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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  
P.O. Box 309  
Madison, Wisconsin 53701

8506200127 850531  
PDR ADOCK 05000266  
R PDR

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## STATE OF WISCONSIN

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### POINT BEACH ENVIRONMENTAL RADIOACTIVITY SURVEY

#### INTRODUCTION

This report 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. This report covers the calendar year 1984. Results of environmental radioactivity monitoring are listed in tabular form. The data presented consists of duplicative sample analysis such as air and TLD data and split 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.

#### SAMPLING TECHNIQUES

##### 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 one cubic foot of air per minute.

##### Surface Water

A split sample consisting of 3.5 liters 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 at the Green Bay Pumping Station - Rostok. A surface water sample from the Coast Guard Station is included as a background sample for Point Beach.

### Milk

A raw milk sample is collected monthly from the Lehrmann farm and W. Funk farm. The milk sample is a split sample for both Wisconsin and the Point Beach nuclear power facility.

### Sediment

Sediment is collected from three locations on an annual basis.

### Fish

Both migratory and non-migratory fish are collected periodically from locations in Lake Michigan near the Point Beach - Kewaunee area.

### Food Products

Vegetation in the form of grass is collected from several locations in the Point Beach area.

### ANALYTICAL PROCEDURES

The procedures given are abstracted to present only the basic steps. 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 monthly composite of air particulate filters is placed on a Ge(Li) detector. Determine the gamma spectrum using 2048 channels of the Canberra Model 85 multichannel analyzer. Scan the gamma spectrum for any peaks and print out regions of interest. 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.

#### Surface Water - Gamma Isotopic

A 3.5 liter sample is placed in a Marinelli beaker and analyzed on a

GeLi detector. The sample is counted for 100 minutes using 2048 channels at 1.0 Kev per channel. Scan the gamma spectrum for any peaks and print out regions of interest. 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.

#### 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 for 900 minutes on a Ge(Li) detector. Scan the gamma spectrum for any peaks and print out regions of interest. 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

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 tetrachlorine 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 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 count for 100 minutes. Determine the gamma spectrum using 2048 channels set at 1.0 Kev per channel. Scan the gamma spectrum for any peaks and print out regions of interest. 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 their 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 program 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 is included in Table 7 following the conclusion section.

## SENSITIVITIES AND ERROR - WISCONSIN DATA

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 capability 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.

The Wisconsin definition for minimum detectable concentration follows closely the equation for the lower limits of detection as defined in the 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:

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

Where:

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

sb 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 is then possible as well as a better evaluation of distributions and trends in the environmental data. 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 DATA

The statement below is taken from a report submitted to the Point Beach nuclear facility by Teledyne Isotopes Midwest Laboratory.

\*For all gamma isotopic analyses, the spectrum is computer scanned from 80 to 2048 KeV. Specifically included are Mn-54, In-65, Co-58, Co-60, Ir-Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. Naturally occurring gamma-emitters such as K-40 and Ra daughters are frequently detected but not listed here. Data listed as "<" are at the 4.66 sigma level, others are 2 sigma. Unless otherwise noted, the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides.



## CONCLUSIONS

### Air Particulate

Wisconsin and Point Beach maintain separate air sampling stations. The indicator site for both Wisconsin and for Point Beach is located at the residency at the north property line, 1.3 miles NNW. The control site for Wisconsin 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.

The quarterly and yearly averages for the gross beta analysis on the air particulate filters are given in Table 1. For Wisconsin the averages are from a log-normal distribution.

Table 1. Comparison of quarterly and yearly averages for gross beta activities of the air particulate samples.

WI - Section of Radiation Protection			Point Beach	
units of pCi/M <sup>3</sup>				
Quarter	Indicator	Control	Indicator	Control
1st	0.016+/-0.002	0.012+/-0.002	0.023+/-0.01	0.023+/-0.01
2nd	0.010+/-0.002	0.004+/-0.002	0.015+/-0.01	0.017+/-0.01
3rd	0.013+/-0.002	0.007+/-0.002	0.022+/-0.01	0.023+/-0.01
4th	0.017+/-0.002	0.014+/-0.003	0.020+/-0.01	0.021+/-0.01
Yearly	0.014+/-0.002	0.011+/-0.003	0.020+/-0.01	0.021+/-0.01

The Wisconsin and Point Beach comparison of quarterly and yearly averages for gross beta activities of the air particulate samples was good except for problems with the Wisconsin control station (Green Bay Pumping Station - Rostok). For the Wisconsin control station, problems were encountered with air leakage through the cartridge holder resulting in decreased gross beta activities. Problems were noted for the periods 9/21/84 - 10/05/84 and 11/09/84 - 12/28/84. Problems were also suspected for the 2nd and 3rd quarters of 1984. For the Wisconsin control station, data in Table 1 was calculated as follows:

4th quarter	average of activities for the period 10/05/84 - 11/09/84 and
yearly	log normal for activities greater than 0.004 pCi/M <sup>3</sup> .

The radioisotopes detected from the gamma isotopic analysis on the air particulate filter composites, for Wisconsin and Point Beach, are listed in Table 2.

Table 2. Radioisotopes detected in the air filter composites.

WI - Section of Radiation Protection (monthly composite)		
Isotope	# composites detected	range (pCi/M <sup>3</sup> )
	Indicator site	
Be-7	12	0.052 - 0.12
	Control site	
Be-7	1	0.10
Point Beach (quarterly composite)		

No radioisotopes were reported.

All of the detected radioisotopes were near the respective MDC for Wisconsin. The Point Beach quarterly analysis on the air particulate filter composites detected no isotopes above the less than value as stated for cesium-137. Beryllium-7 is not commonly analyzed for as stated in the section: Sensitivity - Point Beach Data.

At the observed lower levels of activity the Wisconsin and Point Beach data compared favorably in the gross beta and gamma isotopic analysis on 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 measurements for both Wisconsin and Point Beach were all below the required NRC LLD of 0.07 pCi/M<sup>3</sup> for the indicator and 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. Wisconsin 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.

The Wisconsin and Point Beach analysis of surface water samples detected the radioisotopes listed in Table 3. All gamma isotopic analyses by Wisconsin and Point Beach were below the respective MDC's or LLD's for both the indicator site and the control site.

Table 3. Radioisotopes detected in the monthly surface water samples.

WI - Section of Radiation Protection

Isotope	# samples detected	range (pCi/liter)
	Indicator site - effluent channel	
H-3	4 (monthly)	1800-9400
I-131	2 (monthly)	0.55-1.8

Point Beach

	Indicator site - effluent channel	
H-3	2 (quarterly)	810-4260
	Control site - Coast Guard Station	
H-3	1 (quarterly)	1030

The detected activities for tritium (H-3) from the indicator site, as reported by Wisconsin and Point Beach, are comparable when a quarterly average is taken for the reported Wisconsin results. The detected Wisconsin activities for iodine-131 (I-131) from the indicator site can not be compared since the Wisconsin reported activities of 0.55 and 1.8 pCi/liter are less than the respective Point Beach LLD of 10 pCi/liter (as calculated for Cs-137).

Comparison of the control site (background sample) is not possible as Wisconsin and Point Beach sample at different locations. It is noted that the reported Point Beach 1st quarter activities for tritium (H-3) from the indicator site and control site are <500 pCi/liter and 1030 pCi/liter, respectively. From the reported Point Beach activities it would appear that the reported activity at the control site is not attributable to the Point Beach facility.

The Wisconsin gross beta yearly average was  $4.5 \pm 1.8$  pCi/l at the indicator site and  $3.7 \pm 1.8$  pCi/l at the control site. The Point Beach gross beta yearly average was  $3.1 \pm 0.6$  pCi/l at the indicator site and  $3.9 \pm 0.6$  pCi/l at the control site. The Wisconsin and Point Beach yearly gross beta averages for the indicator and control sites are not significantly different from the reported 1983 yearly gross beta averages for respective sites. All activities reported by either Wisconsin 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 Wisconsin 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.

The Wisconsin and Point Beach analysis of the fish samples detected the radioisotopes listed in Table 4.

Table 4. Radioisotopes detected in fish.

WI - Section of Radiation Protection			
Isotope	# samples detected	range	pCi/kg (wet)
K-40	6		1300-3400
Cs-137	6		80-190

Point Beach

No radioisotopes reported.

For Wisconsin the detected levels of activity for cesium-137 (Cs-137) and naturally occurring potassium-40 (K-40) were also reported in the Point Beach Environmental Radioactivity Survey for 1983. For Point Beach no isotopes were detected above their respective lower limits of detection. Point Beach reported their results as <500 pCi/kg based on cesium-137 detection limits. Naturally occurring isotopes such as potassium-40 are not reported by Point Beach.

Comparison with the Wisconsin data is not possible at the lower limits of detection reported by Point Beach and the fact that Point Beach does not report naturally occurring radioisotopes.

