to sampler pump failure.

Deviations from the program are summarized in Table 5.3.

3.4 Laboratory Procedures

All iodine-131 analyses in milk and drinking water were made by using a sensitive radiochemical procedure which involves separation of the element by use of an ion-exchange resin and subsequent beta counting. All gamma-spectroscopic analyses were performed with HPGe detectors. Levels of airborne iodine-131 in charcoal samples were measured by gamma spectrometry.

Levels of iodine-131 in cabbage were determined by gamma spectrometry.

Tritium levels were determined by liquid scintillation technique.

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

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

3.5 Program Modifications

A new milk location was added to the program in 2001. The Rother Farm (P-42, 4.3 mi. @ 264°), replaced the Born Farm, (P-39) in May of 2001.

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 radiation 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 radiation environmental monitoring program should sampling locations change within the 5 mile radius from the plant.

The 2001 Land Use Census was completed in October, 2001. There were no changes in any of the highest D/Q locations for dairy, nearest residence, or garden sites in 2001. The critical receptor location did not change in 2001, based on the results of the land use census.

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 2001. The last reported test was conducted on October 16, 1980 by the People's Republic of China. There were no reported accidents involving a release to the environment at nuclear reactor facilities in 2001.

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 preoperational 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 are below detection limits. 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 in 2001.

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 15.9 mR/91 days at inner ring locations to 17.4 mR/91 days at outer ring locations. The mean at special locations was 15.9 mR/91 days and 17.2 mR/91 days at the control location. The dose rates measured at the inner and outer ring and the control locations were similar to those observed from 1985 through 2000. The results are tabulated below. No plant effect on ambient gamma radiation was indicated (Figure 5-1).

Year	Average (Inner and Outer Rings)	Control
1985	14.0	15.3
1986	17.1	17.3
1987	16.9	17.0
1988	15.4	16.0
1989	16.5	16.7
1990	15.9	16.3
1991	14.9	14.5
1992	16.3	14.8
1993	15.9	15.4
1994	15.2	16.0
1995	15.6	16.6
1996	14.8	16.4
1997	15.1	16.0
1998	16.7	17.3
1999	16.6	17.5
2000	17.0	17.1
2001	16.8	17.2

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 measured 77.6 mR/91 days inside the ISFSI earth berm and 19.8 mR/91 days outside the ISFSI earth berm. Two additional casks were placed on the ISFSI pad in 2001 for a total of fourteen loaded casks. 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. The 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 16.1 and 15.2 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

The annual gross beta concentration in airborne particulates for both indicator and control locations averaged 0.023 pCi/m^3. These averages were similar to average means reported from 1985 through 2000. The results are tabulated below. The data for 1986 does not include the results from May 19 to June 9, 1986, which were influenced by the accident at Chernobyl. (Figure 5-2).

Year	Average of Indicators	Control
	Concentration (pCi/m^3)	
1985	0.025	0.025
1986	0.024	0.029
1987	0.024	0.023
1988	0.030	0.030
1989	0.028	0.027
1990	0.024	0.023
1991	0.025	0.025
1992	0.023	0.021
1993	0.022	0.019
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

Average annual gross beta concentrations in airborne particulates.

A spring peak in beta activity had been observed almost annually for many years (Wilson *et al.*, 1969). It had been attributed to fallout of nuclides from the stratosphere (Gold *et al.*, 1964). It was pronounced in 1981, occurred to a lesser degree in 1982, and has not occurred since 1983. The highest averages for gross beta occur during the months of January and December, and the first and fourth quarters, as in 1985 through 2001.

Two pieces of evidence indicate conclusively that the elevated activity observed during the winter months was not attributable to the Plant operation. In the first place, elevated activity of similar size occurred simultaneously at both indicator and control locations. Secondly, an identical pattern was observed at the Monticello Nuclear Generating Plant, about 100 miles distant from the Prairie Island Nuclear Generating Plant (Xcel Energy Corp., 2002a).

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

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.07 pCi/m^3 in all samples. There was no indication of a plant effect.

Milk

Iodine-131 results were below the detection limit of 1.0 pCi/L in all samples. Cs-137 results were below the LLD level of 15 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 2001 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 182 pCi/L in all samples.

Gross beta concentrations averaged 8.3 pCi/L throughout the year, ranging from 5.2 – 12.1 pCi/L. These concentrations were similar to or slightly higher than levels observed from 1985 through 1999, but less than the average measured in 2000. 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 2001 data of any effect of plant operation.

Year		Gross Beta (pCi/L)
1985		7.1
1986		6.8
1987		7.9
1988		8.0
1989		7.0
1990		7.0
1991		8.0
1992		7.6
1993		7.5
1994		5.8
1995		3.9
1996		6.3
1997		5.1
1998		5.4
1999		5.3
2000		10.1
2001		8.3

Average annual concentrations; Gross beta in drinking water.

River Water

In one quarterly (4^{th} quarter) composite of downstream river water, tritium was measured at a concentration of 344 pCi/L. This is well below the Environmental Protection Agency's drinking water standard of 20,000 pCi/L. In all other upstream and downstream collections, quarterly composite tritium levels were below the LLD level of 184 pCi/L. Gamma-emitting isotopes were below detection limits in all samples.

Well Water

Tritium was detected in one quarterly (4th quarter) well water composite (P-24, Suter), at a concentration of 240 pCi/L. This is well below the Environmental Protection Agency's drinking water standard of 20,000 pCi/L. At the control well P-41, Huppert Farm and the three indicator wells (P-8, Community Center, P-6, Lock and Dam No. 3, P-9, Plant Well No. 2) no tritium was detected above the LLD level of 181 pCi/L.

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

Crops

Two 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 0.009 pCi/g wet weight in both 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.

The field sampling personnel conducted an annual land use survey and found that there was 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 samples were collected in May and September, 2001 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

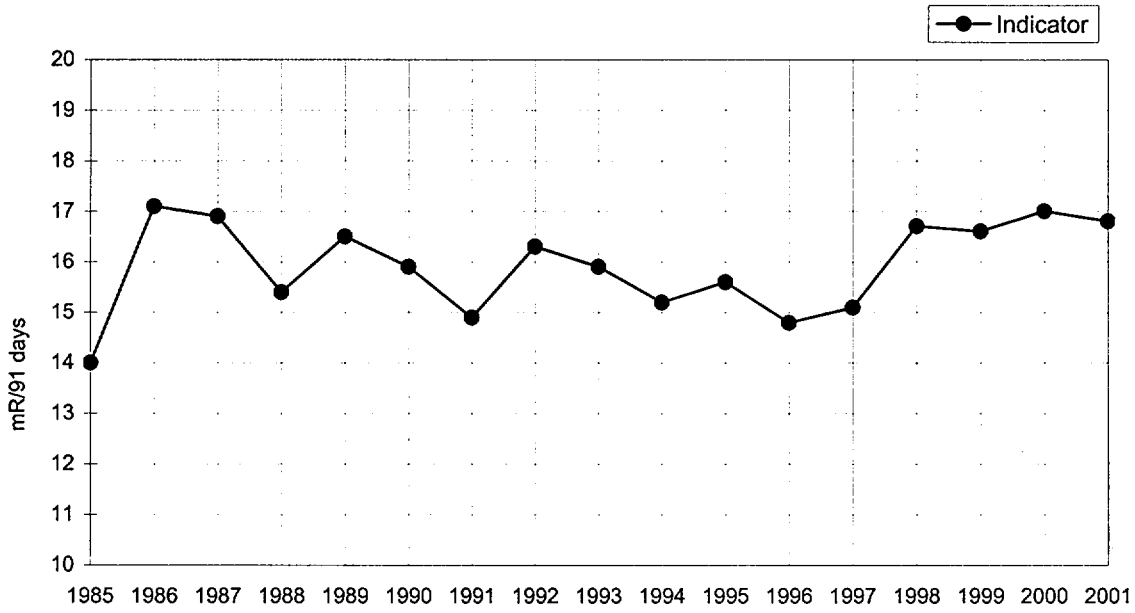
Aquatic insects (invertebrates) or periphyton were collected in June and September, 2001. All gamma-emitting isotopes were below their respective detection limits. There was no indication of any plant effect.

Bottom and Shoreline Sediments

Sediment collections were made in June and September, 2001 and analyzed for gamma-emitting isotopes. All other gamma-emitting isotopes, excepting naturally-occurring potassium-40, were below their respective LLDs. No plant effect was indicated.

5.0 FIGURES AND TABLES

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



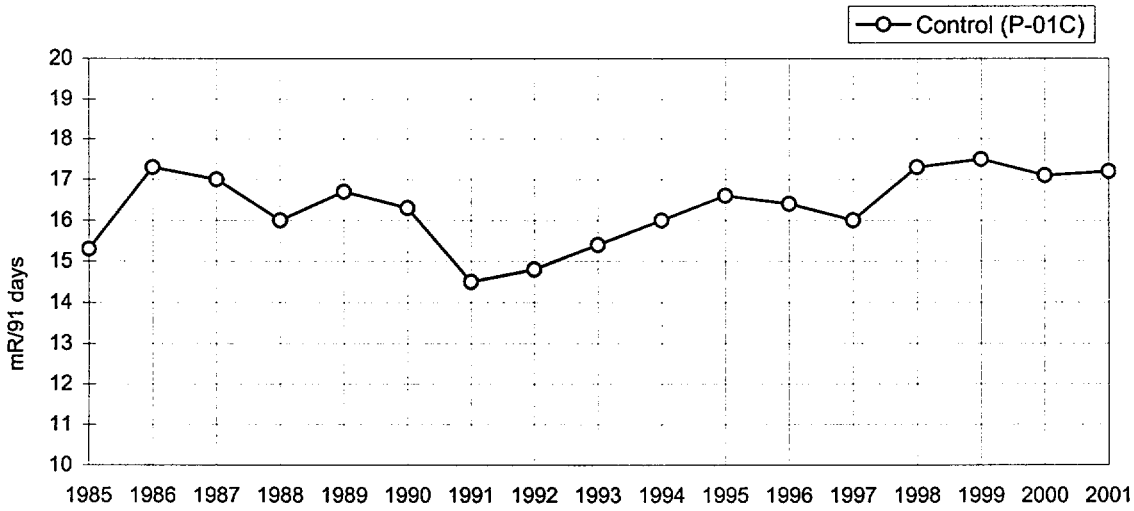
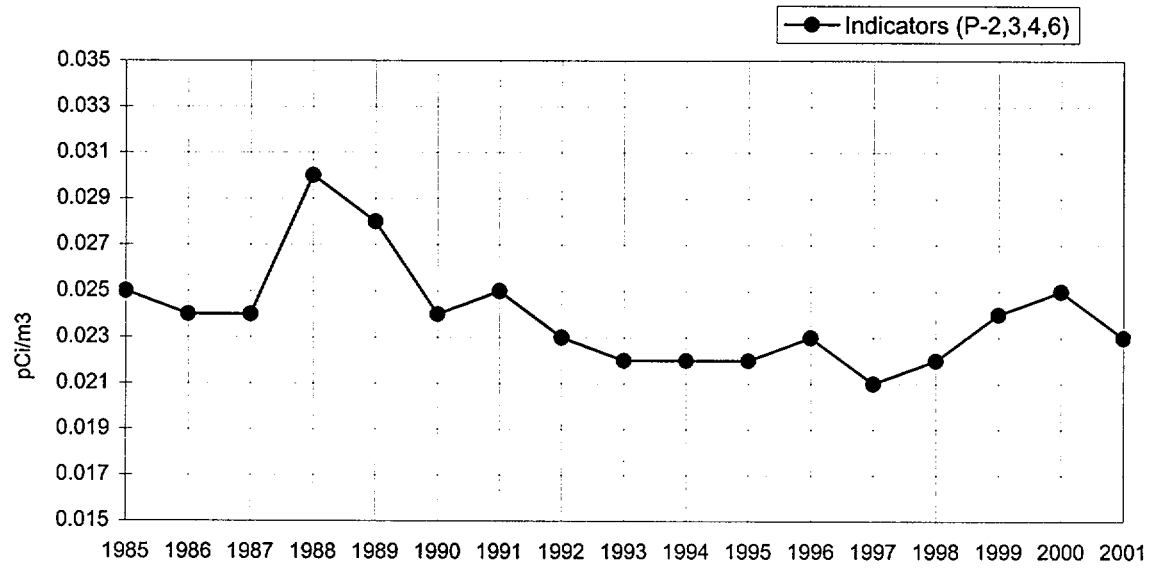
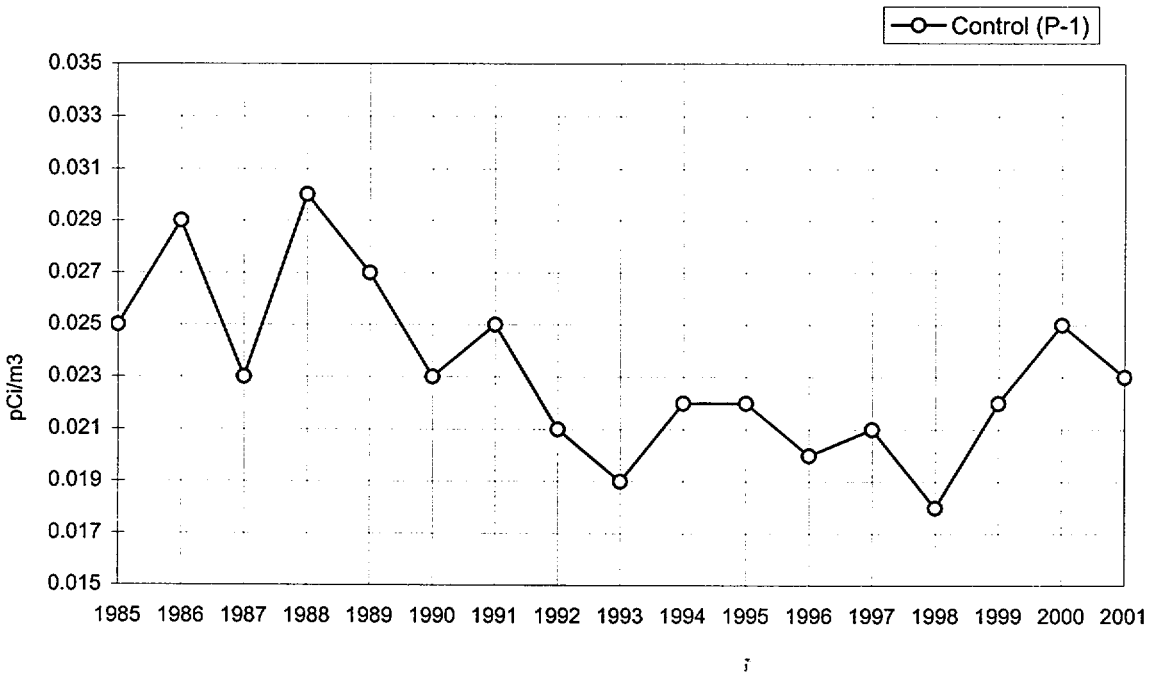


Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.





