STATE OF WISCONSIN

1987

Point Beach

Environmental Radioactivity Survey

NRC 30-83-647

Wisconsin Department of Health and Social Services
Division of Health
Bureau of Environmental Health
Section of Radiation Protection
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POINT BEACH ENVIRONMENTAL RADIOACTIVITY SURVEY

INTRODUCTION

This report covering the calendar year 1987 is prepared under U.S. Nuclear Regulatory Commission Contract NRC 30-83-647 by the State of Wisconsin, Department of Health and Social Services, Section of Radiation Protection. Results of environmental radioactivity monitoring are listed in tabular form. The data presented consists of duplicative sample analysis conducted by the state radiation protection laboratory or subcontractor and the licensee. A brief description of sample collection techniques and analytical procedures conducted by the state laboratory is also given. A sample collection summary for 1987 is included in Table 5. The sample summary includes type and number of analyses performed, Minimum Detectable Concentrations (MDC's) or Lower Limits of Detection (LLD's) as well as the range of reported activities for each type of sample analysis.

SAMPLING TECHNIQUES

Whenever possible a split sample is taken inorder to obtain a valid comparison between WI DHSS and Point Beach results. Split sampling involves the thorough mixing of a sample into a homogeneous mixture that is then split between WI DHSS and Point Beach.

Direct Radiation - Thermoluminescent Dosimeters (TLD's)

Continuous monitoring of direct radiation is performed quarterly using thermoluminescent dosimeters. The dosimeters are placed at 43 locations in the area of the Kewaunee and the Point Beach nuclear power plants.

Air Samples

Continuous air samples are collected weekly from two stations. Air particulate samples are collected on 47 mm. glass fiber filters. Air iodine samples are collected using charcoal absorbers mounted in tandem with the air particulate filters. The nominal sampling rate is 1-2.5 cubic feet of air per minute depending on the type of pump used.

Surface Water

A split sample of liquid effluent is collected monthly at a point close to the discharge of the Point Beach effluent channel. This sample is a monthly composite of weekly grab samples and is collected while the plant is discharging liquid to the channel. A background

surface water sample is also taken for WI DHSS at the Green Bay Pumping Station - Rostok, 15.6 miles NNE. A surface water sample from the Coast Guard Station, 4.8 miles SSE, is included as a background sample for Point Beach.

Milk

A raw milk sample is collected monthly from the Lehrmann farm and the W. Funk farm. The milk sample is split between WI DHSS and the Point Beach nuclear power facility.

Sediment

A split sample for shoreline sediment is collected from three locations on an annual basis.

Fish

Split samples of both migratory and non-migratory fish are collected periodically from Lake Michigan locations in the Point Beach - Kewaunee area.

Food Products

A split sample for vegetation (grass) is collected from several locations in the Point Beach area.

ANALYTICAL PROCEDURES

The procedures given are condensed to present only the basic method. The analysis of the samples has been subcontracted to the State Laboratory of Hygiene. A detailed description of the procedures used is available from the State Laboratory of Hygiene.

Air Particulate Samples - Beta Gamma

Place the 47 mm. glass fiber filter on a 2-inch stainless steel planchet. Beta count in an external gas flow proportional counter. Calculate activity correcting for counter efficiency.

Air Particulate Samples - Gamma

The quarterly composite of air particulate filters is placed on a Ge(Li) detector and the gamma spectrum is collected. Scan the gamma spectrum for any peaks and print out regions of interest which would include possible plant attributable radionuclides. Calculate the activity for isotopes in the regions of interest, regardless if they are above or below the minimum detectable concentration, correcting for counter efficiency and for decay.

Surface Water - Alpha, Beta Gamma

Filter a 500 ml. aliquot of sample. Evaporate filtrate in a 2-inch stainless steel planchet. Place filter paper in a 2-inch stainless

steel planchet and dry at 103 degrees Celsius. Beta and alpha count the soluble and insoluble portions in an external gas flow proportional counter. Calculate activity correcting for counter efficiency and for self-absorption.

Surface Water - Gamma Isotopic

A 3.5 liter sample is placed in a Marinelli beaker and analyzed on a GeLi detector. Scan the gamma spectrum for any peaks and print out regions of interest which would include possible plant attributable radionuclides. Calculate the activity for isotopes in the regions of interest, regardless if they are above or below the minimum detectable concentration, correcting for counter efficiency and for decay.

Surface Water - Iodine 131 Chemical Extraction

A stable iodine carrier is added to a 2 liter sample of raw milk. The sample is passed through an anion exchange column and the iodine is removed from the resin by batch/extraction using NaOCl. After reduction to elemental iodine by hydroxylamine hydrochloride, the iodine is extracted into carbon tetrachloride reduced with bisulfite, and back extracted into water. The iodine is precipitated as palladous iodide with the chemical yield determined gravimetrically and counted in an external gas flow proportional counter. Calculate activity correcting for counter efficiency and for self-absorption.

Surface Water - Strontium 89 & Strontium 90

Strontium and yttrium carriers are added to the surface water samples. The procedure follows through a series of chemical separations whereby all interfering substances are removed. Calcium is removed by precipitating strontium and barium by nitrate precipitation thereby leaving the calcium in solution. Radium is removed by co-precipitation with barium as a chromate. The ingrowing yttrium is separated from the parent strontium through the use of hydroxide scavenging. The purified strontium is converted to a carbonate and beta counted in an external gas flow proportional counter. After two weeks ingrowth, yttrium-90 is separated from the strontium carbonate via a series of hydroxide precipitations and finally converted to an oxalate and beta counted in an external gas flow proportional counter. The strontium-90 activity is calculated from the yttrium-90 count and the strontium-89 activity is calculated using the previous calculation for strontium-90 as well as total strontium activity from the strontium carbonate counting.

Vegetation or Food Product - Alpha, Beta and Gamma Isotopic

Dry sample at 110 degrees Celsius, grind, weigh into stainless steel planchet. Beta and alpha count in an external gas flow proportional counter. Calculate activity correcting for self-absorption and counter efficiency.

The food product sample is finely chopped. The sample is packed to the 500 ml mark of a 500 ml Marinelli beaker, weighed and counted on a Ge(Li) detector. Scan the gamma spectrum for any peaks and print out

regions of interest which would include possible plant attributable radionuclides. Calculate the activity for isotopes in the regions of interest, regardless if they are above or below the minimum detectable concentration, correcting for counter efficiency and for decay.

Soil or Sediment - Alpha, Beta and Gamma Isotopic

Dry sample at 110 degrees Celsius, grind, and weigh into a stainless steel planchet. Beta and alpha count in an external gas flow proportional counter. Calculate activity correcting for self-absorption and counter efficiency.

The dried sediment is added to a 500 ml Marinelli beaker, weighed and counted on a Ge(Li) detector. Scan the gamma spectrum for any peaks and print out regions of interest which would include possible plant attributable radionuclides. Calculate the activity for isotopes in the regions of interest, regardless if they are above or below the minimum detectable concentration, correcting for counter efficiency and for decay.

Milk - Gamma Isotopic

Procedure same as for Surface Water.

Milk - Iodine 131 Chemical Extraction

Procedure same as for Surface Water.

Milk - Strontium 90

Strontium and yttrium carriers are added to milk which has been aged two to four weeks. A one liter sample is passed successively through cation and anion exchange columns. The yttrium is eluted from the anion resin with hydrochloric acid, precipitated as yttrium oxalate, filtered and weighed to determine chemical yield. Beta count in an external gas flow proportional counter. Calculate the activity correcting for counter efficiency and for decay.

Fish - Gamma Isotopic

A sample is placed in a 500 ml. Marinelli beaker. Place the sample on a GeLi detector and collect the gamma spectrum. Scan the gamma spectrum for any peaks and print out regions of interest which would include possible plant attributable radionuclides. Calculate the activity for isotopes in the regions of interest, regardless if they are above or below the minimum detectable concentration, correcting for counter efficiency and for decay.

Direct Radiation

Thermoluminescent dosimeters are supplied by the U.S. Nuclear Regulatory Commission. The exposed TLD's are shipped to NRC Region I and are read by the Commission.

QUALITY ASSURANCE

The analysis of the samples is performed under subcontract with the State Laboratory of Hygiene (SLH). SLH maintains its own quality assurance program which was also reviewed by the NRC in January, 1985.

Analytical procedures provide for routine replicate analyses to verify methods and instrument operation. Traceable sources are used to regularly calibrate the counters and daily performance checks are made between calibrations. In addition, quality control charts are maintained on the counters.

SLH participates in the EPA Cross Check program. The quality assurance progam that the SLH participates in include analysis of blind samples, air filters, food, milk, gamma in water, alpha-beta in water, iodine in water, strontium in water and tritium in water. The EPA Cross Check code for SLH is "AF". A complete listing of the EPA Cross Check results for 1986 and 1987 is included in Table 6.

SENSITIVITIES AND ERROR - WISCONSIN DHSS

Following the recommendations of the Health Physics Society, detection limits will be expressed as a minimum detectable concentration (MDC). The minimum detectable concentration or MDC is an "a priori" estimate of the capabliity for detecting an activity concentration by a given measurement system, procedure, and type of sample. The MDC should not be viewed as an absolute activity concentration that can or cannot be detected. Minimum detectable concentrations (MDC) are based on the analysis performed and for gamma isotopic analysis have been calculated for a zero decay time. Minimum detectable concentrations (MDC's) are listed in Table 5.

The WI DHSS definition for minimum detectable concentration follows closely the equation for the lower limits of detection as defined in NRC contract NRC-30-83-647. Activities defined by the equation for MDC will be used in this report.

The MDC for each radioisotope has been calculated from the following equation:

$$MDC = \frac{4.66\ s_b}{E * V * 2.22 * Y * S * \exp(-dt)}$$

Where:

MDC is the "a priori" lower limit of detection as defined above, as picocuries per unit mass or volume,

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate, as counts per minute,

E is the counting efficiency, as counts per disintegration,

V is the sample size in units of mass or volume,

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield, when applicable,

S is the self-absorption correction factor,

d is the radioactive decay constant for the particular radionuclide, and

t for environmental samples is the elapsed time between sample collection, or end of the sample collection period, and time of counting.

Guidelines adopted by the U.S. Environmental Protection Agency are used in the reporting of specific analyses. Results from specific analyses will be reported whether the results are negative, zero, or positive. Caution should be exercised in the interpretation of individual negative values. While a negative activity value does not have physical significance, it is significant when taken together with other observations which indicate that the true value of a distribution is near zero. This procedure will allow all of the data to be reported and will allow a statistical evaluation without an arbitrary cutoff of small or negative numbers. An estimation of bias in the nuclide analyses as well as a better evaluation of distributions and trends in the environmental data is then possible. It is important when reviewing the data in the following tables to compare the reported result to the actual minimum detectable concentration (MDC) for that analysis.