Bottom Sediments

Split samples were taken for shoreline sediments at three locations.

The Wisconsin and Point Beach analysis of shoreline sediments detected the radioisotopes listed in Table 5.

Table 5. Radisotopes detected in shoreline sediments.

WI - Section of Radiation Protection			
Isotope	# samples detected	range	pCi/kg (dry)
K-40	3		700-6600
Cs-134	1		140
Cs-137	2		90-120
*a	4		90-2670

Point Beach

No radioisotopes reported.

\*a - Naturally occurring radioisotopes from the thorium-232 and uranium-238 decay series.

For Wisconsin the detected levels of activity for cesium-137 (Cs-137) and naturally occurring potassium-40 (K-40) were also reported in the Point Beach Environmental Radioactivity Survey for 1983. For Point Beach no isotopes were detected above their respective lower limits of

detection. Point Beach reports activities as  $\leq 1000$  pCi/kg and does not report naturally occurring radioisotopes.

At the lower level of detection reported by Point Beach and the fact that Point Beach does not report naturally occurring radioisotopes, no comparison can be made with the Wisconsin data. Trace activities for cesium-137 are commonly detected in soil and shoreline sediment samples collected by Wisconsin in other areas of the state.

### 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.

The Wisconsin and Point Beach analysis of milk samples detected the radioisotopes listed in Table 6.

Table 6. Radioisotopes detected in milk samples.

#### WI - Section of Radiation Protection

Isotope	# samples detected	range pCi/liter
K-40	23	1230-1710
I-131	5	0.44-0.50

#### Point Beach

No radioisotopes were reported.

For Wisconsin, naturally occurring potassium-40 (K-40) was detected in all of the samples. The detected activities for iodine-131 (I-131) are only slightly above the Wisconsin MDC of 0.4 pCi/liter. Point Beach did not detect any isotopes above their lower limits of detection in its gamma isotopic analysis. All reported results for iodine-131 were less than 0.5 pCi/l. Naturally occurring potassium-40 (K-40) is not reported by Point Beach.

Comparison with the Wisconsin data is not possible at the lower limits of detection reported by Point Beach and the fact that Point Beach does not report naturally occurring radioisotopes. Influence by the Point Beach nuclear facility is not evident after reviewing the data for Wisconsin and Point Beach.

### Vegetation - Food Products

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

Only naturally occurring potassium-40 (K-40) above its MDC was detected in the gamma isotopic analysis of the Wisconsin samples. Potassium-40 was detected in all three samples in the range of 1900-7100 pCi/kg (wet). Point Beach does not report naturally occurring radioisotopes and no isotopes were reported above their lower limits of detection. Iodine-131 was not detected in any of the Wisconsin or the Point Beach samples.

Comparison with the Wisconsin data is not possible at the lower limits of detection reported by Point Beach and the fact that Point Beach does not report naturally occurring radioisotopes. Influence by the Point Beach nuclear facility is not evident after reviewing the data for Wisconsin and Point Beach.



Table 7. U.S. Environmental Protection Agency's crosscheck program, comparison 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	01-07-83	Sr-89	27.7+/-1.5	29.2+/-5	-0.5
		Sr-90	16.3+/-1.5	17.2+/-1.5	-1.1
Water	01-21-83	Alpha	26+/-2	29+/-7.25	-0.7
		Beta	37+/-2	31+/-5	2.0
Water	02-04-83	Cr-51	<144	45+/-5	
		Co-60	26+/-10	22+/-5	1.4
		Zn-65	27+/-8	21+/-5	0.6
		Ru-106	<112	48+/-5	
		Cs-134	17+/-8	20+/-5	-1.0
		Cs-137	19+/-8	19+/-5	-0.1
Water	02-11-83	H-3	2673+/-300	2560+/-353	0.1
Milk	02-25-83	Sr-89	No data provided	37.4+/-5	
		Sr-90	20.3+/-1.5	17.8+/-1.5	2.9
		I-131	57+/-15	54.5+/-6	0.8
		Cs-137	25+/-10	25.6+/-5	-0.1
		Ba-140	<9	0.0	
		K	1310+/-200	1512+/-76	-4.6
Food	03-04-83	Sr-89	No data provided	34.6+/-5	
		Sr-90	No data provided	27.8+/-1.5	
		I-131	42+/-15	36.9+/-6	1.4
		Cs-137	32+/-15	31.3+/-5	0.4
		Ba-140	<12	0.0	
		K	2217+/-250	2592+/-130	-5.0
Water	03-11-83	Ra-226	13.7+/-1.5	12.7+/-1.9	0.9
		Ra-228	1	0.0	
Water	03-18-83	Alpha	26+/-3	31+/-7.8	-1.0
		Beta	25+/-2	28+/-5	-1.2
Filter	03-25-83	Alpha	36+/-3	26+/-6.5	2.8
		Beta	68+/-5	68+/-5	0.0
		Sr-90	20+/-2	20+/-1.5	0.0
		Cs-137	27+/-8	27+/-5	0.1
Water	04-08-83	H-3	3287+/-330	3330+/-362	-0.2
Water	04-01-83	I-131	25.7+/-5	26.8+/-6	-0.3

Table 7 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a		
			SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	05-06-83	Sr-89	53+/-2	57.1+/-5	-1.5
		Sr-90	37.0+/-1.5	37.7+/-1.9	-0.6
Water	05-09-83	Alpha	51+/-5	64+/-16	-1.4
		Beta	150+/-15	149+/-7.5	0.3
		Sr-89	21+/-1.3	24+/-5	-1.2
		Sr-90	13+/-1.0	13+/-1.5	0.0
		Ra-226	6.8+/-1.5	8.5+/-1.3	-2.3
		Ra-228	6.2+/-1.5	4.7+/-0.7	3.6
		Co-60	29+/-10	30+/-5	-0.2
		Cs-134	29+/-8	33+/-5	-1.3
		Cs-137	32+/-9	27+/-5	1.8
		U	No data provided		25+/-6
Water	05-20-83	Alpha	10+/-3	11+/-5	-0.3
		Beta	57+/-5	57+/-5	0.1
Water	06-03-83	Cr-51	<168	60+/-5	
		Co-60	16+/-8	13+/-5	1.0
		Zn-65	38+/-17	36+/-5	1.0
		Ru-106	<120	40+/-5	
		Cs-134	48+/-12	47+/-5	0.2
		Cs-137	29+/-10	26+/-5	1.2
Water	06-10-83	H-3	1490+/-310	1529+/-337	-0.2
Milk	06-10-83	Sr-89	No data provided		25+/-5
		Sr-90	16+/-2	16+/-1.5	0.0
		I-131	30+/-10	30+/-6	0.0
		Cs-137	42+/-10	47+/-5	-1.7
		K	1500+/-150	1486+/-74	0.4
Water	06-17-83	Ra-226	5.3+/-1.5	4.8+/-0.7	1.3
		Ra-228	<1.0	0.0	
Water	07-15-83	Alpha	6+/-3	7+/-5.0	-0.2
		Beta	25+/-2	22+/-5.0	0.9
Water	08-05-83	I-131	26+/-15	14+/-6	3.4
Water	08-12-83	H-3	1970+/-450	1836+/-342	0.7
Filter	08-26-83	Alpha	16+/-1.8	13+/-5	0.9
		Beta	36+/-1.8	36+/-5	0.0
		Sr-90	9+/-2	10+/-1.5	-0.8
		Cs-137	21+/-6	15+/-5	2.1

Table 7 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a		
			SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	09-02-83	Sr-89	11+/-2	15+/-5	-1.4
		Sr-90	10+/-2	10+/-1.5	-0.4
Water	09-09-83	Ra-226	3.0+/-1.5	3.1+/-0.47	-0.4
		Ra-228	4.4+/-0.8	2.0+/-0.30	13.9
Water	09-16-83	Alpha	5+/-1.5	5+/-5.0	-0.2
		Beta	6+/-1.4	9+/-5.0	-1.0
Water	10-07-83	Cr-51	<80	51+/-5	
		Co-60	20+/-5	19+/-5	0.3
		Zn-65	45+/-10	40+/-5	1.8
		Ru-106	<54	52+/-5	
		Cs-134	15+/-5	15+/-5	0.0
		Cs-137	26+/-5	22+/-5	1.4
Water	10-14-83	H-3	1310+/-420	1210+/-329	0.5
Milk	10-28-83	Sr-89	No data provided	15+/-5	
		Sr-90	15+/-1.5	14+/-1.5	1.2
		I-131	54+/-10	40+/-6	4.0
		Cs-137	36+/-6	33+/-5	1.2
		K	1677+/-200	1550+/-78	2.8
Water	11-18-83	Alpha	13+/-2	14+/-5.0	-0.3
		Beta	7+/-2	16+/-5.0	-3.0
Water	11-14-83	Alpha	19+/-3	22+/-5.5	-0.9
		Ra-226	5.8+/-1.0	5.1+/-0.8	1.6
		Ra-228	4.2+/-0.5	2.8+/-0.4	6.1
		U	No data provided	11+/-6	
		Beta	60+/-3	63+/-5	-0.9
		Sr-89	16+/-1.0	17+/-5	-0.2
		Sr-90	7+/-0.8	8+/-1.5	-1.2
		Co-60	13+/-4	11+/-5	0.8
		Cs-134	19+/-4	15+/-5	1.5
		Cs-137	16+/-5	15+/-5	0.5
Filter	11-25-83	Alpha	24+/-1.8	19+/-5	1.8
		Beta	48+/-2	50+/-5	-0.8
		Sr-90	13+/-0.9	15+/-1.5	-1.9
		Cs-137	23+/-4	20+/-5	0.9
Water	12-09-83	H-3	2280+/-400	2389+/-351	-0.5
Water	12-16-83	I-131	21+/-7	20+/-6	0.4

