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April 30, 2001

U.S. Nuclear Regulatory Commission
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Attached is the Palisades Plant Annual Radiological Environmental Operating Report for 2000. This report was prepared in accordance with the requirements of 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C., and Plant Technical Specifications 5.6.2. The period covered by the attached report is January 1, 2000 through December 31, 2000.

All trending parameters continue to indicate that the operation of Palisades has minimal environmental impact. Most isotopic activity is at environmental background levels. Evidence of an overall environmental isotopic buildup (attributable to Plant effluents) remains negligible. In most instances, sample analytical results were below previously established environmental background levels. There were no reportable events during this period.

SUMMARY OF COMMITMENTS

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

Douglas E. Cooper
Plant General Manager

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

Attachment

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ATTACHMENT

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

April 30, 2001

PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT
JANUARY 1, 2000 THROUGH DECEMBER 31, 2000

167 PAGES

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PALISADES NUCLEAR PLANT

2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

I. INTRODUCTION

The 2000 Palisades Nuclear Plant Annual Radiological Environmental Operating Report provides a summary and data interpretation of the Palisades Radiological Environmental Monitoring Program as conducted during the 2000 reporting period. Reporting requirements are detailed in Palisades Offsite Dose Calculation Manual, Appendix A, sections III.J and IV.B, Tables E-1 through E-3, and Table F-1.

During 2000, the analysis vendor, Teledyne Brown Engineering, underwent a name change to Environmental, Inc.

Detailed sample station identification and location information can be found in Attachment 2 of Health Physics Procedure HP 10.10 (Enclosure C). The results of all environmental samples collected are evaluated as follows:

A. Air iodine and particulate and thermoluminescent dosimetry (TLDs) (monthly, quarterly and annual) data were statistically evaluated at the 95% confidence level by the methodology detailed in Health Physics Procedure HP 10.4. The data were compared against two criteria. The first criterion is the statistical difference which indicates whether the sample results from near sites are greater than those from control sites, and whether or not the difference is significant. The second criterion is the evaluation level (twice the statistical difference) which is the minimum difference in the population means for which a corresponding difference in sample means will exceed the statistical difference with 95% confidence. If the evaluation level is exceeded, then correlation of the results with effluent releases is done.

B. Well water, lake water, sediment, fish and other aquatic biota samples were evaluated using data means comparisons against an appropriate control location (if available) and Palisades Offsite Dose Calculation Manual, Appendix A, limits.

II. NON-ROUTINE REPORTS

No non-routine reportable events occurred during this reporting period.

III. DISCUSSION AND INTERPRETATION OF RESULTS

A. Air Sample

A total of 622 air samples were collected and analyzed for gross beta and I-131 during 2000. One of the 622 samples was not included in the air sample analysis due to low volume. Two samples were not collected in 2000 at station 6-RB due to a power outage. Refer to Enclosure A for all sample collection anomaly evaluations.

Comparison of the airborne particulate sample data between the nine near-site indicator locations, and the three control locations did not exceed the statistical difference. In many instances, control location sample values were greater than indicator location samples. The means of gross beta results for indicator and control locations were identical at 0.026 pCi/m^3. When rounding to 5 significant numbers, the control stations results of 0.02637 pCi/m^3 are slightly higher than indicator stations results at 0.02630. In 2000, station 9-TP had the highest annual mean for gross beta results at 0.027 pCi/m^3. This station is located in the sector with the least prevailing wind direction. Overall gross beta results are trending slightly higher for both indicator and control stations when compared to previous years. No sample analyses identified I-131 activity above minimum detectable levels.

Air iodine/particulate samples are collected on a weekly basis from twelve air sampling locations. Air is metered into the sampling unit at a continuous one cubic foot per minute flow rate (approximately) through a Gelman 47mm air filter (air particulate) and a HI-Q air iodine cartridge. Both filters are in-line with each other and housed within the same filter holder. Weekly samples are sent to Environmental, Inc. Midwest Laboratory for analysis.

B. Lake Water

A total of 36 individual monthly lake water composite samples were collected from three locations during 2000. Lake water samples from the indicator locations, Palisades Lake-in (1-ST Intake), and South Haven Municipal Water system intake (25-SH Raw water), and the control location Ludington Lake-in (32-LP Intake), were collected daily.

Evaluation of the monthly lake water analytical results was based on a data means comparison between the indicator locations and control location. The results were also evaluated against the Palisades ODCM, Appendix A, reporting limits.

Gross beta analyses were completed for all lake water samples. The means for gross beta indicators and controls were 2.1 pCi/L and 2.3 pCi/L, respectively. Tritium was detected in one indicator sample and one control sample at 212 pCi/L, and 150 pCi/L respectively. No trends in gross beta results are discernable when compared to previous years sample results. No Palisades ODCM reporting limits were exceeded.

Although the Lake-out (discharge) sample was not used as an indicator in the Radiological Environmental Monitoring Program, it is monitored for activity. Monthly gross alpha and tritium results from the Palisades Lake-in were used for comparison data against the Lake-out (discharge) sample results. Gross alpha was detected in several Lake-out and Lake-in samples at slightly above minimum detectable activity levels. On four occasions during 2000, the tritium activity was detected in the discharge monthly samples. These elevated levels were all correlated to liquid effluent releases and were confirmed by comparison to calculated effluent tritium concentrations.

Palisades Lake-in, South Haven Municipal, and Ludington Lake-in water samples are collected daily for composite into a monthly sample. One gallon of Palisades Lake-in water, and Ludington Lake-in water, and two gallons each of South Haven Municipal treated and raw water are sent to Environmental, Inc. Midwest Laboratory for analysis. No treatment of the water samples with preservative is required.

C. Drinking Water

A total of 36 individual monthly drinking water samples were collected from three locations in 2000. Lake water samples from the indicator locations, South Haven Municipal Water System (25-SH Raw Water, 25-SH Treated) and the control location, Ludington Lake-in (32-LP Intake), were collected daily and composited into monthly samples.

Evaluation of the drinking water analytical results was based on a data means comparison between the indicator locations and the control location, as well as a comparison to the Palisades ODCM reporting limits. Both of the South Haven Municipal lake water intake and treated drinking water samples require gross beta analyses. A tritium analysis is required

for the treated water only. The gross beta means for the indicator and control locations were 2.1 pCi/L and 2.3 pCi/L, respectively. Tritium was detected in one indicator sample at 178 p/Ci/L and one control sample at 150 pCi/L in 2000. No special or supplemental analyses were required during 2000.

South Haven Municipal and Ludington Lake-in water samples are collected daily for composite into a monthly sample. One gallon of Ludington Lake-in water, and two gallons each of South Haven Municipal treated and raw water are sent to Environmental, Inc. Midwest Laboratory for analysis. No treatment of water samples with preservative is required.

D. Well Water

A total of 108 monthly well water samples were collected from nine locations during 2000. Evaluation of the well water analytical results was based on a data means comparison between the six indicator locations (1-ST, 39-ST, 40-ST, 41-ST, 42-ST and 43-ST) and the three control locations (8-SP, 9-TP, and 32-LP) as well as with the Palisades ODCM reporting limits.

Tritium and gross beta analyses were completed for all well water samples. The gross beta means for indicator and control locations were 4.5 pCi/L and 1.7 pCi/L, respectively. No trends in gross beta results are discernable when compared to previous years sample results. Tritium was detected in 10 indicator samples at a mean of 227 pCi/L. Tritium was not detected in any control samples.

The site well 1-ST had eight out of the ten positive results for tritium for indicator stations, with an average of 243 pCi/L. The Lower Limit of Detection (LLD) required for tritium is 500 pCi/L, the action level is 1000 pCi/L, and the reporting level is 20,000 pCi/L. The site well 1-ST tritiums levels are below LLD; however, since eight out of the twelve monthly sample results were positive for tritium, a condition report has been initiated to evaluate the sampling and analysis techniques at this station, and will also consider the potential of cross contamination.

No Palisades ODCM reporting limits were exceeded for the 2000 well samples. Evaluation of the gross beta activity between indicator and control locations revealed a statistical difference. However, in a comparison between wells used for Plant drinking water (1-ST, 40-ST) versus the three control samples, the gross beta results were identical at 1.7 pCi/l. The Steam Generator storage facility monitoring wells had a

gross beta average of 6.6 pCi/L for 2000, which caused the statistical difference between indicator and control stations.

In 2000, four well samples exceeded the gross beta ODCM action level of 10 pCi/L. One occurred at site #14 (41-ST), and three occurred at site #16 (43-ST), all in the winter months. Results ranged from 11.6 to 17.6 pCi/L. The subsequent gamma analysis of these samples showed no detectable activity. The Steam Generator storage facility and Warehouse wells typically trend around 4 to 8 pCi/L gross beta and it is not unusual for results to exceed the 10 pCi/L action level during the winter months. These well monitoring stations are located in snow pile-up and run-off areas adjacent to parking areas. It's highly probable that the gross beta results are due to road salt, and supports the conclusion that the elevated gross beta results are not the result of plant effluents. Refer to Enclosure A for all sample collection anomaly evaluations.

The Palisades site well (1-ST) location is collected daily and composited into a monthly sample. The other eight well locations consist of monthly grab samples.

Well water samples consisting of two one-gallon quantities for each well are sent to Environmental, Inc. Midwest Laboratory for analysis (Ludington control station consists of one one-gallon sample). No treatment of the water samples with a preservative is necessary.

E. Milk

A total of 48 individual monthly milk samples were collected from four different dairy farms (stations 26-AK, 27-DH, 28-DC and 29-WS) during 2000. The milk samples are obtained as grab samples (from dairy milk holding tanks).

No milk analysis identified activity above the minimum detectable level. No special or supplemental analyses were required, nor were any Palisades ODCM reporting limits exceeded.

Milk samples are required monthly (usually collected the first week of the month) from each designated location. Two one-gallon quantities of raw milk (grab sample) are obtained per sample location in order to meet analytical requirements. Each sample quantity is treated with a sodium bisulfite (40 grams per gallon) preservative prior to being sent to Environmental, Inc. Midwest Laboratory.

F. TLDs - Gamma Dose

There were a total of 348 monthly, 116 quarterly and 29 annual TLDs collected and analyzed during 2000.

The Palisades gamma assessment program consists of 29 locations: one directly on-site, nine near-site and six Steam Generator Storage Facility TLDs for a total of sixteen inner ring TLDs; ten outer ring (1.0 to 5.5 miles out); and, three control TLDs (30 to 55 miles out). A thirtieth TLD is placed in a lead storage cave and used as a control for in-transit dose monitoring and subtraction.

The monthly and quarterly TLD data evaluations were accomplished by statistically comparing the inner ring TLDs (site boundary locations 1-ST, 13-21 ST and 33-38 ST) and, the outer ring TLDs (locations 2-TH through 9-TP, 23-SN25 and 24-SN22), against the control TLD locations (10-GR, 11-KZ, and 12-DG). The annual TLD data evaluation was done by direct comparison of data points only. No monthly or quarterly statistical differences were exceeded.

For 2000, the average gamma readings (mR) were:

	Monthly	Quarterly	Annual
Inner ring TLDs (site boundary)	3.8	11.6	44.0
Outer ring TLDs (1.0 to 5.5 miles out)	4.4	13.2	50.6
Control TLD locations	4.3	13.8	51.8

The one on-site TLD location (1-ST) serves as an individual reference TLD; however, it was evaluated along with the inner ring (site boundary) TLDs in the statistical evaluation.

In evaluating the inner ring TLDs to the control TLDs, control station 11-KZ (35 mi. E) had the greatest monthly, quarterly, and annual mean of 5.0 mR, 15.2 mR, and 57.2 mR respectively.

When the same comparison was made for the outer ring TLDs, 2-TH (Tower Hill, 5 mi. S) had the greatest monthly, quarterly and annual mean for any location of 5.1 mR, 16.7 mR, and 59.9 mR respectively. Overall, the monthly, quarterly and annual results are trending just slightly higher for all locations including control stations.

Environmental gamma doses are measured monthly, quarterly and annually by placement of three TLD badges per designated location. Each TLD badge contains a 4-zone $CaSO_4$ wafer (the wafer includes an additional backup/reserve readout zone). Sensitivity for the multi-zone TLDs are 1.0 millirem with a linear response of 0.1 millirem to 1000 rem.

G. Crops

During 2000, 11 crop samples were collected from two stations (4-JS, and 5-PR). Evaluation of sample analytical results was direct. There was no control location used.

Of the radionuclide analyses listed on Table HP 10.4-2, only gross beta analysis resulted in any detectable activity. The gross beta mean for the indicator locations was 1.37 pCi/g. The crop samples at station 4-JS had the greatest individual mean for gross beta activity of 1.68 pCi/g. No trends for gross beta results are discernable when compared to previous years sample results. No Palisades ODCM action or reporting levels were exceeded, nor were any special/supplemental analyses required during 2000.

Food crop samples were collected when available and in season. Two principal area crops, apples and blueberries, are regularly collected as specified in the ODCM. While there are no designated locations where food crops are collected, samples are generally obtained from the same areas where the air monitoring stations are located within the ESE, SE or SSE sectors. The collection of food crops assists in verifying stack effluent deposition patterns. When collected, approximately 1 Kg of sample is placed in a sealable plastic bag for shipment to Environmental, Inc. Midwest Laboratory. No special treatment of the samples with a preservative is necessary.

H. Sediment

A total of ten individual sediment samples were collected from five locations during 2000. Eight sediment samples were obtained from Palisades (1-ST discharge, 31-STS ½ mi. South of discharge, 30-STN ½ mi. North of discharge and 25-SH South Haven Beach) locations and two samples from the Ludington Control Station (32-LP).

Evaluation of the sediment analytical results was based on a data means comparison between Palisades and the Ludington control samples as well as the Palisades Offsite Dose Calculation Manual, Appendix A, reporting

limits. Of the radionuclide analyses listed on Table HP 10.4-2, only gross beta, and Cs-137 activity were detectable. The gross beta means for indicator and control locations were 7.35 pCi/g and 10.69 pCi/g, respectively. Cs-137 was only detected at the North boundary, station 30-STN at a mean of 0.014 pCi/g. The gross beta results for the control station in Ludington are trending up slightly the past several years. No Palisades ODCM action or reporting levels were exceeded, nor were any special or supplemental analyses required during 2000.

Sediment samples are collected semi-annually from each designated location. A one liter quantity grab sample usually is obtained off-shore. No treatment of the samples with a preservative is necessary prior to shipment to Environmental, Inc. Midwest Laboratory.

I. Fish

A total of eight individual fish samples were collected from two locations during 2000. Four indicator samples were obtained from Palisades (1-ST discharge) and four control samples from the Ludington Station (32-LP). The same species were collected at both locations during each of the two collection periods.

Evaluation of the fish analytical results was based on a data means comparison between the Palisades and Ludington Control Samples as well as with the Palisades ODCM reporting limits. The gross beta means for indicator and control locations were 2.42 pCi/g and 2.46 pCi/g, respectively. Cs-137 was the only gamma emitter detected, with the means identical for indicator and control stations at 0.032 pCi/L. No trends in gross beta or Cs-137 are discernable when compared to previous years sample results.

No Palisades ODCM action levels or reporting levels were exceeded nor were any special analyses requested for 2000.

Fish samples are collected semi-annually. Samples consist of two species of commercially and/or recreationaly important species in vicinity of the Plant discharge area and one sample of the same species in an area not influenced by Plant discharge. Each one liter quantity of fish sample is prepared for shipment to Environmental, Inc. Midwest Laboratory. Each sample is either frozen or treated with a ten percent formaldehyde solution for preservation.

J. Broad Leaf Vegetation

No broad leaf vegetation samples were collected from the surrounding Palisades environs during 2000. The collection of broad leaf vegetation samples serves as a backup and/or alternative sampling media in case any milk sampling location(s) become(s) unavailable. There were no problems associated with the quantity or quality of milk samples for the 2000 reporting year.

K. Non-Routine Samples

No non-routine samples were collected during this reporting period.

L. Gaseous and Liquid Radwaste Effluent Composite Samples

Although not a direct reporting component in the Palisades Annual Radiological Environmental Operating Report, results of the gaseous and liquid monthly radwaste effluent composite samples are evaluated against overall environmental trending data. This evaluation is the basis for determining isotopic dispersion and deposition patterns within the surrounding environs of Palisades. All gaseous and liquid effluent results are compared to Palisades Offsite Dose Calculation Manual, Appendix A, reporting levels. All isotopic LLDs were met.

Both the gaseous and liquid radwaste effluent composite samples are collected monthly and sent to Environmental, Inc. Midwest Laboratory for analysis. No special sample treatment with a preservative is required prior to laboratory analysis. The liquid effluent composite sample is based on a specific amount of sample collected per total batch volume release. As noted in Enclosure A, for months in which there were no liquid batch effluent releases, no sample is sent to Environmental, Inc. Midwest Laboratory. The gaseous radwaste effluent weekly composite sample results are based on analyzing weekly stack gas filters.

IV. ASSESSMENT OF PALISADES OPERATION ENVIRONMENTAL IMPACT

In reviewing the 2000 Palisades radiological environmental monitoring data and comparing it to previous operational and pre-operational data, all trending parameters continue to indicate that the operation of Palisades has minimal environmental impact. Most isotopic activity is at environmental background levels. Evidence of an overall environmental isotopic buildup (attributable to Plant effluents) remains negligible as well. In most instances, sample analytical results were below previously established environment background levels.

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Table HP 10.4-1
Sampling and Analysis Summary

Medium	Description	Location	Number of Samples Collected	Type of Analysis	Frequency of Analysis
Air	Continuous at Weekly @ 1 CFM	1-ST thru 12-DG	622	Gross Beta, I-131	Weekly
Lake Water	1 Gallon Composite	1-ST Intake 25-SH Raw 32-LP Intake	36	Gross Beta, Gross Alpha(1), Tritium(1)	Monthly
Drinking Water	1 Gallon Composite/Grab	25-SH Raw 25-SH Treated 32-LP Intake	36(2,3)	Gross Beta, Tritium(1)	Monthly
Well Water	1 Gallon Grab	1-ST Well, 8-SP, 9-TP, 32-LP Well, 39-ST, 40-ST, 41-ST, 42-ST, 43-ST	108	Gross Beta, Tritium	Monthly
Milk	2 Gallon Grab	26-AK, 27-DH, 28-DC, 29-WS	48	I-131, Cs-137, Cs-134, BaLa-140	Monthly
TLD	Continuous	1-ST thru 24-ST, 33-ST thru 38-ST	348 116 29	Gamma	Monthly Quarterly Annual
Crops	Grab	4-JS, 5-PR,	11	Gross Beta, Cs-137, Other Gamma	In Season
Sediment	Grab	1-ST, 25-SH, 30-STN 31-STS, 32-LP	10	Gross Beta, Cs-137, Other Gamma	Semi-Annual
Fish	Grab	1-ST, 32-LP	8	Gross Beta, Cs-137 Other Gamma	Seasonally

(1) Not required for 25-SH Raw
(2) Same 25-SH Raw water samples as Lake Water
(3) Same 32-LP Intake water samples as Lake Water

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Table HP 10.4-2
Sample Data Summary

Medium or Pathway Sampled Unit of Measurement	Analyses Evaluated/ Analyses Performed		Lower Limit of Detection(a) LLD	All Indicator Locations Mean(b) Range(b)		Location With Greatest Annual Mean Name Distance and Direction		Mean(b) Range(b)	All Control Locations Mean(b) Range(b)		Nonroutine Reports(c)
Air (pCi/m³)	I-131	621/622	0.07	0/465	LLD	N/A		LLD	0/156	LLD	None
	Gross Beta	621/622	0.01	465/465	0.026 (0.011-0.050)	9-TP 1.5 mi SSW	52/52	0.027 (0.011-0.046)	156/156	0.026 (0.015-0.060)	None
Lake Water (pCi/L)	Gross Alpha(f)	12/12	1.0	3/12	0.53 (0.4-0.6)	1-ST Palisades Plant Site	3/12	0.53 (0.4-0.6)	N/A	N/A	None
	Gross Beta	36/36	4.0	24/24	2.1 (1.6-2.8)	32-LP 125 mi N	12/12	2.3 (1.6-3.8	12/12	2.3 (1.6-3.8)	None
	Tritium(f)	24/24	500.0	1/12	212	1-ST Palisades Plant Site	1/12	212	1/12	150	None
Drinking Water (pCi/L)	Gross Beta	36/36	4.0	24/24(1)	2.1 (1.5-2.8)	32-LP 125 mi N	12/12	2.3 (1.6-3.8)	12/12(2)	2.3 (1.6-3.8)	None
	Tritium(f)	24/24	500.0	1/12	178	25-SH 5.5 mi NNE	1/12	178	1/12(2)	150	None
Well Water (pCi/L)	Gross Beta	108/108	4.0	67/72	4.5 (0.9-17.6)	43-ST Palisades Plant Site	12/12	8.4 (4.0-17.6)	21/36	1.7 (0.9-3.8)	None
	Tritium	108/108	500.0	10/72	227 (159-475)	1-ST Palisades Plant Site	8/12	243 (174-475)	0/36	LLD	None
Milk (pCi/L)	I-131	48/48	1.0	0/36	LLD	N/A		LLD	0/12	LLD	None
	Cs-137	48/48	18.0	0/36	LLD	N/A		LLD	0/12	LLD	None
	Other Gamma	48/48	15.0	0/36	LLD	N/A		LLD	0/12	LLD	None

(1) 12 of these indicator samples were from the lake water media indicator location (25-SH Raw).
(2) Control samples were from the lake water media control location (32-LP Intake).

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Medium or Pathway Sampled Unit of Measurement	Analyses Evaluated/ Analyses Performed		Lower Limit of Detection(a) LLD	All Indicator Locations Mean(b) Range(b)		Location With Greatest Annual Mean Name Distance and Direction		Mean(b) Range(b)	All Control Locations Mean(b) Range(b)		Nonroutine Reports(c
TLD (gamma mR) Inner Ring (Site Boundary)	TLD(monthly)(e)	228/228	1.0	192/192	3.8 (2.7-5.3)	11-KZ 35 mi. E	12/12	5.0 (4.1-7.1)	36/36	4.3 (3.0-7.1)	None
	TLD(quarterly)(e)	76/76	1.0	64/64	11.6 (9.4-13.9)	11-KZ 35 mi. E	4/4	15.2 (14.5-16.0)	12/12	13.8 (12.3-16.0)	None
	TLD(annual)	19/19	1.0	16/16	44.0 (39.7-53.1)	11-KZ 35 mi. E	1/1	57.2	3/3	51.8 (48.2-57.2)	None
TLD (gamma mR) Outer Ring	TLD(monthly)(e)	156/156	1.0	120/120	4.4 (3.3-6.2)	2-TH 5.6 mi S	12/12	5.1 (4.2-5.9)	36/36(3)	4.3 (3.0-7.1)	None
	TLD(quarterly)(e)	52/52	1.0	40/40	13.2 (10.6-17.7)	2-TH 5.6 mi S	4/4	16.7 (15.5-17.7)	12/12(3)	13.8 (12.3-16.0)	None
	TLD(annual)	13/13	1.0	10/10	50.6 (45.0-59.9)	2-TH 5.6 mi S	1/1	59.9	3/3(3)	51.8 (48.2-57.2)	None
Crops	Gross Beta	11/11	1.0	11/11	1.37 (0.74-2.76)	4-JS 3.5 mi SE	6/6	1.68 (0.91-2.76)	N/A		None
	Other Gamma	11/11	0.05-0.10	0/11	LLD	N/A		LLD	N/A		None
Sediment (pCi/g dry)	Gross Beta	10/10	1.0	8/8	7.35 (4.65-12.88)	32-LP 125 mi N	2/2	10.69 (10.67-10.70)	2/2	10.69 (10.67-10.70)	None
	Cs-137	10/10	0.15	2/8	0.014 (0.008-0.019)	30-STN 0.5 mi N	2/2	0.014 (0.008-0.019)	0/2	LLD	None
	Other Gamma	10/10	0.05-0.15	0/8	LLD	N/A		LLD	0/2	LLD	None

(3) Same control TLDs as Inner Ring.

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Sample Data Summary

Medium or Pathway Sampled Unit of Measurement	Analyses Evaluated/ Analyses Performed		Lower Limit of Detection(a) LLD	All Indicator Locations Mean(b) Range(b)		Location With Greatest Annual Mean Name Distance and Direction		Mean(b) Range(b)	All Control Locations Mean(b) Range(b)		Nonroutine Reports(c)
Fish (pCi/g wet)	Gross Beta	8/8	1.0	4/4	2.42 (1.37-3.85)	32-LP 125 mi N	4/4	2.46 (1.37-3.63)	4/4	2.46 (1.37-3.63)	None
	Cs-137	8/8	0.15	1/4	0.032	32-LP 125 mi N Plant Site	2/4	0.032 (0.018-0.046)	2/4	0.032 (0.018-0.046)	None
	Other Gamma	8/8	0.10-0.26	0/4	LLD	N/A		LLD	0/4	LLD	None
Broadleaf Vegetation(d) (pCi/g wet)	Gross Beta		1.0	No Samples Collected							
	Cs-137		0.08								
	Other Gamma		0.05-0.10								

(a) Nominal Lower Limit of Detection (LLD) as defined in MASL-300 (Rev 0/73), pages D-06-01, 02 and 03; Palisades ODCM, Appendix A, Table E-3 and vendor analytical capabilities.
(b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specific locations is indicated next to the mean.
(c) Nonroutine reported measurements are defined in the Palisades ODCM, Appendix A, Section IV.C.
(d) Supplemental sample when milk is unavailable.
(e) Monthly TLD results are normalized for 30 days net; Quarterly TLD results are normalized for 91 days net.
(f) Analysis not required for (25-SH) South Haven Municipal raw water.

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Table HP 10.4-3
Greatest Mean Sampling Location

Medium	Type of Analysis	Location	High	Low	Mean
Air (pCi/m^3)	I-131	LLD	-----	-----	<0.07
	Gross Beta	9-TP 1.5 mi SSW	0.046	0.011	0.027
Lake Water (pCi/L)	Gross Alpha	1-ST Palisades Plant Site	0.60	0.40	0.53
	Gross Beta	32-LP Ludington 125 mi N	3.8	1.6	2.3
	Tritium	1-ST Palisades Plant Site	212	212	212
Drinking Water (pCi/L)	Gross Beta	32-LP Ludington 125 mi N	3.8	1.6	2.3
	Tritium	25-SH 5.5 mi NNE	178	178	178
Well Water (pCi/L)	Gross Beta	43-ST Palisades Plant Site	17.6	4.0	8.4
	Tritium	1-ST Palisades Plant Site	475	174	243
Milk (pCi/L)	I-131	LLD	-----	-----	<1.0
	Cs-137	LLD	-----	-----	<18.0
	Other Gamma	LLD	-----	-----	<15.0
TLD (Gamma-mR) Inner Ring (Site Boundary)	TLD (Monthly)	11-KZ 35 mi E	7.1	4.1	5.0
	TLD (Quarterly)	11-KZ 35 mi E	16.0	14.5	15.2
	TLD (Annual)	11-KZ 35 mi E	N/A	N/A	57.2
TLD (Gamma-mR) Outer Ring	TLD (Monthly)	2-TH 5.6 mi S	5.9	4.2	5.1
	TLD (Quarterly)	2-TH 5.6 mi S	17.7	15.5	16.7
	TLD (Annual)	2-TH 5.6 mi S	N/A	N/A	59.9

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 2000
Table HP 10.4-3
Greatest Mean Sampling Location

Medium	Type of Analysis	Location	High	Low	Mean
Crops (pCi/g wet)	Gross Beta	4-JS 3.5 mi SE	2.76	0.91	1.68
	Other Gamma	LLD	-----	-----	<0.05-0.10
Sediment (pCi/g dry)	Gross Beta	32-LO Ludington 125 mi N	10.70	10.67	10.69
	Cs-137	30-STN 0.5 mi N	0.019	0.008	0.014
	Other Gamma	LLD	-----	-----	<0.05-0.15
Fish (pCi/g wet)	Gross Beta	32-LP Ludington 125 mi N	3.63	1.37	2.46
	Cs-137	1-ST Palisades Plant Site	0.046	0.018	0.032
	Other Gamma	LLD	-----	-----	<0.10-0.26
Broad Leaf Veg (pCi/g wet)	Gross Beta	No Samples Collected			
	I-131				
	Other Gamma				

ENCLOSURE A

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

SAMPLE COLLECTION ANOMALIES

2 PAGES

Enclosure A Sample Collection Anomalies

Sample Affected	Location	Date	Problem	Evaluation
AP- I-131 Beta	ST-6	5-30-00	Low sample volume Results not included in statistical analysis	Station lost power (1)
AP-I-131 Beta	ST-6	6-6-00 & 6-12-00	No samples	Station lost power (1)
Well Water	41-ST	Jan	Gross beta analysis result exceeded 10 pCi/L	Activity not due to Plant effluents, suspect road de-icer as contaminant. (2)
Well Water	43-ST	Jan, Feb Mar	Gross beta analysis result exceeded 10 pCi/L	Activity not due to Plant effluents, suspect road de-icer as contaminant. (2)
Liquid Radwaste	Plant Site	Feb, Apr May, June Aug, Sep Oct, Dec	No sample	There were no liquid effluent batch releases during these time periods. Consequently No sample is collected and sent to Environmental Inc.

(1) Station 6 lost power sometime during the week of May 30 due to road construction in conjunction to sewage pipe installation. Station 6 is in a remote area, not residential; therefore, there was no urgency to restore by local power company. Power was restored to the station very late in the day on June 9, and sample collection resumed on June 19 (sample volume on June 12 was too low for collection). Sample collected on May 30 had low volume (102 m^3), the results were greater than 2 standard deviations from the quarterly mean, and were rejected from the statistical analysis. No action necessary to prevent recurrence.

(2) Follow up analysis (gamma spectroscopy) showed all isotopes less than LLD. Activity is not due to Plant effluents, suspect road de-icer as contaminant, as higher activity at this well site is only seen in winter months, and sample locations are near road run-offs and Plant parking areas.

ENCLOSURE B

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

PALISADES 2000 LAND USE CENSUS

10 PAGES

To JL Beer, Palisades

From MLGrogan, Palisades

Date September 15, 2000

Subject PALISADES PLANT - 2000 LAND USE CENSUS

CC JBBurnett, Palisades
REMP/RETS File
ERC: LANUSECEN

CONSUMERS ENERGY

Internal Correspondence

MLG00*011

The attached tables and map are the results of the Palisades Land Use Census conducted by MLGrogan and TAVeal on September 6, 2000. Table 10.11-1 references the distance from Palisades to the nearest residence, garden (greater than 500 square feet), beef/dairy cattle, and goat per meteorological sector. Table 10.11-2 identifies the locations of the nearest residence and garden; and of all beef/dairy cattle and goats within a five (5) mile radius of Palisades per meteorological sector. Table 10.11-3 lists the critical receptor locations used in calculation of the offsite doses by the GASPAR computer program. An accompanying map illustrates Table 10.11-2.

The land use survey noted a herd of goats located closer to the Plant than previously identified, and as a result there was a change to this critical receptor location. The X/Q has increased slightly for goats (from 1.19E-07 sec/m^3 to 2.10E-07 sec/m^3), as the critical receptor changed from the NE sector at 3.2 miles, to the SE sector at 2.0 miles.

Tables 10.11-1 and 10.11-3 are required to be updated in the ODCM as Tables 1.4 and 1.4a respectively. Attached to this report are the new revisions of Tables 1.4 and 1.4a.