Results for specific analyses will be reported as an activity followed by an error term for that analysis. The error term is a plus or minus counting error term at the 2 sigma (95%) confidence interval and is printed as (+/-).

SENSITIVITY - POINT BEACH

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

SAMPLE COLLECTION SUMMARY

The following types and number of samples collected are listed in Table 1. An explanation for missing samples is listed in Table 2.

Table 1. Sample collection summary for 1987.

Sampling period January - December, 1987

Sample Type	Collection and Frequency *a	Number of Locations	Number of Samples Collected	Number of Samples Missed
air particulate	C/W	2	100	1
air iodine	C/W	2	100	1
surface water	G/M	2	23	1
vegetation	G/A	4	4	0
sediment	G/A	3	3	0
fish	G/SA	1	6	0
milk	G/M	2	24	0

*a - Collection type: C/ = continuous; G/ = grab
Frequency: /W = weekly; /M = monthly; /Q = quarterly; /A = annually
/BW = bi-weekly /SA = semi-annually

Table 2. Missing sample report for 1987.

Sample Type	Date	Location	Explanation
Air particulate	06/05/87-06/12/87	Control	Filter was lost in the field.
Air iodine	06/05/87-06/12/87	Control	Cartridge was lost in the field.
Surface water	May, 1987	Control	Sample was not collected.

RESULTS AND DISCUSSION

A sample collection summary for 1987 is included in Table 5. The sample summary includes the type and number of samples collected as well as the range of reported activities for each type of sample analysis. Results from the individual sample analyses are listed in Tables 7-21.

Air Particulate

WI DHSS and Point Beach maintain separate air sampling stations. The indicator site for both WI DHSS and for Point Beach is located at the north property line, 1.3 miles NNW. The control site for WI DHSS is located at the Green Bay Pumping Station - Rostok, 15.6 miles NNE. The control site for Point Beach is located at Silver Lake College, 17 miles WSW.

A summary of reported gross beta activities by WI DHSS and Point Beach from air particulate samples is included in Table 5. Results from the individual sample analyses are listed in Tables 7-10.

The yearly averages, from a log-normal distribution, for the gross beta analysis on the air particulate filters are given in Table 3.

The WI DHSS and Point Beach yearly averages for gross beta activity from the air particulate filters are comparable and showed no significant differences between the respective indicator and control sites.

A summary of reported gamma isotopic activities for WI DHSS and Point Beach from the quarterly air particulate filter composites is included in Table 5. Results from the individual sample analyses are listed in Tables 11-12.

In the WI DHSS gamma isotopic analysis, beryllium-7 (Be-7) was detected in all composites from both the indicator and the control sites. Beryllium-7 (Be-7) is a naturally occurring radioisotope that is constantly produced through nuclear reactions between cosmic rays and nuclei in the atmosphere. All other radionuclides were below their respective MDC.

Table 3. Comparison of the yearly averages for gross beta activity from air particulate filters for 1987.

WI - Section of Radiation Protection		Point Beach	
units of pCi/M^3			
Indicator	Control	Indicator	Control
0.014 ± 0.002	0.012 ± 0.002	0.02 ± 0.01	0.02 ± 0.01

Point Beach did not report any activities above their respective LLD. Point Beach is not required to report naturally occurring radioisotopes and no comparison can be made for the beryllium-7 (Be-7) reported by WI DHSS.

At the observed low level of activity the WI DHSS and Point Beach data are comparable in the gamma isotopic analysis of the air particulate samples. Influence by the Point Beach nuclear facility on air quality is not evident when comparing the data from the indicator and control sites.

Air Iodine

Air iodine samples are taken at the same sites as the air particulate samples.

A summary of reported air iodine activities for WI DHSS and Point Beach is included in Table 5. Results from the individual sample analyses are listed in Tables 7-10.

All reported WI DHSS and Point Beach air iodine measurements were below the required NRC LLD of 0.07 pCi/M^3 for both the indicator and the control sites.

Surface Water

Surface water from the effluent channel is a split sample. This sample is a monthly composite of weekly grab samples. Surface water from a control site is not a split sample. WI DHSS collects a monthly grab sample at the Green Bay Pumping Station - Rostok, 15.6 miles NNE. A monthly grab sample is collected by Point Beach at the Coast Guard Station, 4.8 miles SSE.

A summary of reported activities by WI DHSS and Point Beach from the monthly surface water samples is included in Table 5. Results from the individual sample analyses are listed in Tables 13-16.

All reported activities by WI DHSS and Point Beach are at background levels for the samples taken at the control sites. All reported gamma isotopic activities were less than the respective WI DHSS MDC or the respective Point Beach LLD. Gross beta activities reported by WI DHSS and Point Beach were all at background levels for samples collected at the the control sites. The gross beta yearly average for WI DHSS of 3.2±1.5 pCi/liter and for Point Beach of 2.8±0.7 pCi/liter for the control sites are not significantly different from previous years.

For samples taken at the indicator site, effluent channel, all reported gamma isotopic activities were less than the respective WI DHSS MDC or the respective Point Beach LLD. WI DHSS reported two iodine-131 (I-131) activities above its MDC of 0.4 pCi/liter. The WI DHSS reported activities for iodine-131 (I-131) were 1.0±0.4 and 1.7±1.2 pCi/liter. All reported iodine-131 (I-131) activities for

Point Beach were less than 0.5 pCi/liter. The gross beta yearly average for WI DHSS of 3.1±1.4 pCi/liter and for Point Beach of 2.1±0.5 pCi/liter is not significantly different from previous years.

All activities reported by either WI DHSS or Point Beach are below the standards for uncontrolled areas specified in ICRP Report No. 2 or 10 CFR 20. Plant influence is not evident after comparing WI DHSS and Point Beach data for the indicator and control sites.

Fish

Split samples were taken for fish. The samples were obtained from the Point Beach pumphouse.

A summary of reported activities by WI DHSS and Point Beach for fish samples is included in Table 5. Results from the individual sample analyses are listed in Table 17.

For WI DHSS, the detected activities for cesium-137 (Cs-137) were less than the required NRC LLD. The detected activities for cesium-137 (Cs-137) and for naturally occurring potassium-40 (K-40) were also reported in previous years. For Point Beach all reported gamma isotopic activities were less than their respective LLD. Naturally occurring radioisotopes such as potassium-40 (K-40) are not required to be reported by Point Beach.

At the low level of reported activities the WI DHSS and Point Beach data are comparable.

Shoreline Sediments

Split samples were taken for shoreline sediments at three locations.

A summary of reported activities by WI DHSS and Point Beach for shoreline sediment is included in Table 5. Results from the individual sample analyses are listed in Table 18.

From the WI DHSS gamma isotopic analysis, naturally occurring potassium-40 (K-40) and radioisotopes from uranium and thorium decay series were detected in all three samples. Cesium-134 (Cs-134) and cesium-137 (Cs-137) were detected at site E-06 and cobalt-60 (Co-60) was detected at sites E-1 and E-12. All reported activities for cobalt-60 (Co-60), cesium-134 (Cs-134) and cesium-137 (Cs-137) were less than the respective required NRC LLD.

Point Beach analysis did not detect any radioisotopes above their respective LLD and is not required to report naturally occurring radioisotopes such as potassium-40 (K-40).

Milk

A split sample is taken for milk. Milk is collected from the Funk farm, 3.8 miles WSW and from the Lehrmann farm, 2.7 miles NNW.

A summary of reported activities by WI DHSS and Point Beach for milk samples is included in Table 5. Results from the individual sample analyses are listed in Tables 19-20.

For WI DHSS only naturally occurring potassium-40 (K-4C) was detected in all of the samples. Activities for iodine-131 (I-131) were all less than the WI DHSS MDC of 0.4 pCi/liter

Point Beach did not detect any radioisotopes above their lower limits of detection in its gamma isotopic analysis. Reported results for iodine-131 (I-131) were all less than 0.5 pCi/liter. Naturally occurring radioisotopes such as potassium-40 (K-40) are not required to be reported by Point Beach.

Influence by the Point Beach nuclear facility in the milk pathway is not evident after reviewing the WI DHSS and Point Beach data.

Vegetation - Food Products

Point Beach does not sample for food products. A split sample for vegetation was taken at four sites.

A summary of reported activities by WI DHSS and Point Beach for vegetation samples is included in Table 5. Results from the individual sample analyses are listed in Table 21.

In the WI DHSS gamma isotopic analysis only naturally occurring potassium-40 (K-40) and beryllium-7 (Be-7) were detected in all four samples. Activities for iodine-131 (I-131) were below the WI DHSS MDC of 60 pCi/kg.

Point Beach is not required to report naturally occurring radioisotopes and no comparison is possible for the reported WI DHSS activities for beryllium-7 (Be-7) and potassium-40 (K-40). Point Beach did not detect any radioisotopes above their respective LLD. Activities for iodine-131 (I-131) were below the Point Beach LLD of 80 pCi/kg.

Influence by the Point Beach nuclear facility is not evident in vegetation samples after reviewing the data for WI DHSS and Point Beach.

Dose to an Average Individual

Dose calculations for gaseous and liquid effluent releases were performed according to the mathematical models illustrated in USNRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I". The doses, listed in Table 4, were calculated for the average exposed individual for WI DHSS samples with activities greater than MDC.

The dose to an average individual from exposure to shoreline sediments are due specifically to the detected gamma activities of cobalt-60 (Co-60), cesium-134 (Cs-134) and cesium-137 (Cs-137).

Doses resulting from gaseous and liquid effluent releases from the Point Beach nuclear facility are in compliance with 10 CFR Part 50, Appendix I.

The dose to an average individual from the ingestion of milk and fish are most likely due to background levels of radiation attributable to fallout from previous atmospheric nuclear tests and not to the operation of the Point Beach facility. The dose to an average individual from the ingestion of milk are due specifically to the detected strontium-90 (Sr-90) activities. The dose to an average individual from the ingestion of fish are due specifically to the detected cesium-137 (Cs-137) activities.

The doses listed in Table 4 are well below the state and federal standards of 500 mrem/year.

Table 4. Calculated doses to an average exposed individual for WI DHSS samples with activities greater than MDC.