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	5	P-14, P-18, P-37, P-42 P-41 [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-41 (C)	G/Q	H-3, GS
Edible cultivated crops - leafy green vegetables	2	P-38(C), P-24	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 5.2. 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).

PRAIRIE ISLAND

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-14		Gustafson Farm	M	2.3 mi @ 173°/S
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	VE, WW	0.6 mi @ 158°/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-41	C	Huppert Farm	M, WW	13.8 mi @ 354°/N
P-42		Rother Farm	M	4.3 mi. @ 264°/W
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 Hauschbilt 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]	Approximate 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	Beta, I-131	P-01	9/25/01	Air sampler # 4019, motor running, but not pumping.	Replaced with # 5071.

Table 5.4 Radiological Environmental Monitoring Program Summary

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, 2001

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[f] 40	77.0	15.9 (40/40) (12.1-18.5)	P-07A 0.4 mi @ 268° /W	17 (4/4) (14.8-18.5)	(See Control below.)	0
TLD (Outer Ring, 4-5 mi. distant) mR/91 days)	Gamma[f] 60	3.0	17.4 (60/60) (11.9-22.5)	P-02B, Roy Kinneman, 4.8 mi @ 17° /NNE	20.3 (4/4) (17.1-22.5)	(See Control below.)	0
TLD (Special Interest Areas) mR/91 days)	Gamma[f] 32	3.0	15.9 (32/32) (11.4-21.7)	P-03S, Gustafson Farm, 2.2 mi @ 173° /S	18.6 (4/4) (14.3-20.8)	(See Control below.)	0
TLD (Control) mR/91 days)	Gamma[f] 4	3.0	None	P-01C, R. Kinneman, 11.1 mi @ 331° /NNW	17.2 (4/4) (14.7-18.8)	17.2 (4/4) (14.7-18.8)	0
Airborne Particulates (pCi/m^3)	GB 259	0.005	0.023 (208/208) (0.009-0.052)	P-06, Air Station 1.6 mi @ 129° /SE	0.024 (52 /52) (0.009-0.048)	0.023 (51/51) (0.007-0.057)	0
	GS 20						
	Be-7	0.015	0.058 (16/16) (0.037-0.077)	P-06, Air Station 1.6 mi @ 129° /SE	0.064 (4/4) (0.049-0.077)	0.056 (4/4) (0.042-0.074)	0
	Mn-54	0.0007	< LLD	-	-	< LLD	0
	Co-58	0.0008	< LLD	-	-	< LLD	0
	Co-60	0.0008	< LLD	-	-	< LLD	0
	Zn-65	0.0013	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.0011	< LLD	-	-	< LLD	0
	Ru-103	0.0010	< LLD	-	-	< LLD	0
	Ru-106	0.0082	< LLD	-	-	< LLD	0
	Cs-134	0.0008	< LLD	-	-	< LLD	0
	Cs-137	0.0006	< LLD	-	-	< LLD	0
	Ba-La-140	0.0019	< LLD	-	-	< LLD	0
	Ce-141	0.0017	< LLD	-	-	< LLD	0
	Ce-144	0.0041	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m^3)	I-131 259	0.07	< 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
Reporting Period: January-December, 2001
(County, State)

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Milk (pCi/L)	I-131 85	1.0	< LLD	-	-	< LLD	0
	GS 85						
	K-40	200	1431 (67/67) (1227-1695)	P-14, Gustafson Farm 2.3 mi @ 173° /S	1500 (18 /18) (1401-1642)	1445 (18/18) (1309-1633)	0
	Cs-134	15	< LLD	-	-	< LLD	0
	Cs-137	15	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
River Water (pCi/L)	H-3 8	184	344 (1/4)	P-6, Lock and Dam #3 1.6 mi @ 129° /SE	344 (1/4)	< LLD	0
	GS 24						
	Mn-54	15	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	15	< LLD	-	-	< LLD	0
	Co-60	15	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	15	< LLD	-	-	< LLD	0
	Cs-137	18	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	59	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

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, 2001

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	8.3 (12/12) (5.2-12.1)	P-11, Red Wing S.C. 3.3 mi @ 158° /SSE	8.3 (12/12) (5.2-12.1)	None	0
	I-131 12	1.0	< LLD	-	-	None	0
	H-3 4	182	< LLD	-	-	None	0
	GS 12						
	Mn-54	15	< LLD	-	-	None	0
	Fe-59	30	< LLD	-	-	None	0
	Co-58	15	< LLD	-	-	None	0
	Co-60	15	< LLD	-	-	None	0
	Zn-65	30	< LLD	-	-	None	0
	Zr-Nb-95	15	< LLD	-	-	None	0
	Cs-134	10	< LLD	-	-	None	0
	Cs-137	18	< LLD	-	-	None	0
	Ba-La-140	15	< LLD	-	-	None	0
	Ce-144	56	< LLD	-	-	None	0
Well Water (pCi/L)	H-3 20	181	240 (1/20)	-	-	< LLD	0
	GS 20						
	Mn-54	15	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	15	< LLD	-	-	< LLD	0
	Co-60	15	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	18	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	52	< LLD	-	-	< LLD	0
Crops - Cabbage (pCi/gwet)	I-131 2	0.011	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

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, 2001

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Fish	GS 4						
(pCi/g wet)	K-40	0.10	2.89 (2/2) (2.69-3.08)	P-19, Upstream 1.3 mi. @ 0° /N	3.11 (2/2) (3.08-3.14)	3.11 (2/2) (3.08-3.14)	0
	Mn-54	0.017	< LLD	-	-	< LLD	0
	Fe-59	0.068	< LLD	-	-	< LLD	0
	Co-58	0.017	< LLD	-	-	< LLD	0
	Co-60	0.013	< LLD	-	-	< LLD	0
	Zn-65	0.049	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.028	< LLD	-	-	< LLD	0
	Cs-134	0.016	< LLD	-	-	< LLD	0
	Cs-137	0.014	< LLD	-	-	< LLD	0
	Ba-La-140	0.11	< LLD	-	-	< LLD	0
Invertebrates	GS 4						
(pCi/g wet)	Be-7	0.67	< LLD	-	-	< LLD	0
	K-40	1.47	< LLD	-	-	< LLD	0
	Mn-54	0.052	< LLD	-	-	< LLD	0
	Co-58	0.066	< LLD	-	-	< LLD	0
	Co-60	0.055	< LLD	-	-	< LLD	0
	Zn-65	0.13	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.10	< LLD	-	-	< LLD	0
	Ru-103	0.060	< LLD	-	-	< LLD	0
	Ru-106	0.54	< LLD	-	-	< LLD	0
	Cs-134	0.059	< LLD	-	-	< LLD	0
	Cs-137	0.054	< LLD	-	-	< LLD	0
	Ba-La-140	0.51	< LLD	-	-	< LLD	0
	Ce-141	0.09	< LLD	-	-	< LLD	0
	Ce-144	0.21	< 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	Reporting Period	January-December, 2001
	(County, State)		

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Bottom and Shoreline Sediments (pCi/g dry)	GS 6						
	Be-7	0.24	< LLD	-	-	< LLD	0
	K-40	0.10	7.91 (4/4) (7.12-8.70)	P-20, Upstream 0.9 mi. @ 45° /NE	9.07 (4/4) (8.69-9.45)	9.07 (4/4) (8.69-9.45)	0
	Mn-54	0.023	< LLD	-	-	< LLD	0
	Co-58	0.023	< LLD	-	-	< LLD	0
	Co-60	0.017	< LLD	-	-	< LLD	0
	Zn-65	0.052	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.037	< LLD	-	-	< LLD	0
	Ru-103	0.023	< LLD	-	-	< LLD	0
	Ru-106	0.15	< LLD	-	-	< LLD	0
	Cs-134	0.030	< LLD	-	-	< LLD	0
	Cs-137	0.025	< LLD	-	-	< LLD	0
	Ba-La-140	0.087	< LLD	-	-	< LLD	0
	Ce-141	0.040	< LLD	-	-	< LLD	0
	Ce-144	0.10	< 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.

6.0 REFERENCES CITED

Arnold, J. R. and H. A. Al-Salih. 1955. Beryllium-7 Produced by Cosmic Rays. Science 121: 451-453.

Eisenbud, M. 1963. Environmental Radioactivity, McGraw-Hill, New York, New York, pp. 213, 275 and 276.

Environmental, Inc., Midwest Laboratory. 2002a. Radiation Environmental Monitoring for Monticello Nuclear Generating Plant, Complete Analysis Data Tables, January - December, 2000-2001.

_____ 2002b. Radiation Environmental Monitoring for Prairie Island Nuclear Generating Plant, Complete Analysis Data Tables, January - December, 2000-2001.

_____ 2000. Quality Assurance Program Manual, Rev. 0, 11 October 2000.

_____ 2000. Quality Control Procedures Manual, Rev. 0, 21 September 2000.

_____ 2000. Quality Control Program, Rev. 0, 12 October 2000.

Gold, S., H. W. Barkhau, B. Shlein, and B. Kahn, 1964. Measurement of Naturally Occurring Radionuclides in Air, in the Natural Environment, University of Chicago Press, Chicago, Illinois, 369-382.

Hazleton Environmental Sciences Corporation. 1979a to 1983a. Radiation Environmental Monitoring for Monticello Nuclear Generating Plant, Complete Analysis Data Tables, January - December 1978 through 1982.

Hazleton Environmental Sciences Corporation. 1979b to 1983b. Radiation Environmental Monitoring for Prairie Island Nuclear Generating Plant, Complete Analysis Data Tables, January - December 1978 through 1982.

Hohenemser, C. M. Deicher, A. Ernst, H. Hofsass, G. Lindner, E. Racknagel. 1986. "Chernobyl," Chemtech, October 1986, pp. 596-605.

National Center for Radiological Health, 1968. Radiological Health and Data Reports, Vol. 9, No. 12, 730-746.

Northern States Power Company. 1972. Prairie Island Nuclear Generating Plant, Environmental Monitoring and Ecological Studies Program, January 1, 1971 to December 31, 1971. Minneapolis, Minnesota.

_____ 1973. Prairie Island Nuclear Generating Plant, Environmental Monitoring and Ecological Studies Program, January 1, 1972 to December 31, 1972. Minneapolis, Minnesota.

_____ 1974. Prairie Island Nuclear Generating Plant, Environmental Monitoring and Ecological Studies Program, Volume 1, January 1, 1973 to December 31, 1973. Minneapolis, Minnesota.

_____ 1979 to 1983. Prairie Island Nuclear Generating Plant, Annual Radiation Environmental Monitoring Report to the U.S. Nuclear Regulatory Commission, January 1 to December 31, 1978 through 1982 (prepared by Hazleton Environmental Sciences). Minneapolis, Minnesota.

_____ 1984 to 2000. Prairie Island Nuclear Generating Plant, Annual Radiation Environmental Monitoring Report to the U.S. Nuclear Regulatory Commission, January 1 to December 31, 1983 through 1999 (prepared by Teledyne Brown Engineering Environmental Services, Midwest Laboratory). Minneapolis, Minnesota.

6.0 REFERENCES CITED (continued)

Teledyne Brown Engineering Environmental Services, Midwest Laboratory. 1984a to 2000a. Radiation Environmental Monitoring for Monticello Nuclear Generating Plant, Complete Analysis Data Tables, January - December, 1983 through 1999.

_____ 1984b to 2000b. Radiation Environmental Monitoring for Prairie Island Nuclear Generating Plant, Complete Analysis Data Tables, January - December, 1983 through 1999.

U.S. Dep't of Energy 1997 HASL-300, Edition 28, Procedures Manual, Environmental Measurements Laboratory, New York, NY.

U.S. Environmental Protection Agency . 1980. Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Cincinnati, Ohio (EPA-600/4-80-032).

_____1984. Eastern Environmental Radiation Facility, Radiochemistry Procedures Manual, Montgomery, Alabama (EPA-520/5-84-006).

Wilson, D. W., G. M. Ward and J. E. Johnson. 1969. In Environmental Contamination by Radioactive Materials, International Atomic Energy Agency. p.125.

Xcel Energy Corporation. 2002. Prairie Island Nuclear Generating Plant, Annual Radiation Environmental Monitoring Report to the U.S. Nuclear Regulatory Commission, January 1 to December 31, 2000-2001 (prepared by Environmental, Inc., Midwest Laboratory). Northbrook, Illinois

Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.

700 Landwehr Road • Northbrook, IL 60062-2310
(847) 564-0700 fax (847) 564-4517

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, 2001 through December, 2001

Appendix A

Interlaboratory Comparison Program Results

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

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

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

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

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

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

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

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

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

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

Attachment A lists acceptance criteria for "spiked" samples.

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

ATTACHMENT A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

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

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

[b] Laboratory limit.