If you have any questions, please contact me.

Reviewed by TPNeal 9-15-00

TPNeal, Senior Technical Analyst Date

2000 PALISADES LAND USE CENSUS

TABLE 10.11-1

Distance to the nearest residence, garden, dairy/beef cattle and goat in each sector.

SECTOR	RESIDENCE	GARDEN	BEEF CATTLE	DAIRY COW	GOAT
NNE	1.1 mi	1.8 mi	>5 mi	>5 mi	>5 mi
NE	1.2 mi	1.2 mi	2.9 mi	>5 mi	3.2 mi
ENE	1.3 mi	3.3 mi	1.8 mi	>5 mi	>5 mi
E	1.0 mi	2.1 mi	3.5 mi	>5 mi	>5 mi
ESE	1.0 mi	*1.0 mi	4.0 mi	>5 mi	*2.0 mi
SE	1.0 mi	*1.0 mi	2.2 mi	4.3 mi	*2.0 mi
SSE	0.7 mi	1.6 mi	>5 mi	>5 mi	>5 mi
S	0.5 mi	4.0 mi	>5 mi	>5 mi	4.7 mi
SSW	0.7 mi	4.9 mi	>5 mi	>5 mi	>5 mi

* Note: Garden and Farm bisected by ESE/SE boundary line.

2000 PALISADES LAND USE CENSUS

TABLE 10.11-2

Verification of Items

Sector	Location Description	Item	Number/Comment
NNE Ruggles Rd	State Park Manager	Residence	1
NNE	Fire Ln O, (off 20th) (West side of road)	Garden	1
NE Blue Star Hwy	L. Swetay, Route 3, Box 133 (East side of highway)	Residence Garden	1 1
NE M-140	18847 M-140, .25 miles N of 20th, west side of road	Cattle	2-Beef
NE M-140	C. Bernt, 18019 M-140	Goats	3
NE M-43	M-43, N side of road, between 12th & 16th, (approximately 0.3 mile outside the 5 mile limit)	Goats	20
ENE 24th Ave	Trailer-West 24th Avenue, dead end at sand dune	Residence	1
ENE 24th	72577 24th Street, 0.3 miles West of 72nd St (North side)	Garden	1
ENE 72nd	72nd St, 0.3 miles N of 20th (East side of road)	Cattle	12-Beef
ENE 76th	22595 76th St, .3 mi N of 24th, East side of road	Cattle	2-Beef
ENE 69th	380 & 69th, NE corner	Goat	2

2000 PALISADES LAND USE CENSUS

TABLE 10.11-2

Verification of Items

Sector	Location Description	Item	Number/Comment
E 77th	77th St, Dead end of 77th St near 28th Ave intersection	Residence	1
E 72nd St	C. Mims, 26200 72nd St intersection of 72nd & 26th Ave (Northwest corner of intersection)	Cattle Garden	1-Beef 1
E 75th	27723 75th, 0.1 mile North of 28th (East side of road)	Garden	1
ESE 771/2 St	O. Ashley, 28008 77 1/2th St Northwest corner of 771/2th St and 28th Ave intersection	Residence	1
ESE/SE 34th Ave	Herchy House, 72753 34th Ave (South side of road)	Cattle	4-Beef
ESE/SE 30th	Corner of 30th and 76th SE corner	Goats	15
ESE 69th	A. Karr, 69th St 0.5 mile North of 69th St and 30th Avenue intersection	Cattle	20-Dairy Cow
SE/ESE 28th	77550 28th Avenue	Residense Garden	1 1
SE 36th	72401 36th Avenue, 0.2 mile West from 72nd, South side of road	Cattle Goat	8-Beef, 4 Dairy 1
SE 76th	76th Street, 0.3 mi N of 34th (east side of road)	Cattle	3-Beef

2000 PALISADES LAND USE CENSUS

TABLE 10.11-2

Verification of Items

Sector	Location Description	Item	Number/Comment
SSE 29th	80119 29th Avenue	Residence	1
SSE 77 ½	77 ½ St, 0.3 mile North of 32nd Ave (west side of 77 ½ th St)	Garden	1
SSE 376th	0.1 mi West of 140, south side of road	Cattle	7-Beef
S 29th Ave	Palisades Park, 0.5 mile West of 29th Ave and Blue Star Hwy intersection (North side of 29th)	Residence	1
S CR 376	79911 46th Street (CR 376), at 80th St intersection	Goat	2
S 78th	78th, 0.5 mi North of CR 376 west side of road	Garden	1
SSW 29th	29th Ave, at dead end of Palisades Park	Residence	1
SSW 82nd	Blue Star & 82nd, off of 376th (west side of road)	Garden	1

2000 PALISADES LAND USE CENSUS

TABLE 10.11-3

Critical Receptor Items

Sector	Distance Miles	Location/Description	Item	*X/Q (sec/m^3).
SSE	0.48	Site Boundary	N/A	2.13E-06
S	0.50	Residence, Palisades Park; ½ mile West of 29th Avenue and Blue Star intersection.	Residence	1.38E-06
SE	1.0	77550 28th Avenue	Garden	5.87E-07
ENE	1.8	22595 76th Ave, .3 miles N of 24th, East side of road	Beef Cattle	2.14E-07
SE	4.3	72401 36th Ave.	Dairy Cow	6.83E-08
SE	2.0	SE corner of 30th and 76th	Goat	2.10E-07

*Based on Palisades 5 year composite meteorological data, 1992 -1996.

TABLE 1.4

2000 PALISADES LAND USE CENSUS

Distance to the nearest residence, garden, dairy/beef cattle and goat in each sector.

SECTOR	RESIDENCE	GARDEN	BEEF CATTLE	DAIRY COW	GOAT
NNE	1.1 mi	1.8 mi	>5 mi	>5 mi	>5 mi
NE	1.2 mi	1.2 mi	2.9 mi	>5 mi	3.2 mi
ENE	1.3 mi	3.3 mi	1.8 mi	>5 mi	> 5mi
E	1.0 mi	2.1 mi	3.5 mi	>5 mi	>5 mi
ESE	1.0 mi	*1.0 mi	4.0 mi	>5 mi	*2.0 mi
SE	1.0 mi	*1.0 mi	2.2 mi	4.3 mi	*2.0 mi
SSE	0.7 mi	1.6 mi	>5 mi	>5 mi	>5 mi
S	0.5 mi	4.0 mi	>5 mi	>5 mi	4.7 mi
SSW	0.7 mi	4.9 mi	>5 mi	>5 mi	>5 mi

* Note: Garden and Fam bisected by ESE/SE boundary line.

TABLE 1.4a

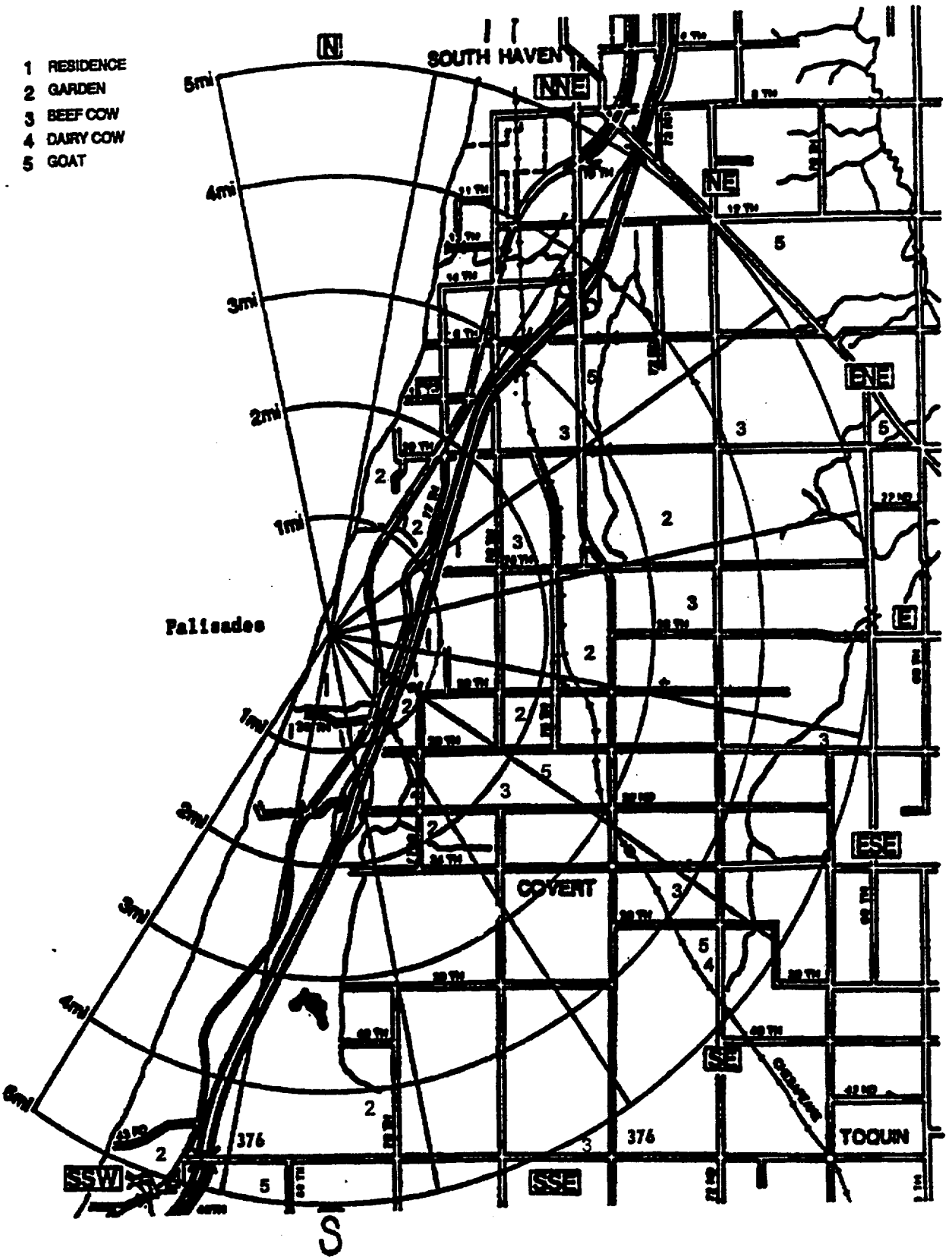
2000 PALISADES LAND USE CENSUS

Critical Receptor Items

Sector	Distance Miles	Location/Description	Item	*X/Q (sec/m^3).
SSE	0.48	Site Boundary	N/A	2.13E-06
S	0.50	Residence, Palisades Park; ½ mile West of 29th Avenue and Blue Star intersection.	Residence	1.38E-06
SE	1.0	77550 28th Avenue	Garden	5.87E-07
ENE	1.8	22595 76th Ave .3 miles N of 24th, East side of road	Beef Cattle	2.14E-07
SE	4.3	72401 36th Ave.	Dairy Cow	6.83E-08
SE	2.0	SE corner of 30th and 76th	Goat	2.10E-07

*Based on Palisades 5 year composite meteorological data, 1992 -1996.

PALISADES LAND USE CENSUS MAP



ENCLOSURE C

CONSUMERS ENERGY COMPANY
PALISADES PLANT
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PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

HEALTH PHYSICS PROCEDURE HP 10.10

35 PAGES

Procedure No HP 10.10
Revision 5
Issued Date 3/16/01

PALISADES NUCLEAR PLANT
HEALTH PHYSICS PROCEDURE

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

[signature] , 3/6/01
Procedure Sponsor Date

MSweet , 4/30/98
Technical Reviewer Date

MSweet , 10/28/99
User Reviewer Date

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

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TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

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ATTACHMENTS

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

USER ALERT
INFORMATION USE PROCEDURE

The activities covered by this procedure may be performed from memory.

1.0 PURPOSE

To provide methodology for collection of environmental samples in support of the Radiological Environmental Monitoring Program (REMP).

2.0 REFERENCES

2.1 SOURCE DOCUMENTS

2.1.1 Reg Guide 4.15(7)

2.1.2 10CFR50, Appendix I

2.1.3 Palisades Administrative Procedure 7.08, "Nuclear Plants Radiological Environmental Monitoring Program"

2.1.4 REMP Sample Shipping Manual, Teledyne Isotopes Midwest Laboratory

2.1.5 Health Physics Procedure 10.1, "Radiological Environmental Monitoring Program Surveillance"

2.1.6 Technical Specifications Chapter 5, Section 5.5.1, "Offsite Dose Calculation Manual (ODCM)"

2.2 REFERENCE DOCUMENTS

2.2.1 Palisades ODCM, Appendix A, Sections III.J, IV.C, and Tables E-1 and E-2

2.2.2 Palisades Administrative Procedure 10.46, "Plant Records"

3.0 PREREQUISITES

As indicated in procedure.

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

4.0 PRECAUTIONS AND LIMITATIONS

4.1 This procedure shall be applicable to Palisades/C&RSD HP, Environmental Department, and any contractual personnel assigned to collect or evaluate REMP samples.

4.2 Any revisions to this procedure shall be reviewed against Palisades ODCM Specifications to verify compliance to all requirements.

4.3 Deviations from the required sampling schedule shall be documented in the Annual Radiological Environmental Operating Report.

4.4 Every effort shall be made to complete corrective action on malfunctioning sampling equipment prior to the end of the next sampling period.

4.5 If it is not possible to obtain the required samples, suitable alternative media and locations shall be substituted within 30 days.

4.6 Samples shall be collected, prepared, and shipped for analysis in a timely manner to preserve integrity. Other specific handling precautions for sample media are indicated in Section 5.0 as required.

4.7 Obtain best available replacement sample for any missing sample. Notify Palisades C&RSD Radiological Environmental contact with description and location of the replacement sample. Some samples are not replaceable (TLDs, air samples, etc), however, water, milk, crop samples, etc, should be.

4.8 Document any missing samples or malfunctioning equipment on sample data collection sheets.

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

5.0 PROCEDURE

USER ALERT
INFORMATION USE PROCEDURE

The activities covered by this procedure may be performed from memory.

5.1 CONTROL AND OVERSIGHT OF SAMPLING FOR THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.1.1 Sampling techniques described by this procedure must be strictly adhered with.

a. This includes use of forceps for air sample media change out to ensure the collected media is not disturbed.

b. Recorded data should be verified including verification of transcribed data to avoid errors.

c. All deviations from performance requirements, unavailable samples, or other sampling anomalies must be reported to the C&RSD Radiological Environmental Contact.

5.1.2 Failure of sample collectors to comply with sampling and reporting requirements may result in remedial training, disciplinary action, or reassignment of sampling duties.

5.1.3 The C&RSD radiological environmental contact shall conduct periodic (annual) audits of sampling activities.

a. These audits shall include observation of collection techniques, verification of procedural compliance and review of equipment condition.

b. Audits should specifically address air sample collection and should include observation of all individuals involved in sample changeout.

c. Audit of collection of other sample media may be performed at the discretion of the C&RSD environmental contact.

d. Results of the audits and any follow up action should be documented in the REMP file.

Collect samples using the following methodology in accordance with schedule and location data described in Attachments 1 and 2.

5.2 REMP AIR SAMPLE COLLECTION

5.2.1 Precautions

a. New filters and cartridges should be transported and handled such that potential contamination of them is minimized (ie, placed in clean plastic bags, etc).

b. If an air sampling unit is discovered not operating, attempt to find the cause and repair. If this cannot be done, replace applicable component and document on air sample collection data sheet.

c. Airflow meters shall be calibrated annually by General Meter. All in service calibrated meters will have affixed a valid calibration sticker/card stating date of calibration and calibration due date.

d. Airflow meters shall be changed out prior to the expiration of calibration dates. Replacement air meters are available from Plant C&RSD Environmental contact.

e. Air station leakage shall be none detectable. If the replacement of air station components is required due to air leakage, document on air sample collection data sheet.

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

5.2.2 **Prerequisites**

a. Glass fiber (particulate) air filters

b. Charcoal cartridges for iodine sampling (prelabeled for each air sampler)

c. Glassine or plastic envelopes (prelabeled for each air sampler)

d. REMP Air Sample Data Sheet (containing installation data)

e. Replacement air sample meters (as required)

f. Forceps

g. Stop Watch

h. Step Ladder

NOTE: The Control Stations 10-GR, 11-KZ, and 12-DG are changed out weekly by three independent collectors, and mailed in separately. The prelabeling of cartridges and envelopes, detailed below, is not required for these stations as sample mix-up is not possible. In addition, for these control stations, the Palisades Sample Collection Form and Records (Page 1 of Attachment 5) is completed by the Technician changing out the nine local stations by transferring the recorded data provided by the independent collectors.

5.2.3 Perform the following weekly at each sample location:

a. Open the protective cover on the air sample station and verify the sampling location number written on the inside of the door is the same as the prelabeled sample change-out package.

b. Verify that the meter serial number and calibration due date are correctly documented on Palisades Plant Environmental Monitor Operability Check and Sample Collection data form (Page 1 of Attachment 5.)

c. Determine and record the "As Found Flow" rate (seconds for one cubic foot of volume).

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

d. Determine and record the "As Found Leak" rate by placing hand over filter housing inlet to form a seal. While holding hand over the inlet, determine if air leakage is evident by checking the air flow meter needle for movement (leakage). If no air leakage, record (N) in the "As Found Leak" column. If air leakage is indicated, determine the cause and repair as soon as possible.

e. Unplug or turn off the air pump and record the "REMOVED MONTH/DAY/YEAR," "REMOVED TIME," and "GAS METER READING REMOVED."

f. Remove the prelabeled charcoal cartridge and place in zip lock bag.

g. Using tweezers, carefully remove particulate filter from the sampler head and place in the prelabeled glassine envelope or plastic envelope.

h. Clean out any residue or moisture buildup in sampler head before replacement filter is installed. Check the condition of the sampler head o-rings. Replace cracked o-rings as necessary to prevent air leakage.

i. Install new particulate filter and charcoal cartridge and ensure that both are properly centered in sampler head to prevent air leakage. Ensure the fiber side of the particulate filter is facing out (smooth side facing inward).

j. Restart air pump. Place hand over the filter housing inlet to form a seal, determine if air leakage is evident by checking air flow meter needle movement. If no air leakage, record (N) in the "As Left Leak" column. If air leakage indicated, determine the cause of the leakage (filter not centered in holder properly or cracked o-ring) and correct problem as soon as possible, restoring system to no air leakage.

k. Determine and record "As Left" flow rate. If greater than 90 seconds are required for one cubic foot of volume, the sample pump is degrading. Replace pump as soon as possible to avoid failure to reach minimum sample volume. (5000 ft^3).

l. If an airflow meter must be replaced, record this in the "Comments" column. Record replacement meter data in the reading on the upcoming week's sample collection data sheet.

m. Close the protective cover on the air sample station.

n. Calculate and record "SAMPLE VOL (FT3)," ALSO ensure all pertinent data is recorded.

o. Proceed to the next station. Date and sign the current weeks data sheet upon completion of the entry of all current data.

p. Transcribe the "REMOVED MONTH/DAY/YR" and "GAS METER READING REMOVED" taken in Step 5.2.3e to the "INSTALLED" reading columns on the sample collection sheet to be used for the upcoming week's air sample collection. Also transcribe the meter serial number and calibration due date to the upcoming week's sample collection sheet.

5.3 REMP LAKE (DRINKING) WATER SAMPLE COLLECTION - SOUTH HAVEN, MICHIGAN

5.3.1 Prerequisites

a. Four clean one-gallon plastic containers labeled with sample type, location, amount, and date (or collection period)

b. REMP Miscellaneous Data Sheet (Attachment 3)

5.3.2 Perform the following sample collection monthly:

a. Leave four containers with the Plant Superintendent at the South Haven Municipal Water Treatment Plant. New water sample containers should be left at the South Haven Water Treatment Plant upon pickup of end-of-month composite samples.

b. Instruct the Plant Superintendent to add approximately 300 ml per day of raw water to container labeled "RAW" and approximately 300 ml per day of treated water to container labeled "TREATED," or "TAP."

c. Return at end of month to collect containers. Obtain verbal verification that Step 5.3.2b was carried out. Note any deviations in "Remarks" column of data sheet.

d. Label containers with sample type, amount, location, and collection period.

e. Package and ship samples per Attachment 4.

f. Record location, sample types (raw and treated), and amount on sample identification data sheet (Attachment 3). Sign and date data sheet.

5.4 REMP WELL WATER SAMPLE COLLECTION

5.4.1 Prerequisites

a. Clean, one-gallon plastic containers

b. REMP Miscellaneous Data Sheet (Attachment 3)

5.4.2 Perform the following sample collection monthly:

NOTE: During the winter months, the State and Township Park wells may be out of service. When this occurs, note the unavailability of the water samples and document on sample data sheet.

a. Turn on water supply (or begin pumping water) and allow water to run for approximately one minute to purge the lines.

b. Fill two clean, one-gallon plastic containers with well water from each sample location.

c. Label containers with sample type, amount, location, and collection date.

d. Package and ship samples per Attachment 4.

e. Record on data sheet (Attachment 3) location, type, date, amount, and under "Remarks" any pertinent information. Sign form in space provided.

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

5.5 REMP MILK SAMPLE COLLECTION

5.5.1 Precautions

a. Milk samples shall be sent to the laboratory as soon as possible because of the short half-life of I-131. Any undue delay may cause ODCM, Appendix A, Table E-3 analytical LLD requirements to be violated.

b. Obtain best available replacement sample for any missing milk sample(s). Identify new sample location(s) and notify Palisades C&RSD Radiological Environmental contact as soon as possible.

c. If milk samples are unavailable, then samples of three different kinds of broad leaf vegetation grown nearest to Palisades in each of two different offsite locations of the highest predicted average ground level D/Q (SE or SSE sectors near site), and one sample of each kind of similar broad leaf vegetation grown 15-30 km distant from Palisades in the least prevalent wind direction (NNE, NE or ENE sectors) may be used as replacement samples. The new sample locations shall be identified and the REMP procedures revised within 30 days to reflect sampling changes. Collect approximately one kilogram (2.2 lb) of each sample type.

5.5.2 Prerequisites

a. Two clean, plastic one-gallon containers for each sample location

b. Sodium bisulfite preservative (approximately 40 gm per gallon of milk required)

c. Miscellaneous sample data form (Attachment 3)

5.5.3 Perform the following monthly at each specified sample collection location:

a. Obtain two one-gallon grab samples of raw milk as specified in Attachments 1 and 2.

b. If problems are encountered in obtaining a sufficient quantity of milk sample, notify the Palisades C&RSD Radiological Environmental contact.

c. Add approximately 40 gm of sodium bisulfite to each one-gallon container of milk and thoroughly mix. The sodium bisulfite can either be in prepared packets or "scooped" with a volumetric measure from its container.

d. Label containers with sample type, amount, location, date, and time.

e. Package and ship samples as per Attachment 4.

f. Record on Sample Data Form (Attachment 3), the location, type, date, and amount of samples. Under "Remarks," note any other pertinent information. Sign form in space provided.

5.6 REMP AQUATIC BIOTA COLLECTION

5.6.1 Precautions

a. Collection to be coordinated between Radiological Services Department RMC Section and the Environmental Department. At least one individual in the collection party is required to have MDNR Cultural and Scientific Fish Collectors Permit.

b. If logistical problems prevent use of a boat to set gill nets from the lake side of Palisades, then the nets can be set offshore from the site boundary (by wading). Notify Security prior to using offshore wading method for beach access.

5.6.2 Prerequisites

a. Boat with required safety equipment, or waders

b. Gill nets (of varying size mesh) and weights and floats

c. Plastic one-liter wide-mouth bottles

d. REMP Miscellaneous Data Sheet (Attachment 3)

e. 10% formaldehyde solution

f. Fillet knives

g. Black permanent felt markers for sample identification on containers

h. Notify district MDNR Fisheries biologist prior to sample collection

5.6.3 Collect samples twice during the season of greatest abundance (typically May through October) as follows:

a. Gill nets are placed at the locations specified in Attachment 1 to collect at least two species of commercially and/or recreationally important fish in the vicinity of the Plant discharge area and the same species in an area not influenced by the Plant discharge (Ludington Pump Storage Plant). One liter of flesh should be collected for each species caught for analysis accuracy.

b. Normally fish will be collected first from the vicinity of the discharge. REMP coordinator will then collect at least two of the same species at Ludington (control station). Or REMP coordinator will provide the Ludington collector with a list of the species collected in the vicinity of the discharge, with instructions to collect at least two of the same species.

c. Label all containers with sample type, amount, location, and date.

d. Package and ship samples per Attachment 4.

e. Record on data sheet (Attachment 3) location, type, date, amount, and under "Remarks" indicate any pertinent information. Sign form in space provided.

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

5.7 REMP SEDIMENT SAMPLE COLLECTION

5.7.1 Prerequisites

a. One-liter, wide-mouth plastic sample bottles

b. Miscellaneous Data Sheet (Attachment 3)

5.7.2 Collect sediment samples semiannually at collection locations specified in Attachment 1 (includes control sample at the Ludington Pump Storage Plant). Palisades C&RSD and/or Environmental Department personnel shall collect these sediment samples.

a. Label containers with sample type, amount, location, and date.

b. Package and ship samples per Attachment 4.

c. Record on Sample Data Sheet (Attachment 3) location, type, date, and amount of sample. Note any other pertinent information in the "Remarks" section. Sign form in space provided.

5.8 REMP FOOD PRODUCT SAMPLE COLLECTION

a. Sample containers

b. Miscellaneous Data Sheet (Attachment 3)

5.8.1 Collect food samples monthly during the harvest season, as per ODCM, Appendix A, Table E-1. One sample each of the two principal fruit crops blueberries and apples must be collected.

a. Collect approximately one kilogram (2.2 lb) of each sample type. Samples are not to be washed, shaken, or cleaned. Samples should not be collected from a single source, but at random from the entire orchard or field.

b. Label all containers with sample type, amount, location, and date.

c. Package and ship samples per Attachment 4.

d. Record on data sheet (Attachment 3) location, type, date, amount, and under "Remarks" note any unusual conditions. Sign form in space provided.

5.9 **REMP TLD SAMPLE COLLECTION**

5.9.1 Prerequisites

a. TLDs

b. TLD Data Sheet (Attachment 5)

5.9.2 Monthly TLDs are to be changed each month; quarterly TLDs during January, April, July, and October; and annual TLDs during January.

5.9.3 Monthly, quarterly, and annually at each sample location perform the following:

a. Upon receipt of TLDs from the laboratory contractor, all TLDs shall be inventoried and immediately placed in the lead cave (at offsite sample collector's residence). Note date of receipt and inventory on TLD data sheet.

b. Field TLDs shall only be removed from the lead cave for delivery to their proper locations. All control TLDs remain in the lead cave throughout the entire exposure period.

c. Remove and replace TLDs at each sample location.

d. For any missing TLDs, perform the following:

1. Search immediate area.

2. If lost TLD is found, collect it and perform standard change out procedure.

3. If lost TLD is not found, post the new TLD in proper location.

4. Record in "Remarks" column of data sheet any of the above circumstances.

e. Store collected field TLDs in lead cave along with control TLDs until ready for mailing to laboratory contractor. Mark "Do not x-ray" on TLD package.

f. Transportation control TLDs are to be stored in a special lead shield provided by laboratory contractor after the field TLDs are posted.

Ensure that designated transportation control TLDs are included with the correct TLD package being mailed to laboratory contractor. Also ensure that laboratory contractor's TLD data sheet is completed and enclosed with shipment.

g. Record TLD collection date and the date that the TLDs are returned to the vendor. Initial/sign the data sheet (Attachment 5). Record the installation date for the new TLDs on the appropriate data sheet.

h. Package and ship samples per Attachment 4.

5.10 MISCELLANEOUS SAMPLES

5.10.1 Ludington - Control Station

e | **NOTE:** Sediment samples are also collected at Ludington Pump Storage Plant per Sections 5.6 and 5.7 of this procedure.

a. Ludington Lake In & Well Water composites are collected daily and shipped to Palisades on a monthly basis.

b. Palisades RETS/REMP personnel record appropriate data on the Sample Identification Form (Attachment 3), and deliver samples to the local Teledyne sample collector for shipment to Teledyne Midwest Laboratory.

TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM SAMPLE COLLECTION AND SHIPMENT

5.10.2 **Palisades Daily Samples**

a. Palisades Lake In, Lake Out, Site Well Water, Service Water, and Turbine Sump effluent samples are collected on a daily basis per Palisades per Health Physics Procedure HP 6.52, "Palisades (Onsite) Radiological Environmental Program Sample Collection."

b. Palisades RETS/REMP personnel record appropriate data on the Sample Identification Form (Attachment 3), label all samples, and deliver samples to the local Teledyne sample collector for shipment to Teledyne Midwest Laboratory.

6.0 ACCEPTANCE CRITERIA

Proper completion of procedure.

7.0 ATTACHMENTS AND RECORDS

7.1 ATTACHMENTS

7.1.1 Attachment 1, "Environmental Sample Collection Schedule"

7.1.2 Attachment 2, "Sample Locations"

7.1.3 Attachment 3, "Sample Identification"

7.1.4 Attachment 4, "Sample Packaging and Shipment"

7.1.5 Attachment 5, "Palisades Sample Collection Forms and Records"

7.2 RECORDS

7.2.1 Distribution of Sample Collection Data Sheet as per Attachment 4.

7.2.2 All Radiological Environmental Monitoring Program Records shall be considered complete when the Annual Radiological Environmental Operating Report is submitted to the NRC. Records shall be retained in accordance with Palisades Administrative Procedure 10.46, "Plant Records."

8.0 SPECIAL REVIEWS

None

ENVIRONMENTAL SAMPLE COLLECTION SCHEDULE

Palisades Nuclear Plant

Exposure Pathway and/or Sample	Number of Samples and Locations*	Sample Type	Collection Frequency
Airborne: Particulates	1 - Onsite 8 - Within a 10 km Radius 3 - 25 to 89 km Distant	Continuous at approximately 1 cfm (may be less due to dust loading)	Weekly
Iodines	Same as Particulates	Same as particulates	Weekly
Waterborne: Lake Water	1 - Intake 1 - Discharge 1 - Intake (Ludington Control)	Daily composite to obtain a two-gallon sample	Monthly
Drinking Water	1 - S Haven Municipal System - Raw 1 - S Haven Municipal System - Treated		
Well Water	6 - Plant Site Locations 1 - State Park 1 - Township park 1 - Ludington Control	Two-gallon grab sample	Monthly
Sediment	1 - Within 152.4 m of discharge (500 ft) 1 - 0.8 km North of discharge 1 - 0.8 km South of discharge 1 - 8.9 km North 1 - Ludington control (2 recommended)	One-liter grab sample	Semiannually
Ingestion: Milk	3 - From 5 to 13 km 1 - Control from 15 to 30 km	Two-gallon grab sample	Monthly

*If samples are unavailable at the specified location, an attempt should be made to sample at an alternate location (Refer to Step 4.5).

ENVIRONMENTAL SAMPLE COLLECTION SCHEDULE

Palisades Nuclear Plant

Exposure Pathway and/or Sample	Number of Samples and Locations*	Sample Type	Collection Frequency
NOTE: If milk samples are unavailable, see Step 5.5.1c.			
Food Products	1 - Each of two principal fruit crops (blueberries and apples).	Two-pound grab sample	At time of harvest
e | Fish	2 - Location in vicinity of Plant discharge 2 - Ludington control	One-liter fish flesh from each available species, two species required. Obtain the same species from the control location.	Twice in season
Direct: TLD	1 - Onsite 16 - Site boundary 9 - Within 12 km radius 3 - Control stations 1 - Control in lead cave (Contractor's House)	Continuous	Monthly Quarterly and Annually

*If samples are unavailable at the specified location, an attempt should be made to sample at an alternate location (Refer to Step 4.5).