Sample type	Description	population	Average Exposed Individual (mrem/year) whole body	bone	thryoid
milk	yearly average	infant	1.8	6.9	---
		child	1.6	6.4	---
		teenager	0.9	3.7	---
		adult	0.5	1.8	---
fish	average of six	infant	---	---	---
		child	0.009	0.06	---
		teenager	0.02	0.05	---
		adult	0.04	0.05	---
shoreline sediment	average of three sites	infant	---		
		child	0.001		
		teenager	0.005		
		adult	0.001		

References

Food and Drug Administration, Background for Protective Action Recommendations: Accidental Radioactive Contamination of Food and Animal Feeds, HHS Publication FDA 82-8196, August, 1982.

Radiation Protection Standards, Federal Radiation Council, Report No. 2, September 1961.

U.S. Environmental Protection Agency, Environmental Radiation Protection Requirements for Normal Operations of Activities in the Uranium Fuel Cycle, 40 CFR 190, November, 1976.

U.S. Environmental Protection Agency, Upgrading Environmental Radiation Data, Health Physics Society Committee Report HPSR-1 (1980), EPA 520/1-80-012, August 1980.

U.S. Nuclear Regulatory Commission, Title 10, Part 20.

Table 5. Sample summary for 1987 from the environmental split sample monitoring program conducted by WI DHSS and Point Beach.

Sample type (units)	WI DHSS data MDC	Number of Samples[a]	Analysis	range	Point Beach data LLD	Number of Samples[a]	Analysis	range
air particulate (pCi/M^3)	0.003	99/99	gross beta	0.005 - 0.045	0.01	103/103	gross beta	<0.01 - 0.04
		8	gamma isotopic			8	gamma isotopic	
	0.025	8/8	Be-7	0.067 - 0.135			Be-7	* b
	0.007	8/0	Zr-95	-0.001 - 0.001			Zr-95	* b
	0.004	8/0	Ru-103	-0.001 - 0.001			Ru-103	* b
	0.016	8/0	Ru-106	-0.001 - 0.002			Ru-106	* b
	0.002	8/0	Cs-134	0.000	0.01	8/0	Cs-134	<0.01
	0.002	8/0	Cs-137	0.000	0.01	8/0	Cs-137	<0.01
	0.006	8/0	Ce-141	0.000			Ce-141	* b
	0.009	8/0	Ce-144	-0.001 - 0.001			Ce-144	* b
air iodine (pCi/M^3)	0.046	99/0	I-131	-0.03 - 0.022	0.03	104/0	I-131	<0.03
surface water (pCi/liter)	1.6	23/23	gross beta	2.1 - 4.4	1.0	24/24	gross beta	<1.5 - 4.7
	750	23/1	H-3	-400 - 780	500	8/0	H-3	<500
	5.0	11/0	Sr-89	-3.2 - 1.0	5.0	8/0	Sr-89	<5
	1.5	11/1	Sr-90	0.1 - 1.9	1.0	8/0	Sr-90	<1
	1.0	23/2	I-131	-0.9 - 1.7	0.5	24/0	I-131	<0.5
		23	gamma isotopic			24	gamma isotopic	
	9	23/0	Mn-54	-7 - 1	10	24/0	Mn-54	<10
	20	23/0	Fe-59	-8 - 8	30	24/0	Fe-59	<30
	13	23/0	Co-58	-6 - 3	10	24/0	Co-58	<10
	11	23/0	Co-60	-4 - 2	10	24/0	Co-60	<10
	22	23/0	Zn-65	-7 - 6	30	24/0	Zn-65	<30
	13	23/0	Cs-134	-4 - 5	10	24/0	Cs-134	<10
	12	23/0	Cs-137	-4 - 3	10	24/0	Cs-137	<10
	15	23/0	Zr-95	-10 - 15	15	24/0	Zr-95	<15
	15	23/0	Ba-140	-13 - 10	15	24/0	Ba-140	<15
fish		6	gamma isotopic			5	gamma isotopic	
(pCi/kg wet)	550	6/6	K-40	2100 - 3200		5	K-40	* b
	40	6/0	Mn-54	-2 - 0	130	5/0	Mn-54	<130
	120	6/0	Fe-59	-5 - 50	260	5/0	Fe-59	<260
	54	6/0	Co-58	-4 - 15	130	5/0	Co-58	<130
	50	6/0	Co-60	-1 - 17	130	5/0	Co-60	<130
	100	6/0	Zn-65	-9 - 20	260	5/0	Zn-65	<260
	45	6/0	Cs-134	1 - 12	130	5/0	Cs-134	<130
	55	6/4	Cs-137	50 - 150	150	5/0	Cs-137	<150

Table 5. (continued)

Sample type (units)	WI DHSS data MDC	Number of Samples[*a]	Analysis	range	Point Beach data LLD	Number of Samples[*a]	Analysis	range
shoreline	5100	3/3	gross beta	9000 - 27000	---	3/3	gross beta	10200 - 15700
sediments		3	gamma isotopic			3	gamma isotopic	
(pCi/kg dry)	70	3/0	Co-58	14 - 50			Co-58	* b
	90	3/2	Co-60	20 - 130			Co-60	* b
	60	3/1	Cs-134	50 - 90			Cs-134	* b
	80	3/2	Cs-137	70 - 100	150	3/0	Cs-137	<150
	450	3/3	K-40	2400 - 3800			K-40	* b
	100	3/3	Ra-226	620 - 1780			Ra-226	* b
	150	3/3	Pb-214	560 - 1580			Pb-214	* b
	150	3/3	Bi-214	610 - 1610			Bi-214	* b
	180	3/3	Tl-208	880 - 1740			Tl-208	* b
	180	3/3	Ac-228	780 - 1740			Ac-228	* b
milk	0.4	24/0	I-131	-0.4 - 0.1	0.5	24/0	I-131	<0.5
(pCi/liter)		24	Sr-89	* b	5.0	24/0	Sr-89	<5
	1.5	24/21	Sr-90	1.0 - 4.1	1.0	24/24	Sr-90	1.3 - 4.4
		24	gamma isotopic			24	gamma isotopic	
	120	24/24	K-40	1200 - 1570			K-40	* b
	12	24/0	Cs-134	-2 - 9	5	24/0	Cs-134	<5
	12	24/0	Cs-137	-8 - 8	5	24/0	Cs-137	<5
	15	24/0	Ba-140	-5 - 2	5	24/0	Ba-140	<5
vegetation	2000	4/4	gross beta	8300 - 9200	---	4/4	gross beta	5900 - 7400
(pCi/kg wet)		4	gamma isotopic			4	gamma isotopic	
	300	4/4	Be-7	2100 - 6700			Be-7	* b
	600	4/4	K-40	5400 - 6800			K-40	* b
	50	4/0	Co-58	-3 - 30			Co-58	* b
	55	4/0	Co-60	-13 - 30			Co-60	* b
	80	4/0	Zr-95	-2 - 40			Zr-95	* b
	60	4/0	I-131	-9 - (-5)	60	4/0	I-131	<60
	50	4/0	Cs-134	1 - 40	60	4/0	Cs-134	<60
	60	4/0	Cs-137	-9 - 44	80	4/0	Cs-137	<80

* a - Number of samples / number of analyses detected above MDC or LLD.

* b - Analysis not required.

Table 6. U.S. Environmental Protection Agency's crosscheck program, comparision of EPA and State Laboratory of Hygiene (SLH) results.

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	01-10-86	Sr-89	32.0+/-1.2	31.0+/-5.0	0.3
		Sr-90	13.3+/-0.7	15.0+/-1.5	-1.9
Water	01-24-86	Alpha	4.0+/-1.4	3.0+/-5.0	0.3
		Beta	7.3+/-1.4	7.0+/-5.0	0.1
Food	01-31-86	Sr-89	No data provided	25.0+/-5.0	
		Sr-90	No data provided	10.0+/-1.5	
		I-131	19+/-9	20.0+/-6.0	-0.2
		Cs-137	18+/-8	15.0+/-5.0	0.9
		K	1030+/-170	950+/-143	1.0
Water	02-07-86	Cr-51	LT 40	38.0+/-5.0	
		Co-60	17+/-3	18.0+/-5.0	-0.2
		Zn-65	38+/-6	40.0+/-5.0	-0.6
		Ru-106	LT 31	0.0+/-5.0	
		Cs-134	28+/-3	30.0+/-5.0	-0.6
		Cs-137	23+/-3	22.0+/-5.0	0.5
Water	02-14-86	H-3	4913+/-370	5227+/-523	-1.0
Water	02-21-86	U (nat)	10+/-5	9.0+/-6.0	0.4
Water	02-28-86	I-131	9.0+/-1.0	9.0+/-6.0	0.0
Water	03-14-86	Ra-226	3.9+/-0.5	4.1+/-0.6	-0.7
		Ra-228	11.9+/-1.8	12.4+/-1.9	-0.4
Water	03-21-86	Alpha	15.7+/-1.5	15.0+/-5.0	0.2
		Beta	10.3+/-1.3	8.0+/-5.0	0.8
Water	04-04-86	I-131	8.0+/-1.5	9.0+/-6.0	-0.3
Filter	04-25-86	Alpha	19.0+/-1.5	15.0+/-5.0	1.4
		Beta	47+/-2	47.0+/-5.0	0.1
		Sr-90	17.0+/-1.5	18.0+/-1.5	-1.2
		Cs-137	11.7+/-3	10.0+/-5.0	0.6