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory result[c]	ERA Result[d]	Control Limits
STW-897	WATER	Jan, 2001	Gr. Alpha	31.9 ± 2.1	45.7 ± 11.4	25.9 - 65.5
STW-897	WATER	Jan, 2001	Gr. Beta	25.3 ± 2.7	16.7 ± 5.0	8.0 - 25.4
STW-900	WATER	Feb, 2001	I-131	27.2 ± 0.8	28.3 ± 3.0	23.1 - 33.5
STW-902	WATER	Feb, 2001	Ra-226	4.0 ± 0.1	4.7 ± 0.7	3.4 - 5.9
STW-902	WATER	Feb, 2001	Ra-228	13.8 ± 0.4	14.4 ± 3.6	8.2 - 20.6
STW-902	WATER	Feb, 2001	Uranium	17.0 ± 0.3	20.4 ± 3.0	15.2 - 25.6
STW-903	WATER	Mar, 2001	H-3	17,400.0 ± 69.7	17,800.0 ± 1,780.0	14,700. - 20,900.0
STW-917	WATER	Apr, 2001	Gr. Alpha	57.4 ± 3.5	56.0 ± 14.0	31.8 - 80.2
STW-917	WATER	Apr, 2001	Ra-226	13.5 ± 0.4	17.7 ± 2.7	13.1 - 22.3
STW-917	WATER	Apr, 2001	Ra-228	10.1 ± 0.6	8.1 ± 2.0	4.6 - 11.6
STW-917	WATER	Apr, 2001	Uranium	14.2 ± 0.2	15.6 ± 3.0	10.4 - 20.8
STW-918	WATER	Apr, 2001	Co-60	27.9 ± 1.4	26.4 ± 5.0	17.7 - 35.1
STW-918	WATER	Apr, 2001	Cs-134	16.0 ± 0.4	16.9 ± 5.0	8.2 - 25.6
STW-918	WATER	Apr, 2001	Cs-137	195.4 ± 1.5	186.0 ± 9.3	170.0 - 202.0
STW-918	WATER	Apr, 2001	Gr. Beta	340.0 ± 51.0	343.0 ± 1.7	252.0 - 428.0
STW-918	WATER	Apr, 2001	Sr-89	62.8 ± 5.7	64.1 ± 5.0	55.5 - 72.8
STW-918	WATER	Apr, 2001	Sr-90	34.2 ± 1.6	33.8 ± 5.0	25.1 - 42.5
STW-919	WATER	Jun, 2001	Ba-133	37.8 ± 1.2	36.0 ± 5.0	27.3 - 44.7
STW-919	WATER	Jun, 2001	Co-60	49.9 ± 0.7	46.8 ± 5.0	38.1 - 55.5
STW-919	WATER	Jun, 2001	Cs-134	16.0 ± 1.4	15.9 ± 5.0	7.2 - 24.6
STW-919	WATER	Jun, 2001	Cs-137	208.0 ± 1.7	197.0 ± 9.9	180.0 - 214.0
STW-919	WATER	Jun, 2001	Zn-65	37.8 ± 0.7	36.2 ± 5.0	27.5 - 44.9
STW-920	WATER	Jun, 2001	Ra-226	14.6 ± 0.4	15.4 ± 2.3	11.4 - 19.4
STW-920	WATER	Jun, 2001	Ra-228	6.2 ± 0.2	4.5 ± 1.1	2.6 - 6.5
STW-920	WATER	Jun, 2001	Uranium	49.0 ± 1.0	55.7 ± 5.6	46.1 - 65.3
STW-921	WATER	Jul, 2001	Sr-89	19.8 ± 1.5	31.2 ± 5.0	22.5 - 39.9
Delay in processing may have attributed to deviation. Result of reanalysis; Sr-89, 35.3 ± 4.4 pCi/L. Sr-90, 25.0 ± 2.8 pCi/L.						
STW-921	WATER	Jul, 2001	Sr-90	26.3 ± 1.1	25.9 ± 5.0	17.2 - 34.6
STW-922	WATER	Jul, 2001	Gr. Alpha	23.3 ± 1.9	17.8 ± 5.0	9.1 - 26.5
STW-922	WATER	Jul, 2001	Gr. Beta	48.5 ± 4.6	53.0 ± 10.0	35.7 - 70.3
STW-924	WATER	Aug, 2001	H-3	2,680.0 ± 41.9	2,730.0 ± 356.0	2,110.0 - 3,350.0
STW-931	WATER	Sep, 2001	Ra-226	10.9 ± 0.2	10.8 ± 1.6	8.0 - 13.6
STW-931	WATER	Sep, 2001	Ra-228	9.7 ± 1.1	9.0 ± 2.2	5.1 - 12.8
STW-931	WATER	Sep, 2001	Uranium	11.2 ± 0.1	13.1 ± 3.0	7.9 - 18.3
STW-932	WATER	Oct, 2001	I-131	7.7 ± 0.3	7.7 ± 2.0	4.2 - 11.2
STW-933	WATER	Oct, 2001	Gr. Alpha	82.2 ± 4.0	97.5 ± 24.4	55.3 - 140.0
STW-933	WATER	Oct, 2001	Ra-226	9.5 ± 1.2	10.8 ± 1.6	8.0 - 13.6

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory result[c]	ERA Result[d]	Control Limits
STW-933	WATER	Oct, 2001	Ra-228	17.0 ± 0.8	15.6 ± 3.9	8.9 - 22.4
STW-933	WATER	Oct, 2001	Uranium	32.2 ± 1.4	37.2 ± 3.7	30.7 - 43.6
STW-934	WATER	Oct, 2001	Co-60	82.4 ± 0.9	78.4 ± 5.0	69.7 - 87.1
STW-934	WATER	Oct, 2001	Cs-134	52.2 ± 1.3	54.1 ± 5.0	45.4 - 62.8
STW-934	WATER	Oct, 2001	Cs-137	39.4 ± 0.6	37.9 ± 5.0	26.3 - 43.7
STW-934	WATER	Oct, 2001	Gr. Beta	166.0 ± 7.1	192.0 ± 28.8	142.0 - 242.0
STW-934	WATER	Oct, 2001	Sr-89	12.8 ± 0.8	16.7 ± 5.0	8.0 - 25.4
STW-934	WATER	Oct, 2001	Sr-90	6.8 ± 0.7	7.7 ± 5.0	-1.0 - 16.4
STW-935	WATER	Oct, 2001	Gr. Alpha	63.5 ± 2.5	64.0 ± 16.0	36.5 - 91.5
STW-935	WATER	Oct, 2001	Gr. Beta	26.0 ± 1.2	21.5 ± 5.0	12.8 - 30.2
STW-938	WATER	Nov, 2001	Ba-133	66.7 ± 1.2	69.3 ± 6.9	57.5 - 81.1
STW-938	WATER	Nov, 2001	Co-60	59.3 ± 0.6	59.7 ± 5.0	51.0 - 68.4
STW-938	WATER	Nov, 2001	Cs-134	86.7 ± 1.5	93.9 ± 5.0	85.2 - 103.0
STW-938	WATER	Nov, 2001	Cs-137	45.0 ± 1.0	42.0 ± 5.0	33.3 - 50.7
STW-938	WATER	Nov, 2001	Zn-65	80.7 ± 0.6	77.3 ± 7.7	63.9 - 90.7

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

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

[c] Unless otherwise indicated, the laboratory 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.

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

Lab Code	TLD Type	Date	Measurement	mR Known Value	mR Lab result ± 2 Sigma	mR Control Limits
Teledyne Brown Engineering						
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #1	17.8	14.4 ± 0.2	12.46 - 23.14
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #2	35.5	32.4 ± 0.1	24.85 - 46.15
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #3	62.2	61.8 ± 0.9	43.54 - 80.86
Teledyne Brown Engineering						
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #1	17.8	21.3 ± 0.3	12.46 - 23.14
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #2	35.5	40.1 ± 1.9	24.85 - 46.15
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #3	62.2	69.9 ± 3.5	43.54 - 80.86
Chips and cards irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March of 2000.						
12th International Intercomparison						
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field	161.0	184.9 ± 1.9	112.70 - 209.30
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field 1	548.0	502.2 ± 1.7	383.60 - 712.40
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field 2	391.0	412.0 ± 2.9	273.70 - 508.30
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Field 3	623.0	643.2 ± 2.9	436.10 - 809.90
022-1	$CaSO_4$: Dy Cards	Jun, 2000	Lab, 1	391.0	442.8 ± 2.5	273.70 - 508.30
Environmental, Inc.						
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #1	4.0	3.7 ± 0.1	2.79 - 5.17
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #1	4.0	3.4 ± 0.1	2.79 - 5.17
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #2	7.1	7.9 ± 0.2	4.95 - 9.19
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #2	7.1	7.6 ± 0.3	4.95 - 9.19
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #3	15.9	18.6 ± 0.4	11.13 - 20.67
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #3	15.9	19.6 ± 0.1	11.13 - 20.67
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #4	63.6	78.2 ± 1.2	44.53 - 82.69
2001-1	$CaSO_4$: Dy Cards	Dec, 2001	Reader 1, #4	63.6	79.9 ± 2.5	44.53 - 82.69

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPAP-477	Air Filter	Jan, 2001	Cs-137	1.76 ± 0.02	1.68	1.01 - 2.35
SPW-479	Water	Jan, 2001	H-3	54702.00 ± 644.00	54549.00	43639.20 - 65458.80
SPW-481	Water	Jan, 2001	Gr. Alpha	58.08 ± 2.79	69.14	34.57 - 103.71
SPW-481	Water	Jan, 2001	Gr. Beta	213.83 ± 3.07	220.26	198.23 - 242.29
SPW-482	Water	Jan, 2001	Gr. Alpha	51.77 ± 2.18	69.14	34.57 - 103.71
SPW-482	Water	Jan, 2001	Gr. Beta	202.48 ± 2.98	220.26	198.23 - 242.29
SPW-483	Water	Jan, 2001	Ra-226	20.11 ± 0.34	20.86	14.60 - 27.12
SPW-483	Water	Jan, 2001	Ra-228	10.55 ± 2.02	19.43	13.60 - 25.26
Sample was lost during analysis. Insufficient sample available to perform reanalysis.						
SPW-485	Water	Jan, 2001	Co-60	33.53 ± 3.40	31.13	21.13 - 41.13
SPW-485	Water	Jan, 2001	Cs-134	32.80 ± 2.54	30.81	20.81 - 40.81
SPW-485	Water	Jan, 2001	Cs-137	42.10 ± 5.60	36.00	26.00 - 46.00
SPW-485	Water	Jan, 2001	Sr-90	154.34 ± 3.49	137.66	110.13 - 165.19
SPAP-754	Air Filter	Jan, 2001	Gr. Beta	8.53 ± 0.02	7.88	-2.12 - 17.88
SPW-1037	Water	Feb, 2001	U-233/4	3.74 ± 0.10	4.17	2.50 - 5.84
SPW-1037	Water	Feb, 2001	U-238	3.81 ± 0.10	4.17	-7.83 - 16.17
SPW-1224	Water	Feb, 2001	Ra-226	21.25 ± 0.50	20.68	14.48 - 26.88
SPW-1224	Water	Feb, 2001	Ra-228	21.76 ± 2.65	19.27	13.49 - 25.05
SPW-1225	Water	Feb, 2001	Gr. Alpha	71.87 ± 3.07	69.14	34.57 - 103.71
SPW-1225	Water	Feb, 2001	Gr. Beta	36.30 ± 1.47	28.75	18.75 - 38.75
SPW-1272	Water	Feb, 2001	I-131	56.82 ± 0.71	63.05	50.44 - 75.66
SPW-1272	Water	Feb, 2001	I-131(g)	65.69 ± 10.21	63.05	53.05 - 73.05
SPVE-1274	Vegetation	Feb, 2001	I-131(g)	0.78 ± 0.05	0.76	0.45 - 1.06
SPCH-1276	Charcoal	Feb, 2001	I-131(g)	1.57 ± 0.05	1.58	0.95 - 2.21
SPMI-1270	Milk	Mar, 2001	Cs-134	31.89 ± 4.71	29.77	19.77 - 39.77
SPMI-1270	Milk	Mar, 2001	Cs-137	46.61 ± 8.81	35.90	25.90 - 45.90
The Cs-137 spike is suspect; A new cesium spike has been prepared. Reference to SPMI-3232.						
SPMI-1270	Milk	Mar, 2001	I-131(g)	81.92 ± 10.80	81.95	71.95 - 91.95
SPU-2901	Urine	Mar, 2001	H-3	51512.00 ± 1369.00	50189.00	40151.20 - 60226.80
SPW-2161	Water	Mar, 2001	Ra-228	29.92 ± 5.13	31.75	22.23 - 41.28
SPU-3128	Urine	Apr, 2001	H-3	2065.00 ± 408.00	2008.00	1317.37 - 2698.63
SPW-3129	Water	Apr, 2001	Gr. Alpha	37.94 ± 2.42	34.57	17.29 - 51.86

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a]		
				Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-3129	Water	Apr, 2001	Gr. Beta	117.83 ± 2.37	109.46	98.51 - 120.41
SPAP-3508	Air Filter	Apr, 2001	Gr. Beta	0.80 ± 0.01	0.78	-9.22 - 10.78
SPMI-3232	Milk	Apr, 2001	Cs-134	32.69 ± 6.50	33.96	23.96 - 43.96
SPMI-3232	Milk	Apr, 2001	Cs-137	44.20 ± 9.08	35.79	25.79 - 45.79
SPMI-3232	Milk	Apr, 2001	I-131	48.05 ± 0.90	56.68	45.34 - 68.02
SPMI-3232	Milk	Apr, 2001	I-131(g)	55.64 ± 11.39	56.68	46.68 - 66.68
SPMI-3232	Milk	Apr, 2001	Sr-90	143.77 ± 3.04	136.82	109.46 - 164.18
SPSO-3356	Soil	Apr, 2001	Co-60	18.49 ± 0.21	19.57	9.57 - 29.57
SPSO-3356	Soil	Apr, 2001	Cs-137	18.71 ± 0.24	16.61	6.61 - 26.61
SPAP-3359	Air Filter	Apr, 2001	Cs-137	1.80 ± 0.01	1.67	1.00 - 2.34
SPW-3376	Water	Apr, 2001	Co-60	48.17 ± 4.85	45.19	35.19 - 55.19
SPW-3376	Water	Apr, 2001	Cs-134	37.14 ± 3.90	33.96	23.96 - 43.96
SPW-3376	Water	Apr, 2001	Sr-90	159.84 ± 3.42	136.82	109.46 - 164.18
SPW-3377	Water	Apr, 2001	I-131	68.60 ± 2.63	85.02	68.02 - 102.02
SPW-3129/1	Water	May, 2001	Gr. Alpha	37.94 ± 2.42	34.57	17.29 - 51.86
SPW-3129/1	Water	May, 2001	Gr. Beta	117.83 ± 2.37	109.46	98.51 - 120.41
SPW-3129/2	Water	Jun, 2001	Gr. Alpha	34.42 ± 2.14	34.57	17.29 - 51.86
SPW-3129/2	Water	Jun, 2001	Gr. Beta	119.99 ± 2.45	109.46	98.51 - 120.41
SPVE-3303	Vegetation	Jun, 2001	I-131(g)	0.81 ± 0.03	0.86	0.51 - 1.20
SPSO-5701	Soil	Jul, 2001	Co-60	17.42 ± 0.19	19.05	9.05 - 29.05
SPSO-5701	Soil	Jul, 2001	Cs-137	16.03 ± 0.22	16.52	6.52 - 26.52
SPW-5779	Water	Jul, 2001	Co-60	250.05 ± 18.63	233.26	209.93 - 256.59
SPW-5779	Water	Jul, 2001	Cs-137	178.68 ± 19.89	175.91	158.32 - 193.50
SPW-5779	Water	Jul, 2001	Sr-90	72.12 ± 2.24	68.12	54.50 - 81.74
SPF-5781	Fish	Jul, 2001	Co-60	1.87 ± 0.08	1.79	1.07 - 2.51
SPF-5781	Fish	Jul, 2001	Cs-137	1.43 ± 0.07	1.39	0.83 - 1.95
SPW-5937	Water	Jul, 2001	H-3	51177.00 ± 631.00	50189.00	40151.20 - 60226.80
SPW-59441	Water	Jul, 2001	Ra-226	36.62 ± 1.74	34.46	24.12 - 44.80
SPW-59441	Water	Jul, 2001	Ra-228	41.46 ± 6.44	36.06	25.24 - 46.88
SPAP-5703	Air Filter	Jul, 2001	Cs-137	1.81 ± 0.02	1.67	1.00 - 2.34
SPW-3129/3	Water	Jul, 2001	Gr. Alpha	35.31 ± 3.04	34.75	17.38 - 52.13