Table 7 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a		
			SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	12-16-83	Ra-226	8.6+/-0.6	7.4+/-1.1	1.8
		Ra-228	4.4+/-0.4	3.9+/-0.56	1.5
Water	01-06-84	Sr-89	39+/-1.5	36+/-5	0.9
		Sr-90	21+/-1.1	24+/-1.5	-3.1
Water	01-20-84	Alpha	11+/-2	10+/-5.0	0.2
		Beta	8+/-1.8	12+/-5.0	-1.5
Food	01-27-84	Sr-89	No data provided	34+/-5.0	
		Sr-90	No data provided	20+/-5.0	
		I-131	22+/-5	20+/-6.0	0.6
		Cs-137	21+/-5	20+/-5.0	0.5
		K	2958+/-180	2720+/-136	3.0
Water	02-03-84	Cr-51	<60	40+/-5	
		Co-60	11+/-3	10+/-5	0.2
		Zn-65	54+/-8	50+/-5	1.4
		Ru-106	<50	61+/-5	
		Cs-134	29+/-5	31+/-5	-0.7
		Cs-137	15+/-4	16+/-5	-0.2
Water	02-10-84	H-3	2767+/-390	2383+/-351	1.9
Milk	03-02-84	I-131	6+/-1.0	6+/-0.9	0.0
Water	03-09-84	Ra-226	4.8+/-0.6	4.1+/-0.6	1.9
		Ra-228	2.2+/-0.3	2.0+/-0.3	1.2
Water	03-18-84	Alpha	5+/-2	5+/-5.0	0.2
		Beta	18+/-2	20+/-5.0	-0.6
Filter	03-23-84	Alpha	20+/-2	15+/-5	1.6
		Beta	49+/-4	51+/-5	-0.6
		Sr-90	20+/-1.5	21+/-1.5	-0.8
		Cs-137	12+/-5	10+/-5	0.6
Water	04-06-84	I-131	4+/-1.0	6+/-0.9	-4.3
Water	04-13-84	H-3	3330+/-400	3508+/-364	-0.8
Water	05-04-84	Sr-89	21+/-1.0	25+/-5	-1.4
		Sr-90	5+/-0.7	5+/-1.5	0.0
Water	05-18-84	Alpha	4+/-1.3	3+/-5.0	0.3
		Beta	8+/-1.5	6+/-5.0	0.6

Table 7 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a		
			SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	06-08-84	H-3	3007+/-400	3081+/-389	-0.2
Water	06-01-84	Cr-51	63+/-30	66+/-5	-1.2
		Co-60	32+/-3	31+/-5	0.5
		Zn-65	68+/-7	63+/-5	1.7
		Ru-106	<35	29+/-5	
		Cs-134	44+/-4	47+/-5	-1.0
		Cs-137	37+/-3	37+/-5	0.0
Water	06-15-84	Ra-226	4.5	3.5+/-0.53	3.4
		Ra-228	1.8	2.0+/-0.30	-1.0
Milk	06-22-84	Sr-89	No data provided	25+/-5	
		Sr-90	17+/-1.5	17+/-1.5	0.4
		I-131	44+/-8	43+/-6	0.2
		Cs-137	39+/-9	35+/-5	1.3
		K	1710+/-210	1496+/-75	4.9
Water	-20-84	Alpha	6+/-1.5	6+/-5	-0.1
		Beta	9+/-1.7	13+/-5	-1.4
Water	08-03-84	I-131	33+/-5	34+/-6	-0.2
Water	08-07-84	H-3	2970+/-360	2817+/-356	0.7
Filter	08-24-84	Alpha	19+/-1.7	17+/-5	0.6
		Beta	47+/-2	51+/-5	-1.5
		Sr-90	17+/-1.0	18+/-1.5	-1.2
		Cs-137	18+/-5	15+/-5	1.2
Water	09-07-84	Sr-89	31+/-1.6	34+/-5	-0.9
		Sr-90	20+/-1.1	19+/-1.5	1.2
Water	09-14-84	Ra-226	5.1+/-0.7	4.9+/-0.74	0.4
		Ra-228	2.1+/-0.4	2.3+/-0.35	-1.2
Water	10-05-84	Cr-51	48+/-16	40+/-5	2.9
		Co-60	19+/-3	20+/-5	-0.2
		Zn-65	158+/-9	147+/-7.4	2.5
		Ru-106	47+/-16	47+/-5	0.0
		Cs-134	29+/-3	31+/-5	-0.8
		Cs-137	23+/-3	24+/-5	-0.2
Water	10-12-84	H-3	2783+/-320	2810+/-356	-0.1

Table 7 (continued)

Sample Type	Date Collected	Analysis	Concentration in pCi/sample *a		
			SLH result +/- 1 sigma	EPA result +/- 1 sigma	Deviation Known
Water	10-22-84	Alpha	13+/-2	14+/-5.0	-0.2
		Beta	69+/-5	64+/-5.0	1.7
		Ra-226	3.0+/-0.5	3.0+/-0.45	0.0
		Ra-228	3.1+/-0.3	2.1+/-0.32	5.2
		Sr-89	12+/-4	11+/-5.0	0.2
		Sr-90	13+/-1.5	12+/-1.5	1.5
		Co-60	15+/-5	14+/-5.0	0.5
		Cs-134	<10	2+/-5.0	
		Cs-137	15+/-5	14+/-5.0	0.2
Milk	10-26-84	Sr-89	No data provided	22+/-5	
		Sr-90	No data provided	16+/-1.5	
		I-131	41+/-9	42+/-6	-0.2
		Cs-137	30+/-7	32+/-5	-0.6
		K	1567+/-150	1517+/-76	1.1
Water	11-16-84	Alpha	8+/-4	7+/-5	0.2
		Beta	22+/-2	20+/-5.0	0.8
Filter	11-23-84	Alpha	18+/-5	15+/-5	1.2
		Beta	53+/-5	52+/-5	0.2
		Sr-90	20+/-1.5	21+/-1.5	-1.2
		Cs-137	11+/-4	10+/-5	0.3
Water	12-07-84	I-131	41+/-8	36+/-6	1.4
Water	12-14-84	H-3	2977+/-320	3182+/-360	-1.0



Table 8 - Minimum Detectable Concentration (MDC)

Wisconsin Division of Health  
Section of Radiation Protection

	Air Particulate Composite (pCi/M <sup>3</sup> )	Air Particulate (pCi/M <sup>3</sup> )	Air Iodine (pCi/M <sup>3</sup> )	Milk (pCi/liter)
Gross beta		0.003		
Be-7	0.050			
K-40				120
Sr-90				1.2
Zr,Nb-95	0.011			
Ru-103	0.005			
Ru-106	0.030			
I-131			0.046	0.4
Cs-134	0.005			12
Cs-137	0.005			12
Ba,La-140				15
Ce-141	0.008			
Ce-144	0.025			

	Surface Water (pCi/liter)	fish (pCi/kg) (wet)	Soil Sediment (pCi/kg) (dry)	Vegetation (pCi/kg) (wet)
Gross beta	1.6		740	740
Gross alpha	1.8		900	900
H-3	750			
Sr-89	1.7			
Sr-90	1.7			
K-40		785	800	600
Mn-54	9	66		
Cr-51	100			
Fe-59	20	145		
Zn-65	22	133		
Co-58	13	54	70	50
Co-60	11	70	90	55
Zr,Nb-95	15			80
I-131	0.4			60
Cs-134	13	51	60	50
Cs-137	12	74	80	60

## References

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

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.

Wisconsin Department of Health and Social Services, Division of Health, Section of Radiation Protection. NRC 05-80-275 1983 Annual report, Point Beach Environmental Radioactivity Survey.