Table 6 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Blind	04-20-86	Alpha	14+/-2	17.0+/-5.0	-0.9
		Beta	33+/-3	35.0+/-5.0	-0.7
		Ra-226	3.1+/-0.4	2.90+/-0.44	0.7
		Ra-228	2.1+/-0.3	2.00+/-0.30	0.8
		U (nat)	3.7+/-5.0	5.0+/-6.0	-0.4
		Sr-89	6.7+/-0.9	7.0+/-5.0	-0.1
		Sr-90	6.0+/-0.7	7.0+/-1.5	-1.2
		Co-60	10+/-3	10.0+/-5.0	-0.1
		Cs-134	4+/-2	5.0+/-5.0	-0.3
		Cs-137	5+/-2	5.0+/-5.0	0.0
Water	05-09-86	Sr-89	5.0+/-2	5.0+/-5.0	0.0
		Sr-90	5.0+/-1.5	5.0+/-1.5	0.0
Water	07-06-86	Cr-51	<38	0.0+/-5.0	
		Co-60	65+/-5	66.0+/-5.0	-0.5
		Zn-65	86+/-5	86.0+/-5.0	0.0
		Ru-106	47+/-5	50.0+/-5.0	-0.9
		Cs-134	45+/-5	49.0+/-5.0	-1.4
		Cs-137	8+/-5	10.0+/-5.0	-0.7
Water	06-20-86	Ra-226	7.3+/-1.3	8.6+/-1.3	-1.7
		Ra-228	12.2+/-2.5	16.7+/-2.5	-3.1
Milk	06-27-86	Sr-89	No data provided	0.0+/-5.0	
		Sr-90	16.6+/-1.7	16.0+/-1.5	0.8
		I-131	39+/-5	41.0+/-6.0	-0.5
		Cs-137	38+/-5	31.0+/-5.0	2.4
		K	1660+/-120	1600+/-80	1.4
Water	07-18-86	Alpha	8+/-2	6.0+/-5.0	0.7
		Beta	18+/-2	18.0+/-5.0	-0.7
Food	07-25-86	Sr-89	No data provided	30+/-5	
		Sr-90	No data provided	19+/-1.5	
		I-131	24+/-5	30.0+/-6.0	-1.6
		Cs-137	21+/-5	20.0+/-5.0	0.2
		K	1180+/-120	1150+/-58	0.9
Water	08-08-86	I-131	41+/-10	45.0+/-6.0	-1.2
Water	08-22-86	U (Nat)	4+/-4	4.0+/-6.0	0.1
Water	09-12-86	Ra-226	6.5+/-0.9	6.1+/-0.9	0.8
		Ra-228	10.3+/-1.5	9.1+/-1.4	1.5

Table 6 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Filter	09-12-86	Alpha	20+/-2	22.0+/-5.0	-0.7
		Beta	67+/-2	66.0+/-5.0	0.3
		Sr-90	21.3+/-1.8	22.0+/-1.5	-0.8
		Cs-137	28+/-5	22.0+/-5.0	2.0
Water	09-19-86	Alpha	11.3+/-2	15.0+/-5.0	-1.3
		Beta	8.7+/-1.5	8.0+/-5.0	0.2
Water	10-10-86	Cr-51	61+/-10	59.0+/-5.0	0.6
		Co-60	32+/-5	31.0+/-5.0	0.2
		Zn-65	88+/-5	85.0+/-5.0	1.0
		Ru-106	68+/-5	74.0+/-5.0	-2.2
		Cs-134	29+/-5	28.0+/-5.0	0.3
		Cs-137	46+/-5	44.0+/-5.0	0.6
Water	10-17-86	H-3	5300+/-300	5973+/-597	-1.0
Water	10-22-86	Alpha	39+/-2	40.0+/-5.0	-0.5
		Beta	50+/-2	51.0+/-5.0	-0.2
		Ra-226	6.2+/-1.0	6.0+/-0.9	0.3
		Ra-228	3.5+/-0.8	5.0+/-0.8	-3.5
		U (nat)	9.3+/-7.0	10.0+/-6.0	-0.2
		Sr-89	10.7+/-2.5	10.0+/-5.0	0.2
		Sr-90	3.7+/-1.5	4.0+/-1.5	-0.4
		Co-60	27+/-5	24.0+/-5.0	1.0
		Cs-134	11+/-4	12.0+/-5.0	-0.5
		Cs-137	10+/-4	8.0+/-5.0	0.7
Water	11-21-86	Alpha	16+/-2	20.0+/-5.0	-1.4
		Beta	23.7+/-2	20.0+/-5.0	1.3
Water	12-12-86	Ra-226	6.2+/-1.0	6.8+/-1.0	-1.0
		Ra-228	10.5+/-1.7	11.1+/-1.7	-0.6

Table 6 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	01-09-87	Sr-89	25+/-5	25.0+/-5.0	0.1
		Sr-90	24.7+/-1.5	25.0+/-1.5	-0.4
Water	01-23-87	Alpha	10+/-2	11.0+/-5.0	-0.2
		Beta	12.3+/-1.7	10.0+/-5.0	0.8
Food	01-30-87	Sr-90	No data provided	49.0+/-10.0	
		I-131	76+/-10	78.0+/-8.0	-0.4
		Cs-137	89+/-8	84.0+/-5.0	1.6
		K	1070+/-110	980+/-49	3.3
Water	02-06-87	Co-60	49+/-7	50.0+/-5.0	-0.5
		Zn-65	92+/-8	91.0+/-5.0	0.5
		Ru-106	90+/-20	100.0+/-5.0	-4.2
		Cs-134	50+/-8	59.0+/-5.0	-3.0
		Cs-137	85+/-8	87.0+/-5.0	-0.6
Water	02-13-87	H-3	4200+/-400	4209+/-420	-0.2
Water	02-20-87	U	11+/-6	8.0+/-6.0	0.7
Milk	02-27-87	I-131	9.3+/-1.0	9.0+/-0.9	0.6
Water	03-13-87	Ra-226	7.4+/-1.1	7.3+/-1.1	0.2
		Ra-228	8.1+/-1.1	7.5+/-1.1	0.9
Water	03-20-87	Alpha	3.7+/-1.5	3.0+/-5.0	0.2
		Beta	14.0+/-1.8	13.0+/-5.0	0.3
Water	04-03-87	I-131	7.0+/-1.0	7.0+/-0.7	0.0
Filter	04-10-87	Alpha	16+/-2	14.0+/-5.0	0.7
		Beta	44+/-3	43.0+/-5.0	0.2
		Sr-90	18.0+/-1.5	17.0+/-1.5	1.2
		Cs-137	8+/-4	8.0+/-5.0	0.1
Blind	04-20-87	Alpha	29+/-5	30.0+/-8.0	-0.3
		Ra-226	3.4+/-1.0	3.9+/-0.6	-0.4
		Ra-228	3.8+/-1.0	4.0+/-0.6	-0.7
		U	6+/-5	5.0+/-6.0	0.3
		Beta	66+/-5	66.0+/-5.0	-0.1
		Sr-89	20+/-3	19.0+/-5.0	0.3
		Sr-90	9.0+/-1.5	10.0+/-1.5	-1.2
		Co-60	8+/-3	8.0+/-5.0	-0.5
		Cs-134	17+/-3	20.0+/-5.0	-0.9
		Cs-137	15+/-3	15.0+/-5.0	-0.1

Table 6 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	05-08-87	Sr-89	39+/-3	41.0+/-5.0	-0.7
		Sr-90	20.7+/-1.5	20.0+/-1.5	0.8
Water	05-22-87	Alpha	9+/-2	11.0+/-5.0	-0.8
		Beta	9.3+/-1.8	7.0+/-5.0	0.8
Water	06-05-87	Cr-51	LT 45	41.0+/-5.0	
		Co-60	65+/-5	64.0+/-5.0	0.2
		Zn-65	9+/-5	10.0+/-5.0	-0.3
		Ru-106	66+/-5	75.0+/-5.0	-3.1
		Cs-134	35+/-5	40.0+/-5.0	-1.6
		Cs-137	77+/-5	80.0+/-5.0	-1.2
Water	06-12-87	H-3	3000+/-300	2895+/-357	0.4
Water	06-19-87	Ra-226	6.8+/-1.5	7.3+/-1.1	-0.8
		Ra-228	19+/-2	15.2+/-2.3	2.6
Milk	06-26-87	Sr-89	No data provided	69.0+/-5.0	
		Sr-90	37+/-3	35.0+/-1.5	2.7
		I-131	62+/-5	59.0+/-6.0	0.9
		Cs-137	77+/-5	74.0+/-5.0	1.0
		K	1680+/-190	1525+/-76	3.4
Water	07-24-87	Alpha	5.3+/-1.6	5.0+/-5.0	0.1
		Beta	5.0+/-1.2	5.0+/-5.0	0.0
Food	07-31-87	Sr-89	No data provided	20.0+/-5.0	
		Sr-90	No data provided	30.0+/-1.5	
		I-131	76+/-7	80.0+/-8.0	-0.7
		Cs-137	49+/-6	50.0+/-5.0	-0.2
		K	1820+/-150	1680+/-84	2.9
Water	08-07-87	I-131	44+/-11	48.0+/-6.0	-1.2
Water	08-21-87	U	14+/-6	13.0+/-6.0	0.2
Filter	08-28-87	Alpha	12.0+/-1.8	10.0+/-5.0	0.7
		Beta	30.0+/-1.5	30.0+/-1.5	0.0
		Sr-90	9.0+/-0.8	10.0+/-1.5	-1.2
		Cs-137	12+/-5	10.0+/-5.0	0.7
Water	09-11-87	Ra-226	9.8+/-1.5	9.7+/-1.5	0.2
		Ra-228	6.7+/-0.8	6.3+/-1.0	0.7

Table 6 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	09-18-87	Alpha	4.0+/-1.8	4.0+/-5.0	-0.1
		Beta	13.0+/-1.3	12.0+/-5.0	0.4
Water	10-09-87	Cr-51	55+/-5	70.0+/-5.0	-5.1
		Co-60	15+/-4	15.0+/-5.0	-0.1
		Zn-65	41+/-5	46.0+/-5.0	-1.9
		Ru-106	48+/-6	61.0+/-5.0	-4.5
		Cs-134	26+/-4	25.0+/-5.0	0.4
		Cs-137	51+/-5	51.0+/-5.0	0.1
Water	10-16-87	H-3	4303+/-300	4492+/-449	-0.7
Water	10-21-87	alpha	32+/-3	28.0+/-7.0	1.0
		beta	73+/-5	72.0+/-5.0	0.5
		Ra-226	4.5+/-0.7	4.80+/-0.72	-0.7
		Ra-228	4.5+/-0.5	3.60+/-0.54	2.8
		U (nat)	4+/-5	3.0+/-6.0	0.4
		Sr-89	16+/-3	16.0+/-5.0	0.0
		Sr-90	9.7+/-1.5	10.0+/-1.5	-0.4
		Co-60	14+/-5	16.0+/-5.0	-0.7
		Cs-134	15+/-5	16.0+/-5.0	-0.5
		Cs-137	22+/-4	24.0+/-5.0	-0.8
Water	11-20-87	alpha	7+/-2	7.0+/-5.0	0.0
		beta	20+/-2	19.0+/-5.0	0.5
Water	12-04-87	I-131	26+/-4	26.0+/-6.0	0.0
Water	12-11-87	Ra-226	4.6+/-0.6	4.80+/-0.72	-0.6
		Ra-228	6.4+/-0.8	5.30+/-0.80	2.5

* a - pCi/sample refers to the following:

Sample	Units
water	pCi/liter
milk	pCi/liter except for K mg/liter
food	pCi/kg except for K mg/kg
filter	pCi/filter