SAMPLE LOCATIONS
Palisades Nuclear Plant

Station	Code		Location	Air Particulates	Air Iodine	Lake Water	Well Water	Milk	Food Products	Sediment	TLD	Fish
*1	ST	Palisades Nuclear Plant	Mounted onsite, 500 ft east of main gate. 25 ft south of access road next to well.	X	X	X	X			X	X	X
2	TH	RR 3 Coloma, MI 5.6 miles S	Along 48th Ave, 500 ft east of 80th St, 25 ft off north side of road.	X	X						X	
3	HS	76182 48th Ave Covert, MI 5.8 miles SSE	Along 48th Ave, 1/4 mile west of 76th St. In barnyard 50 yds off north side of road.	X	X						X	
4	JS	36197 M-140 Hwy Covert, MI 3-1/2 miles SE	Along 36th Ave, 1/2 mile east of M-140 15 ft off south side of road.	X	X				X		X	
5	PR	72723 CR 378 Covert, MI 3-1/2 miles ESE	Along CR 378, 3/4 mile east of M-140, 30 ft off north side of road.	X	X				X		X	
6	RB	RR 3 South Haven, MI 4-1/2 miles NE	Along 12th Ave, 1/4 mile west of M-43, 30 ft off south side of road.	X	X						X	
7	SD	Sherman Dairy South Haven, MI 6.5 miles NNE	Along Phoenix Rd, directly behind Sherman Dairy. 1/4 mile east of I-196 and Phoenix Rd on north side.	X	X							
7a	SN35	Emergency Siren 35 4-3/4 miles NNE	On Monroe Blvd.								X	
8	SP	State Park 1 mile N	Onsite along the dump road, north of Plant. One mile from main gate. Near State Park boundary, on side of road as road turns west.	X	X		X				X	

*Plant Site Well #2 or #3

SAMPLE LOCATIONS
Palisades Nuclear Plant

Station	Code		Location	Air Particulates	Air Iodine	Lake Water	Well Water	Milk	Food Products	Sediment	TLD	Fish
9	TP	Covert Township Park 1.5 miles SSW	Along 32nd Ave, 1/4 mile west of Blue Star Hwy. 5 ft off south side of road.	X	X		X				X	
10	GR	Grand Rapids, MI 55 miles NNE	Control TLD and air sample.	X	X						X	
11	KZ	Kalamazoo, MI 35 miles E	Control TLD and air sample.	X	X						X	
12	DG	Dowagiac, MI 30 miles SSE	Control TLD and air sample.	X	X						X	
13	ST	Perimeter of Palisades	Past #8 along dump road. Proceed west up dune path at right of containment test structure. At first crest, turn north and proceed up adjacent hill to #13 at top (approx 50 yds from crest). Near State Park fence line.								X	
14	ST	Perimeter of Palisades	Along dump road to point where fence divides old Blue Star Hwy, 25 yds to east of road.								X	

SAMPLE LOCATIONS
Palisades Nuclear Plant

Station	Code		Location	Air Particulates	Air Iodine	Lake Water	Well Water	Milk	Food Products	Sediment	TLD	Fish
15	ST	Perimeter of Palisades	North along Blue Star Hwy, 0.75 miles from access road, 10 ft off west side of road.								X	
16	ST	Perimeter of Palisades	North along Blue Star Hwy, 0.4 miles from access road, 50 ft off west side of road.								X	
17	ST	Perimeter of Palisades	Along access road, 25 yds south of southern power line, 15 yds off east side of road.								X	
18	ST	Perimeter of Palisades	20 yds from access road along south road. 40 yds off south road.								X	
19	ST	Perimeter of Palisades	0.2 miles along south road from access road, 30 ft off north side of road.								X	
20	ST	Perimeter of Palisades	0.4 miles along south road from access road, 20 ft off south side of road.								X	
21	ST	Perimeter of Palisades	0.7 miles along south road from access road. 5 ft off east side of road. Near Lake Michigan Bluff.								X	
22	JS	Jerry Sarno 36197 M-140 Hwy Covert, MI 3-1/2 miles SE	Control TLD in lead cave inside garage at Station 4.								X	

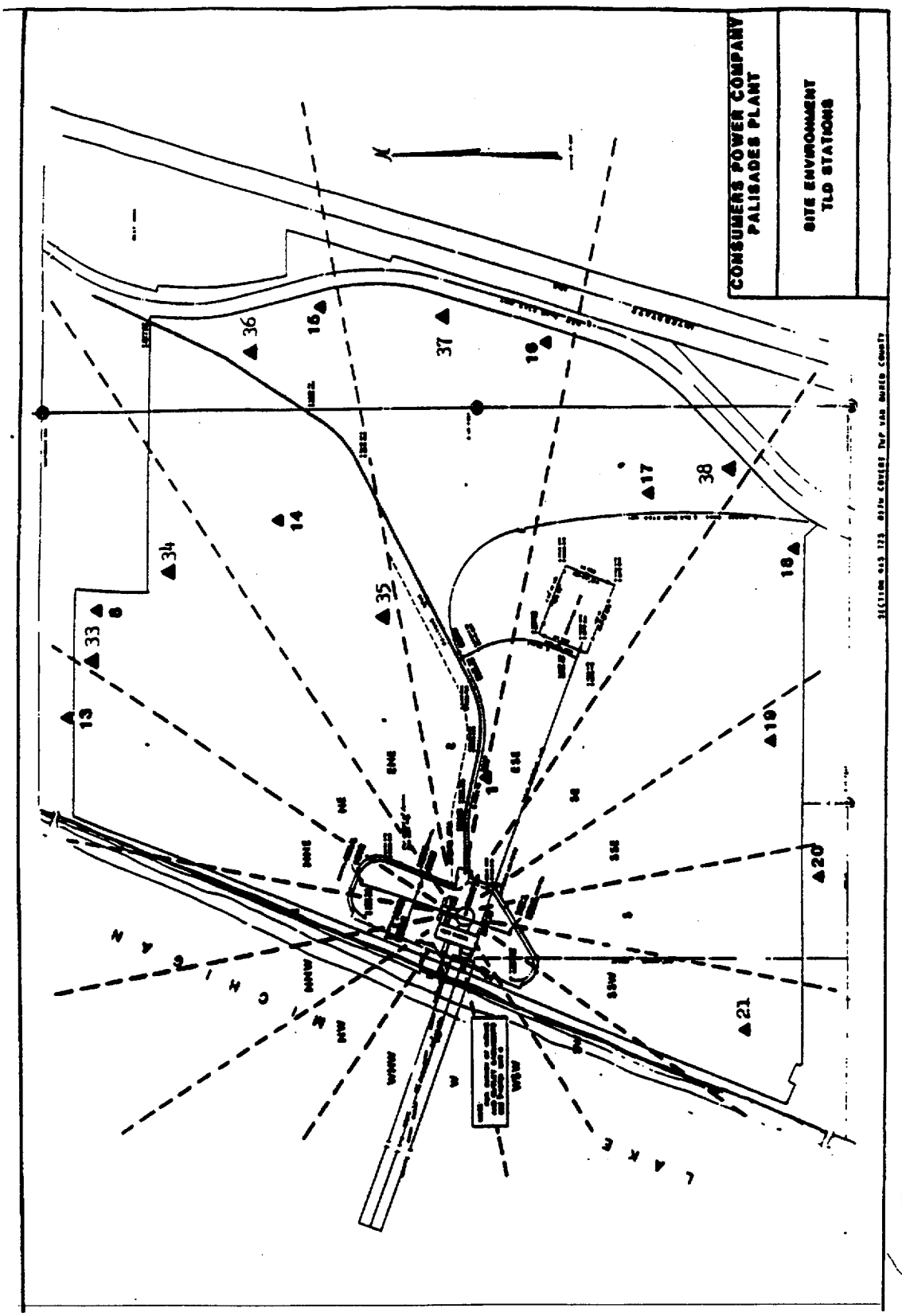
SAMPLE LOCATIONS
Palisades Nuclear Plant

Station	Code	Location		Air Particulates	Air Iodine	Lake Water	Well Water	Milk	Food Products	Sediment	TLD	Fish
23	SN25	Emergency Siren 25 3 miles ENE	On CR 380								X	
24	SN22	Emergency Siren 22 4-1/2 miles E	On 24th Ave								X	
25	SH	South Haven, MI 5-1/2 miles NNE	South Haven Water Treatment Plant			X				X		
26	AK	Allen Karr 31110 68th St Covert, MI 5.75 miles ESE						X				
27	DH	Dennis Hessey 26959 66th St South Haven, MI 6.6 miles E						X				
28	DC	Danny Carpenter 64015 M-43 Bangor, MI 7.25 miles E						X				
29	WS	William Shine 60364 M-43 West Bangor, MI 10 miles E						X				
30	STN	1/2 mile N of discharge								X		
31	STS	1/2 mile S of discharge								X		
32	LP	Ludington Pumped Storage				X	X			X		X
33	ST	Perimeter of Palisades	Onsite along south side dump road, just 15 yards west of Air Station 8SP								X	

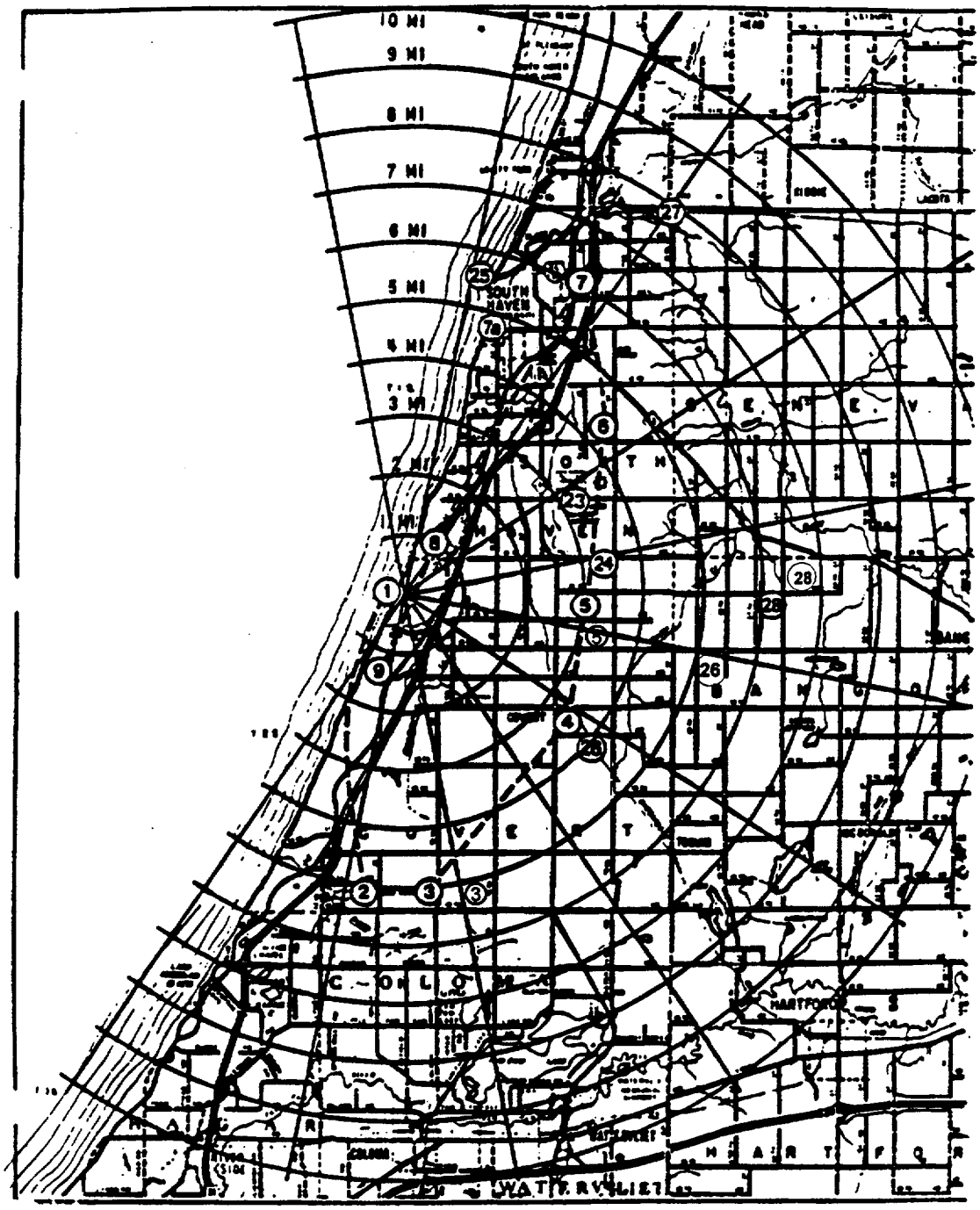
SAMPLE LOCATIONS
Palisades Nuclear Plant

Station	Code		Location	Air Particulates	Air Iodine	Lake Water	Well Water	Milk	Food Products	Sediment	TLD	Fish
34	ST	Perimeter of Palisades	Along dump road to area where fence divides old Blue Star Hwy, 25 yards east of road, near Station 14								X	
35	ST	Perimeter of Palisades	Located on the main post directly across the storeroom, near Training Building								X	
36	ST	Perimeter of Palisades	North along Blue Star Hwy, 0.9 miles from access road, 50 Ft off West side of road								X	
37	ST	Perimeter of Palisades	North along Blue Star Hwy, 0.6 miles from access road, 50 Ft off West side of road								X	
38	ST	Perimeter of Palisades	North along Blue Star Hwy, 0.15 miles from access road, near old RR spur, 50 Ft off West side of road								X	
39	ST	Plant Site Wells #7 or #9 (Warehouse)					X					
40	ST	Plant Site Wells #11, 12, 13 (Outage Building)					X					
41	ST	Plant Site Monitoring Well #14					X					
42	ST	Plant Site Monitoring Well #15					X					
43	ST	Plant Site Monitoring Well #16					X					

SAMPLE LOCATIONS
Palisades Nuclear Plant



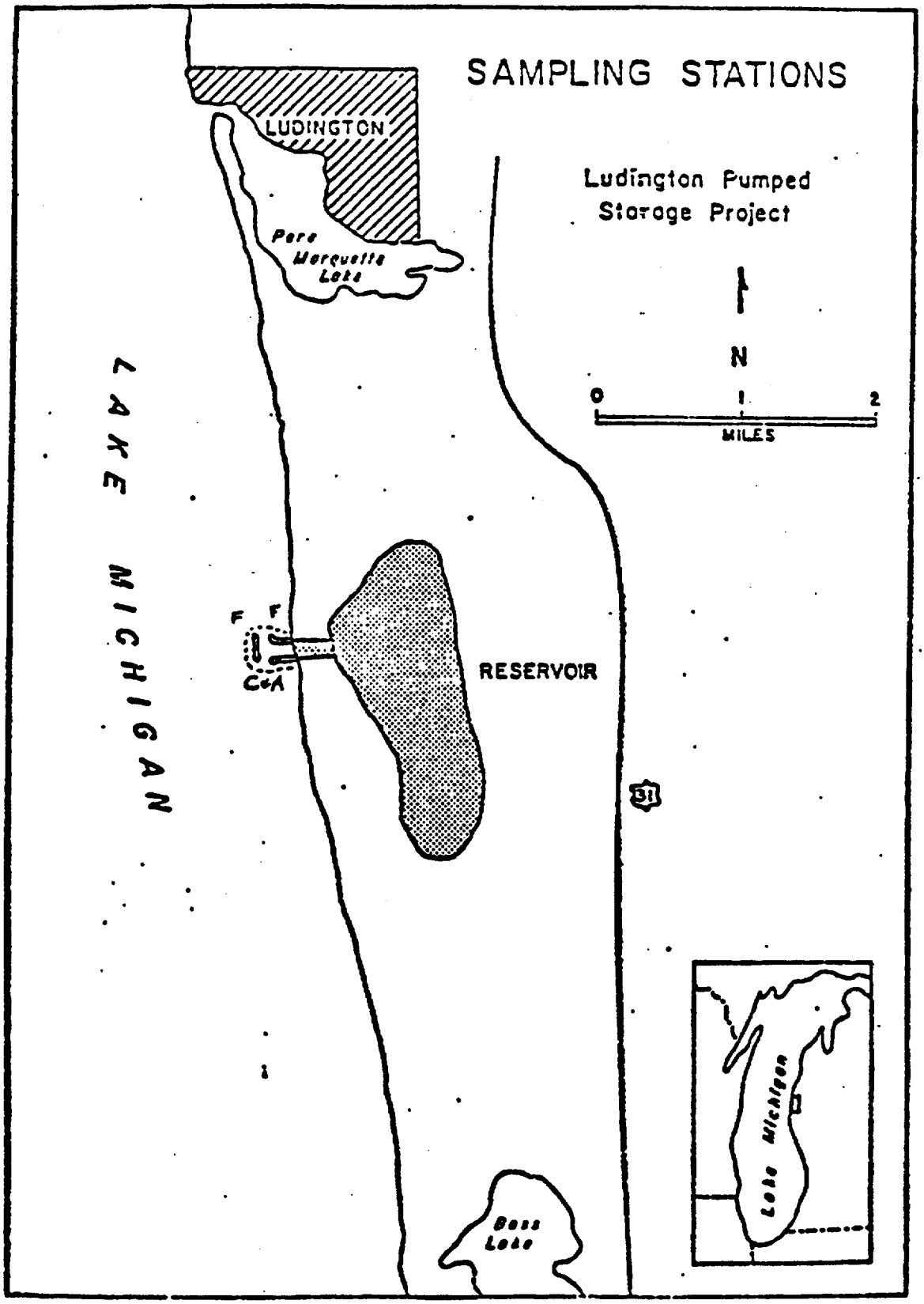
SAMPLE LOCATIONS
Palisades Nuclear Plant



NOT SHOWN (Control Locations)

10 Grand Rapids (55 mi NNE)
11 Kalamazoo (35 mi E)
12 Dowagiac (30 mi SSE)
22 Control TLD placed in lead cave at Location 4
29 William Shine (WS - 10 mi E)

SAMPLE LOCATIONS
Palisades Nuclear Plant



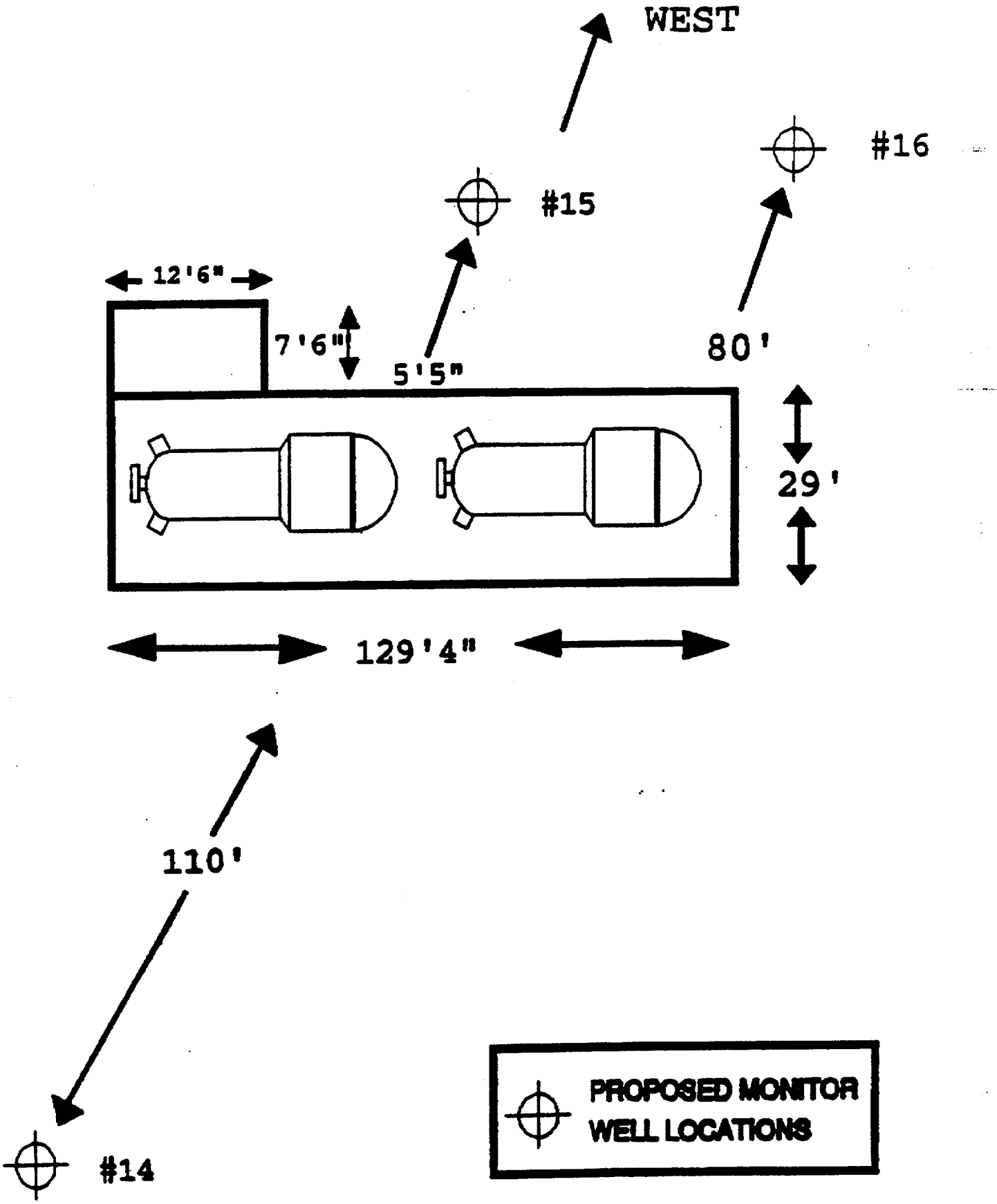
SAMPLE LOCATIONS
Palisades Nuclear Plant

REMP SAMPLING	NUMBER	WELL STATUS	LOCATION
NO	#1	Abandon	NA
YES	#2	In Service	North side of Support Building. Supports Plant site.
YES (Note 1)	#3	Active	Across from East-Radwaste (South Side) backup for well #2.
NO	#4	Abandon	NA
NO	#5	Abandon	NA
NO	#6	Active	Located ~ 145 ft west of Blue Star Hwy. Used for training trailers, well capped when not in service and well is outside of Westerly Groundwater Flow to Plant and interim storage facility.
YES	#7	In Service	Just to the west & between outage building and interim storage facility: Water is nonpotable and used in warehouse restrooms (later to be used for fire system only).
NO	#8	Abandon	NA
YES (Note 2)	#9	Active	Located at junction of access and warehouse road, domestic water supply for warehouse when it is put in service.
NO	#10	Abandon	NA
YES (Note 3)	#11 #12 #13	In Service In Service In Service	North of access road and east of construction road, supplies domestic water for outage building, all in one tie-in.
YES	#14	Active	East of Interim Storage Facility, used for REMP monitoring well.
YES	#15	Active	Southwest of Interim Storage Facility, used for REMP monitoring well.
YES	#16	Active	Northwest of Interim Storage Facility, used for REMP monitoring well.

NOTES:

1. When well #2 is out of service, well #3 is put in service with same sample point as well #2, only one sample required in combination of wells #2 and #3.
2. Sample point will be same as well #7 (in warehouse restroom) when well is put in service.
3. Wells #11, #12, and #13 all have a common line which supplies domestic water to outage building, only one sample required in conjunction with all 3 wells.

SAMPLE LOCATIONS
Palisades Nuclear Plant



SAMPLE IDENTIFICATION

Date: ____________________

Collector: ____________________

____________________________ PLANT

Miscellaneous Radiological Environmental Samples

SAMPLE		DATE	TIME	AMOUNT	REMARKS
Location	Type				

SAMPLE PACKAGING AND SHIPMENT

1. Label samples clearly per Attachment 3.

2. Seal all liquid, biota, fish, and sediment sample containers with tape to prevent leakage.

3. Ship liquid samples separately from air particulate and air iodine samples and TLDs.

4. Use sufficient packing material (ie, crumpled newspaper) to avoid possible sample container damage during shipment.

5. Package air filters in glassine or plastic envelopes.

6. For TLD shipments, make sure that Laboratory contractor's own TLD data sheet is enclosed with package.

7. Ship milk samples as soon as possible. Be sure to add a sufficient amount of sodium bisulfite (40 grams) as preservative to each sample.

8. Ship food products as soon as possible after collection.

9. Ship fish packed in ice, or with a 10% formaldehyde solution added (preservative). Only 10 milliliters is required per sample. Samples should be shipped as soon as possible after processing. | e

10. Distribute copies of the Sample Collection Data Sheet(s) to the:

    Analytical Laboratory
    Radiological Services Department Environmental Contact (Palisades)
    Sample Collector

11. Send samples to the following address:

    Teledyne Brown Engineering Services Midwest Laboratory
    Att: Laboratory Manager
    700 Landwehr Road
    Northbrook, IL 60062

12. Ship all samples to the Laboratory contractor with minimal delay after collection so as to avoid elevated analytical levels of detection.

PALISADES SAMPLE COLLECTION FORMS AND RECORDS

PALISADES PLANT
ENVIRONMENTAL MONITOR OPERABILITY CHECK
AND SAMPLE COLLECTION

				GAS METER READING		METER SERIAL NO	FLOW TEST				REPLACEMENT METER			
							AS FOUND		AS LEFT		SERIAL NUMBER			
	INSTALLED (MO/DA/YR)	REMOVED (MO/DA/YR)	REMOVED TIME	INSTALLED (Ft 3)	REMOVED (Ft 3)	CAL DUE DATE	FLOW (SEC/Ft3)	LEAK (Y/N)	FLOW (SEC/Ft3)	LEAK (Y/N)	CAL DUE DATE	CALIB ACCURACY ACCEPTABLE	SAMPLE VOL (Ft 3)	COMMENTS
1ST														
2TH														
3HS														
4JS														
5PR														
6RB														
7SD														
8SP														
9TP														
10GR														
11KZ														
12DG														

TEST PERFORMED BY: _____ DATE: _____

REVIEWED BY: _____ DATE: _____

PALISADES SAMPLE COLLECTION FORMS AND RECORDS

CONSUMERS ENERGY
PALISADES ENVIRONMENTAL TLD REPORT

☐ MONTHLY
☐ QUARTERLY
☐ ANNUAL

Collector _____

STATION - LOCATION		INSTALLED		COLLECTED		REMARKS
		DATE	TIME	DATE	TIME	
C-1						
C-2						
ST22	ST					
ST5	PR					
ST6	RB					
ST24	SN21					
ST23	SN25					
ST7a	SN35					
ST16	ST					
ST15	ST					
ST1	ST					
ST14	ST					
ST8	SP					
ST13	ST					
ST17	ST					
ST18	ST					
ST19	ST					
ST20	ST					
ST21	ST					
ST9	TP					
ST12	DG					
ST3	HS					
ST2	TH					
ST4	JS					
ST10	GR					
ST11	KZ					
ST-33	ST					
ST-34	ST					
ST-35	ST					
ST-36	ST					
ST-37	ST					
ST-38	ST					

Date Received From Vendor (With Intransit TLDs) and Initials	Date TLDs Inventoried and Placed In Lead Cave (With Intransit TLDs) and Initials	Date TLDs Returned to Vendor For Analysis (With Intransit TLDs) and Initials

ENCLOSURE D

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

2000 PALISADES FINAL REPORT

49 PAGES

Environmental, Inc.
Midwest Laboratory
An Allegheny Technologies Company

700 LANDWEHR ROAD
NORTHBROOK, ILLINOIS 60062-2310
(847) 564-0700 FAX (847) 564-4517

FINAL REPORT
TO
CONSUMERS ENERGY COMPANY
JACKSON, MICHIGAN

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
FOR
PALISADES NUCLEAR GENERATING PLANT

PREPARED AND SUBMITTED
BY
ENVIRONMENTAL, INC., MIDWEST LABORATORY

Project Number: 8022

Reporting Period: January - December, 2000

Reviewed and
Approved by _____ Date 03-08-2001
B. Grob
Technical Lead

Distribution: M. Grogan (1 copy)

TABLE OF CONTENTS

LIST OF TABLES

PALISADES

1.0 INTRODUCTION

The following constitutes the final 2000 Monthly Progress Report for the Radiological Environmental Monitoring Program conducted at the Consumers Energy Company, Palisades Nuclear Generating Plant. Results of completed analyses are presented in the attached tables

For all gamma isotopic analyses, a spectrum is computer scanned from 80 to 2048 KeV. Specifically included are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, I-131, Ba-La-140, Cs-134 and Cs-137. Naturally-occuring 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.

All concentrations, except gross alpha and gross beta, are decay corrected to the time of collection.

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples.

PALISADES

2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
AP	PA-6	06-05-00	No power at sampler pump site.