Table 9. Air particulate gross beta and air iodine (I-131) results for January - June, 1984. Indicator site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

Measurements in units of pCi/M<sup>3</sup>

WI - Section of Radiation Protection data

Point Beach data

North Property Line  
1.3 miles NNW

North Property Line  
1.3 miles NNW

Collection date	Air Particulate	Air Iodine	Collection date	Air Particulate	Air Iodine
01-06-84	0.022+/-0.002	0.020+/-0.014	01-09-84	0.02+/-0.01	<0.03
01-13-84	0.016+/-0.002	0.001+/-0.03	01-16-84	0.02+/-0.01	<0.03
01-20-84	0.020+/-0.002	0.03+/-0.04	01-23-84	0.04+/-0.01	<0.03
01-24-84	0.023+/-0.002	0.02+/-0.03	01-31-84	0.03+/-0.01	<0.03
01-31-84	0.013+/-0.001	0.00+/-0.04	02-06-84	0.03+/-0.01	<0.03
02-09-84	0.014+/-0.001	0.03+/-0.03	02-13-84	0.03+/-0.01	<0.03
02-15-84	0.021+/-0.002	-0.014+/-0.03	02-20-84	0.02+/-0.01	<0.03
02-23-84	0.017+/-0.002	0.001+/-0.03	02-27-84	0.02+/-0.01	<0.03
02-29-84	0.012+/-0.002	0.00+/-0.03	03-05-84	0.01+/-0.01	<0.03
03-09-84	0.015+/-0.001	0.02+/-0.03	03-12-84	0.02+/-0.01	<0.03
03-15-84	0.018+/-0.002	0.020+/-0.03	03-19-84	0.02+/-0.01	<0.03
03-23-84	0.013+/-0.001	0.020+/-0.03	03-27-84	0.02+/-0.01	<0.03
03-28-84	0.015+/-0.002	0.04+/-0.04	04-02-84	0.02+/-0.01	<0.03
04-06-84	0.011+/-0.001	0.03+/-0.04	04-09-84	0.02+/-0.01	<0.03
04-13-84	0.014+/-0.002	-0.03+/-0.03	04-16-84	0.01+/-0.01	<0.03
04-19-84	0.010+/-0.002	0.03+/-0.04	04-23-84	0.01+/-0.01	<0.03
04-25-84	0.011+/-0.002	0.009+/-0.04	04-30-84	0.02+/-0.01	<0.03
05-04-84	0.010+/-0.001	-0.003+/-0.03	05-07-84	0.01+/-0.01	<0.03
05-11-84	0.009+/-0.001	-0.006+/-0.03	05-14-84	0.01+/-0.01	<0.03
05-16-84	0.008+/-0.002	-0.001+/-0.03	05-21-84	0.02+/-0.01	<0.03
05-25-84	0.011+/-0.001	0.016+/-0.03	05-29-84	0.02+/-0.01	<0.03
05-30-84	0.006+/-0.002	-0.010+/-0.03	06-04-84	0.02+/-0.01	<0.03
06-08-84	0.012+/-0.001	-0.007+/-0.03	06-11-84	0.02+/-0.01	<0.03
06-13-84	0.007+/-0.002	-0.004+/-0.03	06-18-84	0.01+/-0.01	<0.03
06-22-84	0.007+/-0.001	-0.003+/-0.013	06-25-84	0.01+/-0.01	<0.03
06-27-84	0.010+/-0.002	-0.008+/-0.03	07-03-84	0.01+/-0.01	<0.03
07-03-84	0.009+/-0.002	-0.010+/-0.03			

Table 10. Air particulate gross beta and air iodine (I-131) results for July - December, 1984. Indicator site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

Measurements in units of pCi/M<sup>3</sup>

WI - Section of Radiation Protection data

North Property Line  
1.3 miles NNW

Collection date	Air Particulate	Air Iodine
07-13-84	0.013+/-0.001	0.00+/-0.03
07-20-84	0.015+/-0.002	-0.002+/-0.019
07-27-84	0.013+/-0.002	0.004+/-0.03
07-31-84	0.013+/-0.002	-0.004+/-0.03
08-10-84	0.018+/-0.002	-0.009+/-0.02
08-15-84	0.009+/-0.002	-0.011+/-0.03
08-24-84	0.013+/-0.001	-0.006+/-0.03
08-29-84	0.022+/-0.002	-0.009+/-0.04
09-06-84	0.006+/-0.001	0.005+/-0.02
09-14-84	0.017+/-0.002	-0.002+/-0.013
09-20-84	0.018+/-0.002	0.00+/-0.02
09-26-84	0.009+/-0.002	-0.007+/-0.02
10-02-84	0.018+/-0.002	0.003+/-0.03
10-12-84	0.017+/-0.001	0.002+/-0.016
10-18-84	0.021+/-0.002	0.005+/-0.03
10-25-84	0.017+/-0.002	-0.011+/-0.031
10-31-84	0.014+/-0.002	-0.001+/-0.03
11-08-84	0.019+/-0.002	-0.012+/-0.03
11-14-84	0.015+/-0.002	-0.017+/-0.03
11-21-84	0.013+/-0.002	0.009+/-0.03
11-28-84	0.020+/-0.002	0.004+/-0.016
12-06-84	0.014+/-0.001	0.001+/-0.020
12-13-84	0.024+/-0.002	-0.007+/-0.02
12-20-84	0.014+/-0.002	-0.010+/-0.04
12-27-84	0.020+/-0.002	0.002+/-0.04
01-03-85	0.021+/-0.002	0.001+/-0.02

Point Beach data

North Property Line  
1.3 miles NNW

Collection date	Air Particulate	Air Iodine
07-09-84	0.02+/-0.01	<0.03
07-16-84	0.03+/-0.01	<0.03
07-23-84	0.02+/-0.01	<0.03
07-30-84	0.01+/-0.01	<0.03
08-06-84	0.03+/-0.01	<0.03
08-13-84	0.02+/-0.01	<0.03
08-20-84	0.02+/-0.01	<0.03
08-27-84	0.02+/-0.01	<0.03
09-04-84	0.02+/-0.01	<0.03
09-10-84	0.02+/-0.01	<0.03
09-17-84	0.02+/-0.01	<0.03
09-24-84	0.03+/-0.01	<0.03
10-03-84	0.03+/-0.01	<0.03
10-08-84	0.02+/-0.01	<0.03
10-15-84	0.03+/-0.01	<0.03
10-22-84	0.02+/-0.01	<0.03
10-29-84	0.02+/-0.01	<0.03
11-05-84	0.02+/-0.01	<0.03
11-12-84	0.03+/-0.01	<0.03
11-19-84	0.01+/-0.01	<0.03
11-26-84	0.01+/-0.01	<0.03
12-03-84	0.02+/-0.01	<0.03
12-10-84	0.02+/-0.01	<0.03
12-17-84	0.03+/-0.01	<0.03
12-26-84	0.02+/-0.01	<0.03
01-02-85	0.01+/-0.01	<0.03

Table 11. Air particulate (gross beta) and air iodine (I-131) results for January - June, 1984. Control site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

Measurements in units of pCi/M<sup>3</sup>

WI - Section of Radiation Protection data

Green Bay Pumping Station - Rostok  
11.5 miles NNE

Collection date	Air Particulate	Air Iodine
01-06-84	0.023+/-0.003	0.03+/-0.03
01-13-84	0.016+/-0.003	0.00+/-0.04
01-20-84	0.019+/-0.003	0.00+/-0.03
01-27-84	0.016+/-0.003	0.00+/-0.07
02-03-84	0.016+/-0.003	*a
02-10-84	0.010+/-0.002	0.00+/-0.02
02-17-84	0.013+/-0.002	0.04+/-0.04
02-24-84	0.009+/-0.002	0.02+/-0.04
03-02-84	0.004+/-0.002	0.06+/-0.04
03-09-84	0.012+/-0.002	-0.005+/-0.03
03-16-84	0.009+/-0.002	0.02+/-0.03
03-27-84	0.008+/-0.002	-0.006+/-0.03
03-30-84	0.006+/-0.005	-0.009+/-0.03
04-06-84	0.004+/-0.002	0.02+/-0.04
04-13-84	0.013+/-0.004	0.05+/-0.04
04-20-84	0.006+/-0.002	0.04+/-0.04
04-27-84	0.006+/-0.002	0.006+/-0.04
05-11-84	0.004+/-0.001	0.007+/-0.03
05-18-84	0.002+/-0.002	-0.02+/-0.04
05-25-84	0.002+/-0.002	0.005+/-0.04
06-01-84	0.003+/-0.002	-0.009+/-0.04
06-15-84	0.004+/-0.001	0.014+/-0.03
06-22-84	0.003+/-0.002	-0.002+/-0.04
06-29-84	0.003+/-0.002	-0.011+/-0.04

Point Beach data

Silver Lake College  
17 miles WSW

Collection date	Air Particulate	Air Iodine
01-09-84	0.02+/-0.01	<0.03
01-16-84	0.02+/-0.01	<0.03
01-23-84	0.04+/-0.01	<0.03
01-31-84	0.03+/-0.01	<0.03
02-06-84	0.03+/-0.01	<0.03
02-13-84	0.03+/-0.01	<0.03
02-20-84	0.01+/-0.01	<0.03
02-27-84	0.01+/-0.01	<0.03
03-05-84	0.01+/-0.01	<0.03
03-12-84	0.03+/-0.01	<0.03
03-19-84	0.03+/-0.01	<0.03
03-27-84	0.02+/-0.01	<0.03
04-02-84	0.02+/-0.01	<0.03
04-09-84	0.02+/-0.01	<0.03
04-16-84	0.02+/-0.01	<0.03
04-23-84	0.02+/-0.01	<0.03
04-30-84	0.01+/-0.01	<0.03
05-07-84	0.02+/-0.01	<0.03
05-14-84	0.01+/-0.01	<0.03
05-21-84	0.02+/-0.01	<0.03
05-29-84	0.02+/-0.01	<0.03
06-04-84	0.02+/-0.01	<0.03
06-11-84	0.02+/-0.01	<0.03
06-18-84	0.01+/-0.01	<0.03
06-25-84	0.01+/-0.01	<0.03
07-03-84	0.02+/-0.01	<0.03

\*a - Sample was not taken.