Table 7. Air particulate gross beta and air iodine (I-131) results for January - June, 1987. Indicator site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/M^3

WI - Section of Radiation Protection data

North Property Line
1.3 miles NNW

Collection date	Air Particulate	Air Iodine
01/06/87	0.016+/-0.002	0.000+/-0.017
01/15/87	0.012+/-0.001	0.016+/-0.03
01/23/87	0.009+/-0.001	-0.002+/-0.016
01/29/87	0.019+/-0.002	0.007+/-0.03
02/04/87	0.016+/-0.002	-0.001+/-0.02
02/12/87	0.015+/-0.001	0.001+/-0.018
02/18/87	0.009+/-0.001	-0.016+/-0.03
02/26/87	0.012+/-0.001	-0.006+/-0.02
03/04/87	0.013+/-0.002	-0.017+/-0.03
03/12/87	0.017+/-0.001	-0.014+/-0.03
03/20/87	0.010+/-0.001	-0.014+/-0.03
03/26/87	0.009+/-0.001	-0.004+/-0.04
04/01/87	0.009+/-0.001	0.013+/-0.03
04/10/87	0.014+/-0.001	-0.010+/-0.03
04/16/87	0.012+/-0.002	-0.007+/-0.04
04/23/87	0.010+/-0.001	0.000+/-0.03
04/30/87	0.012+/-0.001	-0.017+/-0.03
05/08/87	0.015+/-0.001	0.022+/-0.03
05/13/87	0.016+/-0.002	-0.005+/-0.04
05/21/87	0.008+/-0.001	-0.003+/-0.04
05/29/87	0.009+/-0.001	-0.004+/-0.03
06/03/87	0.015+/-0.002	-0.004+/-0.04
06/11/87	0.011+/-0.001	-0.003+/-0.03
06/18/87	0.017+/-0.001	-0.007+/-0.03
06/26/87	0.015+/-0.002	0.006+/-0.03
07/02/87	0.012+/-0.001	-0.016+/-0.04

Point Beach data

North Property Line
1.3 miles NNW

Collection date	Air Particulate	Air Iodine
01/05/87	0.03+/-0.01	<0.03
01/12/87	0.03+/-0.01	<0.03
01/19/87	0.04+/-0.01	<0.03
01/26/87	0.03+/-0.01	<0.03
02/02/87	0.03+/-0.01	<0.03
02/09/87	0.02+/-0.01	<0.03
02/16/87	0.02+/-0.01	<0.03
02/23/87	0.02+/-0.01	<0.03
03/02/87	0.02+/-0.01	<0.03
03/09/87	0.03+/-0.01	<0.03
03/16/87	0.03+/-0.01	<0.03
03/23/87	0.02+/-0.01	<0.03
03/30/87	0.01+/-0.01	<0.03
04/06/87	0.02+/-0.01	<0.03
04/13/87	0.02+/-0.01	<0.03
04/20/87	0.01+/-0.01	<0.03
04/27/87	0.01+/-0.01	<0.03
04/04/87	0.02+/-0.01	<0.03
05/11/87	0.02+/-0.01	<0.03
05/18/87	0.02+/-0.01	<0.03
05/26/87	* a	<0.03
06/01/87	0.02+/-0.01	<0.03
06/08/87	0.02+/-0.01	<0.03
06/15/87	0.02+/-0.01	<0.03
06/22/87	0.02+/-0.01	<0.03
06/29/87	0.02+/-0.01	<0.03

* a - Sample lost in the field.

Table 8. Air particulate gross beta and air iodine (I-131) results for July - December, 1987. Indicator site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/M^3

WI - Section of Radiation Protection data

North Property Line
1.3 miles NNW

Collection date	Air Particulate	Air Iodine
07/08/87	0.013+/-0.001	-0.02+/-0.02
07/17/87	0.014+/-0.001	-0.002+/-0.03
07/24/87	0.028+/-0.002	-0.001+/-0.03
07/29/87	0.013+/-0.002	-0.003+/-0.03
08/06/87	0.016+/-0.001	0.004+/-0.03
08/12/87	0.012+/-0.002	-0.018+/-0.03
08/21/87	0.015+/-0.001	0.017+/-0.03
08/28/87	0.011+/-0.001	-0.001+/-0.03
09/03/87	0.011+/-0.002	-0.001+/-0.03
09/11/87	0.019+/-0.002	-0.007+/-0.018
09/18/87	0.014+/-0.001	-0.005+/-0.03
09/25/87	0.008+/-0.001	-0.010+/-0.03
10/02/87	0.020+/-0.002	-0.002+/-0.03
10/07/87	0.008+/-0.001	-0.015+/-0.03
10/14/87	0.014+/-0.001	0.011+/-0.02
10/20/87	0.020+/-0.002	-0.011+/-0.03
10/28/87	0.008+/-0.001	0.011+/-0.03
11/04/87	0.014+/-0.001	-0.007+/-0.02
11/13/87	0.016+/-0.001	-0.03+/-0.02
11/19/87	0.022+/-0.002	-0.002+/-0.0[illegible]
11/24/87	0.015+/-0.002	0.014+/-0.04
12/02/87	0.009+/-0.001	-0.002+/-0.02
12/11/87	0.011+/-0.001	0.000+/-0.02
12/18/87	0.008+/-0.001	0.002+/-0.03
12/23/87	0.020+/-0.002	-0.008+/-0.02
12/30/87	0.021+/-0.002	-0.003+/-0.05

Point Beach data

North Property Line
1.3 miles NNW

Collection date	Air Particulate	Air Iodine
07/06/87	0.02+/-0.01	<0.03
07/13/87	0.01+/-0.01	<0.03
07/20/87	0.02+/-0.01	<0.03
07/27/87	0.03+/-0.01	<0.03
08/03/87	0.03+/-0.01	<0.03
08/10/87	0.02+/-0.01	<0.03
08/17/87	0.01+/-0.01	<0.03
08/24/87	0.02+/-0.01	<0.03
09/01/87	0.02+/-0.01	<0.03
09/08/87	0.03+/-0.01	<0.03
09/14/87	0.02+/-0.01	<0.03
09/21/87	0.02+/-0.01	<0.03
09/28/87	0.03+/-0.01	<0.03
10/05/87	0.02+/-0.01	<0.03
10/12/87	0.01+/-0.01	<0.03
10/20/87	0.04+/-0.01	<0.03
10/26/87	0.01+/-0.01	<0.03
11/02/87	0.03+/-0.01	<0.03
11/09/87	0.04+/-0.01	<0.03
11/16/87	0.04+/-0.01	<0.03
11/24/87	0.02+/-0.01	<0.03
11/30/87	0.01+/-0.01	<0.03
12/07/87	0.02+/-0.01	<0.03
12/14/87	0.03+/-0.01	<0.03
12/21/87	0.02+/-0.01	<0.03
12/28/87	0.04+/-0.01	<0.03

Table 9. Air particulate gross beta and air iodine (I-131) results for January - June, 1987. Control site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/M^3

WI - Section of Radiation Protection data

Point Beach data

Green Bay Pumping Station - Rostok
15.6 miles NNE

Silver Lake College
17 miles WSW

Collection date	Air Particulate	Air Iodine	Collection date	Air Particulate	Air Iodine
01/09/87	0.014+/-0.001	0.011+/-0.03	01/05/87	0.03+/-0.01	<0.03
01/16/87	0.017+/-0.001	0.000+/-0.018	01/12/87	0.03+/-0.01	<0.03
01/23/87	0.013+/-0.001	-0.005+/-0.017	01/19/87	0.03+/-0.01	<0.03
01/30/87	0.012+/-0.001	0.005+/-0.018	01/26/87	0.03+/-0.01	<0.03
02/06/87	0.014+/-0.001	-0.001+/-0.017	02/02/87	0.03+/-0.01	<0.03
02/13/87	0.012+/-0.001	-0.001+/-0.02	02/09/87	0.02+/-0.01	<0.03
02/19/87	0.013+/-0.001	-0.003+/-0.03	02/16/87	0.02+/-0.01	<0.03
02/17/87	0.013+/-0.001	-0.002+/-0.018	02/23/87	0.02+/-0.01	<0.03
03/06/87	0.010+/-0.001	0.004+/-0.03	03/02/87	0.02+/-0.01	<0.03
03/13/87	0.017+/-0.001	-0.004+/-0.03	03/09/87	0.03+/-0.01	<0.03
03/20/87	0.015+/-0.001	-0.008+/-0.03	03/16/87	0.03+/-0.01	<0.03
03/27/87	0.007+/-0.001	0.006+/-0.018	03/23/87	0.02+/-0.01	<0.03
04/03/87	0.009+/-0.001	-0.007+/-0.03	03/30/87	0.01+/-0.01	<0.03
04/10/87	0.013+/-0.001	-0.008+/-0.03	04/06/87	0.02+/-0.01	<0.03
04/17/87	0.012+/-0.001	-0.015+/-0.03	04/13/87	0.02+/-0.01	<0.03
04/24/87	0.008+/-0.001	-0.003+/-0.03	04/20/87	0.01+/-0.01	<0.03
05/01/87	0.010+/-0.001	-0.006+/-0.03	04/27/87	0.01+/-0.01	<0.03
05/08/87	0.013+/-0.001	-0.003+/-0.03	05/04/87	0.02+/-0.01	<0.03
05/15/87	0.011+/-0.001	-0.003+/-0.03	05/11/87	0.02+/-0.01	<0.03
05/22/87	0.008+/-0.001	-0.005+/-0.03	05/18/87	0.02+/-0.01	<0.03
05/29/87	0.006+/-0.001	0.000+/-0.019	05/26/87	0.01+/-0.01	<0.03
06/05/87	* a	* a	06/01/87	0.02+/-0.01	<0.03
06/12/87	0.014+/-0.001	0.000+/-0.03	06/08/87	0.02+/-0.01	<0.03
06/19/87	0.015+/-0.001	0.03+/-0.03	06/15/87	0.02+/-0.01	<0.03
			06/22/87	0.03+/-0.01	<0.03
07/02/87	0.012+/-0.001	-0.001+/-0.02	06/29/87	0.02+/-0.01	<0.03

* a - Filter and cartridge were not enclosed in the envelope.