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a]		
				Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-3129/3	Water	Jul, 2001	Gr. Beta	113.28 ± 3.65	109.46	98.51 - 120.41
SPMI-6145	Milk	Jul, 2001	Cs-137	188.45 ± 19.10	175.91	158.32 - 193.50
SPW-6604	Water	Jul, 2001	Gr. Alpha	35.36 ± 1.94	34.57	17.29 - 51.86
SPW-6604	Water	Jul, 2001	Gr. Beta	112.56 ± 2.46	108.82	97.94 - 119.70
SPW-9008	Water	Oct, 2001	H-3	48285.00 ± 606.10	50189.00	40151.20 - 60226.80
SPAP-9010	Air Filter	Oct, 2001	Cs-137	1.91 ± 0.01	1.67	1.00 - 2.34
SPW-10723	Water	Dec, 2001	U-233/4	40.12 ± 1.09	41.73	25.04 - 58.42
SPW-10723	Water	Dec, 2001	U-238	40.16 ± 1.09	41.73	29.21 - 54.25
SPAP-11550	Air Filter	Dec, 2001	Gr. Beta	1.58 ± 0.02	1.56	-8.44 - 11.56
SPW-11757	Water	Dec, 2001	Co-60	43.82 ± 3.14	41.36	31.36 - 51.36
SPW-11757	Water	Dec, 2001	Cs-134	24.11 ± 2.42	22.59	12.59 - 32.59
SPW-11757	Water	Dec, 2001	Cs-137	52.11 ± 4.40	50.89	40.89 - 60.89
SPMI-11759	Milk	Dec, 2001	Cs-134	28.03 ± 2.64	27.10	17.10 - 37.10
SPMI-11759	Milk	Dec, 2001	Cs-137	54.59 ± 5.08	50.89	40.89 - 60.89
SPF-11761	Fish	Dec, 2001	Cs-134	0.94 ± 0.02	0.90	0.54 - 1.26
SPF-11761	Fish	Dec, 2001	Cs-137	1.43 ± 0.04	1.43	0.86 - 2.00

[a] All results are in pCi/L, except for elemental potassium (K) in milk, which are in mg/L.; air filter samples, which are in pCi/Filter; and food products, which are in pCi/kg.
[b] Results are based on single determinations.
[c] Control limits are based on Attachment A, Page A2 of this report.

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

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Laboratory results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPAP-478	AIR FILTER	Jan 2001	Co-60	< 1.12		<100.0
SPAP-478	AIR FILTER	Jan 2001	Cs-134	< 1.66		<100.0
SPAP-478	AIR FILTER	Jan 2001	Cs-137	< 2.46		<100.0
SPW-480	WATER	Jan 2001	H-3	< 162.00	-1.86 ± 80.40	<200.0
SPW-484	WATER	Jan 2001	Gr. Alpha	< 0.68		<1.0
SPW-484	WATER	Jan 2001	Gr. Beta	< 1.35		<3.2
SPW-484	WATER	Jan 2001	Ra-226	< 0.02	0.03 ± 0.01	<1.0
SPW-484	WATER	Jan 2001	Ra-228	< 0.97	0.43 ± 0.50	<2.0
SPW-486	WATER	Jan 2001	Co-60	< 2.68		<10.0
SPW-486	WATER	Jan 2001	Cs-134	< 3.46		<10.0
SPW-486	WATER	Jan 2001	Cs-137	< 5.43		<10.0
SPW-486	WATER	Jan 2001	Sr-90	< 0.65	0.06 ± 0.31	<1.0
SPAP-755	AIR FILTER	Jan 2001	Gr. Beta	< 1.60	0.16 ± 0.90	<3.2
SPW-1038	WATER	Feb 2001	U-238	< 0.03		<1.0
SPW-1038	WATER	Feb 2001	U-238	< 0.00		<1.0
SPW-1223	WATER	Feb 2001	Gr. Alpha	< 0.46		<1.0
SPW-1223	WATER	Feb 2001	Gr. Beta	< 1.50		<3.2
SPW-1223	WATER	Feb 2001	Ra-226	< 0.02	0.03 ± 0.01	<1.0
SPW-1223	WATER	Feb 2001	Ra-228	< 0.95	0.45 ± 0.49	<2.0
SPMI-1268	MILK	Feb 2001	Cs-134	< 5.86		<10.0
SPMI-1268	MILK	Feb 2001	Cs-137	< 3.02		<10.0
SPMI-1268	MILK	Feb 2001	I-131(g)	< 7.46		<20.0
SPW-1271	WATER	Feb 2001	Co-60	< 1.06		<10.0
SPW-1271	WATER	Feb 2001	Cs-134	< 2.61		<10.0
SPW-1271	WATER	Feb 2001	Cs-137	< 2.37		<10.0
SPVE-1273	VEGETATION	Feb 2001	Cs-134	< 10.04		<100.0
SPVE-1273	VEGETATION	Feb 2001	Cs-137	< 6.00		<100.0
SPCH-1275	CHARCOAL CANISTER	Feb 2001	I-131(g)	< 0.01		<9.6
SPW-2164	WATER	Mar 2001	Ra-226	< 0.02	0.05 ± 0.01	<1.0
SPU-3126	URINE	Apr 2001	H-3	< 642.00	-66.00 ± 335.00	<200.0

2.0 ml. sample volume.

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPDW-3130	WATER	Apr 2001	Gr. Alpha	< 0.54	0.04 ± 0.38	<1.0
SPDW-3130	WATER	Apr 2001	Gr. Beta	< 1.46	0.67 ± 1.04	<3.2
SPMI-3233	MILK	Apr 2001	Cs-137	< 2.66		<10.0
SPMI-3233	MILK	Apr 2001	I-131	< 0.26	-0.06 ± 0.14	<0.5
SPMI-3233	MILK	Apr 2001	I-131(g)	< 3.91		<20.0
SPMI-3233	MILK	Apr 2001	Sr-89	< 0.79	-0.32 ± 0.79	<5.0
SPMI-3233	MILK	Apr 2001	Sr-90		1.18 ± 0.35	<1.0
Low levels of Sr-90 are still detected in the environment. A concentration of (1-5 pCi/L) in milk is not unusual.						
SPSO-3357	SOIL	Apr 2001	Cs-134	< 14.77		<100.0
SPSO-3357	SOIL	Apr 2001	Cs-137	< 11.72		<100.0
SPAP-3358	AIR FILTER	Apr 2001	Cs-137	< 0.55		<100.0
SPW-3375	WATER	Apr 2001	Co-60	< 2.90		<10.0
SPW-3375	WATER	Apr 2001	Cs-134	< 3.71		<10.0
SPW-3375	WATER	Apr 2001	I-131(g)	< 0.39	0.02 ± 0.22	<20.0
SPW-3375	WATER	Apr 2001	Sr-90	< 0.56	0.05 ± 0.27	<1.0
SPDW-3130	WATER	May 2001	Gr. Alpha	< 0.45	0.15 ± 0.34	<1.0
SPDW-3130	WATER	May 2001	Gr. Beta	< 1.26	0.34 ± 0.95	<3.2
SPDW-3130	WATER	Jun 2001	Gr. Alpha	< 0.44	0.09 ± 0.32	<1.0
SPDW-3130	WATER	Jun 2001	Gr. Beta	< 1.46	0.66 ± 1.04	<3.2
SPVE-3304	VEGETATION	Jun 2001	Co-60	< 7.06		<100.0
SPVE-3304	VEGETATION	Jun 2001	Cs-134	< 11.56		<100.0
SPVE-3304	VEGETATION	Jun 2001	Cs-137	< 8.30		<100.0
SPSO-5702	SOIL	Jul 2001	Co-60	< 12.80		<100.0
SPSO-5702	SOIL	Jul 2001	Cs-134	< 13.96		<100.0
SPSO-5702	SOIL	Jul 2001	Cs-137	< 8.10		<100.0
SPAP-5704	AIR FILTER	Jul 2001	Co-60	< 0.79		<100.0
SPAP-5704	AIR FILTER	Jul 2001	Cs-134	< 0.84		<100.0
SPAP-5704	AIR FILTER	Jul 2001	Cs-137	< 0.60		<100.0
SPW-5780	WATER	Jul 2001	Co-60	< 1.86		<10.0
SPW-5780	WATER	Jul 2001	Cs-134	< 2.46		<10.0
SPW-5780	WATER	Jul 2001	Cs-137	< 3.77		<10.0

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPF-5782	FISH	Jul 2001	Co-60	≤ 5.64		<100.0
SPF-5782	FISH	Jul 2001	Cs-134	< 7.51		<100.0
SPW-5938	WATER	Jul 2001	H-3	< 163.22	-16.21 ± 85.07	<200.0
SPW-59451	WATER	Jul 2001	Ra-226	< 0.01	0.04 ± 0.01	<1.0
SPW-59451	WATER	Jul 2001	Ra-228	< 0.77	0.70 ± 0.44	<2.0
SPDW-3130	WATER	Jul 2001	Gr. Alpha	< 0.54	0.36 ± 0.40	<1.0
SPDW-3130	WATER	Jul 2001	Gr. Beta	< 2.27	-0.78 ± 1.35	<3.2
SPMI-6146	MILK	Jul 2001	Sr-90	< 0.50	1.09 ± 0.36	<1.0
Low levels of Sr-90 are still detected in the environment. A concentration of (1-5 pCi/L) in milk is not unusual.						
SPW-6605	WATER	Jul 2001	Gr. Beta	< 1.34	0.55 ± 1.01	<3.2
SPW-9009	WATER	Oct 2001	H-3	< 160.00	-56.70 ± 76.50	<200.0
SPAP-9011	AIR FILTER	Oct 2001	Co-60	< 0.76		<100.0
SPAP-9011	AIR FILTER	Oct 2001	Cs-137	< 0.58		<100.0
SPW-5780	WATER	Oct 2001	Sr-90	< 0.54	0.36 ± 0.30	<1.0
SPW-10724	WATER	Dec 2001	U-238	< 0.13	0.04 ± 0.10	<1.0
SPAP-11549	AIR FILTER	Dec 2001	Gr. Beta	< 0.00	0.01 ± 0.00	<3.2
SPW-11756	WATER	Dec 2001	Cs-137	< 2.62		<10.0
SPMI-11758	MILK	Dec 2001	Cs-137	< 4.00		<10.0
SPMI-11758	MILK	Dec 2001	I-131(g)	< 16.57		<20.0
SPF-11760	FISH	Dec 2001	Cs-137	< 7.96		<100.0

[a] Liquid sample results are reported in pCi/Liter, air filter sample results are in pCi/filter, charcoal sample results are in pCi/charcoal, and solid sample results are in pCi/kilogram.
[b] The activity reported is the net activity result.

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
AP-10675, 10676	Jan, 2001	Be-7	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01
AP-10803, 10804	Jan, 2001	Be-7	0.04 ± 0.01	0.04 ± 0.01	0.04 ± 0.01
AP-10833, 10834	Jan, 2001	Be-7	0.04 ± 0.01	0.04 ± 0.01	0.04 ± 0.01
WW-51, 52	Jan, 2001	H-3	362.60 ± 94.70	417.20 ± 96.80	389.90 ± 67.71
MI-72, 73	Jan, 2001	K-40	1,566.90 ± 196.80	1,372.40 ± 152.50	1,469.65 ± 124.49
MI-96, 97	Jan, 2001	K-40	1,418.30 ± 117.80	1,545.70 ± 162.50	1,482.00 ± 100.35
U-858, 859	Jan, 2001	Gr. Beta	2.17 ± 2.47	4.23 ± 2.74	3.20 ± 1.84
MI-389, 390	Jan, 2001	K-40	1,489.20 ± 141.10	1,463.30 ± 168.20	1,476.25 ± 109.77
DW-879, 880	Jan, 2001	Gr. Beta	2.63 ± 0.52	2.37 ± 0.50	2.50 ± 0.36
SWU-813, 814	Jan, 2001	Gr. Beta	2.48 ± 0.58	2.46 ± 0.63	2.47 ± 0.43
MI-708, 709	Feb, 2001	K-40	1,179.40 ± 103.00	1,280.40 ± 90.26	1,229.90 ± 68.48
MI-740, 741	Feb, 2001	I-131	0.01 ± 0.26	-0.12 ± 0.26	-0.05 ± 0.18
MI-740, 741	Feb, 2001	K-40	1,434.00 ± 156.50	1,435.00 ± 126.10	1,434.50 ± 100.49
MI-789, 790	Feb, 2001	K-40	1,584.30 ± 158.80	1,390.70 ± 136.50	1,487.50 ± 104.70
DW-901, 902	Feb, 2001	Gr. Beta	4.67 ± 1.08	5.54 ± 1.13	5.11 ± 0.78
SWU-1544, 1545	Feb, 2001	Gr. Beta	3.13 ± 0.63	2.33 ± 0.52	2.73 ± 0.41
DW-1426, 1427	Feb, 2001	Gr. Beta	2.05 ± 0.92	2.34 ± 0.93	2.20 ± 0.65
DW-1426, 1427	Feb, 2001	H-3	42.60 ± 94.23	131.31 ± 95.34	86.96 ± 67.02
WW-1476, 1477	Feb, 2001	H-3	53.06 ± 65.79	53.06 ± 93.03	53.06 ± 56.97
MI-1523, 1524	Mar, 2001	I-131	-0.01 ± 0.20	-0.10 ± 0.37	-0.06 ± 0.21
MI-1523, 1524	Mar, 2001	K-40	1,396.00 ± 184.80	1,576.00 ± 184.90	1,486.00 ± 130.71
MI-1572, 1573	Mar, 2001	K-40	1,499.20 ± 113.30	1,326.00 ± 118.80	1,412.60 ± 82.08
MI-1572, 1573	Mar, 2001	Sr-90	1.65 ± 0.44	1.51 ± 0.52	1.58 ± 0.34
SW-1648, 1649	Mar, 2001	K-40	297.80 ± 67.20	344.80 ± 82.30	321.30 ± 53.13
MI-1800, 1801	Mar, 2001	K-40	1,425.80 ± 183.30	1,372.20 ± 119.70	1,399.00 ± 109.46
SW-1779, 1780	Mar, 2001	Gr. Alpha	2.22 ± 0.73	2.14 ± 0.69	2.18 ± 0.50
SW-1779, 1780	Mar, 2001	Gr. Beta	6.28 ± 0.74	6.62 ± 0.70	6.45 ± 0.51
MI-1447, 1448	Mar, 2001	I-131	-0.65 ± 0.27	0.13 ± 0.55	-0.26 ± 0.31
MI-1447, 1448	Mar, 2001	K-40	1,496.20 ± 155.40	1,413.40 ± 169.60	1,454.80 ± 115.01
WW-2115, 2116	Mar, 2001	H-3	540.04 ± 111.84	500.85 ± 110.46	520.44 ± 78.59
SW-1698, 1699	Mar, 2001	Gr. Beta	6.07 ± 1.75	5.57 ± 1.85	5.82 ± 1.27
DW-2272, 2273	Mar, 2001	Gr. Beta	2.10 ± 0.86	1.63 ± 0.83	1.87 ± 0.60
WW-2356, 2357	Mar, 2001	Gr. Beta	1.22 ± 0.50	1.32 ± 0.47	1.27 ± 0.35
AP-2812, 2813	Mar, 2001	Be-7	0.07 ± 0.02	0.05 ± 0.01	0.06 ± 0.01
AP-2812, 2813	Mar, 2001	Be-7	0.07 ± 0.02	0.05 ± 0.01	0.06 ± 0.01
LW-2217, 2218	Mar, 2001	Gr. Beta	1.85 ± 0.51	2.23 ± 0.55	2.04 ± 0.37