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 1ST - Palisades
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	354	0.036 ± 0.003	< 0.007	07-10-00	329	0.027 ± 0.003	< 0.010
01-17-00	354	0.028 ± 0.003	< 0.009	07-17-00	329	0.018 ± 0.003	< 0.007
01-24-00	360	0.045 ± 0.004	< 0.008	07-24-00	334	0.015 ± 0.003	< 0.007
01-31-00	351	0.020 ± 0.003	< 0.005	07-31-00	329	0.029 ± 0.003	< 0.008
02-07-00	343	0.026 ± 0.003	< 0.008	08-07-00	334	0.025 ± 0.003	< 0.007
02-15-00	405	0.038 ± 0.003	< 0.007	08-14-00	323	0.025 ± 0.003	< 0.011
02-21-00	303	0.035 ± 0.004	< 0.006	08-21-00	331	0.021 ± 0.003	< 0.013
02-28-00	343	0.026 ± 0.003	< 0.009	08-28-00	331	0.031 ± 0.003	< 0.012
03-06-00	346	0.025 ± 0.004	< 0.008	09-05-00	371	0.033 ± 0.003	< 0.009
03-13-00	346	0.020 ± 0.003	< 0.005	09-11-00	283	0.025 ± 0.003	< 0.014
03-20-00	348	0.025 ± 0.003	< 0.012	09-18-00	337	0.022 ± 0.003	< 0.009
03-27-00	343	0.022 ± 0.003	< 0.011	09-25-00	337	0.020 ± 0.003	< 0.009
04-03-00	343	0.019 ± 0.003	< 0.006	10-02-00	337	0.028 ± 0.004	< 0.012
1st Qtr. Mean ± s.d.		0.028 ± 0.008	< 0.012	3rd Qtr. Mean ± s.d.		0.025 ± 0.005	< 0.014
04-10-00	351	0.020 ± 0.003	< 0.004	10-09-00	343	0.027 ± 0.003	< 0.022
04-17-00	346	0.023 ± 0.003	< 0.006	10-16-00	340	0.033 ± 0.004	< 0.010
04-24-00	340	0.022 ± 0.003	< 0.004	10-23-00	337	0.043 ± 0.004	< 0.013
05-01-00	343	0.027 ± 0.003	< 0.008	10-30-00	343	0.042 ± 0.004	< 0.009
05-08-00	334	0.020 ± 0.003	< 0.009	11-06-00	337	0.026 ± 0.003	< 0.011
05-15-00	337	0.021 ± 0.003	< 0.016	11-13-00	346	0.026 ± 0.003	< 0.008
05-22-00	340	0.021 ± 0.003	< 0.011	11-20-00	360	0.028 ± 0.003	< 0.009
05-30-00	385	0.023 ± 0.003	< 0.005	11-27-00	351	0.022 ± 0.003	< 0.006
06-05-00	283	0.021 ± 0.003	< 0.010	12-04-00	272	0.038 ± 0.004	< 0.008
06-12-00	331	0.024 ± 0.003	< 0.008	12-11-00	283	0.033 ± 0.004	< 0.011
06-19-00	334	0.012 ± 0.003	< 0.011	12-18-00	326	0.028 ± 0.003	< 0.009
06-26-00	331	0.019 ± 0.003	< 0.012	12-26-00	377	0.032 ± 0.004	< 0.007
07-03-00	329	0.023 ± 0.003	< 0.011	01-02-01	320	0.018 ± 0.003	< 0.015
2nd Qtr. Mean ± s.d.		0.021 ± 0.003	< 0.016	4th Qtr. Mean ± s.d.		0.030 ± 0.007	< 0.022
				Cumulative Average		0.026	
				Previous Annual Average		0.025	

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 2TH - Coloma (5.6 mi. S)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	351	0.036 ± 0.003	< 0.007	07-10-00	323	0.024 ± 0.003	< 0.010
01-17-00	354	0.029 ± 0.004	< 0.009	07-17-00	323	0.019 ± 0.003	< 0.007
01-24-00	346	0.047 ± 0.004	< 0.009	07-24-00	326	0.014 ± 0.003	< 0.007
01-31-00	334	0.026 ± 0.004	< 0.006	07-31-00	323	0.027 ± 0.003	< 0.008
02-07-00	323	0.022 ± 0.003	< 0.009	08-07-00	295	0.024 ± 0.004	< 0.008
02-15-00	399	0.037 ± 0.003	< 0.007	08-14-00	297	0.026 ± 0.003	< 0.012
02-21-00	297	0.038 ± 0.004	< 0.006	08-21-00	323	0.020 ± 0.003	< 0.014
02-28-00	337	0.029 ± 0.003	< 0.009	08-28-00	326	0.035 ± 0.004	< 0.012
03-06-00	340	0.024 ± 0.004	< 0.008	09-05-00	365	0.031 ± 0.003	< 0.009
03-13-00	337	0.022 ± 0.003	< 0.005	09-11-00	278	0.024 ± 0.003	< 0.015
03-20-00	346	0.022 ± 0.003	< 0.012	09-18-00	331	0.025 ± 0.003	< 0.009
03-27-00	337	0.023 ± 0.003	< 0.011	09-25-00	329	0.023 ± 0.003	< 0.010
04-03-00	337	0.018 ± 0.003	< 0.006	10-02-00	329	0.024 ± 0.003	< 0.012
1st Qtr. Mean ± s.d.		0.029 ± 0.008	< 0.012	3rd Qtr. Mean ± s.d.		0.024 ± 0.005	< 0.015
04-10-00	343	0.020 ± 0.003	< 0.004	10-09-00	337	0.025 ± 0.003	< 0.022
04-17-00	340	0.022 ± 0.003	< 0.006	10-16-00	326	0.031 ± 0.004	< 0.010
04-24-00	334	0.022 ± 0.003	< 0.004	10-23-00	331	0.043 ± 0.004	< 0.013
05-01-00	337	0.024 ± 0.003	< 0.009	10-30-00	334	0.044 ± 0.004	< 0.009
05-08-00	329	0.023 ± 0.003	< 0.009	11-06-00	329	0.028 ± 0.003	< 0.011
05-15-00	329	0.020 ± 0.003	< 0.016	11-13-00	337	0.024 ± 0.003	< 0.008
05-22-00	334	0.022 ± 0.003	< 0.011	11-20-00	351	0.032 ± 0.004	< 0.010
05-30-00	377	0.025 ± 0.003	< 0.005	11-27-00	343	0.024 ± 0.003	< 0.006
06-05-00	280	0.026 ± 0.003	< 0.010	12-04-00	346	0.033 ± 0.003	< 0.006
06-12-00	326	0.025 ± 0.004	< 0.008	12-11-00	346	0.031 ± 0.003	< 0.009
06-19-00	326	0.014 ± 0.003	< 0.011	12-18-00	351	0.034 ± 0.003	< 0.009
06-26-00	326	0.018 ± 0.003	< 0.012	12-26-00	405	0.032 ± 0.003	< 0.007
07-03-00	309	0.026 ± 0.004	< 0.011	01-02-01	351	0.021 ± 0.003	< 0.014
2nd Qtr. Mean ± s.d.		0.022 ± 0.003	< 0.016	4th Qtr. Mean ± s.d.		0.031 ± 0.007	< 0.022
				Cumulative Average		0.027	
				Previous Annual Average		0.025	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 3HS - Covert (5.8 mi. SE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070
01-10-00	340	0.038 ± 0.004	< 0.007
01-17-00	346	0.028 ± 0.004	< 0.009
01-24-00	351	0.050 ± 0.004	< 0.009
01-31-00	343	0.025 ± 0.003	< 0.005
02-07-00	334	0.027 ± 0.004	< 0.009
02-15-00	391	0.037 ± 0.003	< 0.007
02-21-00	295	0.034 ± 0.004	< 0.006
02-28-00	329	0.031 ± 0.004	< 0.009
03-06-00	331	0.026 ± 0.004	< 0.009
03-13-00	334	0.022 ± 0.003	< 0.005
03-20-00	337	0.027 ± 0.003	< 0.012
03-27-00	331	0.023 ± 0.003	< 0.011
04-03-00	329	0.022 ± 0.003	< 0.007
1st Qtr. Mean ± s.d.		0.030 ± 0.008	< 0.012
04-10-00	340	0.018 ± 0.003	< 0.004
04-17-00	331	0.026 ± 0.003	< 0.006
04-24-00	331	0.022 ± 0.003	< 0.004
05-01-00	329	0.025 ± 0.003	< 0.009
05-08-00	320	0.024 ± 0.004	< 0.010
05-15-00	326	0.021 ± 0.003	< 0.017
05-22-00	326	0.024 ± 0.004	< 0.011
05-30-00	368	0.022 ± 0.003	< 0.005
06-05-00	278	0.024 ± 0.003	< 0.010
06-12-00	317	0.026 ± 0.004	< 0.008
06-19-00	329	0.012 ± 0.003	< 0.011
06-26-00	326	0.018 ± 0.003	< 0.012
07-03-00	323	0.021 ± 0.003	< 0.011
2nd Qtr. Mean ± s.d.		0.022 ± 0.004	< 0.017
07-10-00	326	0.024 ± 0.003	< 0.010
07-17-00	326	0.022 ± 0.003	< 0.009
07-24-00	329	0.014 ± 0.003	< 0.009
07-31-00	326	0.027 ± 0.003	< 0.006
08-07-00	329	0.024 ± 0.004	< 0.007
08-14-00	320	0.023 ± 0.003	< 0.011
08-21-00	329	0.019 ± 0.003	< 0.014
08-28-00	326	0.032 ± 0.003	< 0.012
09-05-00	371	0.034 ± 0.003	< 0.009
09-11-00	275	0.025 ± 0.003	< 0.015
09-18-00	334	0.019 ± 0.003	< 0.009
09-25-00	331	0.022 ± 0.003	< 0.010
10-02-00	334	0.025 ± 0.003	< 0.012
3rd Qtr. Mean ± s.d.		0.024 ± 0.005	< 0.015
10-09-00	337	0.026 ± 0.003	< 0.022
10-16-00	334	0.031 ± 0.004	< 0.010
10-23-00	331	0.039 ± 0.004	< 0.013
10-30-00	337	0.039 ± 0.003	< 0.009
11-06-00	331	0.025 ± 0.003	< 0.011
11-13-00	343	0.025 ± 0.003	< 0.008
11-20-00	351	0.030 ± 0.004	< 0.010
11-27-00	346	0.024 ± 0.003	< 0.006
12-04-00	346	0.036 ± 0.003	< 0.006
12-11-00	348	0.031 ± 0.003	< 0.009
12-18-00	357	0.028 ± 0.003	< 0.008
12-26-00	411	0.032 ± 0.003	< 0.007
01-02-01	354	0.022 ± 0.003	< 0.014
4th Qtr. Mean ± s.d.		0.030 ± 0.006	< 0.022
Cumulative Average		0.026	
Previous Annual Average		0.026	

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 4JS - Covert (3.5 mi. SE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	363	0.035 ± 0.003	< 0.007	07-10-00	331	0.023 ± 0.003	< 0.010
01-17-00	365	0.026 ± 0.003	< 0.008	07-17-00	329	0.022 ± 0.003	< 0.009
01-24-00	371	0.045 ± 0.004	< 0.008	07-24-00	334	0.014 ± 0.003	< 0.009
01-31-00	360	0.027 ± 0.003	< 0.005	07-31-00	329	0.028 ± 0.003	< 0.006
02-07-00	351	0.029 ± 0.003	< 0.008	08-07-00	334	0.023 ± 0.003	< 0.007
02-15-00	413	0.038 ± 0.003	< 0.007	08-14-00	326	0.024 ± 0.003	< 0.010
02-21-00	312	0.034 ± 0.004	< 0.005	08-21-00	331	0.021 ± 0.003	< 0.013
02-28-00	346	0.029 ± 0.003	< 0.008	08-28-00	329	0.032 ± 0.003	< 0.012
03-06-00	354	0.019 ± 0.003	< 0.008	09-05-00	371	0.029 ± 0.003	< 0.009
03-13-00	351	0.022 ± 0.003	< 0.005	09-11-00	283	0.026 ± 0.003	< 0.014
03-20-00	357	0.024 ± 0.003	< 0.011	09-18-00	337	0.023 ± 0.003	< 0.009
03-27-00	348	0.022 ± 0.003	< 0.011	09-25-00	337	0.022 ± 0.003	< 0.009
04-03-00	348	0.023 ± 0.003	< 0.006	10-02-00	337	0.024 ± 0.003	< 0.012
1st Qtr. Mean ± s.d.		0.029 ± 0.007	< 0.011	3rd Qtr. Mean ± s.d.		0.024 ± 0.004	< 0.014
04-10-00	354	0.020 ± 0.003	< 0.004	10-09-00	343	0.025 ± 0.003	< 0.022
04-17-00	351	0.023 ± 0.003	< 0.006	10-16-00	340	0.034 ± 0.004	< 0.010
04-24-00	348	0.022 ± 0.003	< 0.004	10-23-00	337	0.040 ± 0.004	< 0.013
05-01-00	346	0.026 ± 0.003	< 0.008	10-30-00	343	0.040 ± 0.003	< 0.009
05-08-00	337	0.024 ± 0.003	< 0.009	11-06-00	337	0.025 ± 0.003	< 0.011
05-15-00	340	0.022 ± 0.003	< 0.016	11-13-00	351	0.026 ± 0.003	< 0.008
05-22-00	346	0.022 ± 0.003	< 0.011	11-20-00	363	0.026 ± 0.003	< 0.009
05-30-00	388	0.021 ± 0.003	< 0.005	11-27-00	354	0.021 ± 0.003	< 0.006
06-05-00	289	0.025 ± 0.003	< 0.010	12-04-00	360	0.029 ± 0.003	< 0.006
06-12-00	334	0.025 ± 0.004	< 0.008	12-11-00	357	0.047 ± 0.005	< 0.008
06-19-00	334	0.013 ± 0.003	< 0.011	12-18-00	368	0.029 ± 0.003	< 0.008
06-26-00	337	0.017 ± 0.003	< 0.012	12-26-00	422	0.030 ± 0.003	< 0.006
07-03-00	331	0.020 ± 0.003	< 0.011	01-02-01	363	0.020 ± 0.003	< 0.013
2nd Qtr. Mean ± s.d.		0.022 ± 0.004	< 0.016	4th Qtr. Mean ± s.d.		0.030 ± 0.008	< 0.022
				Cumulative Average		0.026	
				Previous Annual Average		0.025	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 5PR - Covert (3.5 mi. ESE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	351	0.034 ± 0.003	< 0.007	07-10-00	314	0.026 ± 0.003	< 0.010
01-17-00	354	0.025 ± 0.003	< 0.009	07-17-00	317	0.020 ± 0.003	< 0.008
01-24-00	360	0.048 ± 0.004	< 0.008	07-24-00	320	0.016 ± 0.003	< 0.007
01-31-00	331	0.017 ± 0.003	< 0.006	07-31-00	317	0.030 ± 0.003	< 0.008
02-07-00	340	0.021 ± 0.003	< 0.008	08-07-00	317	0.022 ± 0.003	< 0.007
02-15-00	399	0.039 ± 0.003	< 0.007	08-14-00	314	0.024 ± 0.003	< 0.011
02-21-00	300	0.036 ± 0.004	< 0.006	08-21-00	317	0.023 ± 0.004	< 0.014
02-28-00	331	0.028 ± 0.003	< 0.009	08-28-00	317	0.034 ± 0.004	< 0.013
03-06-00	340	0.022 ± 0.003	< 0.008	09-05-00	357	0.031 ± 0.003	< 0.009
03-13-00	331	0.022 ± 0.003	< 0.005	09-11-00	272	0.026 ± 0.004	< 0.015
03-20-00	343	0.026 ± 0.003	< 0.012	09-18-00	323	0.023 ± 0.003	< 0.009
03-27-00	334	0.022 ± 0.003	< 0.011	09-25-00	320	0.020 ± 0.003	< 0.010
04-03-00	334	0.020 ± 0.003	< 0.006	10-02-00	323	0.026 ± 0.004	< 0.012
1st Qtr. Mean ± s.d.		0.028 ± 0.009	< 0.012	3rd Qtr. Mean ± s.d.		0.025 ± 0.005	< 0.015
04-10-00	340	0.020 ± 0.003	< 0.004	10-09-00	329	0.024 ± 0.003	< 0.023
04-17-00	337	0.024 ± 0.003	< 0.006	10-16-00	323	0.032 ± 0.004	< 0.010
04-24-00	334	0.023 ± 0.003	< 0.004	10-23-00	326	0.041 ± 0.004	< 0.013
05-01-00	331	0.025 ± 0.003	< 0.009	10-30-00	326	0.042 ± 0.004	< 0.009
05-08-00	323	0.021 ± 0.003	< 0.010	11-06-00	326	0.025 ± 0.003	< 0.011
05-15-00	320	0.019 ± 0.003	< 0.017	11-13-00	337	0.022 ± 0.003	< 0.008
05-22-00	329	0.024 ± 0.003	< 0.011	11-20-00	343	0.027 ± 0.004	< 0.010
05-30-00	371	0.023 ± 0.003	< 0.005	11-27-00	340	0.025 ± 0.003	< 0.006
06-05-00	275	0.022 ± 0.003	< 0.010	12-04-00	340	0.034 ± 0.003	< 0.006
06-12-00	320	0.026 ± 0.004	< 0.008	12-11-00	346	0.030 ± 0.003	< 0.009
06-19-00	317	0.014 ± 0.003	< 0.012	12-18-00	351	0.030 ± 0.003	< 0.009
06-26-00	317	0.020 ± 0.003	< 0.013	12-26-00	405	0.031 ± 0.003	< 0.007
07-03-00	317	0.019 ± 0.003	< 0.011	01-02-01	320	0.026 ± 0.004	< 0.015
2nd Qtr. Mean ± s.d.		0.022 ± 0.003	< 0.017	4th Qtr. Mean ± s.d.		0.030 ± 0.006	< 0.023
				Cumulative Average		0.026	
				Previous Annual Average		0.025	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 6RB - South Haven (4.75 mi. NE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	357	0.035 ± 0.003	< 0.009	07-10-00	323	0.024 ± 0.003	< 0.010
01-17-00	357	0.028 ± 0.004	< 0.007	07-17-00	326	0.018 ± 0.003	< 0.007
01-24-00	363	0.044 ± 0.004	< 0.006	07-24-00	323	0.015 ± 0.003	< 0.007
01-31-00	360	0.027 ± 0.003	< 0.007	07-31-00	320	0.028 ± 0.003	< 0.008
02-07-00	346	0.030 ± 0.004	< 0.006	08-07-00	331	0.018 ± 0.003	< 0.007
02-15-00	408	0.036 ± 0.003	< 0.008	08-14-00	326	0.021 ± 0.003	< 0.010
02-21-00	243	0.044 ± 0.005	< 0.018	08-21-00	331	0.023 ± 0.003	< 0.013
02-28-00	343	0.027 ± 0.003	< 0.012	08-28-00	329	0.030 ± 0.003	< 0.012
03-06-00	351	0.023 ± 0.003	< 0.009	09-05-00	363	0.032 ± 0.003	< 0.009
03-13-00	346	0.023 ± 0.003	< 0.012	09-11-00	283	0.023 ± 0.003	< 0.014
03-20-00	354	0.025 ± 0.003	< 0.008	09-18-00	340	0.021 ± 0.003	< 0.008
03-27-00	343	0.026 ± 0.003	< 0.009	09-25-00	337	0.021 ± 0.003	< 0.009
04-03-00	346	0.022 ± 0.003	< 0.012	10-02-00	337	0.026 ± 0.003	< 0.012
1st Qtr. Mean ± s.d.		0.030 ± 0.008	< 0.018	3rd Qtr. Mean ± s.d.		0.023 ± 0.005	< 0.014
04-10-00	351	0.019 ± 0.003	< 0.004	10-09-00	346	0.021 ± 0.003	< 0.022
04-17-00	346	0.020 ± 0.003	< 0.006	10-16-00	337	0.030 ± 0.004	< 0.010
04-24-00	343	0.020 ± 0.003	< 0.004	10-23-00	343	0.040 ± 0.004	< 0.012
05-01-00	343	0.024 ± 0.003	< 0.008	10-30-00	343	0.043 ± 0.004	< 0.009
05-08-00	331	0.025 ± 0.004	< 0.011	11-06-00	337	0.028 ± 0.003	< 0.011
05-15-00	334	0.018 ± 0.003	< 0.008	11-13-00	348	0.024 ± 0.003	< 0.008
05-22-00	340	0.018 ± 0.003	< 0.010	11-20-00	357	0.026 ± 0.003	< 0.010
05-30-00	102	0.050 ± 0.009[a]	< 0.020	11-27-00	351	0.028 ± 0.003	< 0.006
06-05-00	ND[b]	-	-	12-04-00	354	0.035 ± 0.003	< 0.006
06-09-00	ND[b]	-	-	12-11-00	360	0.030 ± 0.003	< 0.008
06-19-00	462	0.015 ± 0.002	< 0.007	12-18-00	363	0.029 ± 0.003	< 0.008
06-26-00	329	0.018 ± 0.003	< 0.008	12-26-00	416	0.031 ± 0.003	< 0.006
07-03-00	329	0.023 ± 0.003	< 0.015	01-02-01	360	0.018 ± 0.003	< 0.014
2nd Qtr. Mean ± s.d.		0.023 ± 0.010	< 0.020	4th Qtr. Mean ± s.d.		0.029 ± 0.007	< 0.022
				Cumulative Average		0.026	
				Previous Annual Average		0.024	

[a] Low volume due to power loss at sampler pump site.
[b] No data; power loss at sampler pump site. Power returned 06-09-00.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 7SD - South Haven (6.5 mi. NNE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	360	0.037 ± 0.003	< 0.006	07-10-00	331	0.023 ± 0.003	< 0.012
01-17-00	357	0.028 ± 0.004	< 0.007	07-17-00	331	0.020 ± 0.003	< 0.009
01-24-00	360	0.046 ± 0.004	< 0.008	07-24-00	334	0.016 ± 0.003	< 0.011
01-31-00	340	0.030 ± 0.004	< 0.014	07-31-00	331	0.025 ± 0.003	< 0.011
02-07-00	343	0.027 ± 0.004	< 0.007	08-07-00	337	0.024 ± 0.003	< 0.014
02-15-00	411	0.037 ± 0.003	< 0.009	08-14-00	215	0.036 ± 0.005	< 0.020
02-21-00	306	0.035 ± 0.004	< 0.006	08-21-00	445	0.015 ± 0.003	< 0.007
02-28-00	343	0.028 ± 0.003	< 0.009	08-28-00	275	0.034 ± 0.004	< 0.012
03-06-00	351	0.026 ± 0.004	< 0.005	09-05-00	374	0.031 ± 0.003	< 0.010
03-13-00	351	0.022 ± 0.003	< 0.013	09-11-00	286	0.027 ± 0.003	< 0.013
03-20-00	354	0.025 ± 0.003	< 0.014	09-18-00	340	0.023 ± 0.003	< 0.007
03-27-00	346	0.021 ± 0.003	< 0.013	09-25-00	337	0.021 ± 0.003	< 0.011
04-03-00	346	0.019 ± 0.003	< 0.006	10-02-00	337	0.027 ± 0.004	< 0.009
1st Qtr. Mean ± s.d.		0.029 ± 0.008	< 0.014	3rd Qtr. Mean ± s.d.		0.025 ± 0.006	< 0.020
04-10-00	354	0.021 ± 0.003	< 0.009	10-09-00	346	0.025 ± 0.003	< 0.019
04-17-00	348	0.024 ± 0.003	< 0.009	10-16-00	340	0.035 ± 0.004	< 0.007
04-24-00	346	0.021 ± 0.003	< 0.011	10-23-00	340	0.044 ± 0.004	< 0.012
05-01-00	346	0.025 ± 0.003	< 0.007	10-30-00	340	0.044 ± 0.004	< 0.007
05-08-00	337	0.023 ± 0.003	< 0.024	11-06-00	340	0.023 ± 0.003	< 0.010
05-15-00	340	0.021 ± 0.003	< 0.013	11-13-00	348	0.020 ± 0.003	< 0.016
05-22-00	343	0.023 ± 0.003	< 0.008	11-20-00	354	0.030 ± 0.004	< 0.010
05-30-00	388	0.023 ± 0.003	< 0.010	11-27-00	351	0.024 ± 0.003	< 0.003
06-05-00	286	0.023 ± 0.003	< 0.009	12-04-00	354	0.032 ± 0.003	< 0.010
06-12-00	337	0.024 ± 0.003	< 0.014	12-11-00	357	0.027 ± 0.003	< 0.011
06-19-00	331	0.014 ± 0.003	< 0.010	12-18-00	360	0.031 ± 0.003	< 0.011
06-26-00	334	0.017 ± 0.003	< 0.009	12-26-00	411	0.029 ± 0.003	< 0.005
07-03-00	331	0.021 ± 0.003	< 0.013	01-02-01	360	0.022 ± 0.003	< 0.008
2nd Qtr. Mean ± s.d.		0.022 ± 0.003	< 0.024	4th Qtr. Mean ± s.d.		0.030 ± 0.008	< 0.019
				Cumulative Average		0.026	
				Previous Annual Average		0.026	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 8SP - State Park (1.0 mi. N)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	337	0.036 ± 0.004	< 0.006	07-10-00	314	0.024 ± 0.003	< 0.012
01-17-00	340	0.028 ± 0.004	< 0.007	07-17-00	314	0.018 ± 0.003	< 0.010
01-24-00	346	0.046 ± 0.004	< 0.009	07-24-00	320	0.017 ± 0.003	< 0.012
01-31-00	340	0.028 ± 0.004	< 0.014	07-31-00	314	0.024 ± 0.003	< 0.011
02-07-00	331	0.024 ± 0.003	< 0.007	08-07-00	317	0.025 ± 0.004	< 0.015
02-15-00	385	0.039 ± 0.003	< 0.009	08-14-00	312	0.023 ± 0.003	< 0.013
02-21-00	289	0.035 ± 0.004	< 0.006	08-21-00	314	0.019 ± 0.003	< 0.010
02-28-00	326	0.028 ± 0.003	< 0.009	08-28-00	314	0.032 ± 0.004	< 0.010
03-06-00	329	0.023 ± 0.004	< 0.005	09-05-00	360	0.032 ± 0.003	< 0.011
03-13-00	320	0.025 ± 0.004	< 0.014	09-11-00	269	0.026 ± 0.004	< 0.013
03-20-00	331	0.026 ± 0.003	< 0.015	09-18-00	323	0.022 ± 0.003	< 0.007
03-27-00	326	0.024 ± 0.003	< 0.014	09-25-00	317	0.021 ± 0.003	< 0.011
04-03-00	326	0.017 ± 0.003	< 0.006	10-02-00	320	0.028 ± 0.004	< 0.010
1st Qtr. Mean ± s.d.		0.029 ± 0.008	< 0.015	3rd Qtr. Mean ± s.d.		0.024 ± 0.005	< 0.015
04-10-00	331	0.020 ± 0.003	< 0.010	10-09-00	326	0.022 ± 0.003	< 0.020
04-17-00	329	0.023 ± 0.003	< 0.009	10-16-00	323	0.036 ± 0.004	< 0.007
04-24-00	326	0.020 ± 0.003	< 0.011	10-23-00	320	0.048 ± 0.005	< 0.012
05-01-00	326	0.024 ± 0.004	< 0.008	10-30-00	326	0.044 ± 0.004	< 0.007
05-08-00	317	0.021 ± 0.003	< 0.025	11-06-00	320	0.030 ± 0.003	< 0.010
05-15-00	320	0.017 ± 0.003	< 0.013	11-13-00	329	0.025 ± 0.003	< 0.017
05-22-00	323	0.021 ± 0.003	< 0.009	11-20-00	337	0.030 ± 0.004	< 0.011
05-30-00	365	0.023 ± 0.003	< 0.011	11-27-00	337	0.020 ± 0.003	< 0.003
06-05-00	286	0.023 ± 0.003	< 0.009	12-04-00	334	0.033 ± 0.003	< 0.010
06-12-00	320	0.023 ± 0.004	< 0.015	12-11-00	340	0.030 ± 0.003	< 0.011
06-19-00	317	0.012 ± 0.003	< 0.011	12-18-00	343	0.030 ± 0.003	< 0.012
06-26-00	317	0.016 ± 0.003	< 0.009	12-26-00	394	0.030 ± 0.003	< 0.005
07-03-00	314	0.021 ± 0.003	< 0.014	01-02-01	275	0.023 ± 0.004	< 0.011
2nd Qtr. Mean ± s.d.		0.020 ± 0.003	< 0.025	4th Qtr. Mean ± s.d.		0.031 ± 0.008	< 0.020
				Cumulative Average		0.026	
				Previous Annual Average		0.026	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 9TP - Covert Township Park (1.5 mi. SSW)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-10-00	286	0.037 ± 0.004	< 0.007	07-10-00	278	0.024 ± 0.003	< 0.014
01-17-00	289	0.029 ± 0.004	< 0.008	07-17-00	275	0.022 ± 0.003	< 0.011
01-24-00	306	0.043 ± 0.004	< 0.010	07-24-00	278	0.016 ± 0.003	< 0.013
01-31-00	295	0.025 ± 0.004	< 0.016	07-31-00	275	0.028 ± 0.003	< 0.013
02-07-00	289	0.019 ± 0.004	< 0.008	08-07-00	278	0.025 ± 0.004	< 0.017
02-15-00	329	0.041 ± 0.004	< 0.011	08-14-00	272	0.026 ± 0.004	< 0.015
02-21-00	244	0.040 ± 0.005	< 0.007	08-21-00	280	0.017 ± 0.004	< 0.011
02-28-00	266	0.031 ± 0.004	< 0.011	08-28-00	275	0.034 ± 0.004	< 0.012
03-06-00	269	0.026 ± 0.004	< 0.007	09-05-00	314	0.030 ± 0.003	< 0.012
03-13-00	280	0.027 ± 0.004	< 0.016	09-11-00	235	0.025 ± 0.004	< 0.015
03-20-00	289	0.027 ± 0.003	< 0.017	09-18-00	286	0.023 ± 0.003	< 0.008
03-27-00	289	0.027 ± 0.003	< 0.016	09-25-00	280	0.021 ± 0.004	< 0.013
04-03-00	289	0.018 ± 0.003	< 0.007	10-02-00	286	0.027 ± 0.004	< 0.011
1st Qtr. Mean ± s.d.		0.030 ± 0.008	< 0.017	3rd Qtr. Mean ± s.d.		0.024 ± 0.005	< 0.017
04-10-00	283	0.021 ± 0.003	< 0.011	10-09-00	292	0.025 ± 0.003	< 0.022
04-17-00	278	0.025 ± 0.004	< 0.011	10-16-00	283	0.035 ± 0.004	< 0.008
04-24-00	278	0.022 ± 0.004	< 0.013	10-23-00	283	0.042 ± 0.005	< 0.014
05-01-00	278	0.029 ± 0.004	< 0.009	10-30-00	283	0.039 ± 0.028	< 0.008
05-08-00	269	0.023 ± 0.004	< 0.030	11-06-00	283	0.046 ± 0.006	< 0.012
05-15-00	275	0.022 ± 0.003	< 0.015	11-13-00	289	0.024 ± 0.004	< 0.020
05-22-00	278	0.023 ± 0.003	< 0.010	11-20-00	295	0.027 ± 0.004	< 0.012
05-30-00	320	0.024 ± 0.003	< 0.012	11-27-00	292	0.024 ± 0.003	< 0.004
06-05-00	238	0.027 ± 0.004	< 0.010	12-04-00	289	0.033 ± 0.004	< 0.012
06-12-00	280	0.027 ± 0.004	< 0.017	12-11-00	261	0.032 ± 0.004	< 0.015
06-19-00	280	0.011 ± 0.003	< 0.012	12-18-00	303	0.029 ± 0.003	< 0.013
06-26-00	280	0.021 ± 0.004	< 0.010	12-26-00	343	0.033 ± 0.004	< 0.006
07-03-00	278	0.025 ± 0.004	< 0.016	01-02-01	300	0.023 ± 0.004	< 0.010
2nd Qtr. Mean ± s.d.		0.023 ± 0.004	< 0.030	4th Qtr. Mean ± s.d.		0.032 ± 0.007	< 0.022
				Cumulative Average		0.027	
				Previous Annual Average		0.025	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 10GR - Grand Rapids (55 mi. NNE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-06-00	360	0.029 ± 0.003	< 0.009	07-06-00	331	0.023 ± 0.003	< 0.018
01-13-00	354	0.036 ± 0.004	< 0.010	07-13-00	323	0.017 ± 0.003	< 0.014
01-20-00	357	0.027 ± 0.003	< 0.005	07-20-00	334	0.016 ± 0.003	< 0.017
01-27-00	360	0.043 ± 0.004	< 0.020	07-27-00	323	0.021 ± 0.003	< 0.017
				08-03-00	329	0.025 ± 0.003	< 0.015
02-03-00	351	0.030 ± 0.003	< 0.010				
02-10-00	348	0.038 ± 0.004	< 0.017	08-10-00	320	0.024 ± 0.003	< 0.020
02-17-00	351	0.027 ± 0.003	< 0.018	08-17-00	323	0.027 ± 0.003	< 0.009
02-24-00	346	0.035 ± 0.004	< 0.016	08-24-00	323	0.022 ± 0.003	< 0.015
03-03-00	374	0.017 ± 0.003	< 0.007	08-31-00	323	0.038 ± 0.004	< 0.020
03-09-00	300	0.034 ± 0.004	< 0.023	09-07-00	326	0.022 ± 0.003	< 0.015
03-16-00	368	0.023 ± 0.003	< 0.019	09-14-00	309	0.023 ± 0.003	< 0.011
03-23-00	340	0.022 ± 0.003	< 0.019	09-21-00	331	0.025 ± 0.003	< 0.015
03-30-00	343	0.015 ± 0.003	< 0.008	09-28-00	337	0.016 ± 0.003	< 0.013
1st Qtr. Mean ± s.d.		0.029 ± 0.008	< 0.023	3rd Qtr. Mean ± s.d.		0.023 ± 0.006	< 0.020
04-06-00	326	0.019 ± 0.003	< 0.015	10-05-00	334	0.032 ± 0.003	< 0.027
04-12-00	309	0.020 ± 0.003	< 0.015	10-12-00	337	0.023 ± 0.003	< 0.010
04-20-00	388	0.020 ± 0.003	< 0.016	10-19-00	329	0.040 ± 0.004	< 0.017
04-27-00	340	0.022 ± 0.003	< 0.010	10-26-00	329	0.047 ± 0.004	< 0.010
				11-02-00	331	0.029 ± 0.003	< 0.014
05-04-00	331	0.022 ± 0.003	< 0.034				
05-11-00	326	0.023 ± 0.003	< 0.020	11-09-00	337	0.031 ± 0.003	< 0.023
05-18-00	334	0.020 ± 0.003	< 0.013	11-16-00	343	0.023 ± 0.003	< 0.015
05-25-00	329	0.018 ± 0.003	< 0.019	11-24-00	379	0.021 ± 0.003	< 0.004
06-01-00	331	0.020 ± 0.003	< 0.012	11-30-00	309	0.041 ± 0.004	< 0.015
06-09-00	374	0.017 ± 0.003	< 0.007	12-07-00	346	0.016 ± 0.003	< 0.016
06-15-00	269	0.020 ± 0.004	< 0.018	12-14-00	340	0.026 ± 0.003	< 0.016
06-22-00	329	0.016 ± 0.003	< 0.013	12-21-00	360	0.035 ± 0.003	< 0.009
06-29-00	320	0.020 ± 0.003	< 0.019	12-28-00	340	0.028 ± 0.003	< 0.013
2nd Qtr. Mean ± s.d.		0.020 ± 0.002	< 0.034	4th Qtr. Mean ± s.d.		0.030 ± 0.009	< 0.027
				Cumulative Average		0.025	
				Previous Annual Average		0.024	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 11KZ - Kalamazoo (35 mi. E)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-06-00	439	0.020 ± 0.002	< 0.007	07-06-00	303	0.023 ± 0.003	< 0.019
01-13-00	337	0.042 ± 0.004	< 0.011	07-13-00	320	0.015 ± 0.003	< 0.014
01-20-00	337	0.033 ± 0.003	< 0.005	07-20-00	309	0.018 ± 0.003	< 0.018
01-27-00	360	0.043 ± 0.004	< 0.020	07-27-00	314	0.022 ± 0.003	< 0.018
				08-03-00	312	0.025 ± 0.003	< 0.016
02-03-00	340	0.029 ± 0.003	< 0.011				
02-10-00	340	0.043 ± 0.004	< 0.017	08-10-00	351	0.022 ± 0.003	< 0.019
02-17-00	343	0.030 ± 0.003	< 0.018	08-17-00	263	0.026 ± 0.004	< 0.011
02-24-00	334	0.035 ± 0.004	< 0.017	08-24-00	326	0.025 ± 0.003	< 0.015
03-02-00	334	0.017 ± 0.003	< 0.007	08-31-00	312	0.034 ± 0.004	< 0.020
03-09-00	323	0.030 ± 0.003	< 0.021	09-07-00	312	0.026 ± 0.003	< 0.016
03-16-00	337	0.025 ± 0.004	< 0.020	09-14-00	320	0.019 ± 0.003	< 0.011
03-23-00	331	0.021 ± 0.003	< 0.019	09-21-00	323	0.027 ± 0.003	< 0.016
03-30-00	323	0.017 ± 0.003	< 0.009	09-29-00	368	0.017 ± 0.003	< 0.012
1st Qtr. Mean ± s.d.		0.030 ± 0.009	< 0.021	3rd Qtr. Mean ± s.d.		0.023 ± 0.005	< 0.020
04-06-00	329	0.025 ± 0.003	< 0.014	10-05-00	283	0.033 ± 0.004	< 0.032
04-12-00	337	0.026 ± 0.003	< 0.010	10-12-00	331	0.024 ± 0.003	< 0.010
04-20-00	388	0.020 ± 0.003	< 0.016	10-19-00	320	0.039 ± 0.004	< 0.017
04-27-00	323	0.026 ± 0.004	< 0.011	10-26-00	297	0.051 ± 0.004	< 0.012
				11-02-00	337	0.034 ± 0.003	< 0.014
05-04-00	323	0.025 ± 0.003	< 0.035				
05-11-00	312	0.026 ± 0.003	< 0.020	11-09-00	329	0.029 ± 0.003	< 0.024
05-18-00	377	0.020 ± 0.003	< 0.011	11-16-00	331	0.017 ± 0.003	< 0.016
05-25-00	275	0.020 ± 0.004	< 0.023	11-22-00	292	0.030 ± 0.003	< 0.015
06-01-00	314	0.017 ± 0.003	< 0.013	11-30-00	391	0.036 ± 0.004	< 0.012
06-08-00	320	0.017 ± 0.003	< 0.008	12-08-00	388	0.022 ± 0.003	< 0.014
06-15-00	309	0.022 ± 0.004	< 0.015	12-14-00	309	0.028 ± 0.003	< 0.018
06-22-00	309	0.018 ± 0.003	< 0.014	12-22-00	382	0.040 ± 0.003	< 0.008
06-29-00	317	0.019 ± 0.003	< 0.019	12-28-00	306	0.031 ± 0.003	< 0.014
2nd Qtr. Mean ± s.d.		0.022 ± 0.004	< 0.035	4th Qtr. Mean ± s.d.		0.032 ± 0.009	< 0.032
				Cumulative Average		0.027	
				Previous Annual Average		0.024	