Table 10. Air particulate gross beta and air iodine (I-131) results for July - December, 1987. Control site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/M^3

WI - Section of Radiation Protection data

Green Bay Pumping Station - Rostok
15.6 miles NNE

Collection date	Air Particulate	Air Iodine
07/09/87	0.013+/-0.001	0.000+/-0.03
07/17/87	0.009+/-0.001	0.007+/-0.02
07/31/87	0.013+/-0.001	-0.001+/-0.02
08/07/87	0.011+/-0.002	0.006+/-0.02
08/14/87	0.013+/-0.002	-0.003+/-0.04
08/21/87	0.012+/-0.002	0.006+/-0.04
08/28/87	0.013+/-0.002	-0.009+/-0.04
09/11/87	0.023+/-0.002	0.006+/-0.04
09/18/87	0.010+/-0.002	-0.012+/-0.0
09/25/87	0.007+/-0.001	0.004+/-0.03
10/05/87	0.014+/-0.001	-0.003+/-0.02
10/09/87	0.005+/-0.002	0.017+/-0.05
10/19/87	0.017+/-0.001	-0.012+/-0.02
10/23/87	0.006+/-0.002	0.008+/-0.04
11/02/87	0.012+/-0.001	-0.001+/-0.02
11/09/87	0.045+/-0.002	-0.014+/-0.02
11/16/87	0.020+/-0.002	-0.002+/-0.012
11/20/87	0.011+/-0.002	0.004+/-0.03
11/30/87	0.010+/-0.001	0.001+/-0.010
12/04/87	0.009+/-0.002	-0.002+/-0.03
12/11/87	0.010+/-0.001	-0.006+/-0.03
12/18/87	0.007+/-0.001	-0.001+/-0.03
12/28/87	0.019+/-0.001	-0.012+/-0.02

Point Beach data

Silver Lake College
17 miles WSW

Collection date	Air Particulate	Air Iodine
07/06/87	0.01+/-0.01	<0.03
07/13/87	0.02+/-0.02	<0.03
07/20/87	0.02+/-0.02	<0.03
07/27/87	0.03+/-0.01	<0.03
08/03/87	0.03+/-0.01	<0.03
08/10/87	0.02+/-0.01	<0.03
08/17/87	0.02+/-0.01	<0.03
08/24/87	0.02+/-0.01	<0.03
08/31/87	0.02+/-0.01	<0.03
09/08/87	0.02+/-0.01	<0.03
09/14/87	0.02+/-0.01	<0.03
09/21/87	0.01+/-0.01	<0.03
09/28/87	0.02+/-0.01	<0.03
10/05/87	0.02+/-0.01	<0.03
10/12/87	0.01+/-0.01	<0.03
12/20/87	0.04+/-0.01	<0.03
10/26/87	0.01+/-0.01	<0.03
11/02/87	0.03+/-0.01	<0.03
11/09/87	0.03+/-0.01	<0.03
11/16/87	0.04+/-0.01	<0.03
11/24/87	0.03+/-0.01	<0.03
11/30/87	0.01+/-0.01	<0.03
12/07/87	0.02+/-0.01	<0.03
12/14/87	0.02+/-0.01	<0.03
12/21/87	0.02+/-0.01	<0.03
12/28/87	0.04+/-0.01	<0.03

Table 11. Gamma isotopic results for January - December, 1987 from the monthly composite of air particulate samples. Indicator site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/M^3

WI - Section of Radiation Protection data

North Property Line
1.3 miles NNW

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Be-7	0.083+/-0.011	0.135+/-0.014	0.081+/-0.010	0.072+/-0.010
Zr-95	0.001+/-0.002	-0.001+/-0.002	0.001+/-0.002	0.000+/-0.002
Ru-103	0.000+/-0.001	0.000+/-0.001	0.001+/-0.001	0.000+/-0.001
Ru-106	-0.001+/-0.004	0.000+/-0.004	-0.001+/-0.004	0.000+/-0.004
I-131	0.000+/-0.03	-0.002+/-0.04	-0.007+/-0.04	-0.001+/-0.03
Cs-134	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001
Cs-137	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001
Ce-141	0.000+/-0.001	0.000+/-0.002	0.000+/-0.002	0.000+/-0.001
Ce-144	-0.001+/-0.002	0.001+/-0.002	0.000+/-0.002	0.000+/-0.002

Isotopes other than those reported were not detected.

Point Beach data

North Property Line
1.3 miles NNW

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Gamma Isotopic				
Cs-134	<0.01	<0.01	<0.01	<0.01
Cs-137	<0.01	<0.01	<0.01	<0.01

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionculides specifically identified in the PRNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 12. Gamma isotopic results for January - December, 1987 from the quarterly composite of air particulate samples. Control site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/M^3

WI - Section of Radiation Protection data

Green Bay Pumping Station - Rostok
15.6 miles NNE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Be-7	0.084+/-0.011	0.081+/-0.011	0.078+/-0.012	0.067+/-0.013
Zr-95	-0.001+/-0.001	0.000+/-0.002	0.001+/-0.002	0.000+/-0.002
Ru-103	0.000+/-0.001	-0.001+/-0.001	0.000+/-0.001	0.000+/-0.001
Ru-106	0.000+/-0.004	-0.001+/-0.004	0.002+/-0.006	0.000+/-0.005
I-131	0.000+/-0.02	-0.001+/-0.03	-0.004+/-0.04	-0.002+/-0.05
Cs-134	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001
Cs-137	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001	0.000+/-0.001
Ce-141	0.000+/-0.001	0.000+/-0.001	0.000+/-0.002	0.000+/-0.002
Ce-144	0.000+/-0.002	0.000+/-0.002	0.000+/-0.003	0.000+/-0.003

Isotopes other than those reported were not detected.

Point Beach data

Silver Lake College
17 miles WSW

Gamma Isotopic	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Cs-134	<0.01	<0.01	<0.01	<0.01
Cs-137	<0.01	<0.01	<0.01	<0.01

Except for naturally occurring radionucledes, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 13. Analysis of surface water samples from January - June, 1987. Indicator site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/liter
WI - Section of Radiation Protection data

Effluent channel
0.1 mile E

Collection Date	January	February	March	April	May	June
Gross Alpha-sol.	0.5+/-1.2	0.5+/-1.1	0.3+/-1.1	-0.2+/-1.1	1.6+/-1.5	0.3+/-1.1
Gross Alpha-insol	0.0+/-0.7	0.2+/-0.7	0.0+/-0.7	0.2+/-0.6	0.8+/-0.7	-0.2+/-0.6
Gross Beta-sol.	3.4+/-1.2	2.9+/-1.2	3.4+/-1.3	2.6+/-1.2	3.0+/-1.2	2.8+/-1.2
Gross Beta-insol.	0.7+/-1.0	-0.2+/-0.9	1.0+/-1.0	0.1+/-0.9	0.6+/-0.9	1.3+/-1.0
H-3	440+/-310	310+/-310	260+/-320	-40+/-310	400+/-330	550+/-440
Sr-89	0.1+/-0.4	0.1+/-0.4	-0.3+/-0.4	-0.3+/-0.4	0.1+/-0.4	-0.8+/-0.4
Sr-90	0.1+/-0.3	0.9+/-0.4	0.4+/-0.4	1.0+/-0.4	0.2+/-0.4	1.0+/-0.4
I-131	0.0+/-0.1	0.3+/-0.4	0.2+/-0.5	0.2+/-1.3	0.1+/-0.4	0.0+/-0.6
Gamma Isotopic						
Mn-54	-3+/-5	-2+/-5	-1+/-5	-3+/-6	1+/-6	-7+/-7
Fe-59	-6+/-12	-4+/-17	8+/-15	-1+/-17	-2+/-13	1+/-20
Co-58	-2+/-7	-2+/-7	-1+/-6	-6+/-8	0+/-6	1+/-10
Co-60	-1+/-6	0+/-5	-1+/-6	0+/-6	-1+/-5	-3+/-8
Zn-65	-4+/-11	4+/-12	-2+/-14	2+/-14	5+/-13	0+/-17
Cs-134	-3+/-6	-1+/-7	5+/-6	-3+/-7	-2+/-7	-3+/-8
Cs-137	-4+/-6	-2+/-6	-3+/-6	-1+/-7	-2+/-6	-2+/-9
Zr-95	-3+/-16	9+/-17	-9+/-15	-7+/-17	11+/-18	4+/-22
Ba,La-140	-8+/-20	8+/-20	-7+/-18	-5+/-27	-4+/-23	-13+/-30

Isotopes other than those detected were not detected.

Point Beach Data

Effluent channel
0.1 mile E

Collection Date	January	February	March	April	May	June
Gross beta	1.6+/-0.3	1.9+/-0.3	1.8+/-0.3	1.8+/-0.5	2.5+/-0.7	2.4+/-0.5
H-3 * a			<500			<500
Sr-89 * a			<5			<5
Sr-90 * a			<1			<1
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Gamma Isotopic						
Mn-54	<10	<10	<10	<10	<10	<10
Fe-59	<30	<30	<30	<30	<30	<30
Co-58	<10	<10	<10	<10	<10	<10
Co-60	<10	<10	<10	<10	<10	<10
Zn-65	<30	<30	<30	<30	<30	<30
Cs-134	<10	<10	<10	<10	<10	<10
Cs-137	<10	<10	<10	<10	<10	<10
Zr-95	<15	<15	<15	<15	<15	<15
Ba,La-140	<15	<15	<15	<15	<15	<15

* a - The analysis is performed on a quarterly composite.

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 14. Analysis of surface water samples from July - December, 1987. Indicator site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/liter
WI - Section of Radiation Protection data

Effluent channel
0.1 mile E

Collection Date	July	August	September	October	November	December
Gross Alpha-sol.	-0.3+/-1.7	0.5+/-1.3	0.4+/-0.9	-0.3+/-0.9	0.7+/-1.1	0.8+/-1.0
Gross Alpha-insol	-0.3+/-0.7	-0.5+/-0.6	0.1+/-0.7	1.3+/-0.8	0.4+/-0.8	-0.2+/-0.5
Gross Beta-sol.	2.9+/-1.3	2.2+/-1.2	2.1+/-1.2	4.2+/-1.3	3.5+/-1.2	2.7+/-1.2
Gross Beta-insol.	0.6+/-0.9	0.3+/-0.9	-0.6+/-0.9	1.6+/-1.0	1.7+/-1.0	2.0+/-1.1
H-3	-90+/-570	-40+/-330	-1+/-270	150+/-280	40+/-280	210+/-300
Sr-89	1.0+/-0.4	-3.2+/-0.4	-0.4+/-0.4	-0.1+/-0.3	-1.4+/-0.4	1.4+/-0.5
Sr-90	0.3+/-0.4	1.9+/-0.3	0.9+/-0.3	0.6+/-0.3	0.6+/-0.4	0.0+/-0.4
I-131	1.7+/-1.2	-0.9+/-0.4	-0.9+/-0.6	1.0+/-0.4	0.1+/-0.2	-0.6+/-0.2
Gamma Isotopic						
Mn-54	-2+/-5	-3+/-7	-6+/-5	-2+/-6	0+/-5	-4+/-5
Fe-59	1+/-16	5+/-19	-6+/-14	-3+/-12	6+/-10	1+/-15
Co-58	-2+/-7	-1+/-9	-5+/-7	-2+/-6	-2+/-5	-2+/-7
Co-60	0+/-6	2+/-9	-4+/-5	2+/-6	-1+/-5	0+/-6
Zn-65	4+/-13	6+/-17	-6+/-13	-7+/-12	1+/-11	-7+/-12
Cs-134	5+/-6	2+/-8	-3+/-6	-2+/-5	-2+/-6	-4+/-5
Cs-137	-1+/-6	0+/-9	0+/-6	-4+/-6	-3+/-6	-3+/-6
Zr-95	-8+/-20	15+/-20	-3+/-15	-3+/-15	-4+/-13	-1+/-16
Ba,La-140	1+/-45	10+/-30	3+/-20	-6+/-15	0+/-7	3+/-30

Isotopes other than those detected were not detected.