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
AP-2833, 2834	Mar, 2001	Be-7	0.04 ± 0.01	0.06 ± 0.02	0.05 ± 0.01
AP-3038, 3039	Mar, 2001	Be-7	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
AP-3038, 3039	Mar, 2001	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
DW-2398, 2399	Mar, 2001	Gr. Beta	1.58 ± 0.89	1.81 ± 0.88	1.69 ± 0.63
LW-2467, 2468	Mar, 2001	Gr. Beta	2.52 ± 0.53	2.42 ± 0.53	2.47 ± 0.37
MI-2446, 2447	Apr, 2001	K-40	1,285.40 ± 177.10	1,376.00 ± 175.90	1,330.70 ± 124.81
AP-3017, 3018	Apr, 2001	Be-7	0.05 ± 0.01	0.05 ± 0.01	0.05 ± 0.00
SW-2423, 2424	Apr, 2001	K-40	255.60 ± 59.80	268.40 ± 65.40	262.00 ± 44.31
BS-3103, 3104	Apr, 2001	Gr. Beta	7.99 ± 1.80	8.17 ± 1.73	8.08 ± 1.25
SWU-3239, 3240	Apr, 2001	Gr. Beta	3.30 ± 0.60	4.30 ± 0.74	3.80 ± 0.48
SS-3322, 3323	Apr, 2001	K-40	15.99 ± 1.08	15.59 ± 1.01	15.79 ± 0.74
W-3990, 3991	Apr, 2001	Sr-89	91.35 ± 18.94	85.29 ± 23.99	88.32 ± 15.28
BS-4347, 4348	Apr, 2001	K-40	3,982.40 ± 489.60	3,255.80 ± 450.10	3,619.10 ± 332.53
BS-4347, 4348	Apr, 2001	K-40	3.26 ± 0.45	3.98 ± 0.49	3.62 ± 0.33
MI-3364, 3365	May, 2001	K-40	1,325.90 ± 160.20	1,453.20 ± 163.00	1,389.55 ± 114.27
SO-3385, 3386	May, 2001	Gr. Alpha	6.51 ± 3.09	9.01 ± 3.44	7.76 ± 2.31
SO-3385, 3386	May, 2001	Gr. Beta	24.63 ± 3.15	28.17 ± 3.12	26.40 ± 2.22
SO-3385, 3386	May, 2001	K-40	19.17 ± 1.08	17.94 ± 0.76	18.56 ± 0.66
CL-4068, 4069	May, 2001	K-40	1.09 ± 0.27	1.13 ± 0.23	1.11 ± 0.18
MI-3475, 3476	May, 2001	Gr. Beta	1,297.10 ± 114.60	1,433.60 ± 156.60	1,365.35 ± 97.03
WW-3545, 3546	May, 2001	Gr. Beta	1.57 ± 0.55	1.36 ± 0.53	1.47 ± 0.38
MI-3681, 3682	May, 2001	K-40	1,417.20 ± 125.70	1,496.20 ± 124.50	1,456.70 ± 88.46
SW-3702, 3703	May, 2001	Gr. Alpha	4.51 ± 1.66	3.22 ± 1.55	3.87 ± 1.13
SW-3702, 3703	May, 2001	Gr. Beta	8.74 ± 1.36	7.11 ± 1.38	7.93 ± 0.97
BS-4021, 4022	May, 2001	Cs-137	224.30 ± 30.20	205.90 ± 43.00	215.10 ± 26.27
BS-4021, 4022	May, 2001	H-3	842.00 ± 47.00	860.00 ± 48.00	851.00 ± 33.59
BS-4021, 4022	May, 2001	K-40	21,117.00 ± 953.00	21,629.00 ± 1,357.00	21,373.00 ± 829.10
BS-4021, 4022	May, 2001	Pu-238	80.30 ± 36.50	59.50 ± 22.00	69.90 ± 21.31
BS-4021, 4022	May, 2001	Pu-239/40	49.40 ± 31.80	41.10 ± 19.60	45.25 ± 18.68
BS-4021, 4022	May, 2001	Ra-226	7,436.00 ± 577.90	9,126.00 ± 751.90	8,281.00 ± 474.16
BS-4021, 4022	May, 2001	Sr-90	10.60 ± 2.71	16.80 ± 3.22	13.70 ± 2.10
F-3813, 3814	May, 2001	K-40	2.10 ± 0.17	2.30 ± 0.26	2.20 ± 0.16
G-4158, 4159	May, 2001	Be-7	0.37 ± 0.13	0.41 ± 0.14	0.39 ± 0.10
SO-4179, 4180	May, 2001	Ac-228	0.45 ± 0.13	0.52 ± 0.14	0.49 ± 0.10
SO-4179, 4180	May, 2001	Bi-214	0.31 ± 0.06	0.41 ± 0.06	0.36 ± 0.04
SO-4179, 4180	May, 2001	Cs-137	0.46 ± 0.05	0.47 ± 0.04	0.47 ± 0.03

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SO-4179, 4180	May, 2001	Gr. Beta	26.65 ± 2.63	24.68 ± 2.52	25.67 ± 1.82
SO-4179, 4180	May, 2001	K-40	16.35 ± 0.86	16.05 ± 0.82	16.20 ± 0.59
SO-4179, 4180	May, 2001	Pb-212	0.35 ± 0.04	0.43 ± 0.05	0.39 ± 0.03
SO-4179, 4180	May, 2001	Ra-226	0.56 ± 0.98	1.03 ± 0.31	0.79 ± 0.51
SO-4179, 4180	May, 2001	Tl-208	0.14 ± 0.03	0.17 ± 0.03	0.15 ± 0.02
BS-4233, 4234	May, 2001	Cs-137	0.03 ± 0.01	0.03 ± 0.02	0.03 ± 0.01
BS-4233, 4234	May, 2001	K-40	8.18 ± 0.48	7.80 ± 0.58	7.99 ± 0.38
SWU-4376, 4377	May, 2001	Gr. Beta	2.58 ± 0.55	2.94 ± 0.58	2.76 ± 0.40
DW-4449, 4450	May, 2001	Gr. Beta	2.83 ± 0.55	3.74 ± 0.65	3.29 ± 0.43
DW-4397, 4398	May, 2001	Gr. Beta	9.13 ± 1.26	10.20 ± 1.34	9.66 ± 0.92
MI-4114, 4115	May, 2001	K-40	1,325.90 ± 118.80	1,394.70 ± 133.10	1,360.30 ± 89.20
F-4284, 4285	May, 2001	K-40	2.23 ± 0.32	2.12 ± 0.35	2.18 ± 0.24
DW-4326, 4327	Jun, 2001	Gr. Beta	2.60 ± 0.97	1.47 ± 0.83	2.04 ± 0.64
MI-4470, 4471	Jun, 2001	K-40	1,514.50 ± 116.60	1,456.80 ± 130.90	1,485.65 ± 87.65
SW-4493, 4494	Jun, 2001	Gr. Beta	4.05 ± 1.23	4.64 ± 1.32	4.35 ± 0.90
BS-4725, 4726	Jun, 2001	Co-60	112.00 ± 24.30	84.50 ± 8.70	98.25 ± 12.91
BS-4725, 4726	Jun, 2001	Cs-137	3,083.10 ± 100.10	3,094.80 ± 35.30	3,088.95 ± 53.07
BS-4725, 4726	Jun, 2001	K-40	8,143.70 ± 640.40	8,083.80 ± 225.10	8,113.75 ± 339.40
MI-4775, 4776	Jun, 2001	K-40	1,362.20 ± 71.80	1,363.90 ± 73.40	1,363.05 ± 51.34
WW-5110, 5111	Jun, 2001	H-3	1,173.50 ± 129.10	1,046.80 ± 125.20	1,110.15 ± 89.92
G-5085, 5086	Jun, 2001	Be-7	0.89 ± 0.17	1.14 ± 0.39	1.02 ± 0.21
G-5085, 5086	Jun, 2001	K-40	5.13 ± 0.39	5.22 ± 0.70	5.17 ± 0.40
MI-5259, 5260	Jun, 2001	K-40	1,529.70 ± 122.70	1,406.20 ± 123.80	1,467.95 ± 87.15
MI-5259, 5260	Jun, 2001	Sr-90	1.69 ± 0.42	1.71 ± 0.44	1.70 ± 0.30
SWU-5422, 5423	Jun, 2001	Gr. Beta	2.59 ± 0.54	1.91 ± 0.52	2.25 ± 0.37
VE-5401, 5402	Jun, 2001	Gr. Beta	8.12 ± 0.24	8.88 ± 0.26	8.50 ± 0.18
VE-5401, 5402	Jun, 2001	K-40	6.55 ± 0.52	6.26 ± 0.65	6.40 ± 0.42
AP-5830, 5831	Jun, 2001	Be-7	0.08 ± 0.01	0.08 ± 0.01	0.08 ± 0.01
SW-5557, 5558	Jun, 2001	Gr. Beta	5.43 ± 1.70	5.96 ± 1.56	5.70 ± 1.15
AP-5851, 5852	Jun, 2001	Be-7	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
SW-5636, 5637	Jun, 2001	Gr. Beta	4.75 ± 1.38	4.18 ± 1.34	4.47 ± 0.96
LW-5681, 5682	Jun, 2001	Gr. Beta	2.42 ± 0.37	2.18 ± 0.34	2.30 ± 0.25
G-5535, 5536	Jul, 2001	Be-7	0.99 ± 0.29	0.97 ± 0.54	0.98 ± 0.31
G-5535, 5536	Jul, 2001	Gr. Beta	7.62 ± 0.12	7.72 ± 0.12	7.67 ± 0.08
G-5535, 5536	Jul, 2001	K-40	7.26 ± 1.03	7.64 ± 0.93	7.45 ± 0.69
AP-5788, 5789	Jul, 2001	Be-7	0.08 ± 0.02	0.07 ± 0.02	0.08 ± 0.01

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
AP-5872, 5873	Jul, 2001	Be-7	0.07 ± 0.02	0.08 ± 0.02	0.07 ± 0.01
AP-5893, 5894	Jul, 2001	Be-7	0.08 ± 0.02	0.08 ± 0.01	0.08 ± 0.01
AP-5809, 5810	Jul, 2001	Be-7	0.07 ± 0.02	0.06 ± 0.01	0.06 ± 0.01
SW-5724, 5725	Jul, 2001	Gr. Alpha	2.95 ± 0.70	2.89 ± 0.60	2.92 ± 0.46
SW-5724, 5725	Jul, 2001	Gr. Beta	8.79 ± 0.71	8.21 ± 0.65	8.50 ± 0.48
SW-5767, 5768	Jul, 2001	I-131	0.79 ± 0.31	0.61 ± 0.26	0.70 ± 0.20
LW-5920, 5921	Jul, 2001	Gr. Beta	3.06 ± 0.64	3.15 ± 0.58	3.11 ± 0.43
SO-6172, 6173	Jul, 2001	Cs-137	0.30 ± 0.05	0.32 ± 0.04	0.31 ± 0.03
SO-6172, 6173	Jul, 2001	K-40	18.20 ± 1.08	17.55 ± 0.82	17.88 ± 0.68
SO-6172, 6173	Jul, 2001	Sr-90	0.03 ± 0.01	0.05 ± 0.02	0.04 ± 0.01
MI-6353, 6354	Jul, 2001	K-40	966.35 ± 82.28	986.31 ± 91.91	976.33 ± 61.68
SW-6376, 6377	Jul, 2001	I-131	0.58 ± 0.16	0.81 ± 0.17	0.70 ± 0.12
VE-6424, 6425	Jul, 2001	Gr. Beta	2.52 ± 0.05	2.49 ± 0.05	2.51 ± 0.03
VE-6424, 6425	Jul, 2001	K-40	3.04 ± 0.26	3.12 ± 0.37	3.08 ± 0.23
MI-6445, 6446	Jul, 2001	K-40	1,407.40 ± 97.10	1,442.20 ± 189.60	1,424.80 ± 106.51
LW-6489, 6490	Jul, 2001	Gr. Beta	2.61 ± 0.57	2.79 ± 0.54	2.70 ± 0.39
MI-6533, 6534	Jul, 2001	K-40	1,498.60 ± 113.90	1,375.50 ± 129.60	1,437.05 ± 86.27
DW-6835, 6836	Jul, 2001	Gr. Beta	2.01 ± 0.59	2.36 ± 0.63	2.19 ± 0.43
MI-6693, 6694	Aug, 2001	K-40	1,294.30 ± 118.70	1,417.30 ± 176.50	1,355.80 ± 106.35
MI-6693, 6694	Aug, 2001	Sr-90	1.47 ± 0.42	1.23 ± 0.41	1.35 ± 0.29
WW-6952, 6953	Aug, 2001	Gr. Beta	5.49 ± 0.69	5.80 ± 0.69	5.64 ± 0.49
MI-6906, 6907	Aug, 2001	K-40	1,613.80 ± 218.50	1,532.70 ± 135.80	1,573.25 ± 128.63
VE-6973, 6974	Aug, 2001	K-40	4.21 ± 0.24	4.29 ± 0.64	4.25 ± 0.34
LW-7851, 7852	Aug, 2001	Gr. Beta	2.20 ± 0.48	2.12 ± 0.42	2.16 ± 0.32
MI-7001, 7002	Aug, 2001	K-40	1,453.80 ± 148.10	1,285.30 ± 190.50	1,369.55 ± 120.65
MI-7073, 7074	Aug, 2001	K-40	1,217.30 ± 80.83	1,218.30 ± 99.13	1,217.80 ± 63.95
LW-7145, 7146	Aug, 2001	Gr. Beta	2.77 ± 0.53	3.60 ± 0.59	3.19 ± 0.39
MI-7221, 7222	Aug, 2001	K-40	1,192.90 ± 95.40	1,388.90 ± 132.70	1,290.90 ± 81.72
MI-7221, 7222	Aug, 2001	Sr-90	2.10 ± 0.48	1.72 ± 0.47	1.91 ± 0.34
SWU-7527, 7528	Aug, 2001	Gr. Beta	17.51 ± 3.06	20.36 ± 3.31	18.93 ± 2.25
VE-7485, 7486	Aug, 2001	K-40	2.12 ± 0.47	2.47 ± 0.34	2.30 ± 0.29
DW-7506, 7507	Aug, 2001	Gr. Beta	4.25 ± 1.18	4.13 ± 1.12	4.19 ± 0.81
MI-7622, 7623	Sep, 2001	K-40	1,340.10 ± 111.10	1,290.80 ± 116.50	1,315.45 ± 80.49
MI-7664, 7665	Sep, 2001	K-40	1,408.10 ± 102.70	1,396.90 ± 114.30	1,402.50 ± 76.83
MI-7876, 7877	Sep, 2001	K-40	1,416.40 ± 192.30	1,318.00 ± 155.50	1,367.20 ± 123.65
G-7960, 7961	Sep, 2001	Be-7	1.27 ± 0.21	1.25 ± 0.25	1.26 ± 0.16