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: 12DG - Dowagiac (30 mi. SSE)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
Required LLD		0.010	0.070			0.010	0.070
01-05-00	329	0.025 ± 0.003	< 0.010	07-05-00	275	0.026 ± 0.004	< 0.021
01-12-00	331	0.038 ± 0.004	< 0.011	07-12-00	300	0.015 ± 0.003	< 0.015
01-19-00	337	0.028 ± 0.003	< 0.005	07-19-00	297	0.019 ± 0.003	< 0.019
01-26-00	343	0.051 ± 0.004	< 0.021	07-26-00	306	0.019 ± 0.003	< 0.018
				08-02-00	300	0.031 ± 0.004	< 0.017
02-02-00	334	0.026 ± 0.003	< 0.011				
02-09-00	334	0.039 ± 0.004	< 0.018	08-09-00	317	0.025 ± 0.003	< 0.021
02-16-00	334	0.039 ± 0.004	< 0.019	08-16-00	272	0.021 ± 0.004	< 0.011
02-23-00	331	0.032 ± 0.004	< 0.017	08-23-00	297	0.021 ± 0.003	< 0.017
03-02-00	360	0.020 ± 0.003	< 0.007	08-30-00	303	0.039 ± 0.004	< 0.021
03-08-00	280	0.035 ± 0.004	< 0.024	09-07-00	331	0.029 ± 0.003	< 0.015
03-16-00	371	0.023 ± 0.003	< 0.019	09-13-00	258	0.022 ± 0.004	< 0.013
03-23-00	312	0.016 ± 0.003	< 0.020	09-21-00	300	0.024 ± 0.003	< 0.017
03-29-00	289	0.016 ± 0.003	< 0.010	09-28-00	329	0.018 ± 0.003	< 0.014
1st Qtr. Mean ± s.d.		0.030 ± 0.010	< 0.024	3rd Qtr. Mean ± s.d.		0.024 ± 0.006	< 0.021
04-05-00	326	0.023 ± 0.003	< 0.015	10-04-00	278	0.033 ± 0.004	< 0.033
04-11-00	323	0.020 ± 0.003	< 0.015	10-12-00	331	0.024 ± 0.003	< 0.010
04-19-00	314	0.027 ± 0.003	< 0.019	10-18-00	272	0.036 ± 0.004	< 0.020
04-27-00	351	0.023 ± 0.003	< 0.010	10-25-00	297	0.060 ± 0.005	< 0.012
				11-01-00	312	0.037 ± 0.004	< 0.016
05-03-00	295	0.025 ± 0.003	< 0.040				
05-10-00	297	0.025 ± 0.003	< 0.022	11-08-00	300	0.030 ± 0.004	< 0.027
05-18-00	334	0.020 ± 0.003	< 0.013	11-15-00	312	0.021 ± 0.004	< 0.018
05-25-00	329	0.018 ± 0.003	< 0.019	11-22-00	317	0.031 ± 0.003	< 0.014
05-31-00	309	0.019 ± 0.003	< 0.014	11-29-00	314	0.040 ± 0.004	< 0.017
06-07-00	309	0.018 ± 0.003	< 0.009	12-06-00	323	0.016 ± 0.003	< 0.018
06-14-00	300	0.026 ± 0.004	< 0.016	12-13-00	320	0.028 ± 0.004	< 0.018
06-21-00	306	0.017 ± 0.003	< 0.014	12-20-00	323	0.045 ± 0.004	< 0.011
06-28-00	329	0.019 ± 0.003	< 0.019	12-27-00	326	0.032 ± 0.003	< 0.014
2nd Qtr. Mean ± s.d.		0.022 ± 0.003	< 0.040	4th Qtr. Mean ± s.d.		0.033 ± 0.011	< 0.033
				Cumulative Average		0.027	
				Previous Annual Average		0.025	

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/30 days[a]

	January	February	March
Date Placed	01-02-00	01-30-00	03-03-00
Date Removed	01-30-00	03-03-00	04-09-00
Intransit (mR)	5.6 ± 0.2	4.7 ± 0.2	4.0 ± 0.3
ST-01	4.1 ± 0.2	3.5 ± 0.2	3.6 ± 0.2
ST-02	5.0 ± 0.2	5.1 ± 0.2	4.7 ± 0.2
ST-03	4.5 ± 0.2	4.6 ± 0.2	4.3 ± 0.2
ST-04	4.9 ± 0.3	4.6 ± 0.2	4.4 ± 0.2
ST-05	4.6 ± 0.2	4.6 ± 0.2	3.9 ± 0.2
ST-06	3.8 ± 0.2	3.6 ± 0.2	3.8 ± 0.2
ST-07A	4.3 ± 0.3	3.9 ± 0.2	3.9 ± 0.2
ST-08	4.1 ± 0.3	3.9 ± 0.2	4.0 ± 0.2
ST-09	3.6 ± 0.2	3.6 ± 0.2	3.3 ± 0.2
ST-10	3.8 ± 0.2	3.5 ± 0.2	3.4 ± 0.2
ST-11	4.6 ± 0.3	5.0 ± 0.2	4.5 ± 0.2
ST-12	3.8 ± 0.3	3.8 ± 0.2	3.8 ± 0.2
ST-13	3.3 ± 0.2	3.4 ± 0.2	3.1 ± 0.2
ST-14	3.0 ± 0.2	3.4 ± 0.2	3.6 ± 0.2
ST-15	4.1 ± 0.3	3.9 ± 0.2	3.9 ± 0.2
ST-16	3.4 ± 0.2	3.1 ± 0.2	3.5 ± 0.2
ST-17	3.7 ± 0.3	3.5 ± 0.2	3.5 ± 0.2
ST-18	4.1 ± 0.3	3.9 ± 0.2	3.9 ± 0.2
ST-19	3.7 ± 0.3	3.8 ± 0.2	3.6 ± 0.2
ST-20	3.7 ± 0.3	3.6 ± 0.2	3.6 ± 0.2
ST-21	3.7 ± 0.3	3.4 ± 0.2	3.9 ± 0.2
ST-22	1.9 ± 0.3	1.7 ± 0.2	1.6 ± 0.2
ST-23	4.2 ± 0.3	4.2 ± 0.2	4.2 ± 0.2
ST-24	3.8 ± 0.2	3.7 ± 0.2	3.4 ± 0.2
ST-33	3.7 ± 0.2	3.4 ± 0.2	3.6 ± 0.2
ST-34	3.8 ± 0.2	3.7 ± 0.2	3.7 ± 0.2
ST-35	4.5 ± 0.2	4.6 ± 0.2	4.3 ± 0.2
ST-36	3.1 ± 0.2	3.5 ± 0.2	3.2 ± 0.2
ST-37	3.3 ± 0.2	3.4 ± 0.2	3.4 ± 0.2
ST-38	2.8 ± 0.2	3.0 ± 0.2	2.9 ± 0.2
Mean ± s.d.	3.8 ± 0.6	3.8 ± 0.7	3.7 ± 0.6
Control 1	2.0 ± 0.3	1.7 ± 0.3	1.6 ± 0.2
Control 2	1.5 ± 0.2	1.6 ± 0.2	1.6 ± 0.2

[a] Intransit exposure has been subtracted.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/30 days[a]

	April	May	June
Date Placed	04-09-00	04-30-00	06-04-00
Date Removed	04-30-00	06-04-00	07-02-00
Intransit (mR)	5.1 ± 0.2	5.1 ± 0.2	5.1 ± 0.2
ST-01	5.3 ± 0.2	3.5 ± 0.2	3.8 ± 0.2
ST-02	5.3 ± 0.3	5.1 ± 0.2	4.9 ± 0.3
ST-03	5.2 ± 0.3	4.3 ± 0.2	4.4 ± 0.2
ST-04	5.3 ± 0.3	4.7 ± 0.2	4.9 ± 0.3
ST-05	5.0 ± 0.2	4.4 ± 0.2	4.5 ± 0.3
ST-06	3.9 ± 0.3	4.1 ± 0.2	4.1 ± 0.3
ST-07A	4.1 ± 0.4	4.2 ± 0.2	4.1 ± 0.3
ST-08	4.3 ± 0.3	4.1 ± 0.2	4.1 ± 0.3
ST-09	3.7 ± 0.3	3.7 ± 0.2	3.8 ± 0.2
ST-10	3.3 ± 0.2	3.6 ± 0.2[b]	3.0 ± 0.2
ST-11	4.1 ± 0.2	4.7 ± 0.2	4.3 ± 0.2
ST-12	4.4 ± 0.2	4.0 ± 0.2	4.1 ± 0.2
ST-13	3.3 ± 0.4	3.3 ± 0.2	4.0 ± 0.3
ST-14	3.7 ± 0.3	3.2 ± 0.2	3.6 ± 0.2
ST-15	3.7 ± 0.3	3.6 ± 0.2	4.1 ± 0.3
ST-16	3.7 ± 0.3	3.3 ± 0.2	3.6 ± 0.3
ST-17	3.6 ± 0.2	3.3 ± 0.2	4.1 ± 0.3
ST-18	4.1 ± 0.3	4.0 ± 0.2	3.7 ± 0.2
ST-19	4.7 ± 0.3	3.6 ± 0.2	4.0 ± 0.3
ST-20	3.5 ± 0.3	3.6 ± 0.2	3.6 ± 0.3
ST-21	3.1 ± 0.3	3.6 ± 0.2	3.7 ± 0.2
ST-22	2.0 ± 0.3	1.9 ± 0.2	1.4 ± 0.2
ST-23	4.4 ± 0.3	4.0 ± 0.2	4.1 ± 0.3
ST-24	4.1 ± 0.3	3.7 ± 0.2	3.8 ± 0.3
ST-33	3.1 ± 0.3	3.7 ± 0.2	3.6 ± 0.2
ST-34	3.9 ± 0.3	3.3 ± 0.2	4.0 ± 0.2
ST-35	5.3 ± 0.3	4.3 ± 0.2	4.9 ± 0.3
ST-36	3.7 ± 0.3	3.0 ± 0.2	4.1 ± 0.3
ST-37	3.8 ± 0.3	3.2 ± 0.2	4.0 ± 0.2
ST-38	3.4 ± 0.3	3.0 ± 0.2	3.6 ± 0.3
Mean ± s.d.	4.0 ± 0.8	3.7 ± 0.6	3.9 ± 0.6
Control 1	1.9 ± 0.3	1.5 ± 0.2	1.4 ± 0.2
Control 2	1.9 ± 0.3	1.5 ± 0.2	1.4 ± 0.2

[a] Intransit exposure has been subtracted.

[b] Regular TLD missing; result of Spare #1.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/30 days[a]

	July	August	September
Date Placed	07-02-00	07-30-00	09-03-00
Date Removed	07-30-00	09-03-00	10-05-00
Intransit (mR)	4.7 ± 0.2	4.8 ± 0.2	4.9 ± 0.2
ST-01	3.7 ± 0.2	3.9 ± 0.2	3.9 ± 0.3
ST-02	5.0 ± 0.3	5.3 ± 0.2	5.3 ± 0.2
ST-03	4.7 ± 0.3	4.6 ± 0.2	4.6 ± 0.2
ST-04	5.0 ± 0.3	4.9 ± 0.2	4.9 ± 0.3
ST-05	4.5 ± 0.2	4.7 ± 0.2	4.6 ± 0.2
ST-06	4.3 ± 0.2	3.9 ± 0.2	4.2 ± 0.2
ST-07A	4.1 ± 0.2	4.2 ± 0.2	4.2 ± 0.2
ST-08	4.0 ± 0.2	3.9 ± 0.2	4.3 ± 0.2
ST-09	3.5 ± 0.3	3.9 ± 0.2	3.5 ± 0.2
ST-10	3.3 ± 0.3	4.2 ± 0.2	4.2 ± 0.3
ST-11	5.0 ± 0.3	4.6 ± 0.2	5.2 ± 0.2
ST-12	4.2 ± 0.2	4.2 ± 0.2	3.8 ± 0.3
ST-13	3.3 ± 0.3	3.9 ± 0.2	3.4 ± 0.2
ST-14	3.2 ± 0.2	3.5 ± 0.2	3.4 ± 0.2
ST-15	4.1 ± 0.2	3.6 ± 0.2	4.2 ± 0.3
ST-16	3.3 ± 0.3	3.5 ± 0.2	3.4 ± 0.2
ST-17	3.4 ± 0.3	3.5 ± 0.2	3.4 ± 0.2
ST-18	4.0 ± 0.2	3.8 ± 0.2	3.9 ± 0.2
ST-19	4.0 ± 0.2	4.0 ± 0.2	4.2 ± 0.2
ST-20	3.6 ± 0.4	3.5 ± 0.2	3.5 ± 0.2
ST-21	3.6 ± 0.2	3.2 ± 0.2	3.8 ± 0.2
ST-22	1.8 ± 0.2	1.8 ± 0.2	2.0 ± 0.2
ST-23	4.2 ± 0.2	4.3 ± 0.2	4.3 ± 0.3
ST-24	3.7 ± 0.3	3.8 ± 0.2	3.8 ± 0.2
ST-33	3.7 ± 0.2	3.2 ± 0.2	3.9 ± 0.3
ST-34	3.5 ± 0.3	3.9 ± 0.2	3.7 ± 0.2
ST-35	4.7 ± 0.3	4.9 ± 0.2	4.4 ± 0.3
ST-36	3.2 ± 0.3	3.9 ± 0.2	3.1 ± 0.2
ST-37	3.4 ± 0.3	3.9 ± 0.2	3.4 ± 0.2
ST-38	3.3 ± 0.3	3.5 ± 0.2	2.7 ± 0.2
Mean ± s.d.	3.8 ± 0.7	3.9 ± 0.7	3.9 ± 0.7
Control 1	1.5 ± 0.2	1.8 ± 0.2	1.5 ± 0.2
Control 2	1.9 ± 0.2	1.7 ± 0.2	1.5 ± 0.2

[a] Intransit exposure has been subtracted.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/30 days[a]

	October	November	December
Date Placed	10-05-00	11-05-00	12-03-00
Date Removed	11-05-00	12-03-00	01-04-01
Intransit (mR)	4.0 ± 0.3	3.1 ± 0.2	4.4 ± 0.2
ST-01	4.2 ± 0.3	4.9 ± 0.2	3.3 ± 0.2
ST-02	5.6 ± 0.3	5.9 ± 0.2	4.2 ± 0.3
ST-03	4.8 ± 0.3	5.0 ± 0.2	4.2 ± 0.3
ST-04	5.7 ± 0.3	6.2 ± 0.2	4.5 ± 0.2
ST-05	4.9 ± 0.3	5.4 ± 0.2	4.1 ± 0.2
ST-06	4.6 ± 0.3	5.2 ± 0.2	3.8 ± 0.2
ST-07A	4.6 ± 0.3	5.8 ± 0.2	3.7 ± 0.2
ST-08	4.9 ± 0.3	4.9 ± 0.2	3.6 ± 0.2
ST-09	4.5 ± 0.3	4.9 ± 0.2	3.4 ± 0.2
ST-10	5.0 ± 0.3	4.0 ± 0.2	3.9 ± 0.3
ST-11	5.1 ± 0.3	6.2 ± 0.2	7.1 ± 0.5
ST-12	4.5 ± 0.3	5.2 ± 0.2	4.0 ± 0.2
ST-13	4.9 ± 0.3	4.1 ± 0.2	3.5 ± 0.2
ST-14	3.7 ± 0.3	4.5 ± 0.2	3.6 ± 0.2
ST-15	4.5 ± 0.3	4.8 ± 0.2	3.7 ± 0.3
ST-16	4.1 ± 0.3	4.4 ± 0.3	3.1 ± 0.3
ST-17	4.0 ± 0.3	4.5 ± 0.3	3.3 ± 0.2
ST-18	4.5 ± 0.3	4.9 ± 0.3	3.5 ± 0.2
ST-19	4.9 ± 0.3	4.9 ± 0.3	3.5 ± 0.3
ST-20	4.1 ± 0.3	4.1 ± 0.2	3.2 ± 0.3
ST-21	3.7 ± 0.3	4.4 ± 0.3	2.9 ± 0.3
ST-22	1.7 ± 0.3	2.1 ± 0.2	1.5 ± 0.2
ST-23	4.5 ± 0.3	4.9 ± 0.2	3.9 ± 0.3
ST-24	4.5 ± 0.3	4.5 ± 0.2	3.4 ± 0.2
ST-33	3.8 ± 0.3	4.4 ± 0.2	3.1 ± 0.3
ST-34	4.0 ± 0.3	4.4 ± 0.2	3.8 ± 0.3
ST-35	5.2 ± 0.3	5.3 ± 0.2	4.2 ± 0.3
ST-36	4.2 ± 0.3	4.4 ± 0.2	3.9 ± 0.3
ST-37	4.1 ± 0.3	4.0 ± 0.2	3.7 ± 0.2
ST-38	4.1 ± 0.3	4.5 ± 0.3	3.5 ± 0.2
Mean ± s.d.	4.4 ± 0.7	4.8 ± 0.8	3.7 ± 0.8
Control 1	1.7 ± 0.3	1.9 ± 0.2	1.4 ± 0.2
Control 2	1.6 ± 0.3	1.8 ± 0.2	1.5 ± 0.2

[a] Intransit exposure has been subtracted.

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Table 3. Gamma radiation, as measured by TLDs, quarterly exposure.
Units: mR/91 days[a]

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Date Placed	01-02-00	04-09-00	07-02-00	10-05-00
Date Removed	04-09-00	07-02-00	10-05-00	01-04-01
Intransit (mR)	5.9 ± 0.7	5.1 ± 0.6	4.8 ± 0.6	6.0 ± 0.6
ST-01	11.4 ± 0.6	13.2 ± 0.6	12.4 ± 0.6	13.1 ± 0.6
ST-02	15.5 ± 0.8	17.6 ± 0.6	17.7 ± 0.6	16.1 ± 0.6
ST-03	13.3 ± 0.6	14.4 ± 0.6	14.2 ± 0.6	13.9 ± 0.6
ST-04	13.6 ± 0.6	14.8 ± 0.6	14.1 ± 0.6	14.4 ± 0.7
ST-05	12.8 ± 0.6	14.7 ± 0.6	13.3 ± 0.6	14.2 ± 0.7
ST-06	12.0 ± 0.6	12.2 ± 0.6	13.2 ± 0.6	12.7 ± 0.6
ST-07A	11.2 ± 0.6	13.0 ± 0.6	12.1 ± 0.6	12.2 ± 0.6
ST-08	11.6 ± 0.6	12.6 ± 0.6	12.5 ± 0.6	12.7 ± 0.6
ST-09	10.9 ± 0.7	11.6 ± 0.6	11.8 ± 0.6	11.3 ± 0.6
ST-10	12.3 ± 0.7	12.8 ± 0.6	12.4 ± 0.6	13.6 ± 0.6
ST-11	14.5 ± 0.7	15.0 ± 0.6	15.3 ± 0.7	16.0 ± 0.6
ST-12	12.3 ± 0.6	14.2 ± 0.6	12.8 ± 0.6	14.2 ± 0.7
ST-13	11.6 ± 0.6	12.4 ± 0.7	11.2 ± 0.7	12.8 ± 0.6
ST-14	9.7 ± 0.7	10.7 ± 0.6	10.6 ± 0.7	11.1 ± 0.6
ST-15	10.8 ± 0.6	12.0 ± 0.6	10.9 ± 0.6	11.8 ± 0.6
ST-16	9.4 ± 0.7	11.8 ± 0.7	10.8 ± 0.7	11.5 ± 0.6
ST-17	10.7 ± 0.6	11.6 ± 0.6	10.7 ± 0.7	11.1 ± 0.6
ST-18	11.6 ± 0.6	12.1 ± 0.8	12.0 ± 0.6	12.2 ± 0.6
ST-19	11.6 ± 0.6	12.9 ± 0.6	12.4 ± 0.6	12.5 ± 0.6
ST-20	11.5 ± 0.6	12.1 ± 0.7	11.8 ± 0.6	11.8 ± 0.6
ST-21	10.7 ± 0.6	11.3 ± 0.7	11.3 ± 0.6	11.3 ± 0.6
ST-22	5.8 ± 0.6	6.0 ± 0.6	6.5 ± 0.6	6.0 ± 0.7
ST-23	11.5 ± 0.6	13.4 ± 0.6	12.8 ± 0.6	12.7 ± 0.6
ST-24	10.6 ± 0.6	13.0 ± 0.6	11.5 ± 0.6	12.3 ± 0.6
ST-33	9.6 ± 0.6	11.9 ± 0.6	10.8 ± 0.7	11.9 ± 0.6
ST-34	10.7 ± 0.6	11.9 ± 0.6	11.0 ± 0.7	11.8 ± 0.7
ST-35	13.4 ± 0.7	13.9 ± 0.6	13.3 ± 0.6	13.8 ± 0.6
ST-36	11.0 ± 0.6	12.0 ± 0.6	10.9 ± 0.7	11.8 ± 0.6
ST-37	11.5 ± 0.6	12.0 ± 0.7	11.8 ± 0.6	11.9 ± 0.6
ST-38	11.0 ± 0.6	11.7 ± 0.7	11.1 ± 0.7	11.4 ± 0.6
Mean ± s.d.	11.5 ± 1.7	12.6 ± 1.9	12.1 ± 1.9	12.5 ± 1.8
Control 1	5.5 ± 0.6	5.8 ± 0.6	5.8 ± 0.6	5.8 ± 0.7
Control 2	5.5 ± 0.7	5.9 ± 0.6	5.7 ± 0.6	5.9 ± 0.7

[a] Intransit exposure has been subtracted.

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Table 4. Gamma radiation, as measured by TLDs, annual exposure.
Units: mR/365 days[a]

	2000
Date Placed	01-02-00
Date Removed	01-04-01
Intransit (mR)	2.4 ± 0.6
ST-01	44.7 ± 0.8
ST-02	59.9 ± 0.7
ST-03	52.3 ± 0.7
ST-04	53.9 ± 0.6
ST-05	50.9 ± 0.6
ST-06	49.5 ± 0.6
ST-07A	48.5 ± 0.7
ST-08	48.4 ± 0.7
ST-09	46.7 ± 0.6
ST-10	48.2 ± 0.6
ST-11	57.2 ± 0.6
ST-12	50.1 ± 0.6
ST-13	44.7 ± 0.7
ST-14	39.7 ± 0.6
ST-15	42.9 ± 0.6
ST-16	41.4 ± 0.7
ST-17	41.4 ± 0.6
ST-18	46.2 ± 0.6
ST-19	48.6 ± 0.7
ST-20	45.0 ± 0.7
ST-21	45.9 ± 0.8
ST-22	24.5 ± 0.6
ST-23	50.7 ± 0.6
ST-24	45.0 ± 0.7
ST-33	41.4 ± 0.6
ST-34	41.5 ± 0.6
ST-35	53.1 ± 0.6
ST-36	41.9 ± 0.7
ST-37	42.9 ± 0.6
ST-38	42.4 ± 0.6
Mean ± s.d.	46.3 ± 6.5
Control 1	22.2 ± 0.6
Control 2	22.2 ± 0.6

[a] Intransit exposure has been subtracted.

Table 5. Lake Water, analyses for gross alpha, gross beta and tritium.
Collection: Monthly composites of daily collections.
Units: pCi/L

Location		Discharge		
Date Collected	Lab Code	Gross Alpha	Gross Beta	H-3
Required LLD		1.0	4.0	500
01-31-00	PALW -677	< 0.4	2.5 ± 0.5	2295 ± 162
02-29-00	-1277	< 0.8	2.1 ± 0.5	< 183
03-31-00	-2205	0.7 ± 0.4	2.6 ± 0.3	2844 ± 175
04-30-00	-3285	2.7 ± 0.6	2.6 ± 0.4	< 157
05-31-00	-3776	< 0.6	2.3 ± 0.5	< 180
07-10-00	-4988	0.6 ± 0.3	2.5 ± 0.4	< 154
08-01-00	-5709	< 0.5	1.9 ± 0.4	< 175
09-11-00	-6603	< 0.5	2.2 ± 0.4	1696 ± 145
09-30-00	-7751	< 0.4	2.3 ± 0.5	< 158
10-31-00	-9056	< 0.5	2.3 ± 0.4	3265 ± 175
11-30-00	-9781	< 0.4	2.0 ± 0.4	< 180
12-31-00	10529,30	< 0.4	2.1 ± 0.3	< 178

Location		Intake		
Date Collected	Lab Code	Gross Alpha	Gross Beta	H-3
Required LLD		1.0	4.0	500
01-31-00	PALW -678	0.6 ± 0.4	1.8 ± 0.4	< 183
02-29-00	-1278	< 0.7	2.0 ± 0.4	< 183
03-31-00	-2204	< 0.7	2.3 ± 0.4	212 ± 101
04-30-00	-3284	< 0.5	2.0 ± 0.4	< 157
05-31-00	-3775	< 0.5	2.4 ± 0.4	< 180
07-10-00	-4987	0.6 ± 0.3	2.2 ± 0.3	< 154
08-01-00	-5708	< 0.5	2.1 ± 0.4	< 175
09-11-00	-6602	< 0.4	1.6 ± 0.3	< 179
09-30-00	-7750	< 0.5	1.8 ± 0.5	< 158
10-31-00	-9057	0.4 ± 0.3	1.8 ± 0.4	< 148
11-30-00	-9782	< 0.5	1.7 ± 0.4	< 180
12-31-00	-10531	< 0.5	2.2 ± 0.4	< 178

Table 6. Lake Water, drinking, analyses for gross beta and tritium[a].
Collection: Monthly composites of daily collections.
Units: pCi/L

Location	South Haven Municipal System (Raw)		
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
02-06-00	PALW -680	1.9 ± 0.6	-
03-14-00	-1533	1.8 ± 0.7	-
04-12-00	-2348	2.6 ± 0.6	-
05-03-00	-3136	2.5 ± 0.6	-
05-31-00	-3895	1.9 ± 0.5	-
07-10-00	-4990	2.8 ± 0.6	-
07-31-00	-5985	2.2 ± 0.5	-
08-31-00	-6524	2.0 ± 0.6	-
09-30-00	-7753	1.9 ± 0.5	-
10-31-00	-9059	2.0 ± 0.5	-
11-30-00	-9640	2.3 ± 0.5	-
12-31-00	-10533	2.3 ± 0.6	-

Location	South Haven Municipal System (Treated)		
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
02-06-00	PALW -681	1.9 ± 0.6	< 182
03-14-00	-1534	1.5 ± 0.7	< 177
04-12-00	-2349	2.3 ± 0.6	< 179
05-03-00	-3137	2.0 ± 0.6	< 157
05-31-00	-3896	2.7 ± 0.6	< 180
07-10-00	-4991, 2	2.5 ± 0.4	< 154
07-31-00	-5986	1.9 ± 0.5	< 177
08-31-00	-6525	2.0 ± 0.5	< 180
09-30-00	-7754	2.4 ± 0.5	< 158
10-31-00	-9060	2.0 ± 0.5	178 ± 86
11-30-00	-9641	2.0 ± 0.5	< 180
12-31-00	-10534	1.8 ± 0.5	< 178

[a] Tritium analysis required on treated samples only.