Point Beach Data

Effluent channel
0.1 mile E

Collection Date	July	August	September	October	November	December
Gross beta	3.0+/-0.7	1.5+/-0.4	2.0+/-0.4	2.2+/-0.1	2.2+/-0.5	2.8+/-0.5
H-3 * a			<500			<500
Sr-89 * a			<5			<5
Sr-90 * a			<1			<1
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Gamma Isotopic						
Mn-54	<10	<10	<10	<10	<10	<10
Fe-59	<30	<30	<30	<30	<30	<30
Co-58	<10	<10	<10	<10	<10	<10
Co-60	<10	<10	<10	<10	<10	<10
Zn-65	<30	<30	<30	<30	<30	<30
Cs-134	<10	<10	<10	<10	<10	<10
Cs-137	<10	<10	<10	<10	<10	<10
Zr-95	<15	<15	<15	<15	<15	<15
Ba,La-140	<15	<15	<15	<15	<15	<15

* a - The analysis is performed on a quarterly composite.

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 15. Analysis of surface water samples from January - June, 1987. Control site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/liter
WI - Section of Radiation Protection data

Green Bay Pumping
15.6 miles NNE

Collection Date	01/01/87	02/02/87	03/02/87	04/06/87	* a	06/22/87
Gross Alpha-sol.	1.1+/-1.2	0.5+/-1.0	-0.2+/-0.9	0.7+/-1.1		0.6+/-1.2
Gross Alpha-insol	0.1+/-0.7	0.0+/-0.7	0.3+/-1.1	0.2+/-0.7		-0.1+/-0.6
Gross Beta-sol.	3.1+/-1.2	3.5+/-1.2	3.8+/-1.2	3.3+/-1.2		2.6+/-1.2
Gross Beta-insol.	0.4+/-1.2	0.4+/-0.9	-0.3+/-1.4	0.3+/-0.9		0.5+/-1.0
H-3	-5+/-300	210+/-310	540+/-310	350+/-320		-400+/-500
Sr-89	-0.8+/-0.5	-0.2+/-0.4	-0.4+/-0.4	0.1+/-0.4		0.4+/-0.4
Sr-90	1.3+/-0.5	0.5+/-0.4	0.8+/-0.4	0.4+/-0.4		0.7+/-0.4
I-131	0.4+/-0.2	0.0+/-0.2	0.4+/-0.2	0.2+/-0.1		0.2+/-0.2
Gamma Isotopic						
Mn-54	-1+/-5	1+/-6	-1+/-5	0+/-5		0+/-4
Fe-59	-1+/-12	1+/-10	-8+/-8	-3+/-9		-2+/-8
Co-58	2+/-6	0+/-5	3+/-7	-1+/-5		-1+/-4
Co-60	0+/-6	-2+/-6	-1+/-6	0+/-5		0+/-4
Zn-65	1+/-11	-1+/-11	-3+/-13	5+/-12		-1+/-8
Cs-134	2+/-7	0+/-6	3+/-6	1+/-6		0+/-4
Cs-137	-1+/-7	-1+/-6	0+/-6	2+/-6		-1+/-4
Zr-95	-6+/-15	-10+/-15	1+/-14	-2+/-13		-3+/-11
La-140	-3+/-7	-1+/-8	-5+/-8	-2+/-6		0+/-7

* a - A sample was not collected.
Isotopes other than those reported were not detected.

Point Beach data

Coast Guard Station
4.8 miles SSE

Collection Date	01/05/87	02/02/87	03/02/87	04/02/87	05/04/87	06/01/87
Gross beta	3.9+/-0.7	4.7+/-0.5	2.9+/-0.5	2.9+/-0.6	1.8+/-0.7	2.6+/-0.5
H-3 * a			<500			<500
Sr-89 * a			<5			<5
Sr-90 * a			<1			<1
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Gamma Isotopic						
Mn-54	<10	<10	<10	<10	<10	<10
Fe-59	<30	<30	<30	<30	<30	<30
Co-58	<10	<10	<10	<10	<10	<10
Co-60	<10	<10	<10	<10	<10	<10
Zn-65	<30	<30	<30	<30	<30	<30
Cs-134	<10	<10	<10	<10	<10	<10
Cs-137	<10	<10	<10	<10	<10	<10
Zr-95	<15	<15	<15	<15	<15	<15
La-140	<15	<15	<15	<15	<15	<15

* a - Analysis is performed on a quarterly composite.

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 16. Analysis of surface water samples from July - December, 1987. Control site.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/liter
WI - Section of Radiation Protection data

Green Bay Pumping
15.6 miles NNE

Collection Date	07/06/87	08/03/87	09/04/87	10/01/87	11/02/87	12/02/87
Gross Alpha-sol.	0.5+/-1.3	-0.4+/-1.3	0.7+/-1.5	1.3+/-1.3	-0.1+/-1.2	1.1+/-1.2
Gross Alpha-insol	-0.2+/-0.6	-0.1+/-0.8	-0.3+/-0.7	0.4+/-0.7	0.1+/-0.6	0.7+/-0.8
Gross Beta-sol.	2.9+/-1.2	2.3+/-1.2	2.1+/-1.2	4.0+/-1.2	2.7+/-1.2	3.2+/-1.2
Gross Beta-insol.	0.2+/-1.0	2.1+/-1.0	0.2+/-0.8	1.1+/-0.9	0.6+/-0.9	1.5+/-1.0
H-3	-20+/-500	780+/-580	140+/-330	130+/-240	190+/-270	50+/-280
Sr-89	0.4+/-0.4	0.4+/-0.4	-0.1+/-0.4	-0.5+/-0.3	0.0+/-0.3	-0.5+/-0.4
Sr-90	0.2+/-0.3	0.3+/-0.4	0.8+/-0.4	0.9+/-0.3	0.4+/-0.3	0.3+/-0.4
I-131	0.1+/-0.1	0.0+/-0.2	0.05+/-0.2	0.2+/-0.2	0.3+/-0.2	-0.1+/-0.2
Gamma Isotopic						
Mn-54	-3+/-5	-3+/-5	-1+/-5	-5+/-6	-2+/-5	0+/-4
Fe-59	-3+/-9	-1+/-10	4+/-11	-3+/-16	-2+/-10	-2+/-8
Co-58	-1+/-5	-1+/-5	-2+/-5	-2+/-7	-2+/-5	-2+/-3
Co-60	1+/-5	-3+/-5	0+/-6	0+/-8	0+/-6	0+/-4
Zn-65	2+/-11	5+/-12	3+/-12	0+/-16	-3+/-11	-2+/-8
Cs-134	0+/-6	-1+/-6	3+/-6	1+/-8	0+/-6	-1+/-4
Cs-137	1+/-6	3+/-6	-3+/-6	1+/-9	-1+/-6	0+/-4
Zr-95	-8+/-12	5+/-14	5+/-14	3+/-17	2+/-14	-3+/-10
Ba,La-140	-1+/-7	0+/-7	-1+/-9	4+/-9	-1+/-8	-1+/-5

Isotopes other than those reported were not detected.

Point Beach data

Coast Guard Station
4.8 miles SSE

Collection Date	07/06/87	08/03/87	09/01/87	10/01/87	11/02/87	12/07/87
Gross beta	2.4+/-0.5	1.7+/-0.5	2.5+/-0.7	2.6+/-0.5	2.5+/-0.5	3.1+/-0.5
H-3 * a			<500			<500
Sr-89 * a			<5			<5
Sr-90 * a			<1			<1
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Gamma Isotopic						
Mn-54	<10	<10	<10	<10	<10	<10
Fe-59	<30	<30	<30	<30	<30	<30
Co-58	<10	<10	<10	<10	<10	<10
Co-60	<10	<10	<10	<10	<10	<10
Zn-65	<30	<30	<30	<30	<30	<30
Cs-134	<10	<10	<10	<10	<10	<10
Cs-137	<10	<10	<10	<10	<10	<10
Zr-95	<15	<15	<15	<15	<15	<15
La-140	<15	<15	<15	<15	<15	<15

* a - Analysis is performed on a quarterly composite.