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
G-7960, 7961	Sep, 2001	K-40	5.21 ± 0.57	5.70 ± 0.63	5.45 ± 0.43
F-8011, 8012	Sep, 2001	Cs-137	0.06 ± 0.02	0.04 ± 0.02	0.05 ± 0.01
F-8011, 8012	Sep, 2001	Gr. Beta	3.68 ± 0.12	3.50 ± 0.11	3.59 ± 0.08
F-8011, 8012	Sep, 2001	K-40	3.47 ± 0.49	3.38 ± 0.47	3.43 ± 0.34
MI-8149, 8150	Sep, 2001	K-40	1,551.70 ± 118.00	1,489.90 ± 123.60	1,520.80 ± 85.44
MI-8343, 8344	Sep, 2001	K-40	1,550.30 ± 170.60	1,368.10 ± 126.70	1,459.20 ± 106.25
VE-8319, 8320	Sep, 2001	Gr. Beta	3.37 ± 0.10	3.42 ± 0.11	3.39 ± 0.07
VE-8319, 8320	Sep, 2001	K-40	2.14 ± 0.46	2.24 ± 0.37	2.19 ± 0.29
AP-9069, 9070	Sep, 2001	Be-7	0.07 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
AP-9566, 9567	Sep, 2001	Be-7	0.08 ± 0.02	0.09 ± 0.03	0.09 ± 0.02
VE-8700, 8701	Oct, 2001	Be-7	0.24 ± 0.10	0.19 ± 0.10	0.22 ± 0.07
VE-8700, 8701	Oct, 2001	K-40	2.03 ± 0.24	2.03 ± 0.21	2.03 ± 0.16
VE-8700, 8701	Oct, 2001	Sr-90	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00
AP-9048, 9049	Oct, 2001	Be-7	0.07 ± 0.01	0.07 ± 0.00	0.07 ± 0.01
DW-8636, 8637	Oct, 2001	Gr. Beta	4.74 ± 1.06	5.08 ± 1.21	4.91 ± 0.80
DW-8615, 8616	Oct, 2001	Gr. Beta	4.65 ± 0.58	4.28 ± 0.54	4.47 ± 0.40
AP-9090, 9091	Oct, 2001	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
AP-9166, 9167	Oct, 2001	Be-7	0.08 ± 0.02	0.08 ± 0.02	0.08 ± 0.01
AP-9187, 9188	Oct, 2001	Be-7	0.07 ± 0.01	0.05 ± 0.01	0.06 ± 0.01
VE-10562, 10563	Oct, 2001	Be-7	309.90 ± 158.80	348.30 ± 168.10	329.10 ± 115.62
VE-10562, 10563	Oct, 2001	K-40	6,407.10 ± 620.70	6,057.50 ± 660.40	6,232.30 ± 453.15
WW-8636, 8637	Oct, 2001	Gr. Beta	5.08 ± 1.20	4.74 ± 1.06	4.91 ± 0.80
DW-8894, 8895	Oct, 2001	Gr. Beta	4.28 ± 0.89	3.40 ± 0.90	3.84 ± 0.63
MI-9232, 9233	Oct, 2001	K-40	1,440.70 ± 46.60	1,424.80 ± 76.40	1,432.75 ± 44.75
VE-9518, 9519	Oct, 2001	K-40	1.91 ± 0.22	1.97 ± 0.39	1.94 ± 0.22
WW-10257, 10258	Nov, 2001	H-3	755.90 ± 102.50	684.70 ± 99.90	720.30 ± 71.57
VE-10333, 10334	Nov, 2001	Be-7	0.68 ± 0.26	0.99 ± 0.26	0.84 ± 0.18
VE-10333, 10334	Nov, 2001	K-40	6.10 ± 0.72	5.83 ± 0.72	5.97 ± 0.51
MI-10588, 10589	Nov, 2001	K-40	1,428.40 ± 114.70	1,445.50 ± 129.40	1,436.95 ± 86.46
DW-10688, 10689	Nov, 2001	Gr. Beta	3.49 ± 0.91	2.36 ± 0.76	2.93 ± 0.60
WW-10905, 10906	Dec, 2001	H-3	233.90 ± 90.60	226.30 ± 90.20	230.10 ± 63.92
SS-10953, 10954	Dec, 2001	Ac-228	1.10 ± 0.25	0.91 ± 0.16	1.00 ± 0.15
SS-10953, 10954	Dec, 2001	Bi-214	0.69 ± 0.08	0.75 ± 0.08	0.72 ± 0.06
SS-10953, 10954	Dec, 2001	Co-58	0.21 ± 0.05	0.18 ± 0.04	0.19 ± 0.03
SS-10953, 10954	Dec, 2001	Co-60	0.93 ± 0.06	0.94 ± 0.06	0.93 ± 0.04
SS-10953, 10954	Dec, 2001	Cs-137	0.13 ± 0.03	0.16 ± 0.03	0.14 ± 0.02

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SS-10953, 10954	Dec, 2001	K-40	9.91 ± 0.83	8.36 ± 0.80	9.13 ± 0.57
SS-10953, 10954	Dec, 2001	Pb-212	0.94 ± 0.05	0.91 ± 0.06	0.92 ± 0.04
SS-10953, 10954	Dec, 2001	Pb-214	0.83 ± 0.08	0.82 ± 0.07	0.83 ± 0.05
SS-10953, 10954	Dec, 2001	Ra-226	1.76 ± 0.37	1.67 ± 0.37	1.72 ± 0.26
SS-10953, 10954	Dec, 2001	Tl-208	0.34 ± 0.05	0.31 ± 0.05	0.32 ± 0.04
MI-11033, 11034	Dec, 2001	K-40	1,339.80 ± 128.70	1,435.80 ± 117.30	1,387.80 ± 87.07
MI-11033, 11034	Dec, 2001	Sr-90	1.31 ± 0.41	1.38 ± 0.37	1.35 ± 0.28
AP-11888, 11889	Dec, 2001	Be-7	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01

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 elemental potassium (K) in milk (mg/L), air filters (pCi/Filter), food products and vegetation (pCi/g), soil and sediments (pCi/kg).

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration[b] Laboratory result[c]	MAPEP Result[d] 1s, N=1	Control Limits
STSO-923	SOIL	Jan, 2001	Am-241			0.0 - 2.6
Included in the testing series as a "false positive". No activity expected. Result of analysis; < 0.8 Bq/L.						
STSO-923	SOIL	Jan, 2001	Co-57	100.2 ± 3.5	103.0± 10.3	72.1 - 133.9
STSO-923	SOIL	Jan, 2001	Co-60	1,285.1 ± 5.3	1,270.0± 127.0	889.0 - 1,651.0
STSO-923	SOIL	Jan, 2001	Cs-134	81.1 ± 1.8	91.1± 9.1	63.8 - 118.4
STSO-923	SOIL	Jan, 2001	Cs-137	1,210.6 ± 6.6	1,240.0± 124.0	868.0 - 1,612.0
STSO-923	SOIL	Jan, 2001	K-40	732.6 ± 21.2	652.0± 65.2	456.4 - 847.6
STSO-923	SOIL	Jan, 2001	Mn-54	212.6 ± 6.7	203.0± 20.3	142.1 - 263.9
STSO-923	SOIL	Jan, 2001	Pu-238	110.7 ± 7.2	115.0± 11.5	80.5 - 149.5
STSO-923	SOIL	Jan, 2001	Pu-239/40	79.6 ± 5.9	83.4± 8.3	58.4 - 108.4
STSO-923	SOIL	Jan, 2001	Sr-90	159.8 ± 9.5	209.0± 20.9	146.3 - 271.7
STSO-923	SOIL	Jan, 2001	U-233/4	45.0 ± 3.9	60.0± 6.0	42.0 - 78.0
STSO-923	SOIL	Jan, 2001	U-238	165.6 ± 7.4	191.0± 19.1	133.7 - 248.3
STSO-923	SOIL	Jan, 2001	Zn-65	428.5 ± 10.9	382.0± 38.2	267.4 - 496.6

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

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

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

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result	EML Result[c]	Control Limits[d]
STSO-904	SOIL	Mar, 2001	Ac-228	45.60 ± 4.0	42.70	0.80 - 1.50
STSO-904	SOIL	Mar, 2001	Am-241	14.40 ± 0.5	14.80	0.63 - 2.64
STSO-904	SOIL	Mar, 2001	Bi-212	53.20 ± 3.1	42.00	0.45 - 1.23
	Naturally-occurring radium and thorium daughters are present in the shield background, and a probable cause of the higher bias seen for isotopes of lead and bismuth.					
STSO-904	SOIL	Mar, 2001	Bi-214	42.10 ± 7.7	32.60	0.78 - 1.50
STSO-904	SOIL	Mar, 2001	Cs-137	1,772.60 ± 79.8	1,740.00	0.80 - 1.29
STSO-904	SOIL	Mar, 2001	K-40	583.80 ± 52.6	468.00	0.80 - 1.37
STSO-904	SOIL	Mar, 2001	Pb-212	46.60 ± 8.5	41.50	0.74 - 1.36
STSO-904	SOIL	Mar, 2001	Pb-214	45.30 ± 8.6	34.30	0.76 - 1.53
STSO-904	SOIL	Mar, 2001	Pu-239/40	26.00 ± 0.8	25.60	0.71 - 1.33
STSO-904	SOIL	Mar, 2001	Sr-90	55.60 ± 2.2	69.00	0.61 - 3.91
STW-905	WATER	Mar, 2001	Am-241	2.15 ± 0.1	1.67	0.76 - 1.48
STW-905	WATER	Mar, 2001	Co-60	97.00 ± 0.8	98.20	0.80 - 1.20
STW-905	WATER	Mar, 2001	Cs-137	70.10 ± 4.0	73.00	0.80 - 1.20
STW-905	WATER	Mar, 2001	H-3	76.50 ± 5.5	79.30	0.74 - 2.29
STW-905	WATER	Mar, 2001	Pu-238	1.69 ± 0.1	1.58	0.74 - 1.22
STW-905	WATER	Mar, 2001	Pu-239/40	1.69 ± 0.1	1.64	0.75 - 1.26
STW-905	WATER	Mar, 2001	Sr-90	3.85 ± 0.1	4.40	0.64 - 1.50
STW-905	WATER	Mar, 2001	U-233/4	0.90 ± 0.1	1.04	0.80 - 1.40
STW-905	WATER	Mar, 2001	U-238	0.88 ± 0.1	1.04	0.80 - 1.29
STW-906	WATER	Mar, 2001	Gr. Alpha	1,724.60 ± 141.7	1,900.00	0.58 - 1.26
STW-906	WATER	Mar, 2001	Gr. Beta	1,246.40 ± 31.1	1,297.00	0.56 - 1.50
STAP-907	AIR FILTER	Mar, 2001	Am-241	0.47 ± 0.0	0.49	0.69 - 2.40
STAP-907	AIR FILTER	Mar, 2001	Co-60	20.11 ± 0.2	19.44	0.79 - 1.30
STAP-907	AIR FILTER	Mar, 2001	Cs-134	2.71 ± 0.2	2.83	0.74 - 1.21
STAP-907	AIR FILTER	Mar, 2001	Cs-137	9.86 ± 0.2	8.76	0.78 - 1.35
STAP-907	AIR FILTER	Mar, 2001	Mn-54	7.25 ± 0.2	6.52	0.80 - 1.36
STAP-907	AIR FILTER	Mar, 2001	Pu-238	0.23 ± 0.0	0.22	0.66 - 1.35
STAP-907	AIR FILTER	Mar, 2001	Pu-239/40	0.12 ± 0.0	0.14	0.69 - 1.29