\*b - Gasket missing in cartridge holder. Possible air leakage.

Table 12. Air particulate gross beta and air iodine (I-131) results for July - December, 1984. Control site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

Measurements in units of pCi/M<sup>3</sup>

WI - Section of Radiation Protection data

Green Bay Pumping Station - Rostok  
15.6 miles NNE

Collection date	Air Particulate	Air Iodine
07-06-84	0.002+/-0.002	0.007+/-0.03
07-13-84	0.005+/-0.002	-0.010+/-0.03
07-27-84	0.005+/-0.001	0.014+/-0.04
08-10-84	0.009+/-0.002	0.004+/-0.05
08-17-84	0.007+/-0.002	0.009+/-0.04
08-24-84	0.010+/-0.002	-0.02+/-0.03
09-01-84	0.017+/-0.002	0.000+/-0.04
09-08-84	0.007+/-0.002	0.002+/-0.04
09-14-84	0.013+/-0.001	-0.001+/-0.02
09-21-84	0.014+/-0.001	-0.006+/-0.02
09-28-84 *b	0.001+/-0.001	0.012+/-0.02
10-05-84	0.004+/-0.001	0.001+/-0.02
10-12-84	0.013+/-0.001	0.012+/-0.02
10-19-84	0.016+/-0.001	-0.001+/-0.02
10-26-84	0.014+/-0.001	-0.017+/-0.02
11-02-84	0.010+/-0.001	0.008+/-0.02
11-09-84	0.019+/-0.002	-0.011+/-0.02
11-16-84 *b	0.001+/-0.001	0.002+/-0.03
11-23-84 *b	0.002+/-0.001	-0.019+/-0.03
11-30-84 *b	0.002+/-0.001	-0.002+/-0.02
12-07-84 *b	0.003+/-0.002	0.000+/-0.03
12-14-84 *b	0.004+/-0.001	-0.010+/-0.02
12-21-84 *b	0.002+/-0.001	0.006+/-0.02
12-28-84 *b	0.002+/-0.001	0.008+/-0.02

Point Beach data

Silver Lake College  
17 miles WSW

Collection date	Air Particulate	Air Iodine
07-09-84	0.02+/-0.01	<0.03
07-16-84	0.02+/-0.01	<0.03
07-23-84	0.03+/-0.01	<0.03
07-30-84	0.01+/-0.01	<0.03
08-06-84	0.04+/-0.01	<0.03
08-13-84	0.03+/-0.01	<0.03
08-20-84	0.03+/-0.01	<0.03
08-27-84	0.02+/-0.01	<0.03
09-04-84	0.03+/-0.01	<0.03
09-10-84	0.01+/-0.01	<0.03
09-17-84	0.03+/-0.01	<0.03
09-24-84	0.02+/-0.01	<0.03
10-03-84	0.01+/-0.01	<0.03
10-08-84	0.02+/-0.01	<0.03
10-15-84	0.03+/-0.01	<0.03
10-22-84	0.01+/-0.01	<0.03
10-29-84	0.02+/-0.01	<0.03
11-05-84	0.02+/-0.01	<0.03
11-12-84	0.02+/-0.01	<0.03
11-19-84	0.01+/-0.01	<0.03
11-26-84	0.02+/-0.01	<0.03
12-03-84	0.01+/-0.01	<0.03
12-10-84	0.03+/-0.01	<0.03
12-17-84	0.02+/-0.01	<0.03
12-26-84	0.03+/-0.01	<0.03
01-02-85	0.03+/-0.01	<0.03

\*a - Sample was not taken.

\*b - Gasket missing in cartridge holder. Possible air leakage.



Table 13. Gamma isotopic results for January - December, 1984 from the monthly composite of air particulate samples. Indicator site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach  
1984

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Measurements in units of pCi/M<sup>3</sup>

WI - Section of Radiation Protection data

North property line  
1.3 miles NNW

	January	February	March	April	May	June
Be-7	0.091+/-0.019	0.052+/-0.015	0.07+/-0.02	0.08+/-0.03	0.067+/-0.015	0.06+/-0.02
Zr,Nb-95	0.002+/-0.003	0.000+/-0.003	-0.002+/-0.004	0.001+/-0.005	0.002+/-0.002	0.004+/-0.004
Ru-103	NA	NA	0.000+/-0.002	0.000+/-0.003	0.001+/-0.001	0.001+/-0.002
Ru-106	0.010+/-0.009	-0.003+/-0.009	-0.011+/-0.014	0.006+/-0.017	0.004+/-0.009	-0.001+/-0.014
Cs-134	0.003+/-0.001	0.000+/-0.001	-0.001+/-0.002	0.000+/-0.002	0.000+/-0.001	0.000+/-0.001
Cs-137	0.000+/-0.001	0.000+/-0.001	0.000+/-0.002	0.000+/-0.002	0.000+/-0.001	-0.001+/-0.001
Ce-141	NA	NA	0.001+/-0.003	0.000+/-0.004	0.000+/-0.002	0.002+/-0.003
Ce-144	0.000+/-0.008	0.004+/-0.005	-0.002+/-0.008	0.005+/-0.009	0.002+/-0.004	0.006+/-0.008
	July	August	September	October	November	December
Be-7	0.12+/-0.02	0.10+/-0.03	0.07+/-0.03	0.075+/-0.019	0.084+/-0.019	0.06+/-0.03
Zr,Nb-95	0.001+/-0.004	0.009+/-0.008	0.000+/-0.005	0.001+/-0.004	0.000+/-0.003	0.000+/-0.006
Ru-103	0.000+/-0.002	0.000+/-0.003	0.000+/-0.003	0.000+/-0.002	-0.001+/-0.002	-0.002+/-0.003
Ru-106	-0.003+/-0.012	-0.019+/-0.020	0.000+/-0.019	0.006+/-0.012	0.000+/-0.011	0.013+/-0.021
Cs-134	0.000+/-0.001	0.000+/-0.002	-0.001+/-0.002	0.000+/-0.001	0.000+/-0.001	0.001+/-0.002
Cs-137	0.001+/-0.002	-0.001+/-0.003	0.001+/-0.002	0.000+/-0.001	0.000+/-0.001	0.000+/-0.002
Ce-141	-0.001+/-0.002	0.003+/-0.005	0.001+/-0.004	0.002+/-0.002	0.001+/-0.002	-0.001+/-0.004
Ce-144	-0.002+/-0.007	0.001+/-0.012	-0.006+/-0.010	0.003+/-0.007	0.002+/-0.007	0.001+/-0.011

Isotopes other than those reported were not detected.

NA - Isotope was not analyzed for.

Point Beach data

North property line  
1.3 miles NNW

	January	February	March	April	May	June
Gamma isotopic			<0.01 *a			<0.01 *a
	July	August	September	October	November	December
Gamma isotopic			<0.01 *a			<0.01 *a

\*a - Unless otherwise noted, the less than value (<\*) is for Cs-137 and may be higher or lower for other radionuclides  
The gamma isotopic analysis is performed on a quarterly composite.