Table 7. Well water, analyses for gross beta and tritium.
Collection: Monthly composites of daily collections.
Units: pCi/L

Location	Site Wells No. 2 and 3 (Domestic)		
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-31-00	PAWW -682	3.7 ± 0.7	< 183
02-29-00	-1280	1.5 ± 0.5	< 183
03-31-00	-2207	2.1 ± 0.6	259 ± 103
04-30-00	-3283	2.3 ± 0.6	174 ± 90
05-31-00	-3777	2.5 ± 0.6	475 ± 108[a]
07-10-00	-4985	2.2 ± 0.6	< 154
08-01-00	-5711	2.5 ± 0.6	194 ± 95
09-11-00	-6605	2.2 ± 0.6	205 ± 97
09-30-00	-7762	2.7 ± 0.5	242 ± 89
10-31-00	-9047	3.3 ± 0.6	178 ± 84
11-30-00	-9778	2.5 ± 0.6	< 180
12-31-00	-10520	1.9 ± 0.5	219 ± 98

Location	State Park		
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-05-00	PAWW -54	< 1.0	< 179
02-06-00	-684	< 1.0	< 182
03-14-00	-1531	< 0.9	< 177
04-12-00	-2346	< 0.9	< 147
05-02-00	-3134	3.3 ± 0.6	< 157
06-07-00	-3893	2.8 ± 0.6	< 177
07-10-00	-4983	2.8 ± 0.6	< 154
08-09-00	-5983	3.4 ± 0.6	< 177
09-07-00	-6522	3.6 ± 0.6	< 180
10-10-00	-7760	3.8 ± 0.6	< 158
11-08-00	-9049	1.5 ± 0.5	< 153
12-05-00	-9642	1.4 ± 0.5	< 180

[a] Analysis was repeated; Result of reanalysis, 488 ± 106 pCi/L.

Table 7. Well water, analyses for gross beta and tritium.
Collection: Monthly composites of daily collections.
Units: pCi/L

Location		Township Park	
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-04-00	PAWW -53	1.2 ± 0.5	< 179
02-06-00	-685	2.5 ± 0.6	< 182
03-14-00	-1532	3.0 ± 0.7	< 177
04-12-00	-2347	2.3 ± 0.7	< 147
05-02-00	-3135	2.4 ± 0.6	< 157
06-01-00	-3894	1.2 ± 0.6	< 177
07-10-00	-4984	1.4 ± 0.6	< 154
08-08-00	-5984	1.0 ± 0.4	< 177
09-07-00	-6523	2.3 ± 0.6	< 180
10-11-00	-7761	3.1 ± 0.6	< 158
11-04-00	-9050	1.6 ± 0.5	< 153
12-02-00	-9643	1.9 ± 0.5	< 180

Location		Warehouse (Site Well #7)	
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-03-00	PAWW -48	4.2 ± 1.3	< 179
02-06-00	-686, 7	4.7 ± 0.9	< 182
03-14-00	-1526	3.6 ± 1.2	< 177
04-12-00	-2340	4.3 ± 1.3	159 ± 84
05-02-00	-3128, 9	4.9 ± 0.9	< 157
06-06-00	-3888	2.5 ± 1.1	< 177
07-10-00	-4978	5.1 ± 1.3	< 154
08-09-00	-5977	1.9 ± 1.0	< 177
09-06-00	-6517	3.1 ± 1.2	< 180
10-10-00	-7755	3.2 ± 1.0	< 158
11-08-00	-9051	4.7 ± 1.1	< 153
12-04-00	-9644	3.3 ± 1.1	< 180

NOTE: Gamma isotopic analysis required if gross beta exceeds 10 pCi/L. Results listed in Appendix C.

Table 7. Well water, analyses for gross beta and tritium.
Collection: Monthly composites of daily collections.
Units: pCi/L

Location	Outage Buildings (Site Wells #11, 12 and 13)		
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-03-00	PAWW -49	< 0.9	< 179
02-06-00	-688	< 1.0	< 182
03-14-00	-1527	1.2 ± 0.5	< 177
04-12-00	-2341	< 1.0	< 147
05-02-00	-3130	0.9 ± 0.5	< 157
06-06-00	-3889	< 0.9	< 177
07-10-00	-4979	1.3 ± 0.5	< 154
08-09-00	-5978	< 0.9	< 177
09-06-00	-6518	0.9 ± 0.5	< 180
10-10-00	-7756	1.2 ± 0.4	< 158
11-08-00	-9052	1.0 ± 0.4	< 153
12-04-00	-9645	1.2 ± 0.4	< 180

Location	Site Well #14		
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-03-00	PAWW -50	12.3 ± 1.0	< 179
02-06-00	-689	3.6 ± 0.6	< 182
03-14-00	-1528	4.3 ± 0.7	< 177
04-12-00	-2342, 3	4.4 ± 0.6	< 147
05-02-00	-3131	5.1 ± 0.8	< 157
06-06-00	-3890	3.5 ± 0.6	< 177
07-10-00	-4980	4.6 ± 0.7	< 154
08-09-00	-5979	4.8 ± 0.8	< 177
09-06-00	-6519	5.8 ± 0.7	< 180
10-10-00	-7757	3.3 ± 0.6	< 158
11-08-00	-9053	4.3 ± 0.6	< 153
12-04-00	-9646	3.9 ± 0.6	< 180

NOTE: Gamma isotopic analysis required if gross beta exceeds 10 pCi/L. Results listed in Appendix C.

Table 7. Well water, analyses for gross beta and tritium.
Collection: Monthly composites of daily collections.
Units: pCi/L

Location		Site Well #15	
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-03-00	PAWW -51	8.1 ± 0.9	< 179
02-06-00	-690	7.1 ± 0.9	< 182
03-14-00	-1529	6.8 ± 0.9	< 177
04-12-00	-2344	6.4 ± 0.8	< 147
05-02-00	-3132	6.9 ± 0.9	< 157
06-06-00	-3891	6.6 ± 0.9	< 177
07-10-00	-4981	6.6 ± 0.8	< 154
08-09-00	-5980	5.9 ± 0.7	< 177
09-06-00	-6520	6.7 ± 0.8	< 180
10-10-00	-7758	4.7 ± 0.7	< 158
11-08-00	-9054	5.1 ± 0.7	< 153
12-04-00	-9647	6.2 ± 0.7	< 180

Location		Site Well #16	
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-03-00	PAWW -52	17.6 ± 1.2	< 179
02-06-00	-691	14.3 ± 0.5	< 182
03-14-00	-1530	11.6 ± 1.1	< 177
04-12-00	-2345	9.7 ± 1.0	166 ± 85
05-02-00	-3133	6.2 ± 0.8	< 157
06-06-00	-3892	4.0 ± 0.7	< 177
07-10-00	-4982	6.0 ± 0.8	< 154
08-09-00	-5981, 2	5.4 ± 0.6	< 177
09-06-00	-6521	5.2 ± 0.8	< 180
10-10-00	-7759	9.0 ± 0.4	< 156
11-08-00	-9055	5.1 ± 0.4	< 153
12-04-00	-9648	6.8 ± 0.7	< 180

NOTE: Gamma isotopic analysis required if gross beta exceeds 10 pCi/L. Results listed in Appendix C.

Table 8. Water, Ludington controls, analyses for gross beta and tritium.
Collection: Monthly composites of daily collections.
Units: pCi/L

Location		Ludington (Lake In)	
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
01-31-00	PALW -679	2.7 ± 0.7	< 183
03-01-00	-1279	1.9 ± 0.6	< 183
04-03-00	-2206	3.8 ± 0.7	< 177
05-02-00	-3147	2.7 ± 0.6	< 157
06-01-00	-3774	2.1 ± 0.6	< 180
07-03-00	-4989	2.4 ± 0.6	< 154
08-01-00	-5710	2.4 ± 0.6	< 175
09-05-00	-6604	1.6 ± 0.6	< 179
09-30-00	-7752	2.2 ± 0.5	< 158
10-31-00	-9058	1.9 ± 0.5	150 ± 85
12-01-00	-9783	2.4 ± 0.5	< 180
01-02-01	-10532	1.8 ± 0.5	< 178

Location		Ludington (Well water)	
Date Collected	Lab Code	Gross Beta	H-3
Required LLD		4.0	500
02-01-00	PAWW -683	< 1.0	< 183
03-01-00	-1281	< 1.1	< 177
04-03-00	-2208	< 0.9	< 177
05-02-00	-3148	< 0.9	< 157
06-01-00	-3778	< 1.0	< 180
07-10-00	-4986	< 0.9	< 154
08-01-00	-5710	< 1.0	< 175
09-05-00	-6606	< 1.0	< 179
09-30-00	-7763	< 0.8	< 158
11-01-00	-9048	0.9 ± 0.5	< 153
12-01-00	-9779	< 0.8	< 180
01-02-01	-10521	< 0.9	< 178

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.
Collection: Monthly composites
Units: uCi/mL

Location		Service Water		
Date Collected Lab Code	Required LLD	01-31-00 PACW-676	02-29-00 PACW-1276	03-31-00 PACW-2203
Gross Alpha	1.0 E-09	< 5.9 E-10	< 7.7 E-10	< 6.6 E-10
Gross Beta	1.0 E-09	2.2 ± 0.4 E-09	1.9 ± 0.4 E-09	2.2 ± 0.4 E-09
H-3	5.0 E-07	< 1.8 E-07	< 1.8 E-07	< 1.8 E-07
Sr-89	5.0 E-09	< 5.7 E-10	< 6.0 E-10	< 5.9 E-10
Sr-90	1.0 E-09	4.4 ± 2.8 E-10	7.9 ± 3.4 E-10	< 4.9 E-10
Cs-137	1.0 E-08	< 3.2 E-09	< 5.6 E-09	< 4.4 E-09
Others[a]	1.0 E-08	< 1.3 E-09	< 4.6 E-09	< 1.9 E-09
Date Collected Lab Code	Required LLD	04-30-00 PACW-3282	05-31-00 PACW-3773	07-10-00 PACW-4977
Gross Alpha	1.0 E-09	< 5.4 E-10	< 5.4 E-10	< 4.8 E-10
Gross Beta	1.0 E-09	2.8 ± 0.5 E-09	2.3 ± 0.5 E-09	2.3 ± 0.4 E-09
H-3	5.0 E-07	< 1.8 E-07	< 1.8 E-07	< 1.5 E-07
Sr-89	5.0 E-09	< 7.3 E-10	< 6.7 E-10	< 6.6 E-10
Sr-90	1.0 E-09	< 5.0 E-10	< 5.6 E-10	< 4.7 E-10
Cs-137	1.0 E-08	< 4.2 E-09	< 4.8 E-09	< 3.5 E-09
Others[a]	1.0 E-08	< 2.6 E-09	< 2.0 E-09	< 2.3 E-09

[a] Co-60

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.
Collection: Monthly composites
Units: uCi/mL

Location	Service Water			
Date Collected	Required	08-01-00	09-11-00	09-30-00
Lab Code	LLD	PACW-5707	PACW-6601	PACW-7748, 9
Gross Alpha	1.0 E-09	< 3.5 E-10	< 4.4 E-10	5.6 ± 2.3 E-10
Gross Beta	1.0 E-09	2.4 ± 0.4 E-09	2.4 ± 0.5 E-09	2.2 ± 0.3 E-09
H-3	5.0 E-07	< 1.8 E-07	< 1.8 E-07	< 1.6 E-07
Sr-89	5.0 E-09	< 7.9 E-10	< 6.0 E-10	< 1.1 E-09
Sr-90	1.0 E-09	< 5.8 E-10	< 5.5 E-10	< 5.8 E-10
Cs-137	1.0 E-08	< 3.3 E-09	< 3.7 E-09	< 1.9 E-09
Others[a]	1.0 E-08	< 2.1 E-09	< 2.2 E-09	< 2.4 E-09
Date Collected	Required	10-31-00	11-30-00	12-31-00
Lab Code	LLD	PACW-9061	PACW-9780	PACW-10535
Gross Alpha	1.0 E-09	< 3.6 E-10	< 4.8 E-10	< 5.1 E-10
Gross Beta	1.0 E-09	2.0 ± 0.3 E-09	2.0 ± 0.4 E-09	2.1 ± 0.4 E-09
H-3	5.0 E-07	< 1.8 E-07	< 1.8 E-07	< 1.8 E-07
Sr-89	5.0 E-09	< 5.1 E-10	< 7.4 E-10	< 1.1 E-09
Sr-90	1.0 E-09	< 1.1 E-09	< 7.6 E-10	< 6.6 E-10
Cs-137	1.0 E-08	< 2.3 E-09	< 2.5 E-09	< 2.6 E-09
Others[a]	1.0 E-08	< 8.6 E-10	< 2.5 E-09	< 2.7 E-09

[a] Co-60

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.
Collection: Monthly composites
Units: uCi/mL

Location		Turbine Sump		
Date Collected	Required	01-31-00	02-29-00	03-31-00
Lab Code	LLD	PACW-753	PACW-1422	PACW-2235
Gross Alpha	1.0 E-09	< 4.6 E-10	< 8.2 E-10	7.2 ± 4.1 E-10
Gross Beta	1.0 E-09	1.1 ± 0.4 E-09	1.8 ± 0.5 E-09	< 6.2 E-10
H-3	5.0 E-07	5.3 ± 0.2 E-06	4.1 ± 0.2 E-06	7.1 ± 0.3 E-06
Sr-89	5.0 E-09	< 7.0 E-10	< 5.4 E-10	< 7.5 E-10
Sr-90	1.0 E-09	5.9 ± 3.1 E-10	< 4.9 E-10	< 7.2 E-10
Cs-137	1.0 E-08	< 1.7 E-09	< 1.7 E-09	< 3.2 E-09
Others[a]	1.0 E-08	< 2.5 E-09	< 1.9 E-09	< 2.2 E-09
Date Collected	Required	04-30-00	05-31-00	07-10-00
Lab Code	LLD	PACW-3250	PACW-4084	PACW-4995
Gross Alpha	1.0 E-09	4.0 ± 3.0 E-10	< 3.6 E-10	8.4 ± 3.9 E-10
Gross Beta	1.0 E-09	1.5 ± 0.4 E-09	9.2 ± 3.4 E-10	9.2 ± 3.4 E-10
H-3	5.0 E-07	6.1 ± 0.2 E-06	9.3 ± 0.3 E-06	1.3 ± 0.1 E-05
Sr-89	5.0 E-09	< 7.4 E-10	< 8.0 E-10	< 8.1 E-10
Sr-90	1.0 E-09	< 4.9 E-10	< 6.9 E-10	< 5.1 E-10
Cs-137	1.0 E-08	< 2.8 E-09	< 3.3 E-09	< 3.4 E-09
Others[a]	1.0 E-08	< 2.7 E-09	< 3.5 E-09	< 2.3 E-09

[a] Co-60

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.
Collection: Monthly composites
Units: uCi/mL

Location		Turbine Sump		
Date Collected	Required	07-31-00	08-31-00	09-30-00
Lab Code	LLD	PACW-5834	PACW-6514, 5	PACW-7575
Gross Alpha	1.0 E-09	3.8 ± 2.6 E-10	< 2.9 E-10	< 3.9 E-10
Gross Beta	1.0 E-09	2.0 ± 0.4 E-09	1.4 ± 0.3 E-09	1.4 ± 0.4 E-09
H-3	5.0 E-07	4.7 ± 0.2 E-06	5.5 ± 0.2 E-06	3.3 ± 0.2 E-06
Sr-89	5.0 E-09	< 8.2 E-10	< 6.8 E-10	< 7.6 E-10
Sr-90	1.0 E-09	< 7.6 E-10	< 6.8 E-10	< 6.0 E-10
Cs-137	1.0 E-08	< 2.4 E-09	< 3.2 E-09	< 3.4 E-09
Others[a]	1.0 E-08	< 2.0 E-09	< 2.3 E-09	< 2.7 E-09
Date Collected	Required	11-01-00	11-30-00	12-31-00
Lab Code	LLD	PACW-8582	PACW-10047	PACW-10776
Gross Alpha	1.0 E-09	< 2.8 E-10	< 2.6 E-10	9.5 ± 0.4 E-10
Gross Beta	1.0 E-09	1.3 ± 0.3 E-09	1.0 ± 0.4 E-09	1.2 ± 2.8 E-09
H-3	5.0 E-07	5.1 ± 0.2 E-06	8.0 ± 0.3 E-06	8.8 ± 0.3 E-06
Sr-89	5.0 E-09	< 1.4 E-09	< 5.7 E-10	< 1.2 E-9
Sr-90	1.0 E-09	< 7.0 E-10	< 7.5 E-10	< 6.9 E-10
Cs-137	1.0 E-08	< 4.8 E-09	< 1.7 E-09	< 2.3 E-09
Others[a]	1.0 E-08	< 5.9 E-09	< 6.4 E-10	< 1.1 E-09

[a] Co-60

Table 10. Milk, analyses for iodine-131 and gamma emitting isotopes,
Collection: Monthly

Location		AK - Allen Karr Farm				
Date	Lab	Concentration (pCi/L)				
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-La-140
Required LLD		1.0	-	15.0	18.0	15.0
01-10-00	PAMI -171	< 0.3	1025 ± 130	< 2.9	< 6.1	< 2.7
02-07-00	-675	< 0.3	1211 ± 169	< 4.2	< 4.8	< 5.0
03-07-00	-1275	< 0.3	1497 ± 99	< 2.8	< 2.4	< 3.4
04-09-00	-2191	< 0.3	1454 ± 172	< 6.2	< 4.2	< 3.3
05-08-00	-3127	< 0.3	1380 ± 148	< 4.3	< 2.4	< 5.8
06-05-00	-3772	< 0.3	1269 ± 108	< 4.0	< 3.7	< 1.8
07-10-00	-4839, 40	< 0.4	1356 ± 118	< 5.9	< 3.4	< 3.8
08-01-00	-5706	< 0.3	1407 ± 167	< 6.0	< 3.4	< 4.7
09-11-00	-6586	< 0.3	1195 ± 116	< 4.2	< 11.7	< 2.1
10-09-00	-7488	< 0.4	1149 ± 128	< 6.1	< 4.7	< 2.5
11-06-00	-8820	< 0.4	1130 ± 80	< 3.0	< 2.5	< 4.4
12-11-00	9776,7	< 0.4	1298 ± 98	< 2.2	< 2.8	< 2.3

Location		DC - Danny Carpenter Farm				
Date	Lab	Concentration (pCi/L)				
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-La-140
Required LLD		1.0	-	15.0	18.0	15.0
01-05-00	PAMI -44, 5	< 0.2	1368 ± 112	< 2.7	< 3.2	< 3.7
02-06-00	-672	< 0.3	1343 ± 166	< 7.4	< 7.6	< 2.9
03-14-00	-1506	< 0.4	1554 ± 176	< 6.6	< 3.7	< 2.7
04-12-00	-2337	< 0.4	1074 ± 158	< 6.7	< 5.9	< 6.6
05-03-00	-2914	< 0.3	1230 ± 151	< 3.2	< 4.3	< 2.5
06-07-00	-3806	< 0.3	1293 ± 113	< 2.5	< 2.9	< 1.9
07-10-00	-4949, 50	< 0.5	1327 ± 40	< 2.1	< 2.2	< 3.7
08-09-00	-5807	< 0.3	1369 ± 133	< 6.0	< 4.7	< 11.0
09-07-00	-6449	< 0.3	1591 ± 164	< 3.6	< 3.1	< 7.1
10-10-00	-7549	< 0.4	1802 ± 152	< 5.3	< 4.8	< 2.2
11-14-00	-8954	< 0.2	1568 ± 186	< 4.7	< 5.9	< 5.2
12-05-00	-9483	< 0.4	1468 ± 185	< 7.8	< 4.1	< 4.8

Table 10. Milk, analyses for iodine-131 and gamma emitting isotopes,
Collection: Monthly

Location		DS - Dennis Hessey Farm				
Date	Lab	Concentration (pCi/L)				
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-La-140
Required LLD		1.0	-	15.0	18.0	15.0
01-10-00	PAMI -46	< 0.3	1317 ± 159	< 4.9	< 4.7	< 3.6
02-06-00	-673	< 0.2	1368 ± 177	< 5.4	< 2.6	< 3.1
03-14-00	-1508	< 0.3	1369 ± 77	< 3.0	< 2.5	< 1.4
04-12-00	-2339	< 0.4	1245 ± 152	< 4.9	< 3.3	< 5.3
05-03-00	-2915	< 0.4	1207 ± 106	< 2.7	< 2.4	< 6.3
06-07-00	-3807	< 0.4	1303 ± 109	< 4.4	< 2.7	< 2.9
07-10-00	-4841	< 0.4	1302 ± 105	< 2.2	< 2.5	< 3.8
08-09-00	-5808, 9	< 0.4	1248 ± 99	< 3.3	< 2.9	< 6.4
09-07-00	-6450, 1	< 0.5	1283 ± 74	< 3.3	< 2.7	< 2.5
10-10-00	-7550	< 0.4	1257 ± 90	< 2.4	< 2.4	< 2.9
11-14-00	-8955	< 0.2	1039 ± 144	< 4.4	< 2.5	< 10.8
12-05-00	-9484	< 0.3	1314 ± 166	< 5.2	< 3.0	< 6.5

Location		WS - William Shine Farm				
Date	Lab	Concentration (pCi/L)				
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-La-140
Required LLD		1.0	-	15.0	18.0	15.0
01-10-00	PAMI -47	< 0.3	1394 ± 164	< 5.0	< 6.1	< 4.1
02-06-00	-674	< 0.2	1589 ± 173	< 7.6	< 4.2	< 3.1
03-14-00	-1507	< 0.4	1385 ± 121	< 4.8	< 5.7	< 3.2
04-12-00	-2338	< 0.4	1149 ± 145	< 3.3	< 3.9	< 3.2
05-03-00	-2916	< 0.3	1385 ± 145	< 5.9	< 5.1	< 3.7
06-07-00	-3808	< 0.3	1520 ± 121	< 4.6	< 3.0	< 2.0
07-10-00	-4842	< 0.3	1498 ± 148	< 4.6	< 5.1	< 3.3
08-09-00	-5810	< 0.3	1299 ± 157	< 6.7	< 5.0	< 11.4
09-07-00	-6452	< 0.3	1509 ± 124	< 4.0	< 3.6	< 3.9
10-10-00	-7551	< 0.3	1325 ± 174	< 3.3	< 6.6	< 8.1
11-14-01	-8956	< 0.3	1545 ± 105	< 3.7	< 3.1	< 2.6
12-05-00	-9485	< 0.4	1390 ± 120	< 3.7	< 3.7	< 2.1

Table 11. Food Crops, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually, at the time of harvest.
Units: pCi/g wet

Location	Paul Rood	Paul Rood	H.S.	R.B.	
Lab Code	PAVE-5780	PAVE-7554,5	PAVE-5781	7556	
Date Collected	8/8/00	10/10/00	8/8/00	10/10/00	Req. LLD
Sample Type	Blueberries	Apples	Plums	Apples	
Gross Beta	0.75 ± 0.03	0.74 ± 0.01	1.21 ± 0.06	1.36 ± 0.03	1.00
Mn-54	< 0.013	< 0.009	< 0.009	< 0.014	0.08
Fe-59	< 0.027	< 0.012	< 0.014	< 0.023	0.10
Co-58	< 0.009	< 0.008	< 0.008	< 0.017	0.08
Co-60	< 0.004	< 0.006	< 0.007	< 0.016	0.05
Zn-65	< 0.011	< 0.014	< 0.009	< 0.019	0.10
Zr-Nb-95	< 0.014	< 0.010	< 0.004	< 0.019	0.10
I-131	< 0.037	< 0.015	< 0.036	< 0.019	0.06 [a]
Cs-134	< 0.009	< 0.012	< 0.009	< 0.014	0.08
Cs-137	< 0.010	< 0.010	< 0.007	< 0.011	0.08

Location	Paul Rood	
Lab Code	PAVE-8821	
Date Collected	11/4/00	Req. LLD
Sample Type	Pears	
Gross Beta	0.98 ± 0.02	1.00
Mn-54	< 0.010	0.08
Fe-59	< 0.018	0.10
Co-58	< 0.006	0.08
Co-60	< 0.007	0.05
Zn-65	< 0.013	0.10
Zr-Nb-95	< 0.008	0.10
I-131	< 0.022	0.06 [a]
Cs-134	< 0.007	0.08
Cs-137	< 0.009	0.08

[a] Required for broadleaf vegetation only.

Table 11. Food Crops, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually, at the time of harvest.
Units: pCi/g wet

Location	J. Sarno Farm				
Lab Code	PAVE-5776	PAVE-5777	PAVE-5778	PAVE-5779	
Date Collected	8/8/00	8/8/00	8/8/00	8/8/00	Req. LLD
Sample Type	Peaches	Pears	Plums	Apples	
Gross Beta	2.04 ± 0.10	0.91 ± 0.03	1.40 ± 0.08	1.59 ± 0.06	1.00
Mn-54	< 0.014	< 0.008	< 0.008	< 0.006	0.08
Fe-59	< 0.017	< 0.011	< 0.017	< 0.018	0.10
Co-58	< 0.012	< 0.008	< 0.006	< 0.009	0.08
Co-60	< 0.013	< 0.009	< 0.011	< 0.010	0.05
Zn-65	< 0.017	< 0.010	< 0.009	< 0.016	0.10
Zr-Nb-95	< 0.012	< 0.009	< 0.007	< 0.011	0.10
I-131	< 0.022	< 0.023	< 0.037	< 0.026	0.06 [a]
Cs-134	< 0.012	< 0.009	< 0.010	< 0.009	0.08
Cs-137	< 0.014	< 0.006	< 0.010	< 0.007	0.08

Location	J. Sarno Farm		
Lab Code	PAVE-7552	PAVE-7553	
Date Collected	10/10/00	10/10/00	Req. LLD
Sample Type	White grapes	Blue grapes	
Gross Beta	1.35 ± 0.07	2.76 ± 0.09	1.00
Mn-54	< 0.006	< 0.008	0.08
Fe-59	< 0.014	< 0.022	0.10
Co-58	< 0.010	< 0.005	0.08
Co-60	< 0.005	< 0.010	0.05
Zn-65	< 0.018	< 0.022	0.10
Zr-Nb-95	< 0.010	< 0.007	0.10
I-131	< 0.014	< 0.015	0.06[a]
Cs-134	< 0.014	< 0.009	0.08
Cs-137	< 0.006	< 0.010	0.08

[a] Required for broadleaf vegetation only.

Table 12. Fish, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location	Discharge				
Lab Code	PAF-4435	PAF-4436	PAF-7874	PAF-7875	
Date Collected	5/25/00	5/25/00	9/26/00	9/26/00	Req. LLD
Sample Type	Freshwater Drum	Carp	Freshwater Drum	Chinook Salmon	
Gross Beta	1.37 ± 0.08	1.76 ± 0.05	2.69 ± 0.13	3.85 ± 0.12	1.00
Mn-54	< 0.012	< 0.008	< 0.015	< 0.008	0.13
Fe-59	< 0.044	< 0.022	< 0.049	< 0.046	0.26
Co-58	< 0.018	< 0.007	< 0.025	< 0.012	0.13
Co-60	< 0.010	< 0.004	< 0.015	< 0.011	0.13
Zn-65	< 0.019	< 0.015	< 0.019	< 0.013	0.26
Zr-Nb-95	< 0.021	< 0.030	< 0.019	< 0.028	0.10
Cs-134	< 0.011	< 0.009	< 0.015	< 0.011	0.13
Cs-137	< 0.010	< 0.008	< 0.013	0.032 ± 0.013	0.15

Location	Ludington Pumped Storage Plant (Control)				
Lab Code	PAF-4437	PAF-4438, 9	PAF-7876	PAF-7877	
Date Collected	6/20/00	6/23/00	10/5/00	10/5/00	Req. LLD
Sample Type	Freshwater Drum	Carp	Freshwater Drum	Chinook Salmon	
Gross Beta	1.37 ± 0.08	2.19 ± 0.04	2.64 ± 0.10	3.63 ± 0.09	1.00
Mn-54	< 0.008	< 0.012	< 0.009	< 0.007	0.13
Fe-59	< 0.024	< 0.040	< 0.024	< 0.022	0.26
Co-58	< 0.011	< 0.017	< 0.013	< 0.010	0.13
Co-60	< 0.006	< 0.010	< 0.009	< 0.007	0.13
Zn-65	< 0.010	< 0.016	< 0.017	< 0.016	0.26
Zr-Nb-95	< 0.018	< 0.020	< 0.019	< 0.015	0.10
Cs-134	< 0.008	< 0.009	< 0.008	< 0.005	0.13
Cs-137	< 0.015	< 0.018	0.018 ± 0.009	0.046 ± 0.008	0.15

Table 13. Algae, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location	Palisades Discharge	
Lab Code	NS[a]	Req. LLD
Date Collected	-	
Gross Beta	-	1.00
Mn-54	-	0.08
Fe-59	-	0.10
Co-58	-	0.08
Co-60	-	0.05
Zn-65	-	0.10
Zr-Nb-95	-	0.10
Cs-134	-	0.15
Cs-137	-	0.18

Location	Ludington (Control)	
Lab Code	NS[a]	Req. LLD
Date Collected	-	
Gross Beta	-	1.00
Mn-54	-	0.08
Fe-59	-	0.10
Co-58	-	0.08
Co-60	-	0.05
Zn-65	-	0.10
Zr-Nb-95	-	0.10
Cs-134	-	0.15
Cs-137	-	0.18

[a] NS = No sample; Samples not collected in 2000.