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 17. Analysis of fish samples for 1987.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/kg (wet)

WI - Section of Radiation Protection

Collection Date	03/11/87	03/11/87	06/10/87	06/10/87	12/16/87	12/16/87
Type	lake trout	white fish	salmon	salmon	salmon	trout
Location	Point Beach	Point Beach	Point Beach	Point Beach	Point Beach	Point Beach
Gamma Isotopic						
K-40	2800+/-400	2800+/-400	3000+/-500	2100+/-400	3100+/-500	3200+/-500
Mn-54	-1+/-16	-1+/-17	-2+/-20	0+/-14	-1+/-17	-1+/-18
Fe-59	50+/-40	30+/-40	-3+/-60	7+/-30	50+/-50	-5+/-60
Co-58	7+/-17	15+/-18	-4+/-20	-2+/-20	-2+/-20	-2+/-20
Co-60	4+/-20	7+/-20	17+/-20	6+/-20	-1+/-20	12+/-20
Zn-65	8+/-40	11+/-40	20+/-50	6+/-40	13+/-60	-9+/-50
Cs-134	5+/-16	10+/-16	1+/-19	8+/-16	2+/-20	12+/-20
Cs-137	120+/-30	80+/-20	50+/-20	50+/-20	110+/-30	150+/-30

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	03/11/87	03/11/87	08/26/87	12/16/87	12/16/87
Type	whitefish	lake trout	trout	trout	salmon
Location	Point Beach	Point Beach	Point Beach	Point Beach	Point Beach
Gamma Isotopic					
Mn-54	<130	<130	<130	<130	<130
Fe-59	<260	<260	<260	<260	<260
Co-58	<130	<130	<130	<130	<130
Co-60	<130	<130	<130	<130	<130
Zn-65	<260	<260	<260	<260	<260
Cs-134	<130	<130	<130	<130	<130
Cs-137	<150	<150	<150	<150	<150

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 18. Analysis of shoreline sediments for 1987.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/kg (dry)

MI - Section of Radiation Protection data

Collection Date	10/01/87	10/01/87	10/01/87
Type	shoreline sed.	shoreline sed.	shoreline sed.
Location	Met. Tower	Coast Guard St.	Eff. channel
	E-01	E-06	E-12
Analysis			
Gross beta (dry)	9000+/-400	20000+/-5000	27000+/-5000
Gross alpha (dry)	-300+/-5000	15000+/-8000	11000+/-7000
Gamma Isotopic			
Co-58	14+/-30	50+/-40	40+/-40
Co-60	90+/-30	20+/-20	130+/-30
Cs-134	50+/-30	90+/-30	60+/-30
Cs-137	100+/-30	90+/-30	70+/-30
K-40	3700+/-400	2400+/-300	3800+/-400
Ra-226 * a	620+/-40	1780+/-100	1300+/-70
Pb-214 * a	560+/-60	1580+/-80	1170+/-80
Bi-214 * a	610+/-70	1610+/-90	1230+/-90
Tl-208 * a	880+/-90	1740+/-110	1490+/-120
Ac-228 * a	780+/-120	1740+/-140	1430+/-140

*a - Naturally occurring radioisotopes Ac-228 and Tl-208 are from the Thorium-232 decay series. Ra-226, Pb-214, and Bi-214 are from the Uranium-238 decay series.

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	10/01/87	10/01/87	10/01/87
Type	shoreline sed.	shoreline sed.	shoreline sed.
Location	Met. Tower	Coast Guard St.	Eff. channel
	E-01	E-06	E-12
Gross beta (dry)	15700+/-2150	10200+/-2800	10300+/-2700
Gamma Isotopic			
Cs-137	<150	<150	<150

Shoreline sediment analyses are not required by the Point Beach Radiological Effluent Technical Specifications. However, analyses are conducted to provide a comparison to previous monitoring results.

Table 19. Analysis of milk samples for January - December, 1987.
Funk farm.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/liter

Funk farm
3.8 miles WSW

WI - Section of Radiation Protection data

Collection date	01/07/87	02/04/87	03/04/87	04/01/87	05/13/87	06/03/87
Isotope:						
I-131	-0.1+/-0.1	0.0+/-0.1	0.1+/-0.1	-0.1+/-0.1	0.1+/-0.1	-0.2+/-0.1
La-140	-5+/-7	-4+/-5	-4+/-5	0+/-6	0+/-7	-5+/-5
Cs-134	5+/-8	5+/-7	3+/-7	1+/-7	1+/-7	9+/-8
Cs-137	0+/-9	4+/-7	1+/-7	1+/-7	-1+/-8	-1+/-8
K-40	1360+/-190	1530+/-190	1310+/-180	1570+/-190	1300+/-190	1380+/-180
Sr-90	1.7+/-0.6	1.6+/-0.5	1.6+/-0.6	1.7+/-0.6	1.9+/-0.7	2.7+/-0.7

Collection date	07/08/87	08/12/87	09/02/87	10/07/87	11/04/87	12/02/87
Isotope:						
I-131	0.1+/-0.2	-0.3+/-0.2	0.0+/-0.2	0.1+/-0.2	0.0+/-0.2	0.0+/-0.2
La-140	-2+/-6	1+/-10	-4+/-5	1+/-8	0+/-7	0+/-6
Cs-134	2+/-7	2+/-8	3+/-7	5+/-7	8+/-9	5+/-6
Cs-137	3+/-8	-4+/-10	-1+/-8	4+/-7	-2+/-10	0+/-7
K-40	1330+/-190	1400+/-200	1510+/-190	1420+/-190	1350+/-190	1220+/-180
Sr-90	2.9+/-0.8	1.2+/-0.6	4.1+/-1.1	1.0+/-0.6	3.0+/-0.7	1.3+/-0.8

Isotopes other than those reported were not detected.

Point Beach data

Funk farm
3.8 miles WSW

Collection date	01/07/87	02/04/87	03/04/87	04/01/87	05/13/87	06/03/87
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
La-140	<5	<5	<5	<5	<5	<5
Cs-134	<5	<5	<5	<5	<5	<5
Cs-137	<5	<5	<5	<5	<5	<5
Sr-89	<5	<5	<5	<5	<5	<5
Sr-90	1.8+/-0.5	2.2+/-0.4	2.6+/-0.5	2.0+/-0.5	2.4+/-0.7	2.1+/-0.5

Collection date	07/08/87	08/12/87	09/02/87	10/07/87	11/04/87	12/02/87
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
La-140	<5	<5	<5	<5	<5	<5
Cs-134	<5	<5	<5	<5	<5	<5
Cs-137	<5	<5	<5	<5	<5	<5
Sr-89	<5	<5	<5	<5	<5	<5
Sr-90	1.7+/-0.5	1.5+/-0.5	2.5+/-0.6	1.9+/-0.4	2.2+/-0.6	1.7+/-0.4

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 20. Analysis of milk samples for January - December, 1987.
Lehrmann farm.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/liter

Lehrmann farm
2.7 miles NNW

WI - Section of Radiation Protection data

Collection date	01/07/87	02/04/87	03/04/87	04/01/87	05/13/87	06/03/87
Isotope:						
I-131	-0.4+/-0.1	-0.2+/-0.1	0.0+/-0.1	-0.2+/-0.1	-0.2+/-0.1	-0.2+/-0.1
La-140	0+/-9	0+/-6	0+/-8	-1+/-7	-2+/-7	0+/-6
Cs-134	3+/-8	4+/-6	4+/-8	5+/-7	-2+/-8	4+/-7
Cs-137	-3+/-11	3+/-7	-8+/-10	3+/-8	2+/-10	8+/-7
K-40	1370+/-190	1330+/-180	1500+/-200	1280+/-180	1200+/-200	1290+/-180
Sr-90	2.0+/-0.6	2.2+/-0.5	2.3+/-0.6	2.4+/-0.7	2.5+/-0.8	2.7+/-0.7

Collection date	07/08/87	08/12/87	09/02/87	10/07/87	11/04/87	12/02/87
Isotope:						
I-131	-0.1+/-0.1	0.0+/-0.2	-0.3+/-0.2	-0.3+/-0.2	0.1+/-0.2	-0.3+/-0.2
La-140	-2+/-6	-3+/-7	1+/-6	-1+/-9	2+/-7	0+/-6
Cs-134	-2+/-7	0+/-6	3+/-8	6+/-6	0+/-7	4+/-7
Cs-137	0+/-8	6+/-7	-1+/-8	1+/-7	4+/-6	4+/-6
K-40	1410+/-190	1520+/-190	1360+/-180	1420+/-180	1310+/-180	1280+/-180
Sr-90	3.3+/-0.8	1.4+/-0.6	1.5+/-0.5	2.5+/-0.7	2.4+/-0.6	1.9+/-0.9

Isotopes other than those reported were not detected.

Point Beach data

Lehrmann farm
2.7 miles NNW

Collection date	01/07/87	02/04/87	03/04/87	04/01/87	05/13/87	06/03/87
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
La-140	<5	<5	<5	<5	<5	<5
Cs-134	<5	<5	<5	<5	<5	<5
Cs-137	<5	<5	<5	<5	<5	<5
Sr-89	<5	<5	<5	<5	<5	<5
Sr-90	2.3+/-0.6	4.4+/-0.9	3.2+/-0.6	2.7+/-0.7	3.3+/-0.7	1.6+/-0.6

Collection date	07/08/87	08/12/87	09/02/87	10/07/87	11/04/87	12/02/87
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
La-140	<5	<5	<5	<5	<5	<5
Cs-134	<5	<5	<5	<5	<5	<5
Cs-137	<5	<5	<5	<5	<5	<5
Sr-89	<5	<5	<5	<5	<5	<5
Sr-90	2.9+/-0.6	1.4+/-0.4	1.3+/-0.5	1.7+/-0.4	2.3+/-0.6	2.2+/-0.5

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.

Table 21. Analysis of food product samples for 1987.

WISCONSIN DIVISION OF HEALTH
SECTION OF RADIATION PROTECTION

Point Beach
1987

Measurements in units of pCi/kilogram (wet)

WI - Section of Radiation Protection data

Collection Date	10/01/87	10/01/87	10/01/87	10/01/87
Type	vegetation	vegetation	vegetation	vegetation
Location	SW corner	W boundary	N prop line	Park
	E-02	E-03	E-04	E-06
Analysis				
Gross beta (wet)	8400+/-1900	9200+/-1600	8400+/-1300	8300+/-1300
Gross alpha (wet)	-400+/-1900	1[illegible]0+/-1700	-200+/-1000	800+/-1400
Gamma Isotopic				
Be-7	6700+/-200	3500+/-300	2100+/-400	2800+/-150
K-40	5800+/-300	6200+/-600	6800+/-900	5400+/-300
Co-58	-3+/-13	9+/-30	30+/-40	-2+/-12
Co-60	3+/-17	-13+/-30	30+/-40	3+/-15
Zr-95	20+/-30	40+/-60	-2+/-80	7+/-30
I-131	-6+/-16	-9+/-30	-5+/-30	-6+/-16
Cs-134	1+/-14	5+/-20	40+/-30	11+/-12
Cs-137	-6+/-16	-9+/-20	40+/-40	44+/-14

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	10/01/87	10/01/87	10/01/87	10/01/87
Type	vegetation	vegetation	vegetation	vegetation
Location	SW corner	W boundary	N prop line	Park
	E-02	E-03	E-04	E-06
Analysis				
Gross beta (wet)	7000+/-200	6200+/-200	7000+/-300	5800+/-200
Gamma Isotopic				
I-131	<60	<60	<60	<60
Cs-134	<60	<60	<60	<60
Cs-137	<80	<80	<80	<80

Except for naturally occurring radionuclides, all radionuclides detected at concentrations equal to or above their LLD are reported. Only the radionuclides specifically identified in the PBNP Radiological Effluent Technical Specifications are reported as less than the LLD.