Table 14. Gamma isotopic results for January - December, 1984 for the monthly composite of air particulate filters. Control site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach  
1984

Measurements in units of pCi/M<sup>3</sup>

WI - Section of Radiation Protection data

Green Bay Pumping Station - Rostok  
15.6 miles NNE

	January	February	March	April	May	June
Ce-141	NA	NA	-0.001+/-0.006	-0.003+/-0.007	0.001+/-0.003	-0.003+/-0.007
Ce-144	0.021+/-0.016	0.002+/-0.011	-0.010+/-0.017	-0.002+/-0.019	-0.005+/-0.008	0.010+/-0.019
Be-7	0.03+/-0.04	0.03+/-0.03	0.04+/-0.04	0.06+/-0.05	0.05+/-0.03	0.03+/-0.05
Zr,Nb-95	0.001+/-0.007	-0.001+/-0.005	0.003+/-0.010	-0.005+/-0.010	0.004+/-0.006	0.003+/-0.010
Ru-103	NA	NA	0.004+/-0.005	-0.001+/-0.006	-0.001+/-0.003	0.000+/-0.006
Ru-106	0.014+/-0.019	0.004+/-0.020	0.006+/-0.03	0.002+/-0.04	-0.003+/-0.017	0.008+/-0.04
Cs-134	0.001+/-0.003	-0.001+/-0.002	0.000+/-0.003	-0.003+/-0.003	0.001+/-0.002	0.001+/-0.004
Cs-137	0.001+/-0.003	0.001+/-0.002	-0.001+/-0.004	0.001+/-0.004	0.000+/-0.002	0.001+/-0.004
	July	August	September	October	November	December
Ce-141	0.001+/-0.011	0.004+/-0.09	0.001+/-0.002	0.003+/-0.004	0.000+/-0.002	0.001+/-0.004
Ce-144	0.006+/-0.03	0.000+/-0.02	0.001+/-0.002	0.009+/-0.010	0.002+/-0.006	-0.004+/-0.011
Be-7	0.04+/-0.06	0.10+/-0.05	0.05+/-0.02	0.04+/-0.02	0.027+/-0.013	0.001+/-0.02
Zr,Nb-95	0.001+/-0.015	0.002+/-0.012	0.000+/-0.003	0.002+/-0.005	0.000+/-0.003	0.002+/-0.006
Ru-103	0.000+/-0.008	-0.001+/-0.006	0.001+/-0.002	0.000+/-0.003	-0.001+/-0.001	0.000+/-0.003
Ru-106	0.02+/-0.05	0.03+/-0.04	0.005+/-0.010	-0.009+/-0.016	-0.006+/-0.009	-0.006+/-0.02
Cs-134	-0.001+/-0.005	0.001+/-0.004	0.000+/-0.001	0.000+/-0.002	0.000+/-0.001	0.001+/-0.002
Cs-137	-0.001+/-0.006	-0.002+/-0.004	0.000+/-0.001	0.001+/-0.002	0.000+/-0.001	0.000+/-0.002

Isotopes other than those reported were not detected.

NA - Isotope was not analyzed for.

Point Beach data

Silver Lake College  
17 miles WSW

	January	February	March	April	May	June
Gamma isotopic			<0.01 *a			<0.01 *a
	July	August	September	October	November	December
Gamma isotopic			<0.01 *a			<0.01 *a

\*a - Unless otherwise noted the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides.  
The gamma isotopic analysis is performed on a quarterly composite.

Table 15. Analysis of surface water samples from January - June, 1984. Indicator site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

Measurements in units of pCi/liter

Effluent channel  
0.1 mile E

WI - Section of Radiation Protection

Collection Date	01-15-84	02-29-84	03-28-84	04-25-84	05-30-84	06-26-84
Gross Alpha-sol.	0.3+/-0.8	0.9+/-0.8	0.0+/-0.7	0.1+/-0.8	0.7+/-0.9	0.3+/-0.8
Gross Alpha-insol	0.1+/-0.6	0.2+/-0.5	0.0+/-0.5	0.2+/-0.5	0.2+/-0.5	0.3+/-0.6
Gross Beta-sol.	3.2+/-1.2	3.5+/-1.2	3.2+/-1.2	3.7+/-1.3	3.9+/-1.3	2.7+/-1.2
Gross Beta-insol.	1.2+/-1.0	1.4+/-1.0	0.3+/-1.0	-0.3+/-0.9	0.4+/-1.0	-0.2+/-0.9
H-3	500+/-400	270+/-400	400+/-300	300+/-300	200+/-300	1800+/-400
I-131	1.8+/-0.7	-0.17+/-0.2	-0.3+/-0.2	-0.06+/-0.17	0.39+/-0.13	0.55+/-0.17
Sr-89	1.8+/-0.8	0.15+/-0.6	0.14+/-0.5	0.12+/-0.5	0.05+/-0.5	-1.3+/-0.6
Sr-90	-0.3+/-0.8	0.6+/-0.6	0.4+/-0.5	0.7+/-0.5	0.6+/-0.5	0.9+/-0.6
Gamma Isotopic						
Mn-54	-1+/-4	7+/-3	-6+/-5	-4+/-6	-1+/-2	-12+/-9
Fe-59	-5+/-10	0+/-9	1+/-10	-1+/-11	2+/-3	-3+/-19
Co-58	-1+/-6	8+/-4	2+/-6	-2+/-6	0+/-2	-7+/-10
Co-60	-2+/-6	2+/-6	0+/-6	-3+/-6	-1+/-2	0+/-11
Zn-65	6+/-12	-6+/-11	-2+/-11	5+/-13	0+/-4	-10+/-19
Cs-134	0+/-5	0+/-6	3+/-6	-3+/-6	2+/-2	-5+/-9
Cs-137	-1+/-6	5+/-5	-3+/-6	-2+/-7	0+/-2	-13+/-10
Zr-95	4+/-15	-3+/-13	4+/-13	-2+/-13	19+/-6	-26+/-21
Ba,La-140	-2+/-19	1+/-5	-2+/-7	0+/-7	-1+/-2	0+/-12

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	01-15-84	02-29-84	03-28-84	04-25-84	05-30-84	06-26-84
Gross Alpha	*a	*a	*a	*a	*a	*a
Gross Beta	2.8+/-0.6	4.1+/-0.7	3.3+/-0.6	3.2+/-0.6	2.6+/-0.4	2.1+/-0.6
H-3 *b			<500			810+/-100
Sr-89 *b			<5			<5
Sr-90 *b			1.1+/-0.8			<1
Gamma Isotopic *c	<10	<10	<10	<10	<10	<10

\*a - Analysis was not performed.

\*b - Analyses are performed on a quarterly composite.

\*c - Data listed "<" are at the 4.66 sigma level, others are 2 sigma. Unless otherwise noted, the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides.

Table 16. Analysis of surface water samples from July - December, 1984. Indicator site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

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Measurements in units of pCi/liter

Effluent channel

0.1 mile E

WI - Section of Radiation Protection data

Collection Date	07-31-84	08-29-84	09-26-84	10-31-84	11-28-84	12-26-84
Gross Alpha-sol.	0.3+/-0.9	0.0+/-0.7	-0.2+/-0.8	0.1+/-0.8	0.2+/-0.9	0.3+/-0.8
Gross Alpha-insol	0.5+/-0.7	0.6+/-0.7	0.3+/-0.6	0.2+/-0.6	0.5+/-0.7	0.3+/-0.6
Gross Beta-sol.	3.1+/-1.2	3.0+/-1.2	2.2+/-1.2	3.9+/-1.2	6.3+/-1.4	4.9+/-1.3
Gross Beta-insol.	1.1+/-1.0	1.4+/-1.0	0.0+/-0.9	1.7+/-1.1	2.6+/-1.1	1.0+/-1.0
H-3	50+/-300	-300+/-300	-100+/-300	9400+/-500	1900+/-300	2100+/-300
I-131	-0.3+/-0.2	0.0+/-0.2	-0.3+/-0.2	0.38+/-0.18	-0.04+/-0.2	-0.05+/-1.2
Sr-89	-0.2+/-0.6	-1.2+/-0.5	0.15+/-0.5	-0.8+/-0.4	-1.8+/-0.4	-1.4+/-0.4
Sr-90	0.3+/-0.6	1.7+/-0.6	0.8+/-0.4	0.8+/-0.4	0.8+/-0.4	1.1+/-0.4
Gamma Isotopic						
Mn-54	1+/-2	-2+/-4	0+/-2	1+/-4	2+/-5	-1+/-2
Fe-59	1+/-3	0+/-8	1+/-4	-3+/-7	-2+/-8	0+/-5
Co-58	1+/-2	1+/-4	1+/-2	0+/-4	6+/-5	1+/-3
Co-60	-1+/-2	-1+/-5	0+/-2	1+/-5	2+/-5	0+/-3
In-65	3+/-4	-1+/-9	3+/-4	4+/-10	13+/-11	0+/-5
Cs-134	2+/-2	4+/-5	2+/-2	1+/-5	7+/-5	3+/-3
Cs-137	0+/-2	4+/-5	1+/-2	3+/-5	0+/-5	2+/-3
Ir-95	2+/-4	4+/-11	-1+/-5	-2+/-10	10+/-12	-2+/-6
Ba,La-140	-4+/-3	-3+/-8	-4+/-3	-2+/-7	-2+/-7	-4+/-5

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	07-31-84	08-29-84	09-26-84	10-31-84	11-28-84	12-26-84
Gross Alpha	*a	*a	*a	*a	*a	*a
Gross Beta	2.8+/-0.6	2.2+/-0.6	2.2+/-0.6	2.5+/-0.6	5.8+/-0.5	3.2+/-0.7
H-3 *b			500			4260+/-160
Sr-89 *b			<5			<5
Sr-90 *b			<1			1.4+/-0.6
Gamma Isotopic *c	<10	<10	<10	<10	<10	<10

\*a - Analysis was not performed.