Table 14. Bottom sediment, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	Palisades Discharge		
Lab Code	PABS-3210	PABS-7514	
Date Collected	4/28/00	10/6/00	Req. LLD
Gross Beta	6.24 ± 1.16	5.12 ± 1.18	1.00
Mn-54	< 0.007	< 0.007	0.08
Fe-59	< 0.014	< 0.021	0.10
Co-58	< 0.009	< 0.011	0.08
Co-60	< 0.011	< 0.010	0.05
Zn-65	< 0.020	< 0.015	0.10
Zr-Nb-95	< 0.018	< 0.010	0.10
Cs-134	< 0.011	< 0.012	0.15
Cs-137	< 0.010	< 0.012	0.18

Location	North Property (0.8 mi.)		South Property (0.8 mi.)		
Lab Code	PABS-3212, 3	PABS-7516	PABS-3214	PABS-7518	
Date Collected	4/28/00	10/3/00	4/28/00	10/6/00	Req. LLD
Gross Beta	7.74 ± 1.36	7.67 ± 1.28	6.25 ± 1.76	4.65 ± 1.07	1.00
Mn-54	< 0.007	< 0.005	< 0.007	< 0.010	0.08
Fe-59	< 0.020	< 0.008	< 0.020	< 0.021	0.10
Co-58	< 0.012	< 0.005	< 0.009	< 0.007	0.08
Co-60	< 0.007	< 0.004	< 0.008	< 0.009	0.05
Zn-65	< 0.022	< 0.010	< 0.020	< 0.023	0.10
Zr-Nb-95	< 0.011	< 0.007	< 0.009	< 0.013	0.10
Cs-134	< 0.010	< 0.006	< 0.008	< 0.012	0.15
Cs-137	0.019 ± 0.007	0.008 ± 0.003	< 0.011	< 0.009	0.18

Table 14. Bottom sediment, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	South Haven (8.9 km North)		Ludington (Control)		
Lab Code	PABS-3211	PABS-7517	PABS-4360	PABS-7515	
Date Collected	4/28/00	10/3/00	6/16/00	10/5/00	Req. LLD
Gross Beta	8.26 ± 1.24	12.88 ± 1.49	10.70 ± 1.40	10.67 ± 1.42	1.00
Mn-54	< 0.009	< 0.010	< 0.005	< 0.007	0.08
Fe-59	< 0.025	< 0.042	< 0.018	< 0.017	0.10
Co-58	< 0.012	< 0.012	< 0.006	< 0.010	0.08
Co-60	< 0.011	< 0.012	< 0.005	< 0.009	0.05
Zn-65	< 0.023	< 0.028	< 0.010	< 0.021	0.10
Zr-Nb-95	< 0.010	< 0.018	< 0.007	< 0.012	0.10
Cs-134	< 0.014	< 0.017	< 0.006	< 0.008	0.15
Cs-137	< 0.012	< 0.012	< 0.004	< 0.008	0.18

Table 15.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.
Collection: Monthly
Units: uCi/ml

Lab Code	Required LLD	PARW-755	NS[a]	PARW-2236
Date Collected	-	01-31-00	02-28-00	03-20-00
Gross Alpha	1.0 E-07	3.5 ± 1.6 E-09	-	< 1.4 E-09
H-3	1.0 E-05	2.97 ± 0.01 E-01	-	2.25 ± 0.01 E-01
Sr-89	5.0 E-08	< 5.6 E-09	-	< 3.9 E-09
Sr-90	5.0 E-08	2.2 ± 0.3 E-08	-	1.0 ± 0.1 E-08
Pu-239	5.0 E-08	< 2.0 E-10	-	< 1.4 E-10
Cr-51	5.0 E-07	< 1.59 E-07	-	< 8.61 E-08
Mn-54	5.0 E-07	6.78 ± 2.58 E-09	-	< 3.83 E-09
Fe-59	5.0 E-07	< 1.09 E-08	-	< 9.47 E-09
Co-58	5.0 E-07	8.23 ± 0.57 E-08	-	< 1.18 E-07
Co-60	5.0 E-07	1.45 ± 0.05 E-07	-	< 9.75 E-08
Zn-65	5.0 E-07	< 1.09 E-08	-	< 8.48 E-09
Zr-95	5.0 E-07	< 1.13 E-08	-	< 5.02 E-09
Nb-95	5.0 E-07	< 8.51 E-08	-	< 5.73 E-09
Ag-110m	5.0 E-07	< 1.20 E-08	-	< 6.36 E-09
Sb-124	5.0 E-07	< 2.69 E-08	-	< 1.60 E-08
Cs-134	5.0 E-07	4.15 ± 0.06 E-07	-	< 2.08 E-07
Cs-137	5.0 E-07	2.92 ± 0.02 E-06	-	1.40 ± 0.02 E-06
Ba-140	5.0 E-07	< 1.74 E-07	-	< 8.36 E-08
La-140	5.0 E-07	< 2.04 E-08	-	< 7.26 E-09
Ce-141	5.0 E-07	< 1.75 E-08	-	< 1.32 E-08
Ce-144	5.0 E-07	< 4.22 E-08	-	< 2.42 E-08

[a] No sample received.

Table 15.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.
Collection: Monthly
Units: uCi/ml

Lab Code	Required LLD	NS[a]	NS[a]	NS[a]
Date Collected	-	04-30-00	05-31-00	06-30-00
Gross Alpha	1.0 E-07	-	-	-
H-3	1.0 E-05	-	-	-
Sr-89	5.0 E-08	-	-	-
Sr-90	5.0 E-08	-	-	-
Pu-239	5.0 E-08	-	-	-
Cr-51	5.0 E-07	-	-	-
Mn-54	5.0 E-07	-	-	-
Fe-59	5.0 E-07	-	-	-
Co-58	5.0 E-07	-	-	-
Co-60	5.0 E-07	-	-	-
Zn-65	5.0 E-07	-	-	-
Zr-95	5.0 E-07	-	-	-
Nb-95	5.0 E-07	-	-	-
Ag-110m	5.0 E-07	-	-	-
Sb-124	5.0 E-07	-	-	-
Cs-134	5.0 E-07	-	-	-
Cs-137	5.0 E-07	-	-	-
Ba-140	5.0 E-07	-	-	-
La-140	5.0 E-07	-	-	-
Ce-141	5.0 E-07	-	-	-
Ce-144	5.0 E-07	-	-	-

[a] No sample received.

Table 15.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.
Collection: Monthly
Units: uCi/ml

Lab Code	Required LLD	PARW-5835	NS[a]	NS[a]
Date Collected	-	08-02-00	08-31-00	09-30-00
Gross Alpha	1.0 E-07	1.0 ± 0.7 E-09	-	-
H-3	1.0 E-05	2.71 ± 0.01 E-01	-	-
Sr-89	5.0 E-08	< 3.5 E-09	-	-
Sr-90	5.0 E-08	< 1.1 E-09	-	-
Pu-239	5.0 E-08	< 2.2 E-10	-	-
Cr-51	5.0 E-07	< 2.87 E-08	-	-
Mn-54	5.0 E-07	1.42 ± 0.43 E-08	-	-
Fe-59	5.0 E-07	< 4.16 E-09	-	-
Co-58	5.0 E-07	3.47 ± 0.49 E-08	-	-
Co-60	5.0 E-07	1.53 ± 0.05 E-07	-	-
Zn-65	5.0 E-07	< 7.83 E-08	-	-
Zr-95	5.0 E-07	< 5.31 E-09	-	-
Nb-95	5.0 E-07	< 5.33 E-09	-	-
Ag-110m	5.0 E-07	1.68 ± 0.29 E-08	-	-
Sb-124	5.0 E-07	< 6.11 E-09	-	-
Cs-134	5.0 E-07	3.20 ± 0.55 E-08	-	-
Cs-137	5.0 E-07	2.48 ± 0.08 E-07	-	-
Ba-140	5.0 E-07	< 3.35 E-08	-	-
La-140	5.0 E-07	< 5.46 E-09	-	-
Ce-141	5.0 E-07	< 7.53 E-09	-	-
Ce-144	5.0 E-07	< 1.68 E-08	-	-

[a] No sample received.

Table 15.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.
Collection: Monthly
Units: uCi/ml

Lab Code	Required LLD	NS[a]	PARW-8683	NS[a]
Date Collected	-	10-31-00	11-01-00	12-31-00
Gross Alpha	1.0 E-07	-	< 1.1 E-09	-
H-3	1.0 E-05	-	3.00 ± 0.01 E-01	-
Sr-89	5.0 E-08	-	< 3.3 E-09	-
Sr-90	5.0 E-08	-	3.3 ± 1.2 E-09	-
Pu-239	5.0 E-08	-	< 8.1 E-11	-
Cr-51	5.0 E-07	-	< 3.31 E-08	-
Mn-54	5.0 E-07	-	1.07 ± 0.48 E-08	-
Fe-59	5.0 E-07	-	< 2.86 E-09	-
Co-58	5.0 E-07	-	4.44 ± 0.40 E-08	-
Co-60	5.0 E-07	-	1.07 ± 0.05 E-07	-
Zn-65	5.0 E-07	-	< 8.29 E-09	-
Zr-95	5.0 E-07	-	< 6.72 E-09	-
Nb-95	5.0 E-07	-	< 1.19 E-08	-
Ag-110m	5.0 E-07	-	1.93 ± 0.32 E-08	-
Sb-124	5.0 E-07	-	< 4.38 E-09	-
Cs-134	5.0 E-07	-	< 4.79 E-09	-
Cs-137	5.0 E-07	-	5.62 ± 0.44 E-08	-
Ba-140	5.0 E-07	-	< 1.32 E-08	-
La-140	5.0 E-07	-	< 4.53 E-09	-
Ce-141	5.0 E-07	-	< 5.66 E-09	-
Ce-144	5.0 E-07	-	< 1.70 E-08	-

[a] No sample received.

Table 15.2. Stack Filters, analyses for gross alpha, plutonium-239, strontium-89 and strontium-90.
Collection: Continuous, monthly exchange.
Units: pCi/filter

Location		Palisades			
Date Collected	Lab Code	Gross Alpha	Sr-89	Sr-90	Pu-239
Required LLD		10	10	10	10
01-27-00	PASP -754	< 0.8	< 5.9	< 2.6	< 0.2
02-23-00	-1423	< 0.8	< 8.6	< 3.4	< 0.2
03-30-00	-2237	< 0.9	< 3.1	< 2.2	< 0.4
04-27-00	-3251	< 0.7	< 4.3	< 2.2	< 0.3
06-01-00	-4085	< 0.4	< 6.5	< 3.0	< 0.3
06-29-00	-4996	< 0.3	< 4.7	< 2.9	< 0.8
08-03-00	-5836	< 0.5	< 4.1	< 2.4	< 0.3
08-31-00	-6516	< 0.4	< 5.2	< 3.2	< 0.2
09-28-00	-7576, 7	< 0.9	< 11.3	< 6.7	< 0.3
11-01-00	-8584	< 0.5	< 4.5	< 3.8	< 0.2
11-30-00	-10046	< 0.4	< 6.6	< 3.2	< 0.1
12-31-00	-10777	< 0.4	< 5.8	< 3.0	< 1.1

APPENDIX C

SPECIAL ANALYSES

Appendix C. Well Water, analysis for gamma emitting isotopes.
Collection: Monthly
Units: pCi/L

Lab Code	PAWW-50	PAWW-52	PAWW-691
Date Collected	01-03-00	01-03-00	02-06-00
K-40	< 53.6	< 53.1	< 35.8
Mn-54	< 2.5	< 2.1	< 1.5
Fe-59	< 7.0	< 7.9	< 5.8
Co-58	< 2.7	< 3.0	< 1.7
Co-60	< 1.9	< 1.6	< 1.2
Zn-65	< 5.4	< 5.1	< 2.6
Zr-Nb-95	< 4.4	< 3.0	< 3.6
Cs-134	< 2.7	< 2.4	< 1.7
Cs-137	< 2.3	< 1.5	< 1.2
Ce-141	< 14.8	< 12.7	< 9.8
Ce-144	< 21.2	< 21.6	< 14.1

Lab Code	PAWW-1530
Date Collected	03-14-00
K-40	< 52.7
Mn-54	< 1.8
Fe-59	< 3.4
Co-58	< 2.3
Co-60	< 2.7
Zn-65	< 7.3
Zr-Nb-95	< 7.7
Cs-134	< 3.6
Cs-137	< 2.9
Ce-141	< 11.9
Ce-144	< 32.6

ENCLOSURE E

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

INTERLABORATORY COMPARISON PROGRAM RESULTS

27 PAGES

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

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

January, 2000 through December, 2000

Appendix A

Interlaboratory Comparison Program Results

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

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

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

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

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

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

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

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

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

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

Attachment A lists acceptance criteria for "spiked" samples.

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

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory results ±2 Sigma[c]	ERA Result[d] 1s, N=1	Control Limits
STW-863	WATER	Jan, 2000	Gr. Alpha	39.3 ± 5.2	25.4 ± 6.4	14.5 - 36.3
The analysis was repeated and recalculated with Am-241 efficiency; result of reanalysis 29.32 ± 5.79 pCi/L. Internal spike program results do not indicate a problem.						
STW-863	WATER	Jan, 2000	Gr. Beta	40.7 ± 1.2	42.1 ± 4.2	33.4 - 50.8
STW-866	WATER	Jan, 2000	Sr-89	17.1 ± 2.2	22.5 ± 5.0	13.8 - 31.2
STW-866	WATER	Jan, 2000	Sr-90	8.1 ± 0.6	9.6 ± 5.0	0.9 - 18.3
STW-868	WATER	Feb, 2000	Ra-226	7.6 ± 0.5	8.3 ± 1.2	6.1 - 10.4
STW-868	WATER	Feb, 2000	Ra-228	5.6 ± 1.0	2.3 ± 0.6	1.3 - 3.2
Result of reanalysis: 6.34 ± 0.94. Activity confirmed by gamma spectroscopy (6.00 ± 1.42 pCi/L).						
STW-868	WATER	Feb, 2000	Uranium	5.4 ± 0.2	6.1 ± 3.0	0.9 - 11.3
STW-869	WATER	Mar, 2000	H-3	23,500.0 ± 306.0	23,800.0 ± 2,380.0	19,800.0 - 27,800.0
STW-867	WATER	Mar, 2000	Gr. Alpha	83.6 ± 5.8	58.4 ± 5.8	33.3 - 83.5
Results were recalculated with Am-241 efficiency; 57.80 ± 5.73 pCi/L. Refer to STW-863.						
STW-867	WATER	Mar, 2000	Gr. Beta	15.4 ± 0.9	16.8 ± 1.7	8.1 - 25.5
STW-876	WATER	Mar, 2000	I-131	18.7 ± 0.6	19.9 ± 2.0	18.1 - 28.5
STW-877	WATER	Apr, 2000	Gr. Alpha	52.3 ± 2.3	54.0 ± 13.5	30.8 - 77.2
STW-877	WATER	Apr, 2000	Ra-226	17.5 ± 1.1	18.6 ± 2.8	13.8 - 23.4
STW-877	WATER	Apr, 2000	Ra-228	3.7 ± 0.4	3.6 ± 0.9	2.0 - 5.1
STW-878	WATER	Apr, 2000	Co-60	19.2 ± 0.6	16.9 ± 5.0	8.2 - 25.6
STW-878	WATER	Apr, 2000	Cs-134	81.0 ± 1.3	86.4 ± 5.0	77.7 - 95.1
STW-878	WATER	Apr, 2000	Cs-137	119.0 ± 2.6	123.0 ± 6.2	112.0 - 134.0
STW-878	WATER	Apr, 2000	Gr. Beta	276.0 ± 9.6	289.0 ± 43.4	214.0 - 364.0
STW-878	WATER	Apr, 2000	Sr-89	32.3 ± 3.3	50.7 ± 5.0	42.0 - 59.4
STW-878	WATER	Apr, 2000	Sr-90	11.3 ± 1.0	32.8 ± 5.0	24.1 - 41.5
An error was found in calculation. Result of recalculation: Sr-89, 55.5± 7.2 pCi/L / Sr-90, 30.7 ± 3.0 pCi/L. Results of reanalysis: Sr-89, 47.4 ± 14.5 pCi/L / Sr-90, 33.0 ± 1.35 pCi/L. Both results are within limits.						
STW-879	WATER	Jun, 2000	Ba-133	22.4 ± 2.1	25.5 ± 5.0	16.8 - 34.2
STW-879	WATER	Jun, 2000	Co-60	69.9 ± 3.7	65.6 ± 5.0	56.9 - 74.3
STW-879	WATER	Jun, 2000	Cs-134	13.5 ± 0.8	13.8 ± 5.0	5.1 - 22.5
STW-879	WATER	Jun, 2000	Cs-137	232.0 ± 7.8	238.0 ± 11.9	217.0 - 259.0
STW-879	WATER	Jun, 2000	Zn-65	50.9 ± 3.8	54.6 ± 5.5	45.3 - 63.9
STW-880	WATER	Jun, 2000	Ra-226	2.8 ± 0.2	3.0 ± 0.5	2.2 - 3.8
STW-880	WATER	Jun, 2000	Ra-228	10.0 ± 0.9	13.0 ± 3.3	7.4 - 18.6
STW-880	WATER	Jun, 2000	Uranium	57.0 ± 4.4	63.4 ± 6.3	52.6 - 74.2
STW-883	WATER	Jul, 2000	Gr. Alpha	6.9 ± 1.1	7.2 ± 5.0	0.0 - 15.9
STW-883	WATER	Jul, 2000	Gr. Beta	88.8 ± 9.8	87.5 ± 10.0	70.2 - 105.0
STW-884	WATER	Aug, 2000	H-3	8,740.0 ± 174.0	8,320.0 ± 832.0	6,910.0 - 9,730.0
STW-891	WATER	Sep, 2000	Ra-226	17.9 ± 1.3	18.9 ± 2.8	14.0 - 23.8
STW-891	WATER	Sep, 2000	Ra-228	5.7 ± 0.5	6.2 ± 1.6	3.5 - 8.8

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] Laboratory results ±2 Sigma[c]	ERA Result[d] 1s, N=1	Control Limits
STW-891	WATER	Sep, 2000	Uranium	10.3 ± 0.1	11.9 ± 3.0	6.7 - 17.1
STW-892	WATER	Oct, 2000	I-131	16.9 ± 0.3	15.9 ± 1.6	10.7 - 21.1
STW-892	WATER	Oct, 2000	I-131(g)	17.1 ± 5.4	15.9 ± 1.6	10.7 - 21.1
STW-893	WATER	Oct, 2000	Gr. Alpha	66.3 ± 5.3	74.4 ± 18.6	42.2 - 107.0
STW-893	WATER	Oct, 2000	Ra-226	10.1 ± 1.0	10.5 ± 1.6	7.8 - 13.2
STW-893	WATER	Oct, 2000	Ra-228	21.2 ± 0.5	19.4 ± 4.9	11.0 - 27.8
STW-893	WATER	Oct, 2000	Uranium	41.4 ± 1.9	44.5 ± 4.5	36.8 - 52.2
STW-894	WATER	Oct, 2000	Co-60	93.4 ± 1.6	91.1 ± 5.0	82.4 - 99.8
STW-894	WATER	Oct, 2000	Cs-134	54.8 ± 0.3	59.8 ± 5.0	51.1 - 68.5
STW-894	WATER	Oct, 2000	Cs-137	45.5 ± 2.3	45.0 ± 5.0	36.3 - 53.7
STW-894	WATER	Oct, 2000	Cs-137	45.5 ± 2.3	45.0 ± 5.0	36.3 - 53.7
STW-894	WATER	Oct, 2000	Gr. Beta	209.0 ± 7.9	256.0 ± 38.4	189.0 - 323.0
STW-894	WATER	Oct, 2000	Sr-89	32.8 ± 3.0	41.3 ± 5.0	32.6 - 50.0
STW-894	WATER	Oct, 2000	Sr-90	16.0 ± 2.4	18.0 ± 5.0	9.3 - 26.7
STW-895	WATER	Nov, 2000	Gr. Alpha	50.3 ± 2.6	60.3 ± 15.1	34.4 - 86.2
STW-895	WATER	Nov, 2000	Gr. Beta	28.6 ± 1.3	25.5 ± 5.0	16.8 - 34.2
STW-896	WATER	Nov, 2000	Ba-133	78.0 ± 2.0	82.2 ± 8.2	68.0 - 96.4
STW-896	WATER	Nov, 2000	Co-60	30.8 ± 1.7	27.8 ± 5.0	19.1 - 36.5
STW-896	WATER	Nov, 2000	Cs-134	67.2 ± 3.3	76.0 ± 5.0	67.3 - 84.7
The mean value for Cs-134 of all participating laboratories was 70.7 pCi/L. Other gamma emitters are within limits, the counting efficiency is not suspect. Library values were reviewed and found to be correct.						
STW-896	WATER	Nov, 2000	Cs-137	109.0 ± 1.0	106.0 ± 5.3	96.8 - 115.0
STW-896	WATER	Nov, 2000	Zn-65	81.5 ± 7.4	79.0 ± 7.9	65.3 - 92.7

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

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

[c] Unless otherwise indicated, the laboratory results are given as the mean ± 2 standard deviations for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

12-31-00

ATTACHMENT A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

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

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

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

[b] Laboratory limit.

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

Lab Code	TLD Type	Date	Measurement	mR: Laboratory results ± 2 Sigma	mR: Known Value	mR: Average ± 2 Sigma (All Participants)
Environmental, Inc.						
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #1	14.5 ± 0.5	15.4	-
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #2	29.3 ± 1.0	31.8	-
1999-1	LiF-100 Chips	Mar, 1999	Reader 1, #3	60.0 ± 0.2	59.1	-
Environmental, Inc.						
1999-2	$CaSO_4$: Dy Cards	Mar, 1999	Reader 1, #1	18.3 ± 0.5	15.4	-
1999-2	$CaSO_4$: Dy Cards	Mar, 1999	Reader 1, #2	35.9 ± 1.3	31.8	-
1999-2	$CaSO_4$: Dy Cards	Mar, 1999	Reader 1, #3	66.5 ± 4.4	59.1	-

Chips and Cards were irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March, 1999.

Environmental, Inc.						
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #1	14.4 ± 0.2	17.8	-
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #2	32.4 ± 0.1	35.5	-
2000-1	LiF-100 Chips	Mar, 2000	Reader 1, #3	61.8 ± 0.9	62.2	-
Environmental, Inc.						
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #1	21.3 ± 0.3	17.8	-
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #2	40.1 ± 1.9	35.5	-
2000-2	$CaSO_4$: Dy Cards	Mar, 2000	Reader 1, #3	69.9 ± 3.5	62.2	-

Chips and Cards were irradiated by Teledyne Brown Engineering, Westwood, New Jersey, in March, 2000.

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-271	WATER	Jan, 2000	Ra-226	14.81 ± 0.44	13.76	9.63 - 17.89
SPW-271	WATER	Jan, 2000	Ra-228	16.97 ± 2.12	14.68	10.28 - 19.08
SPW-272	WATER	Jan, 2000	Gr. Alpha	44.35 ± 1.95	41.14	20.57 - 61.71
SPW-272	WATER	Jan, 2000	Gr. Beta	31.19 ± 5.02	29.50	19.50 - 39.50
SPW-756	WATER	Jan, 2000	H-3	56339.00 ± 666.00	57667.00	46133.60 - 69200.40
SPW-480	WATER	Jan, 2000	Co-60	32.33 ± 2.87	28.36	18.36 - 38.36
SPW-480	WATER	Jan, 2000	Cs-137	35.58 ± 4.20	36.83	26.83 - 46.83
SPMI-482	MILK	Jan, 2000	Sr-90	16.93 ± 1.07	14.10	4.10 - 24.10
SPAP-484	AIR FILTER	Jan, 2000	Cs-137	1.84 ± 0.01	1.72	1.03 - 2.41
SPW-917	WATER	Feb, 2000	Gr. Alpha	16.59 ± 1.90	41.10	20.55 - 61.65
An insufficient amount of Am-241 spike was available for an accurate test.						
SPW-917	WATER	Feb, 2000	Gr. Beta	32.61 ± 2.06	29.43	19.43 - 39.43
SPW-918	WATER	Feb, 2000	Ra-226	21.15 ± 0.49	20.68	14.48 - 26.88
SPW-918	WATER	Feb, 2000	Ra-228	14.24 ± 1.64	14.51	10.16 - 18.86
SPVE-1262	VEGETATION	Mar, 2000	I-131(g)	1.17 ± 0.07	1.12	0.67 - 1.57
SPCH-1264	CHARCOAL CANISTER	Mar, 2000	I-131(g)	0.56 ± 0.02	0.53	0.32 - 0.74
SPMI-1274	MILK	Mar, 2000	I-131	47.02 ± 3.36	48.00	36.00 - 60.00
SPW-1301	WATER	Mar, 2000	I-131	66.03 ± 1.06	76.84	61.47 - 92.21
SPW-1301	WATER	Mar, 2000	I-131(g)	80.31 ± 6.28	76.84	66.84 - 86.84
SPW-1477	WATER	Mar, 2000	Gr. Alpha	32.09 ± 1.82	41.13	20.57 - 61.70
SPW-1477	WATER	Mar, 2000	Gr. Beta	29.20 ± 1.56	29.38	19.38 - 39.38
SPW-1478	WATER	Mar, 2000	Ra-226	21.78 ± 0.47	20.69	14.48 - 26.90
SPW-1478	WATER	Mar, 2000	Ra-228	14.41 ± 1.70	14.39	10.07 - 18.71
SPMI-2275	MILK	Apr, 2000	Cs-134	33.53 ± 2.82	32.12	22.12 - 42.12
SPMI-2275	MILK	Apr, 2000	Cs-137	36.38 ± 4.94	36.66	26.66 - 46.66
SPMI-2275	MILK	Apr, 2000	I-131	46.06 ± 0.82	55.50	44.40 - 66.60
SPW-2277	WATER	Apr, 2000	Ra-226	20.51 ± 0.44	20.68	14.48 - 26.88
SPW-2278	WATER	Apr, 2000	Gr. Alpha	40.22 ± 2.50	38.44	19.22 - 57.66
SPW-2278	WATER	Apr, 2000	Gr. Beta	32.63 ± 1.81	29.30	19.30 - 39.30
SPW-2278	WATER	Apr, 2000	Ra-228	14.91 ± 1.70	14.25	9.98 - 18.53
SPW-2279	WATER	Apr, 2000	Co-60	37.12 ± 3.86	34.54	24.54 - 44.54
SPW-2279	WATER	Apr, 2000	Cs-134	34.70 ± 3.32	32.12	22.12 - 42.12
SPW-2279	WATER	Apr, 2000	Cs-137	39.60 ± 5.12	36.66	26.66 - 46.66
SPW-2279	WATER	Apr, 2000	I-131	49.92 ± 0.67	55.50	44.40 - 66.60
SPW-2279	WATER	Apr, 2000	I-131(g)	60.63 ± 6.58	55.50	45.50 - 65.50
SPW-2281	WATER	Apr, 2000	H-3	58829.00 ± 682.00	56996.00	45596.80 - 68395.20
SPAP-3097	AIR FILTER	Apr, 2000	Cs-137	1.81 ± 0.02	1.71	1.03 - 2.39
SPW-3093	WATER	May, 2000	I-131	83.39 ± 1.06	85.38	68.30 - 102.46
SPW-3094	WATER	May, 2000	Ra-226	20.86 ± 0.42	20.68	14.48 - 26.88
SPW-3094	WATER	May, 2000	Ra-228	14.17 ± 1.59	14.12	9.88 - 18.36
SPW-3095	WATER	May, 2000	Gr. Alpha	38.99 ± 2.09	38.44	19.22 - 57.66

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a]		
				Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-3095	WATER	May, 2000	Gr. Beta	30.65 ± 1.53	29.30	19.30 - 39.30
SPAP-274	AIR FILTER	May, 2000	Gr. Beta	5.08 ± 0.03	5.97	-4.03 - 15.97
SPMI-3138	MILK	May, 2000	I-131	85.08 ± 1.05	85.38	68.30 - 102.46
SPF-3180	FISH	May, 2000	Cs-134	0.52 ± 0.02	0.50	0.30 - 0.70
SPF-3180	FISH	May, 2000	Cs-137	0.65 ± 0.04	0.59	0.35 - 0.82
SPAP-3902	AIR FILTER	Jun, 2000	Gr. Beta	5.81 ± 0.03	5.35	-4.65 - 15.35
SPF-5182	FISH	Jun, 2000	Cs-134	0.60 ± 0.04	0.59	0.35 - 0.83
SPF-5182	FISH	Jun, 2000	Cs-137	0.60 ± 0.05	0.58	0.35 - 0.81
SPW-3911	WATER	Jun, 2000	Ra-226	23.73 ± 0.85	20.68	14.48 - 26.88
SPW-3911	WATER	Jun, 2000	Ra-228	20.43 ± 1.77	20.75	14.53 - 26.98
SPW-3910	WATER	Jun, 2000	Gr. Alpha	38.28 ± 2.12	38.44	19.22 - 57.66
SPW-3910	WATER	Jun, 2000	Gr. Beta	35.14 ± 1.74	29.22	19.22 - 39.22
SPW-4342	WATER	Jun, 2000	Sr-89	73.70 ± 4.77	81.00	64.80 - 97.20
SPW-4342	WATER	Jun, 2000	Sr-90	58.13 ± 2.17	55.90	44.72 - 67.08
SPW-4687	WATER	Jul, 2000	Ra-226	21.07 ± 0.56	20.68	14.48 - 26.88
SPW-4687	WATER	Jul, 2000	Ra-228	16.35 ± 1.70	20.75	14.53 - 26.98
SPW-4688	WATER	Jul, 2000	H-3	56205.00 ± 663.00	56228.00	44982.40 - 67473.60
SPAP-4807	AIR FILTER	Jul, 2000	Gr. Beta	6.07 ± 0.02	5.96	-4.04 - 15.96
SPAP-4809	AIR FILTER	Jul, 2000	Cs-137	1.82 ± 0.02	1.71	1.03 - 2.39
SPMI-4856	MILK	Jul, 2000	Cs-134	33.24 ± 3.74	29.56	19.56 - 39.56
SPMI-4856	MILK	Jul, 2000	Cs-137	39.80 ± 6.77	36.45	26.45 - 46.45
SPMI-4856	MILK	Jul, 2000	Sr-89	46.35 ± 5.10	56.34	45.07 - 67.61
SPMI-4856	MILK	Jul, 2000	Sr-90	70.47 ± 2.06	69.73	55.78 - 83.68
SPW-5372	WATER	Jul, 2000	Co-60	33.31 ± 4.61	33.24	23.24 - 43.24
SPW-5372	WATER	Jul, 2000	Cs-134	59.70 ± 4.57	58.26	48.26 - 68.26
SPW-5372	WATER	Jul, 2000	Cs-137	40.00 ± 5.58	36.42	26.42 - 46.42
SPW-4686	WATER	Aug, 2000	Gr. Alpha	34.12 ± 1.71	38.43	19.22 - 57.65
SPW-4686	WATER	Aug, 2000	Gr. Beta	35.42 ± 1.51	29.21	19.21 - 39.21
SPW-5564	WATER	Aug, 2000	Sr-89	62.97 ± 4.73	67.61	54.09 - 81.13
SPW-5564	WATER	Aug, 2000	Sr-90	65.40 ± 2.47	55.70	44.56 - 66.84
SPW-5792	WATER	Aug, 2000	Ra-226	12.82 ± 0.30	13.79	9.65 - 17.93
SPW-5792	WATER	Aug, 2000	Ra-228	15.00 ± 1.21	13.69	9.58 - 17.80
SPW-6631	WATER	Sep, 2000	Ra-228	22.20 ± 2.20	20.32	14.22 - 26.42
SPW-6632	WATER	Sep, 2000	Ra-226	13.58 ± 0.29	13.79	9.65 - 17.93
SPW-6632	WATER	Sep, 2000	Ra-228	18.84 ± 2.59	20.32	14.22 - 26.42
SPW-6633	WATER	Sep, 2000	Fe-55	1757.00 ± 674.00	1852.00	1481.60 - 2222.40
SPW-5791	WATER	Sep, 2000	Gr. Alpha	52.28 ± 9.41	69.00	34.50 - 103.50
SPW-5791	WATER	Sep, 2000	Gr. Beta	34.60 ± 4.71	29.10	19.10 - 39.10
SPW-6630	WATER	Sep, 2000	Gr. Alpha	71.54 ± 7.15	69.14	34.57 - 103.71
SPW-6630	WATER	Sep, 2000	Gr. Beta	37.78 ± 1.62	29.04	19.04 - 39.04
SPW-7744	WATER	Oct, 2000	Ra-226	12.36 ± 0.25	13.79	9.65 - 17.93

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[a] Laboratory results 2s, n=1[b]	Known Activity	Control[c] Limits
SPW-7744	WATER	Oct, 2000	Ra-228	10.37 ± 1.15	13.40	9.38 - 17.42
SPW-7745	WATER	Oct, 2000	H-3	54650.00 ± 643.00	55391.00	44312.80 - 66469.20
SPAP-7764	AIR FILTER	Oct, 2000	Gr. Beta	6.14 ± 0.03	5.91	-4.09 - 15.91
SPAP-7766	AIR FILTER	Oct, 2000	Cs-137	1.84 ± 0.01	1.69	1.01 - 2.37
SPMI-8347	MILK	Oct, 2000	Cs-134	29.18 ± 6.51	26.83	16.83 - 36.83
SPMI-8347	MILK	Oct, 2000	Cs-134	29.37 ± 3.63	26.83	16.83 - 36.83
SPMI-8347	MILK	Oct, 2000	Cs-137	39.04 ± 8.76	36.20	26.20 - 46.20
SPMI-8347	MILK	Oct, 2000	Cs-137	34.89 ± 5.71	36.20	26.20 - 46.20
SPF-8349	FISH	Oct, 2000	Cs-134	0.56 ± 0.02	0.54	0.32 - 0.75
SPF-8349	FISH	Oct, 2000	Cs-137	0.92 ± 0.04	0.87	0.52 - 1.22
SPW-8369	WATER	Oct, 2000	Co-60	32.49 ± 1.86	32.19	22.19 - 42.19
SPW-8369	WATER	Oct, 2000	Cs-134	55.87 ± 1.71	53.66	43.66 - 63.66
SPW-8369	WATER	Oct, 2000	Cs-137	36.46 ± 2.73	36.21	26.21 - 46.21
SPW-7743	WATER	Oct, 2000	Gr. Alpha	51.28 ± 2.28	69.10	34.55 - 103.65
SPW-7743	WATER	Oct, 2000	Gr. Beta	36.86 ± 1.66	29.00	19.00 - 39.00
SPW-9101	WATER	Nov, 2000	Ra-226	14.35 ± 0.24	13.79	9.65 - 17.93
SPW-9101	WATER	Nov, 2000	Ra-228	22.14 ± 1.56	20.09	14.06 - 26.12
SPW-9102	WATER	Dec, 2000	Gr. Alpha	77.76 ± 3.02	69.14	34.57 - 103.71
SPW-9102	WATER	Dec, 2000	Gr. Beta	36.71 ± 1.65	28.99	18.99 - 38.99
SPW-9726	WATER	Dec, 2000	Gr. Alpha	43.03 ± 2.18	69.14	34.57 - 103.71
SPW-9726	WATER	Dec, 2000	Gr. Beta	32.17 ± 1.55	28.89	18.89 - 38.89
SPW-9727	WATER	Dec, 2000	Ra-226	13.35 ± 0.29	13.79	9.65 - 17.93
SPW-9727	WATER	Dec, 2000	Ra-228	15.44 ± 1.23	19.75	13.83 - 25.68
SPCH-10228	CHARCOAL CANISTER	Dec, 2000	Ba-133	1.80 ± 0.05	2.11	1.26 - 2.95

[a] All results are in pCi/L, except for elemental potassium (K) in milk, which are in mg/L.; air filter samples, which are in pCi/Filter; and food products, which are in mg/kg.