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result	EML Result[c]	Control Limits[d]
STAP-907	AIR FILTER	Mar, 2001	Sr-90	7.41 ± 0.2	7.10	0.55 - 2.05
STAP-907	AIR FILTER	Mar, 2001	U-233/4	0.05 ± 0.0	0.05	0.80 - 1.92
STAP-907	AIR FILTER	Mar, 2001	U-238	0.05 ± 0.0	0.05	0.80 - 1.59
STAP-908	AIR FILTER	Mar, 2001	Gr. Alpha	2.66 ± 0.0	3.97	0.57 - 1.47
STAP-908	AIR FILTER	Mar, 2001	Gr. Beta	2.30 ± 0.0	2.58	0.76 - 1.52
STVE-909	VEGETATION	Mar, 2001	Am-241	6.10 ± 0.2	6.17	0.72 - 2.34
STVE-909	VEGETATION	Mar, 2001	Cm-244	3.50 ± 0.5	3.69	0.61 - 1.61
STVE-909	VEGETATION	Mar, 2001	Co-60	28.50 ± 2.1	30.40	0.75 - 1.51
STVE-909	VEGETATION	Mar, 2001	Cs-137	795.50 ± 76.4	842.00	0.80 - 1.37
STVE-909	VEGETATION	Mar, 2001	K-40	592.60 ± 42.5	603.00	0.78 - 1.43
STVE-909	VEGETATION	Mar, 2001	Pu-239/40	8.50 ± 0.6	9.58	0.67 - 1.49
STVE-909	VEGETATION	Mar, 2001	Sr-90	1,239.60 ± 130.0	1,330.00	0.52 - 1.23
STW-925	WATER	Sep, 2001	Am-241	0.70 ± 0.1	0.76	0.76 - 1.48
STW-925	WATER	Sep, 2001	Co-60	206.70 ± 4.7	209.00	0.80 - 1.20
STW-925	WATER	Sep, 2001	Cs-137	46.60 ± 0.8	45.13	0.80 - 1.24
STW-925	WATER	Sep, 2001	H-3	254.10 ± 3.6	207.00	0.74 - 2.29
STW-925	WATER	Sep, 2001	Ni-63	50.90 ± 3.0	45.25	0.70 - 1.30
STW-925	WATER	Sep, 2001	Pu-238	1.10 ± 0.1	1.09	0.74 - 1.22
STW-925	WATER	Sep, 2001	Pu-239/40	1.60 ± 0.1	1.63	0.75 - 1.26
STW-925	WATER	Sep, 2001	Sr-90	4.10 ± 0.3	3.73	0.64 - 1.50
STW-925	WATER	Sep, 2001	Uranium	2.20 ± 0.2	2.37	0.73 - 1.37
STW-926	WATER	Sep, 2001	Gr. Alpha	1,220.00 ± 32.0	1,150.00	0.58 - 1.26
STW-926	WATER	Sep, 2001	Gr. Beta	8,461.00 ± 206.0	7,970.00	0.56 - 1.50
STSO-927	SOIL	Sep, 2001	Ac-228	68.10 ± 1.4	59.57	0.80 - 1.50
STSO-927	SOIL	Sep, 2001	Am-241	5.20 ± 1.3	4.43	0.63 - 2.64
STSO-927	SOIL	Sep, 2001	Bi-212	65.10 ± 1.6	62.07	0.45 - 1.23
STSO-927	SOIL	Sep, 2001	Bi-214	47.30 ± 4.7	36.90	0.78 - 1.50
STSO-927	SOIL	Sep, 2001	Cs-137	659.20 ± 10.8	612.33	0.80 - 1.29
STSO-927	SOIL	Sep, 2001	K-40	737.70 ± 16.6	623.33	0.80 - 1.37

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result	EML Result[c]	Control Limits[d]
STSO-927	SOIL	Sep, 2001	Pb-212	64.70 ± 3.8	58.33	0.74 - 1.36
STSO-927	SOIL	Sep, 2001	Pb-214	53.70 ± 7.7	39.67	0.76 - 1.53
STSO-927	SOIL	Sep, 2001	Pu-239/40	9.30 ± 2.9	8.95	0.71 - 1.33
STSO-927	SOIL	Sep, 2001	Sr-90	27.40 ± 6.3	30.60	0.61 - 3.91
STSO-927	SOIL	Sep, 2001	Uranium	155.60 ± 7.8	194.23	0.62 - 1.35
STVE-928	VEGETATION	Sep, 2001	Am-241	7.00 ± 0.3	6.92	0.72 - 2.34
STVE-928	VEGETATION	Sep, 2001	Cm-244	4.30 ± 0.8	4.31	0.61 - 1.61
STVE-928	VEGETATION	Sep, 2001	Co-60	40.20 ± 0.9	35.30	0.75 - 1.51
STVE-928	VEGETATION	Sep, 2001	Cs-137	1,184.00 ± 2.8	1,030.00	0.80 - 1.37
STVE-928	VEGETATION	Sep, 2001	K-40	1,023.00 ± 44.1	898.67	0.78 - 1.43
STVE-928	VEGETATION	Sep, 2001	Pu-239/40	8.90 ± 1.4	11.02	0.67 - 1.49
STVE-928	VEGETATION	Sep, 2001	Sr-90	1,364.00 ± 18.4	1,612.80	0.52 - 1.23
STAP-929	AIR FILTER	Sep, 2001	Am-241	0.09 ± 30.0	0.09	0.69 - 2.40
STAP-929	AIR FILTER	Sep, 2001	Co-60	16.90 ± 0.3	17.50	0.79 - 1.30
STAP-929	AIR FILTER	Sep, 2001	Cs-134	11.80 ± 0.2	12.95	0.74 - 1.21
STAP-929	AIR FILTER	Sep, 2001	Cs-137	18.30 ± 0.3	17.10	0.78 - 1.35
STAP-929	AIR FILTER	Sep, 2001	Mn-54	85.40 ± 1.3	81.15	0.80 - 1.36
STAP-929	AIR FILTER	Sep, 2001	Pu-238	0.05 ± 0.0	0.07	0.66 - 1.35
STAP-929	AIR FILTER	Sep, 2001	Pu-239/40	0.22 ± 0.0	0.23	0.69 - 1.29
STAP-929	AIR FILTER	Sep, 2001	Sr-90	3.11 ± 0.1	3.48	0.55 - 2.05
STAP-929	AIR FILTER	Sep, 2001	Uranium	0.24 ± 0.1	0.22	0.80 - 2.54
STAP-930	AIR FILTER	Sep, 2001	Gr. Alpha	6.30 ± 0.1	5.36	0.57 - 1.47
STAP-930	AIR FILTER	Sep, 2001	Gr. Beta	13.80 ± 0.1	12.77	0.76 - 1.52

[a] The Environmental Measurements Laboratory provides the following nuclear species : Air Filters, Soil, Vegetation and Water.
[b] Results are reported in Bq/L with the following exceptions: Air Filter results are reported in Bq/Filter, Soil results are reported in Bq/Kg, Vegetation results are reported in Bq/Kg.
[c] The EML result listed is the mean of replicate determinations for each nuclide±the standard error of the mean.
[d] Control limits are reported by EML as the ratio of Reported Value / EML value.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

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

2.0. Single Measurements

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

where: x = value of the measurement;

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

In cases where the activity is less than the lower limit of detection L, it is reported as: <L,

where L = the lower limit of detection based on 4.66s uncertainty for a background sample.

3.0. Duplicate analyses

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

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

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

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

4.0. Computation of Averages and Standard Deviations

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

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

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

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

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

4.5 In rounding off, the following rules are followed:

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

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

APPENDIX C

Maximum Permissible Concentrations

of Radioactivity in Air and Water

Above Background in Unrestricted Areas

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

	Air (pCi/m^3)		Water (pCi/L)
Gross alpha	1×10^{-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.

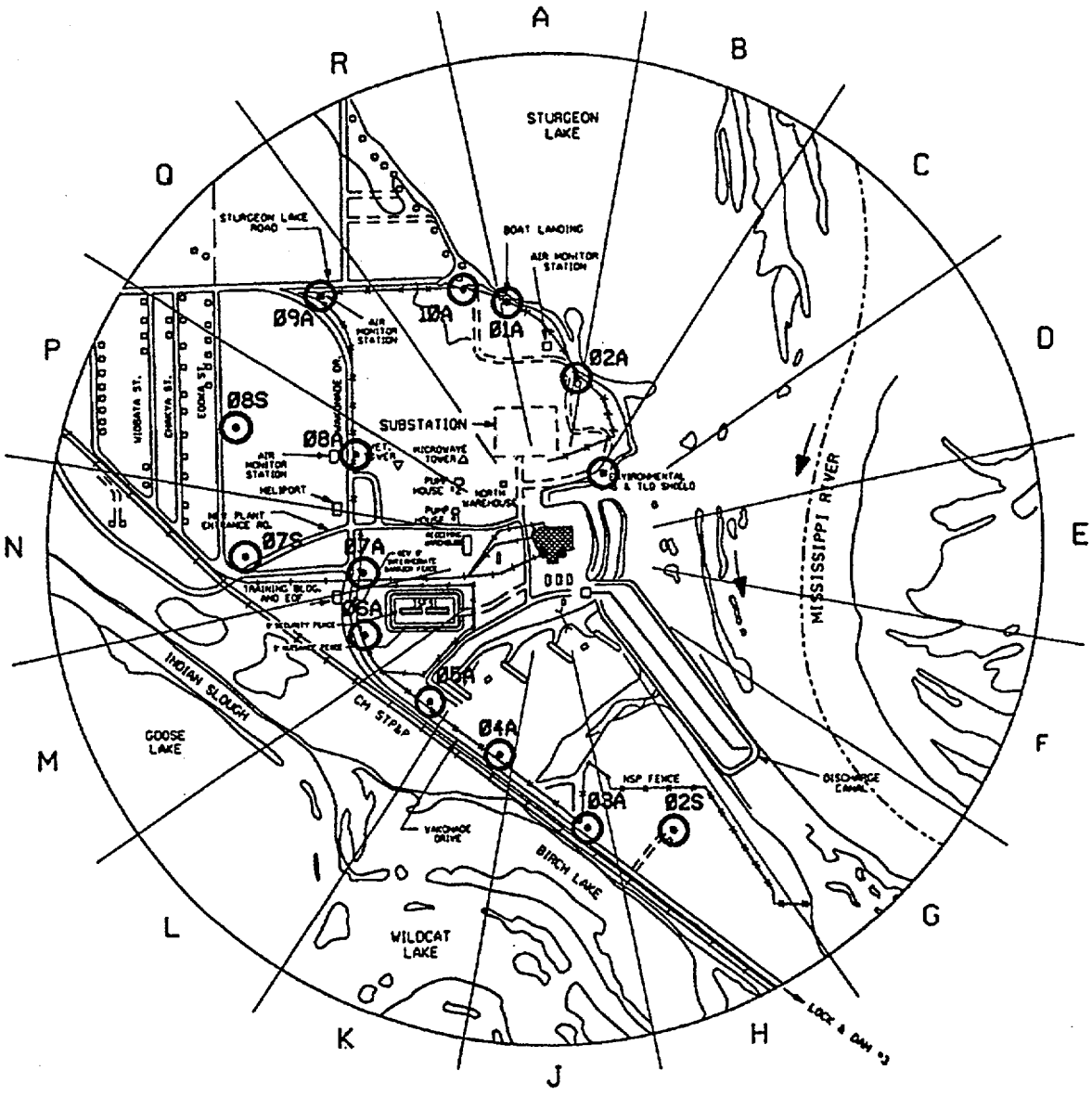
b Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

c A natural radionuclide.

APPENDIX D

Sampling Location Maps

TLD LOCATIONS
ONE MILE RADIUS



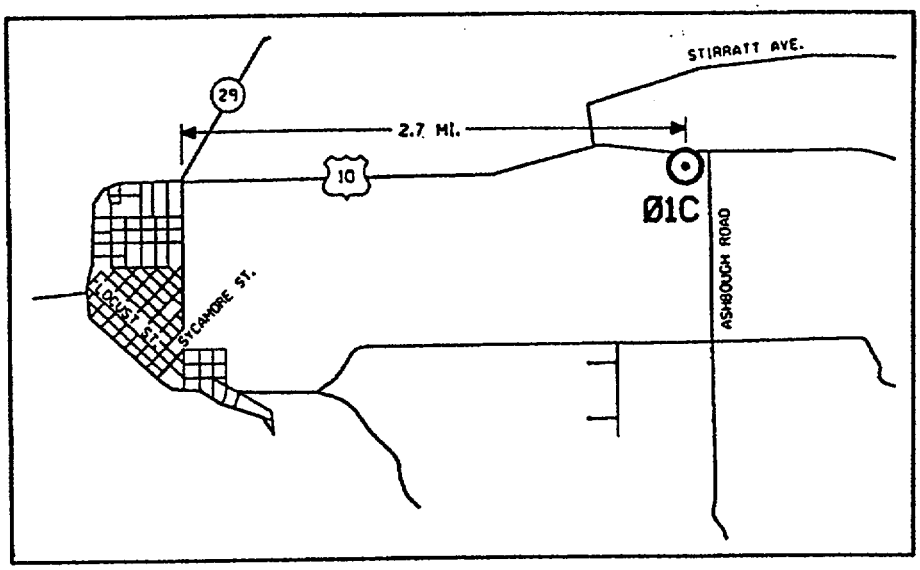
PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]
[NO SCALE]

MONITORING LEGEND:

⊙ N.S.P. TLD POINTS

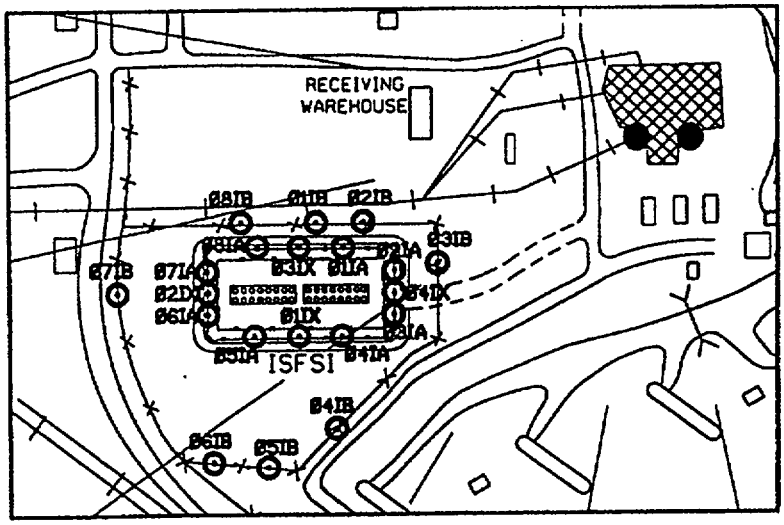
TLDØ1.DGN

TLD LOCATIONS



CONTROL POINTS

PRESCOTT, WISCONSIN



ISFSI AREA TLD LOCATIONS

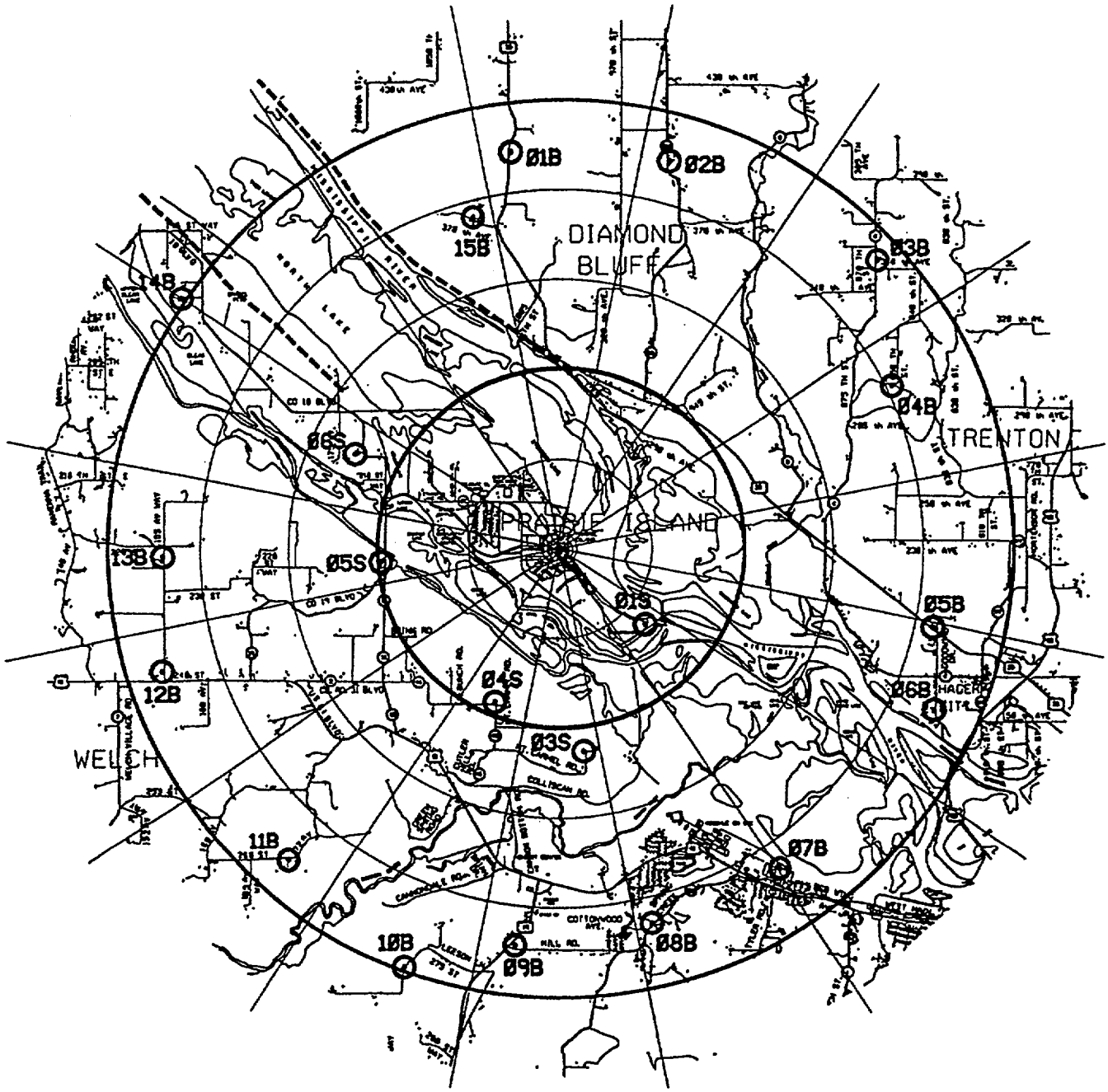
MONITORING LEGEND:

⊙ N.S.P. TLD POINTS

TLDØ2.DGN

TLD LOCATIONS

FIVE MILE RADIUS

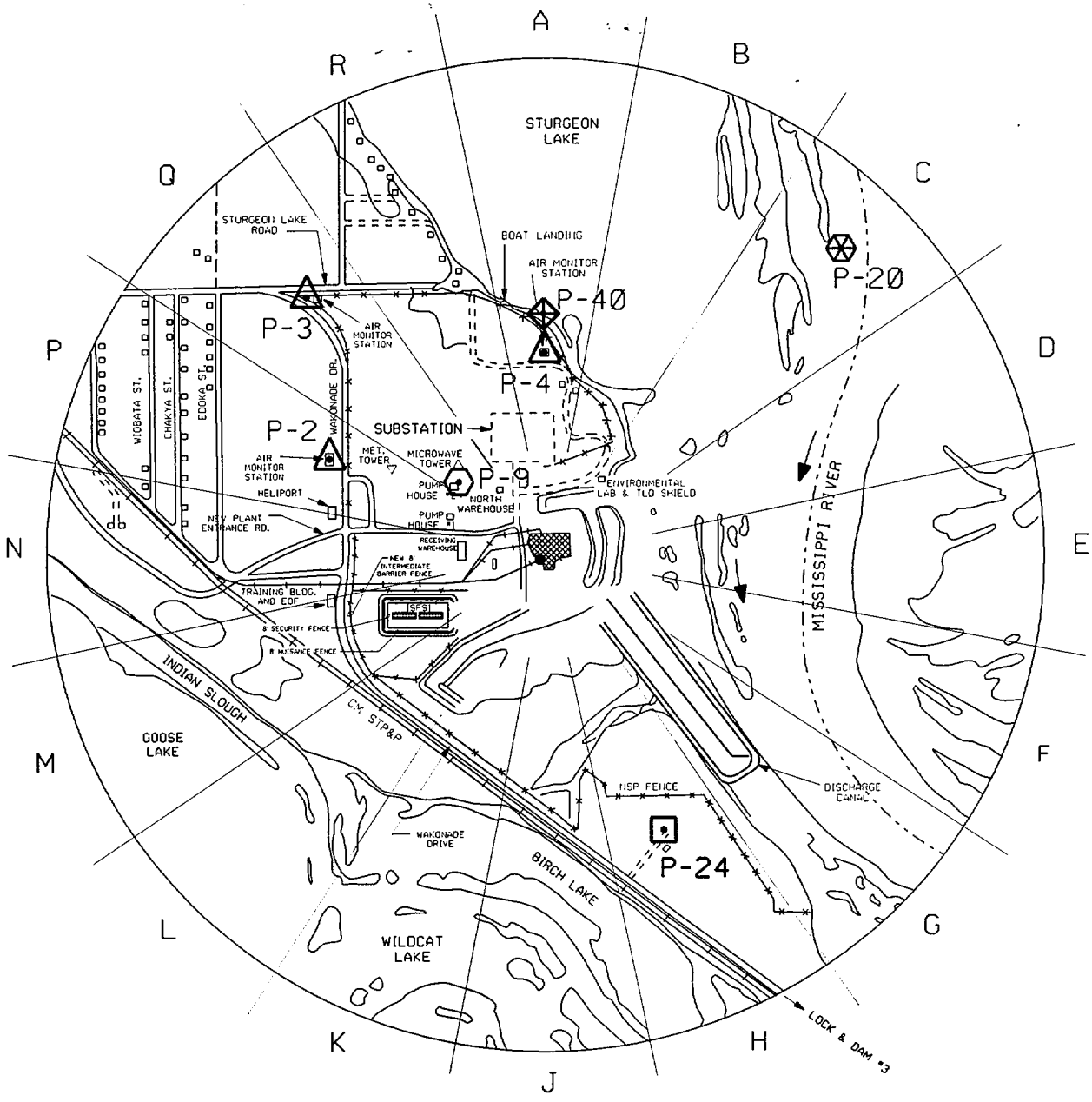


MONITORING LEGEND:

⊙ N.S.P. TLD POINTS

TLDØ3.DGN

ENVIRONMENTAL SAMPLING POINTS
ONE MILE RADIUS



PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]

[NO SCALE]

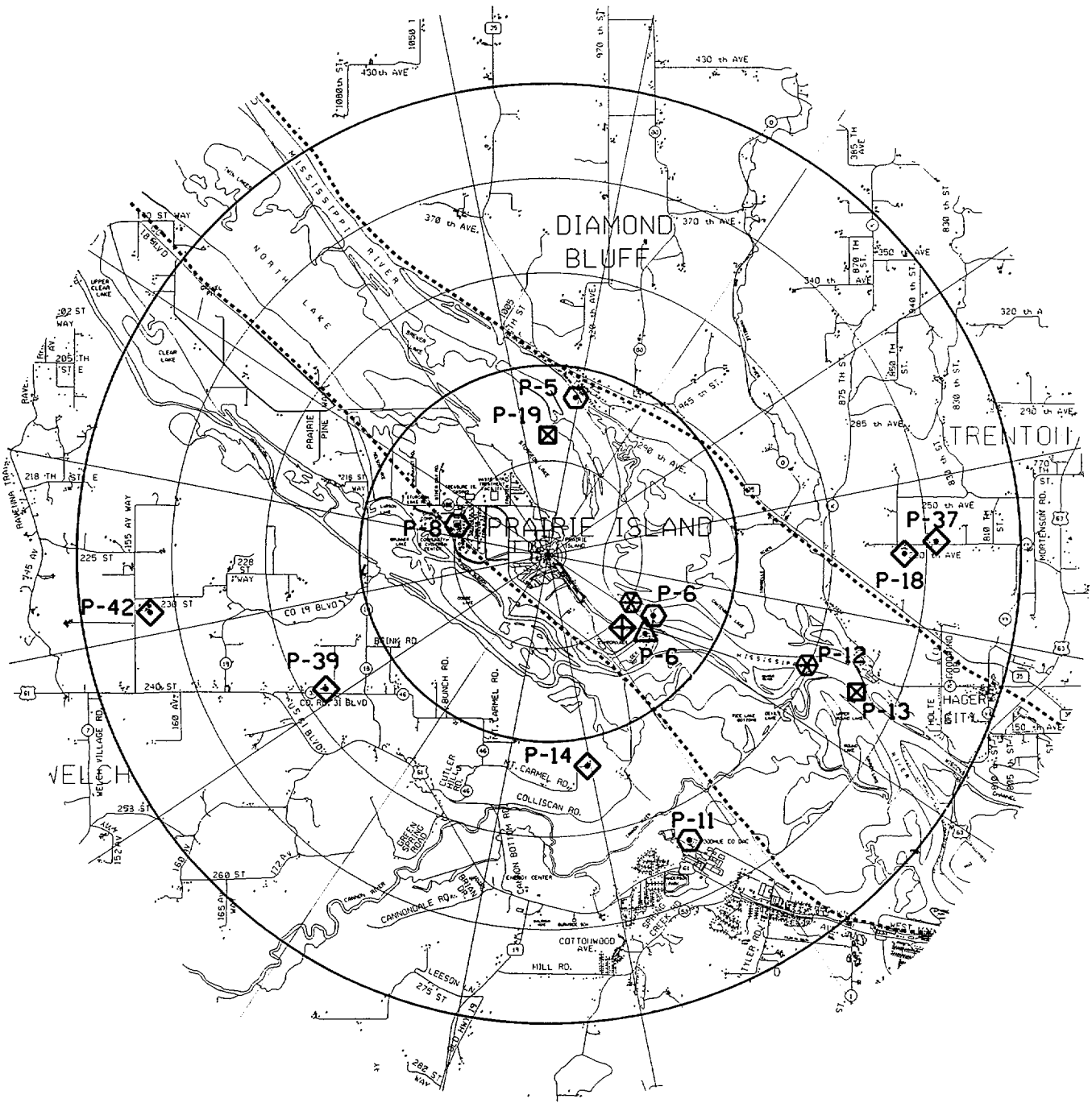
MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS
  P-14, P-18, P-25, P-37, P-39, P-41, P-42
- 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-25
- VEGETATION / VEGETABLES ID NUMBERS
  P-24, P-38
- 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

SAMP01.DGN

ENVIRONMENTAL SAMPLING POINTS

FIVE MILE RADIUS

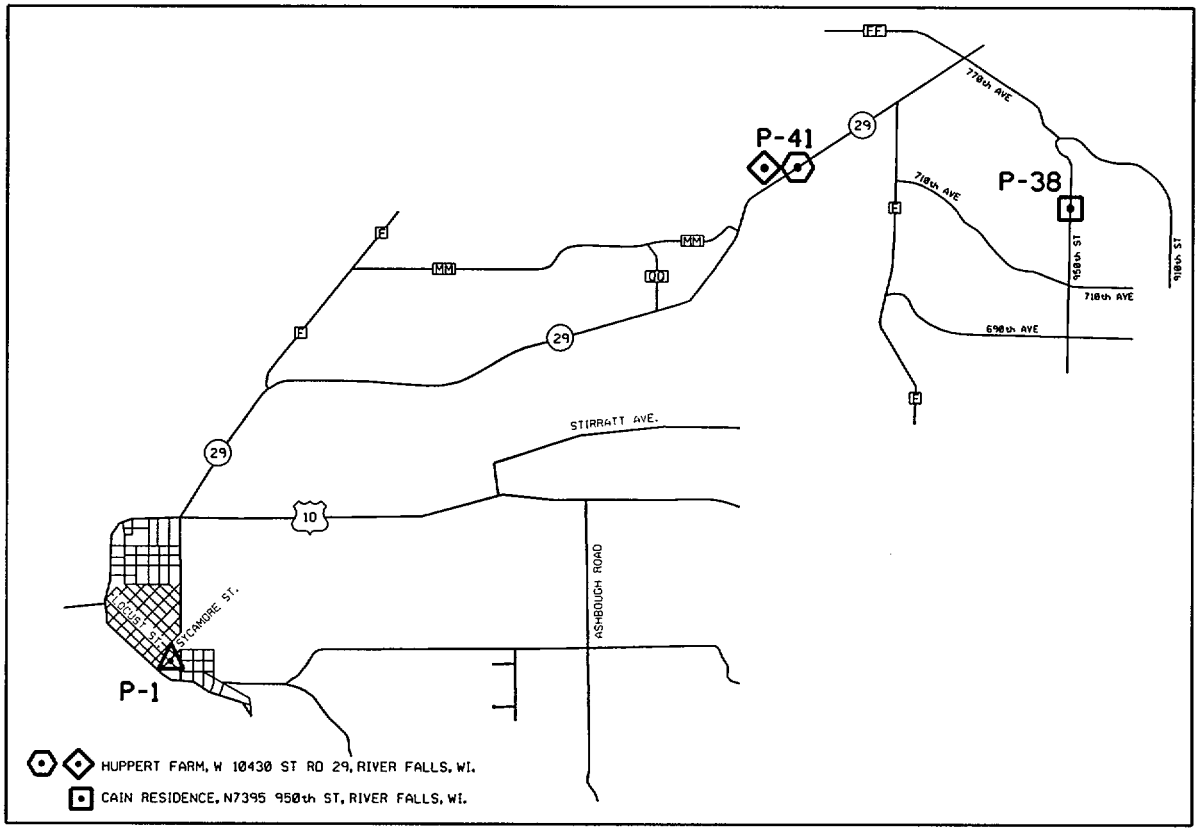


MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS P-14, P-18, P-25, P-37, P-39, P-41, P-42
- 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-25
- VEGETATION / VEGETABLES ID NUMBERS P-24, P-38
- 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

SAMP03.DGN

ENVIRONMENTAL SAMPLING POINTS



CONTROL POINTS
PRESCOTT, WISCONSIN

MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS
  P-14, P-18, P-25, P-37, P-39, P-41, P-42
- 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-25
- VEGETATION / VEGETABLES ID NUMBERS
  P-24, P-38

SAMPØ2.DGN