\*b - Analyses are performed on a quarterly composite.

\*c - Data listed "<" are at the 4.66 sigma level, others are 2 sigma. Unless otherwise noted, the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides.

Table 17. Analysis of surface water samples from January - June, 1984. Control site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach  
1984

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Measurements in units of pCi/liter

WI - Section of Radiation Protection data  
Green Bay Pumping Station - Rostok  
15.6 miles NNE

Collection Date	01-10-84	02-29-84	04-03-84	04-30-84	05-08-84	*a
Gross Alpha-sol.	-0.1+/-0.7	0.4+/-0.7	0.1+/-0.7	0.3+/-0.9	0.0+/-0.7	
Gross Alpha-insol	0.4+/-0.6	-0.1+/-0.4	-0.2+/-0.4	-0.1+/-0.4	-0.3+/-0.4	
Gross Beta-sol.	3.3+/-1.2	2.7+/-1.2	2.9+/-1.2	3.0+/-1.2	2.0+/-1.2	
Gross Beta-insol.	1.2+/-1.0	0.2+/-0.9	1.0+/-1.0	0.9+/-1.0	-0.5+/-0.9	
H-3	-50+/-360	-130+/-400	150+/-330	110+/-320	420+/-350	
Sr-89	1.1+/-0.4	0.7+/-0.9	-0.6+/-0.5	-0.6+/-0.5	-0.3+/-0.5	
Sr-90	-0.3+/-0.4	0.4+/-0.9	0.9+/-0.5	0.6+/-0.6	0.6+/-0.5	
Gamma Isotopic						
Mn-54	0+/-4	1+/-2	-1+/-5	-4+/-4	-2+/-3	
Fe-59	3+/-6	-4+/-4	4+/-10	-1+/-7	-1+/-5	
Co-58	2+/-4	-1+/-2	0+/-5	-2+/-4	0+/-3	
Co-60	1+/-5	2+/-3	-3+/-5	-3+/-4	1+/-3	
Zn-65	4+/-11	-3+/-5	-1+/-10	0+/-9	-1+/-6	
I-131	-0.4+/-0.2	0.8+/-0.2	-0.02+/-0.14	-0.10+/-0.16	-0.15+/-0.16	
Cs-134	0+/-4	2+/-3	-1+/-5	-1+/-4	0+/-3	
Cs-137	5+/-5	0+/-3	0+/-6	-3+/-5	-1+/-3	
Zr-95	0+/-10	3+/-5	2+/-12	1+/-9	2+/-7	
Ba,La-140	6+/-4	-1+/-4	4+/-8	-2+/-4	-1+/-3	

\*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	01-03-84	02-06-84	03-05-84	04-02-84	05-07-84	06-04-84
Gross Alpha	*d	*d	*d	*d	*d	*d
Gross Beta	7.6+/-0.8	6.9+/-0.6	2.7+/-0.6	3.2+/-0.6	3.8+/-0.7	3.2+/-0.6
H-3 *b			1030+/-110			<500
Sr-89 *b			<5			<5.9
Sr-90 *b			1.1+/-0.4			<1.9
Gamma Isotopic *c	<10	<10	<10	<10	<10	<10

\* b - Analysis is performed on a quarterly composite.

\* c - Data listed \*(<) are at the 4.66 sigma level, others are 2 sigma. Unless otherwise noted, the less than value (<\*) is for Cs-137 and may be higher or lower for other radionuclides.

\* d - Analysis is not performed.

Table 18. Analysis of surface water samples from July - December, 1984. Control site.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach  
1984

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Measurements in units of pCi/liter

WI - Section of Radiation Protection data  
Green Bay Pumping Station - Rostok  
15.6 miles NNE

Collection Date	07-02-84	*a	09-06-84	10-05-84	*a	12-03-84
Gross Alpha-sol.	-0.2+/-0.7		0.2+/-0.8	0.1+/-0.8		0.3+/-0.7
Gross Alpha-insol	0.1+/-0.5		-0.2+/-0.5	-0.3+/-0.5		-0.3+/-0.6
Gross Beta-sol.	3.8+/-1.2		2.3+/-1.1	3.0+/-1.2		4.1+/-1.2
Gross Beta-insol.	0.2+/-0.9		1.7+/-1.0	2.3+/-1.1		-0.6+/-0.9
H-3	140+/-350		170+/-320	-20+/-300		70+/-280
I-131	0.17+/-0.15		0.17+/-0.3	-0.3+/-0.4		0.6+/-0.3
Sr-89	-1.1+/-0.6		0.14+/-0.5	-1.0+/-0.5		-0.3+/-0.4
Sr-90	0.7+/-0.7		0.9+/-0.5	0.9+/-0.5		0.3+/-0.4
Gamma Isotopic						
Mn-54	-1+/-4		0+/-1	-3+/-3		0+/-4
Fe-59	5+/-10		0+/-3	3+/-7		2+/-9
Co-58	2+/-5		1+/-1	-1+/-4		-1+/-4
Co-60	-3+/-5		-1+/-2	-1+/-4		-1+/-5
In-65	0+/-10		0+/-3	3+/-7		7+/-11
Cs-134	6+/-5		1+/-1	1+/-3		3+/-5
Cs-137	0+/-5		1+/-2	0+/-4		-3+/-4
Ir-95	-4+/-11		0+/-3	0+/-8		1+/-11
Ba,La-140	-8+/-8		-4+/-3	-3+/-6		-7+/-8

\*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	07-02-84	08-06-84	09-04-84	10-03-84	11-05-84	12-03-84
Gross Alpha	*d	*d	*d	*d	*d	*d
Gross Beta	3.0+/-0.6	2.4+/-0.6	3.5+/-0.6	3.2+/-0.6	3.6+/-0.7	3.1+/-0.7
H-3 *b			<500			<500
Sr-89 *b			<5			<5
Sr-90 *b			<1.5			<1
Gamma Isotopic *c	<10	<10	<10	<10	<10	<10

\* b - Analysis is performed on a quarterly composite.

\* c - Data listed \*(<) are at the 4.66 sigma level, others are 2 sigma. Unless otherwise noted, the less than value (<\*) is for Cs-137 and may be higher or lower for other radionuclides.

\* d - Analysis is not performed.



Table 19. Analysis of fish samples.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

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Measurements in units of pCi/kg (wet)

WI - Section of Radiation Protection

Collection date	04-24-84	04-24-84	08-29-84	08-29-84	12-19-84	12-19-84
Type	trout	trout	salmon	salmon	trout	trout
Location	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse
Gamma Isotopic						
K-40	2500+/-700	2200+/-600	3400+/-700	3100+/-500	2400+/-700	1300+/-300
Mn-54	-3+/-30	8+/-30	-1+/-30	-3+/-17	30+/-30	-8+/-14
Fe-59	40+/-60	30+/-60	-9+/-80	1+/-40	70+/-70	1+/-30
Co-58	-2+/-30	20+/-30	17+/-30	-6+/-18	1+/-30	-8+/-13
Co-60	10+/-40	50+/-30	-7+/-40	10+/-20	20+/-40	10+/-20
Zn-65	20+/-80	70+/-70	60+/-60	30+/-40	60+/-70	8+/-30
Cs-134	50+/-30	15+/-30	14+/-30	12+/-15	40+/-30	3+/-14
Cs-137	80+/-40	120+/-50	110+/-40	190+/-30	160+/-40	100+/-20

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	04-24-84	04-24-84	08-29-84	08-29-84	12-19-84	12-19-84
Type	trout	trout	salmon	salmon	trout	trout
Location	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse	E-12 pumphouse
Gamma Isotopic	<500 #a	<500 #a	<500 #a	<500 #a	<500 #a	<500 #a

#a - Unless otherwise noted, the less than value is for Cs-137 and may be higher or lower for other radionuclides.

Table 20. Analysis of bottom sediments.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION SECTION

Point Beach

1984

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Measurements in units of pCi/kg (dry)

WI - Section of Radiation Protection data

Collection Date	10-03-84	10-03-84	10-03-84
Type	shoreline sed.	shoreline sed.	shoreline sed.
Location	E-05 1.8 miles NNW	E-06 4.8 miles SSE	E-12 0.1 mile E
Analysis			
Gross beta (dry)	8000+/-4000	17000+/-4000	9000+/-4000
Gross alpha (dry)	-3000+/-4000	8000+/-6000	0+/-5000
Gamma isotopic			
Co-58	9+/-30	16+/-30	-2+/-30
Co-60	13+/-40	20+/-30	70+/-40
Cs-134	-2+/-30	140+/-40	-2+/-30
Cs-137	40+/-30	90+/-40	120+/-40
K-40	6600+/-700	700+/-300	4600+/-600
Ra-226 *	500+/-300	4800+/-900	500+/-600
Pb-214 *	90+/-50	2260+/-90	200+/-60
Bi-214 *	190+/-60	2300+/-100	280+/-60
Tl-208 *	140+/-80	2650+/-120	180+/-80
Ac-228 *	110+/-100	2670+/-150	300+/-100

\* Naturally occurring isotopes. The isotopes Ac-228 and Tl-208 are from the Thorium-232 decay series. The isotopes 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

Type	shoreline sed.	shoreline sed.	shoreline sed.
Collection Date	10-03-84	10-03-84	10-03-84
Location	E-05 1.8 miles NNW	E-06 4.8 miles SSE	E-12 0.1 mile E
Analysis			
Gross beta (dry)	7000+/-3000	16000+/-4000	5000+/-3000
Gross alpha (dry)	* a	* a	* a
Gamma isotopic	<1000 * b	<1000 * b	<1000 * b

\* a - Analysis was not performed.

\* b - Unless otherwise noted, the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides.

Table 21. Analysis of milk samples for January - December, 1984.  
Funk farm.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach  
1984

Measurements in units of pCi/liter

Funk farm

3.8 miles WSM

WI - Section of Radiation Protection data

Collection date	01-31-84	02-29-84	03-28-84	04-25-84	05-30-84	06-27-84
Isotope:						
I-131	-0.2+/-0.2	-0.3+/-0.3	0.5+/-0.2	-0.2+/-0.17	-0.13+/-0.07	-1.3+/-0.3
Ba,La-140	-4+/-40	4+/-5	8+/-6	6+/-5	9+/-5	0+/-6
Cs-134	1+/-8	-1+/-7	1+/-8	4+/-7	0+/-7	5+/-8
Cs-137	6+/-10	3+/-7	-1+/-9	5+/-8	-1+/-8	5+/-9
K-40	1400+/-200	1240+/-180	1310+/-190	1440+/-190	1440+/-180	1400+/-200
Sr-90	1.0+/-0.8	1.2+/-0.9	0.9+/-0.6	1.8+/-0.7	0.7+/-0.6	1.2+/-0.6
Collection date	07-31-84	08-29-84	09-29-84	10-31-84	11-28-84	12-27-84
Isotope:						
I-131	-0.4+/-0.4	-0.1+/-0.17	0.44+/-0.19	-0.4+/-0.16	0.04+/-0.14	0.14+/-0.2
Ba,La-140	-2+/-4	0+/-6	3+/-6	0+/-5	4+/-6	1+/-6
Cs-134	4+/-6	6+/-6	-1+/-6	7+/-5	1+/-7	6+/-6
Cs-137	4+/-6	9+/-5	0+/-7	6+/-6	2+/-7	3+/-7
K-40	1320+/-170	1610+/-180	1230+/-170	1520+/-190	1500+/-180	1710+/-190
Sr-90	1.7+/-0.7	1.3+/-0.6	1.5+/-0.6	2.7+/-0.8	2.3+/-0.7	3.8+/-1.9

Isotopes other than those reported were not detected.

Point Beach data

Collection date	01-30-84	02-29-84	03-28-84	04-25-84	05-30-84	06-27-84
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sr-90	1.8+/-0.6	1.3+/-0.4	1.5+/-0.5	1.3+/-0.4	0.9+/-0.3	1.5+/-0.5
Ba,La-140	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-134	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-137	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
K-40	* c	* c	* c	* c	* c	* c
Collection date	07-31-84	08-29-84	09-26-84	10-31-84	11-28-84	12-27-84
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sr-90	1.6+/-0.4	1.3+/-0.5	<0.8	1.1+/-0.1	<1.4	1.4+/-0.5
Ba,La-140	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-134	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-137	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
K-40	* c	* c	* c	* c	* c	* c

\* b - Unless otherwise noted, the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides.

\* c - Naturally occurring radionuclides are not reported.

Table 22. Analysis of milk samples for January ~ December, 1984.  
Lehrmann farm.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION  
Point Beach  
1984

Measurements in units of pCi/liter

Lehrmann farm  
2.7 miles KMW

WI - Section of Radiation Protection data

Collection date	01-30-84	02-29-84	03-28-84	04-25-84	05-30-84	06-27-84
Isotope:						
I-131	-0.3+/-0.19	-0.4+/-0.3	0.5+/-0.2	-0.15+/-0.16	-0.07+/-0.08	-0.6+/-0.2
Ba,La-140	10+/-8	6+/-5	5+/-4	-1+/-8	3+/-4	3+/-3
Cs-134	0+/-8	3+/-9	6+/-6	8+/-8	1+/-7	7+/-6
Cs-137	-2+/-9	-2+/-9	3+/-8	11+/-9	-1+/-8	3+/-7
K-40	1230+/-190	1340+/-190	1440+/-180	1310+/-180	110+/-190	1400+/-190
Sr-90	2.3+/-0.8	1.6+/-0.9	1.6+/-1.0	2.7+/-0.9	3.1+/-0.6	3.6+/-0.9
Collection date	* a	08-29-84	09-26-84	10-31-84	11-28-84	12-27-84
Isotope:						
I-131		0.49+/-0.19	0.46+/-0.18	-0.3+/-0.16	-0.05+/-0.13	0.01+/-0.3
Ba,La-140		2+/-5	-4+/-7	0+/-5	0+/-4	2+/-6
Cs-134		7+/-6	0+/-5	-1+/-6	5+/-6	5+/-5
Cs-137		4+/-6	7+/-6	3+/-6	8+/-5	1+/-7
K-40		1560+/-180	1440+/-170	1570+/-180	1530+/-180	1500+/-180
Sr-90		2.4+/-0.7	2.0+/-0.6	4.1+/-1.1	3.0+/-0.8	1.8+/-0.7

\* a - Sample was not collected.

Isotopes other than those reported were not detected.

Point Beach data

Collection date	01-30-84	02-29-84	03-28-84	04-25-84	05-30-84	06-27-84
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sr-90	2.0+/-0.6	1.7+/-0.5	1.8+/-0.5	1.0+/-0.5	2.1+/-0.4	2.1+/-0.5
Ba,La-140	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-134	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-137	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
K-40	* c	* c	* c	* c	* c	* c
Collection date	07-31-84	08-29-84	09-26-84	10-31-84	11-28-84	12-27-84
Isotope:						
I-131	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sr-90	2.2+/-0.4	2.3+/-0.6	1.0+/-0.5	1.5+/-0.1	<0.6	0.6+/-0.2
Ba,La-140	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-134	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
Cs-137	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b	<5 * b
K-40	* c	* c	* c	* c	* c	* c

\* b - Unless otherwise noted, the less than value (<\*) is for Cs-137 and may be higher or lower for other radionuclides.

\* c - Naturally occurring radionuclides are not reported.

Table 23. Analysis of vegetation samples.

WISCONSIN DIVISION OF HEALTH  
SECTION OF RADIATION PROTECTION

Point Beach

1984

Measurements in units of pCi/kg (wet)

WI - Section of Radiation Protection data

Collection Date	10-03-84	10-03-84	10-03-84
Type	vegetation	vegetation	vegetation
Location	PBK-2 or E-02 0.7 miles SW	PBK-4 or E-04 1.2 miles NNW	PBK-6 or E-06 4.8 miles SSE
Analysis			
Gross alpha (wet)	0+/-17000	600+/-2700	-700+/-3000
Gross beta (wet)	7700+/-1700	10000+/-3000	5000+/-3000
Gamma Isotopic			
I-131	-20+/-30	-13+/-30	-17+/-18
Ba-7	4100+/-400	8300+/-400	4800+/-200
Zr-95	40+/-60	50+/-70	14+/-40
Co-58	-17+/-30	-8+/-30	-13+/-16
Co-60	30+/-30	-6+/-40	20+/-20
Cs-134	2+/-30	0+/-30	-4+/-16
Cs-137	10+/-30	-10+/-40	15+/-18
K-40	6100+/-700	7100+/-700	1900+/-300

Isotopes other than those reported were not detected.

Point Beach data

Collection Date	10-03-84	10-03-84	10-03-84
Type	vegetation	vegetation	vegetation
Location	PBK-2 or E-02 0.7 miles SW	PBK-4 or E-04 1.2 miles NNW	PBK-6 or E-06 4.8 miles SSE
Analysis			
Gross alpha (wet)	* a	* a	* a
Gross beta (wet)	7300+/-300	7200+/-400	6900+/-400
Gamma Isotopic	<250 * b	<250 * b	<250 * b

\* a - Analysis was not performed.

\* b - Unless otherwise noted, the less than value ("<") is for Cs-137 and may be higher or lower for other radionuclides. Naturally occurring radionuclides are not reported.