[b] All samples are the results of single determinations.

[c] Control limits are based on Attachment A, page A2 of this report.

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

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-270	WATER	Jan 2000	Gr. Alpha	< 0.50	0.52 ± 0.41	< 1.0
SPW-270	WATER	Jan 2000	Gr. Beta	< 1.50	-0.34 ± 1.11	< 3.2
SPW-270	WATER	Jan 2000	Ra-226		0.06 ± 0.01	< 1.0
SPW-270	WATER	Jan 2000	Ra-228	< 0.94	0.14 ± 0.45	< 2.0
SPW-447	WATER	Jan 2000	H-3	< 184.00	-54.70 ± 88.60	< 200.0
SPW-481	WATER	Jan 2000	Co-60	< 2.42		< 10.0
SPW-481	WATER	Jan 2000	Cs-134	< 3.99		< 10.0
SPW-481	WATER	Jan 2000	Cs-137	< 2.90		< 10.0
SPMI-483	MILK	Jan 2000	Cs-137	< 2.73		< 10.0
SPMI-483	MILK	Jan 2000	Sr-90		1.03 ± 0.40	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPAP-485	AIR FILTER	Jan 2000	Cs-137	< 1.64		< 100.0
SPW-919	WATER	Feb 2000	Gr. Alpha	< 0.80	0.56 ± 0.61	< 1.0
SPW-919	WATER	Feb 2000	Gr. Beta	< 1.65	0.11 ± 1.16	< 3.2
SPW-919	WATER	Feb 2000	Ra-226	< 0.02	0.02 ± 0.01	< 1.0
SPW-919	WATER	Feb 2000	Ra-228	< 0.60	0.02 ± 0.01	< 2.0
SPVE-1263	VEGETATION	Mar 2000	Cs-134	< 11.48		< 100.0
SPVE-1263	VEGETATION	Mar 2000	Cs-137	< 24.82		< 100.0
SPCH-1265	CHARCOAL CANISTER	Mar 2000	I-131(g)	< 7.00		< 9.6
SPMI-1292	MILK	Mar 2000	I-131	< 0.32	0.05 ± 0.18	< 0.5
SPMI-1292	MILK	Mar 2000	I-131(g)	< 4.60		< 20.0
SPW-1302	WATER	Mar 2000	I-131	< 0.30	0.01 ± 0.14	< 0.5
SPW-1479	WATER	Mar 2000	Gr. Alpha	< 0.84	-0.32 ± 0.53	< 1.0
SPW-1479	WATER	Mar 2000	Gr. Beta	< 1.86	-1.39 ± 1.19	< 3.2
SPW-1479	WATER	Mar 2000	Ra-226	< 0.01	0.06 ± 0.01	< 1.0
SPW-1479	WATER	Mar 2000	Ra-228	< 1.00	1.17 ± 0.60	< 2.0
SPMI-2276	MILK	Apr 2000	Cs-134	< 4.20		< 10.0
SPMI-2276	MILK	Apr 2000	Cs-137	< 3.33		< 10.0
SPMI-2276	MILK	Apr 2000	I-131	< 0.50	0.32 ± 0.30	< 0.5
SPW-2280	WATER	Apr 2000	Co-60	< 2.78		< 10.0
SPW-2280	WATER	Apr 2000	Cs-134	< 3.56		< 10.0

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Laboratory results (4.66 Sigma) Activity[b]	Acceptance Criteria (4.66 Sigma)
SPW-2280	WATER	Apr 2000	Cs-137	< 2.81		< 10.0
SPW-2280	WATER	Apr 2000	Gr. Alpha	< 0.60	0.55 ± 0.45	< 1.0
SPW-2280	WATER	Apr 2000	Gr. Beta	< 1.66	0.62 ± 1.11	< 3.2
SPW-2280	WATER	Apr 2000	I-131	< 0.29	-0.16 ± 0.19	< 0.5
SPW-2280	WATER	Apr 2000	I-131(g)	< 3.42		< 20.0
SPW-2280	WATER	Apr 2000	Ra-226		0.03 ± 0.01	< 1.0
SPW-2280	WATER	Apr 2000	Ra-228	< 0.87	0.65 ± 0.47	< 2.0
SPW-2282	WATER	Apr 2000	H-3	< 151.60	-5.40 ± 74.90	< 200.0
SPAP-3098	AIR FILTER	Apr 2000	Cs-137	< 1.37		< 100.0
SPW-3096	WATER	May 2000	Gr. Alpha	< 0.68		< 1.0
SPW-3096	WATER	May 2000	Gr. Beta	< 1.62		< 3.2
SPW-3096	WATER	May 2000	Ra-226		0.05 ± 0.01	< 1.0
SPW-3096	WATER	May 2000	Ra-228	< 0.90	0.05 ± 0.01	< 2.0
SPAP-273	AIR FILTER	May 2000	Gr. Beta	< 0.54	0.90 ± 0.32	< 3.2
SPMI-3139	MILK	May 2000	I-131	< 0.33		< 0.5
SPF-3181	FISH	May 2000	Cs-134	< 3.02		< 100.0
SPF-3181	FISH	May 2000	Cs-137	< 4.99		< 100.0
SPAP-3903	AIR FILTER	Jun 2000	Gr. Beta	< 0.48		< 3.2
SPW-3912	WATER	Jun 2000	Gr. Alpha	< 0.35	0.28 ± 0.28	< 1.0
SPW-3912	WATER	Jun 2000	Gr. Beta	< 1.22	0.54 ± 0.86	< 3.2
SPW-3912	WATER	Jun 2000	Ra-226		0.04 ± 0.02	< 1.0
SPW-3912	WATER	Jun 2000	Ra-228	< 0.65		< 2.0
SPMI-4343	MILK	Jun 2000	Sr-89	< 0.73		< 5.0
SPMI-4343	MILK	Jun 2000	Sr-90	< 0.56		< 1.0
SPW-4689	WATER	Jul 2000	Ra-226		0.03 ± 0.01	< 1.0
SPW-4689	WATER	Jul 2000	Ra-228	< 0.93	1.11 ± 0.55	< 2.0
SPW-4690	WATER	Jul 2000	H-3	< 178.00	18.57 ± 89.13	< 200.0
SPW-4808	WATER	Jul 2000	Gr. Alpha	< 0.45		< 1.0
SPAP-4810	AIR FILTER	Jul 2000	Cs-137	< 2.18		< 100.0
SPMI-4857	MILK	Jul 2000	Cs-137	< 6.13		< 10.0
SPMI-4857	MILK	Jul 2000	I-131(g)	< 7.19		< 20.0

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPMI-4857	MILK	Jul 2000	Sr-89	< 0.66		< 5.0
SPMI-4857	MILK	Jul 2000	Sr-90		1.15 ± 0.32	< 1.0
Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.						
SPF-5183	FISH	Jul 2000	Cs-134	< 17.71		< 100.0
SPF-5183	FISH	Jul 2000	Cs-137	< 12.81		< 100.0
SPW-4689	WATER	Jul 2000	Gr. Alpha	< 0.50		< 1.0
SPW-4689	WATER	Jul 2000	Gr. Beta	< 1.20		< 3.2
SPW-5373	WATER	Jul 2000	Co-60	< 5.20		< 10.0
SPW-5373	WATER	Jul 2000	Cs-134	< 4.80		< 10.0
SPW-5373	WATER	Jul 2000	Cs-137	< 4.00		< 10.0
SPW-5565	WATER	Aug 2000	Sr-89	< 1.56	-0.64 ± 1.11	< 5.0
SPW-5565	WATER	Aug 2000	Sr-90	< 0.59	0.17 ± 0.30	< 1.0
SPW-5793	WATER	Aug 2000	Gr. Alpha	< 0.51	0.02 ± 0.36	< 1.0
SPW-5793	WATER	Aug 2000	Ra-226		0.05 ± 0.02	< 1.0
SPW-5793	WATER	Aug 2000	Ra-228	< 0.95	0.26 ± 0.47	< 2.0
SPW-5793	WATER	Aug 2000	Gr. Beta	< 1.40	-0.13 ± 1.01	< 3.2
SPW-6634	WATER	Sep 2000	Fe-55	< 617.00	-105.90 ± 453.40	< 1000.0
SPW-6634	WATER	Sep 2000	Ra-226	< 0.01	0.03 ± 0.01	< 1.0
SPW-6634	WATER	Sep 2000	Ra-228	< 0.99	0.36 ± 0.51	< 2.0
SPW-6634	WATER	Sep 2000	Gr. Alpha	< 0.67	-0.22 ± 0.45	< 1.0
SPW-6634	WATER	Sep 2000	Gr. Beta	< 1.60	-0.20 ± 1.12	< 3.2
SPSO-10595	SOIL	Oct 2000	Cs-134	< 16.87		< 100.0
SPSO-10595	SOIL	Oct 2000	Cs-137	< 9.40		< 100.0
SPW-7746	WATER	Oct 2000	Ra-226	< 0.03	0.04 ± 0.02	< 1.0
SPW-7746	WATER	Oct 2000	Ra-228	< 1.08	0.00 ± 0.87	< 2.0
SPW-7747	WATER	Oct 2000	H-3	< 158.00	-38.00 ± 77.00	< 200.0
SPAP-7765	AIR FILTER	Oct 2000	Gr. Beta	< 0.64	0.00 ± 0.00	< 3.2
SPAP-7767	AIR FILTER	Oct 2000	Co-60	< 0.19		< 100.0
SPAP-7767	AIR FILTER	Oct 2000	Cs-134	< 0.32		< 100.0
SPAP-7767	AIR FILTER	Oct 2000	Cs-137	< 2.32		< 100.0
SPMI-8348	MILK	Oct 2000	Cs-134	< 3.35		< 10.0
SPMI-8348	MILK	Oct 2000	Cs-137	< 3.07		< 10.0

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

Lab Code	Sample Type	Sample Date	Analysis	Concentration pCi/L[a]. Laboratory results (4.66 Sigma) LLD	Activity[b]	Acceptance Criteria (4.66 Sigma)
SPF-8350	FISH	Oct 2000	Cs-134	< 10.26		< 100.0
SPF-8350	FISH	Oct 2000	Cs-137	< 10.51		< 100.0
SPW-8370	WATER	Oct 2000	Co-60	< 4.67		< 10.0
SPW-8370	WATER	Oct 2000	Cs-134	< 5.28		< 10.0
SPW-8370	WATER	Oct 2000	Cs-137	< 4.93		< 10.0
SPW-7746	WATER	Oct 2000	Gr. Alpha	< 0.46	0.06 ± 0.33	< 1.0
SPW-7746	WATER	Oct 2000	Gr. Beta	< 1.24	0.00 ± 0.87	< 3.2
SPW-9103	WATER	Nov 2000	Ra-226	< 0.01	0.02 ± 0.01	< 1.0
SPW-9103	WATER	Nov 2000	Ra-228	< 1.00	0.14 ± 0.48	< 2.0
SPW-9729	WATER	Dec 2000	Gr. Alpha	< 0.46	0.23 ± 0.36	< 1.0
SPW-9729	WATER	Dec 2000	Gr. Beta	< 1.33	-0.46 ± 0.98	< 3.2
SPW-9729	WATER	Dec 2000	Ra-226	< 0.02	0.05 ± 0.01	< 1.0
SPW-9729	WATER	Dec 2000	Ra-228	< 0.70	0.22 ± 0.35	< 2.0
SPW-9103	WATER	Dec 2000	Gr. Alpha	< 0.51	-0.11 ± 0.37	< 1.0
SPW-9103	WATER	Dec 2000	Gr. Beta	< 1.21	0.55 ± 0.91	< 3.2
SPCH-10583	CHARCOAL CANISTER	Dec 2000	I-131(g)	< 1.49		< 9.6

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

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
CF-23, 24	Jan, 2000	Gr. Beta	13.05 ± 0.39	12.46 ± 0.36	12.75 ± 0.26
CF-23, 24	Jan, 2000	K-40	13.00 ± 0.90	11.73 ± 0.79	12.36 ± 0.60
CF-23, 24	Jan, 2000	Sr-90	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00
WW-65, 66	Jan, 2000	Co-60	-0.53 ± 1.62	0.44 ± 2.11	-0.04 ± 1.33
WW-65, 66	Jan, 2000	Cs-137	-2.13 ± 1.70	0.41 ± 2.35	-0.86 ± 1.45
WW-65, 66	Jan, 2000	H-3	131.62 ± 84.13	182.81 ± 86.33	157.22 ± 60.27
WW-686, 687	Jan, 2000	Gr. Beta	4.76 ± 1.22	4.59 ± 1.27	4.67 ± 0.88
AP-1204, 1205	Jan, 2000	Be-7	0.19 ± 0.09	0.10 ± 0.07	0.14 ± 0.06
SW-68, 69	Jan, 2000	K-40 (FP)	1.30 ± 0.13	1.30 ± 0.13	1.30 ± 0.09
MI-277, 278	Jan, 2000	I-131	-0.08 ± 0.27	-0.00 ± 0.26	-0.04 ± 0.19
MI-277, 278	Jan, 2000	K-40	1,664.70 ± 113.20	1,431.30 ± 90.30	1,548.00 ± 72.40
MI-277, 278	Jan, 2000	Sr-90	0.63 ± 0.42	0.51 ± 0.40	0.57 ± 0.29
SW-728, 729	Jan, 2000	Co-60	0.39 ± 1.79	1.04 ± 1.53	0.72 ± 1.18
SW-728, 729	Jan, 2000	Cs-137	-0.67 ± 1.86	1.22 ± 1.38	0.27 ± 1.16
SW-403, 404	Jan, 2000	H-3	795.21 ± 109.04	857.22 ± 111.09	826.22 ± 77.83
SWT-437, 438	Jan, 2000	Gr. Beta	1.73 ± 0.57	2.60 ± 0.58	2.16 ± 0.41
PW-637, 638	Jan, 2000	Co-60	4.90 ± 2.92	-2.56 ± 2.80	1.17 ± 2.02
PW-637, 638	Jan, 2000	Cs-137	2.73 ± 2.51	-1.68 ± 2.71	0.53 ± 1.85
PW-637, 638	Jan, 2000	Gr. Beta	1.67 ± 1.31	4.00 ± 1.59	2.83 ± 1.03
SW-587, 588	Jan, 2000	Co-60	-1.24 ± 1.86	-0.27 ± 1.79	-0.76 ± 1.29
SW-587, 588	Jan, 2000	Cs-137	1.35 ± 1.94	0.23 ± 1.80	0.79 ± 1.32
SW-587, 588	Jan, 2000	Gr. Beta	3.80 ± 1.56	6.76 ± 1.75	5.28 ± 1.17
SW-611, 612	Jan, 2000	H-3	2,229.26 ± 158.61	2,115.19 ± 155.80	2,172.23 ± 111.16
SW-459, 460	Feb, 2000	Gr. Beta	2.15 ± 0.94	2.79 ± 0.94	2.47 ± 0.66
WW-774, 775	Feb, 2000	Co-60	4.26 ± 3.48	1.61 ± 4.46	2.93 ± 2.83
WW-774, 775	Feb, 2000	Cs-137	-1.19 ± 3.78	2.37 ± 4.65	0.59 ± 2.99
WW-774, 775	Feb, 2000	H-3	2,841.35 ± 174.48	2,566.76 ± 168.19	2,704.05 ± 121.17
SW-707, 708	Feb, 2000	Gr. Alpha	2.20 ± 1.73	0.16 ± 1.29	1.18 ± 1.08
SW-707, 708	Feb, 2000	Gr. Beta	7.90 ± 1.70	7.70 ± 1.70	7.80 ± 1.20
SW-707, 708	Feb, 2000	H-3	117.00 ± 92.00	69.00 ± 90.00	93.00 ± 64.35
CW-854, 855	Feb, 2000	Gr. Beta	2.13 ± 1.36	1.34 ± 1.25	1.74 ± 0.93
SW-881, 882	Feb, 2000	H-3	1,794.91 ± 145.81	1,762.31 ± 144.95	1,778.61 ± 102.80
SW-959, 960	Feb, 2000	Gr. Alpha	1.04 ± 1.00	0.92 ± 0.67	0.98 ± 0.60
SW-959, 960	Feb, 2000	Gr. Beta	1.24 ± 0.89	1.79 ± 0.90	1.51 ± 0.63
PW-1055, 1056	Feb, 2000	Co-60	-0.72 ± 3.18	1.73 ± 1.89	0.51 ± 1.85
PW-1055, 1056	Feb, 2000	Cs-137	0.55 ± 2.81	0.90 ± 1.86	0.72 ± 1.69
PW-1055, 1056	Feb, 2000	Gr. Beta	2.40 ± 1.52	2.20 ± 1.50	2.30 ± 1.07

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
MI-1079, 1080	Mar, 2000	Calcium	0.79 ± 0.08	0.78 ± 0.08	0.79 ± 0.06
MI-1079, 1080	Mar, 2000	K-40	1,229.00 ± 138.00	1,387.00 ± 162.00	1,308.00 ± 106.40
MI-1079, 1080	Mar, 2000	Sr-90	0.90 ± 0.40	1.70 ± 0.50	1.30 ± 0.32
CW-1156, 1157	Mar, 2000	H-3	1,994.51 ± 143.09	2,012.54 ± 143.55	2,003.53 ± 101.34
SW-1967, 1968	Mar, 2000	Gr. Beta	11.96 ± 1.31	12.57 ± 1.31	12.27 ± 0.93
SW-2468, 2469	Mar, 2000	Sr-90	0.93 ± 0.45	0.50 ± 0.29	0.72 ± 0.27
WW-1402, 1403	Mar, 2000	H-3	93.34 ± 97.05	60.63 ± 95.75	76.98 ± 68.17
LW-1269, 1270	Mar, 2000	Gr. Beta	1.97 ± 0.57	3.22 ± 0.69	2.60 ± 0.45
AP-,	Mar, 2000	Be-7	0.06 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
MI-1541, 1542	Mar, 2000	K-40	1,380.00 ± 122.00	1,476.00 ± 158.00	1,428.00 ± 99.81
CW-1571, 1572	Mar, 2000	Gr. Beta	2.29 ± 1.48	1.35 ± 1.27	1.82 ± 0.98
CW-1693, 1694	Mar, 2000	Gr. Beta	0.56 ± 1.18	1.91 ± 1.49	1.24 ± 0.95
SWT-,	Mar, 2000	Gr. Beta	2.36 ± 0.65	2.01 ± 0.57	2.19 ± 0.43
WW-1916, 1917	Mar, 2000	H-3	25.37 ± 90.21	3.90 ± 89.27	14.63 ± 63.46
AP-2155, 2156	Mar, 2000	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
SWU-2547, 2548	Mar, 2000	Sr-90	0.57 ± 0.24	0.55 ± 0.24	0.56 ± 0.17
CW-1798, 1799	Mar, 2000	Gr. Beta	2.73 ± 1.85	0.76 ± 1.71	1.75 ± 1.26
AP-2176, 2177	Mar, 2000	Be-7	0.06 ± 0.01	0.08 ± 0.02	0.07 ± 0.01
WW-2046, 2047	Mar, 2000	H-3	221.85 ± 101.64	185.19 ± 100.24	203.52 ± 71.38
SW-1967, 1968	Apr, 2000	K-40	9.20 ± 0.90	9.10 ± 0.90	9.15 ± 0.64
SW-2241, 2242	Apr, 2000	Gr. Alpha	2.49 ± 1.44	3.15 ± 1.53	2.82 ± 1.05
SW-2241, 2242	Apr, 2000	Gr. Beta	8.37 ± 1.36	7.20 ± 1.29	7.79 ± 0.94
WW-,	Apr, 2000	Gr. Beta	4.20 ± 0.64	4.68 ± 0.73	4.44 ± 0.49
WW-2711, 2712	Apr, 2000	Cs-137	-0.76 ± 2.19	1.43 ± 3.63	0.34 ± 2.12
WW-2711, 2712	Apr, 2000	H-3	3,877.05 ± 192.54	3,951.88 ± 193.99	3,914.46 ± 136.66
WW-2511, 2512	Apr, 2000	H-3	108.10 ± 79.80	127.80 ± 80.70	117.95 ± 56.75
SO-2435, 2436	Apr, 2000	K-40	4.73 ± 0.38	4.83 ± 0.53	4.78 ± 0.33
SS-2669, 2670	Apr, 2000	K-40	8.60 ± 0.55	9.18 ± 0.45	8.89 ± 0.36
SWU-2732, 2733	Apr, 2000	Gr. Beta	3.33 ± 0.68	3.19 ± 0.69	3.26 ± 0.48
PW-2605, 2606	Apr, 2000	Co-60	0.36 ± 1.10	1.05 ± 2.03	0.71 ± 1.16
PW-2605, 2606	Apr, 2000	Cs-137	-0.07 ± 0.93	-0.98 ± 2.37	-0.53 ± 1.27
PW-2605, 2606	Apr, 2000	Gr. Beta	1.51 ± 1.31	2.91 ± 1.39	2.21 ± 0.96
WW-2711, 2712	Apr, 2000	H-3	3,877.00 ± 192.50	3,951.90 ± 194.00	3,914.45 ± 136.65
WW-2711, 2712	Apr, 2000	Co-60	0.97 ± 1.93	0.82 ± 3.64	0.90 ± 2.06
BS-3212, 3213	Apr, 2000	Gr. Beta	7.90 ± 1.97	7.57 ± 1.88	7.74 ± 1.36
SW-,	May, 2000	K-40	1.30 ± 0.13	1.20 ± 0.12	1.25 ± 0.09
MI-2810, 2811	May, 2000	K-40	1,285.00 ± 111.00	1,338.00 ± 127.00	1,311.50 ± 84.34

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SW-3003, 3004	May, 2000	Gr. Beta	5.06 ± 0.73	5.27 ± 0.73	5.17 ± 0.52
F-2831, 2832	May, 2000	Co-60	0.01 ± 0.01	0.00 ± 0.01	0.01 ± 0.01
F-2831, 2832	May, 2000	Cs-137	-0.00 ± 0.01	0.00 ± 0.01	0.00 ± 0.01
WW-3128, 3129	May, 2000	Gr. Beta	5.41 ± 1.35	4.43 ± 1.22	4.92 ± 0.91
BS-3411, 3412	May, 2000	Co-60	-0.00 ± 0.01	0.01 ± 0.01	0.00 ± 0.01
BS-3411, 3412	May, 2000	Cs-137	0.01 ± 0.01	0.00 ± 0.01	0.00 ± 0.00
F-3436, 3437	May, 2000	Co-60	0.01 ± 0.01	0.00 ± 0.01	0.01 ± 0.00
F-3436, 3437	May, 2000	Cs-137	0.00 ± 0.01	-0.00 ± 0.00	-0.00 ± 0.00
F-2978, 2979	May, 2000	K-40	2.72 ± 0.26	2.14 ± 0.30	2.43 ± 0.20
SS-3482, 3483	May, 2000	Cs-137	0.11 ± 0.03	0.12 ± 0.03	0.12 ± 0.02
SS-3482, 3483	May, 2000	K-40	11.26 ± 0.57	11.37 ± 0.54	11.32 ± 0.39
BS-3458, 3459	May, 2000	Co-60	0.01 ± 0.01	0.02 ± 0.01	0.01 ± 0.01
BS-3458, 3459	May, 2000	Cs-137	0.04 ± 0.01	0.03 ± 0.02	0.03 ± 0.01
MI-3510, 3511	May, 2000	Co-60	0.48 ± 3.05	-0.80 ± 2.74	-0.16 ± 2.05
MI-3510, 3511	May, 2000	Cs-137	1.17 ± 2.96	0.38 ± 2.60	0.77 ± 1.97
MI-3510, 3511	May, 2000	I-131	-0.06 ± 0.25	-0.04 ± 0.24	-0.05 ± 0.17
SO-3629, 3630	May, 2000	Cs-137	0.23 ± 0.03	0.20 ± 0.03	0.22 ± 0.02
SO-3629, 3630	May, 2000	Gr. Beta	20.49 ± 2.82	19.14 ± 2.73	19.82 ± 1.96
SO-3629, 3630	May, 2000	K-40	13.03 ± 0.61	12.25 ± 0.57	12.64 ± 0.42
SW-3904, 3905	May, 2000	Gr. Beta	6.27 ± 1.83	7.02 ± 1.90	6.65 ± 1.32
SW-3904, 3905	May, 2000	Co-60	-0.65 ± 1.54	1.32 ± 1.77	0.33 ± 1.17
SW-3904, 3905	May, 2000	Cs-137	0.19 ± 1.22	-0.16 ± 1.15	0.01 ± 0.84
SW-3904, 3905	May, 2000	Gr. Beta	6.27 ± 1.83	7.02 ± 1.90	6.64 ± 1.32
SP-3833, 3834	May, 2000	Gr. Alpha	4.19 ± 1.34	3.22 ± 1.20	3.71 ± 0.90
MI-3105, 3106	May, 2000	K-40	1,460.00 ± 173.00	1,452.00 ± 110.00	1,456.00 ± 102.50
VE-3191, 3192	May, 2000	Be-7	0.42 ± 0.23	0.39 ± 0.16	0.40 ± 0.14
VE-3191, 3192	May, 2000	Gr. Alpha	0.15 ± 0.06	0.28 ± 0.07	0.22 ± 0.05
VE-3191, 3192	May, 2000	Gr. Beta	3.76 ± 0.13	3.88 ± 0.14	3.82 ± 0.10
VE-3191, 3192	May, 2000	K-40	3.58 ± 0.43	3.47 ± 0.72	3.53 ± 0.42
MI-3718, 3719	May, 2000	K-40	1,447.00 ± 165.00	1,444.00 ± 177.00	1,445.50 ± 120.99
DW-3770, 3771	May, 2000	Gr. Beta	5.92 ± 1.32	4.54 ± 1.10	5.23 ± 0.86
MI-3653, 3654	Jun, 2000	K-40	1,407.00 ± 170.00	1,388.00 ± 102.00	1,397.50 ± 99.13
SW-4614, 4615	Jun, 2000	Sr-90	0.50 ± 0.27	0.55 ± 0.27	0.53 ± 0.19
WW-3883, 3884	Jun, 2000	H-3	4,401.80 ± 204.60	4,298.00 ± 202.70	4,349.90 ± 144.00
WW-3883, 3884	Jun, 2000	Co-60	0.91 ± 3.01	-0.28 ± 1.52	0.32 ± 1.69
WW-3883, 3884	Jun, 2000	Cs-137	0.49 ± 2.16	0.66 ± 1.82	0.57 ± 1.41
WW-3883, 3884	Jun, 2000	H-3	4,401.78 ± 204.63	4,297.96 ± 202.67	4,349.87 ± 144.00

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
BS-3980, 3981	Jun, 2000	Cs-137	0.07 ± 0.02	0.08 ± 0.02	0.08 ± 0.01
BS-3980, 3981	Jun, 2000	Cs-137	0.06 ± 0.02	0.07 ± 0.02	0.07 ± 0.01
BS-3980, 3981	Jun, 2000	K-40	1,458.60 ± 69.40	1,421.90 ± 52.20	1,440.25 ± 43.42
VE-4065, 4066	Jun, 2000	K-40	6.37 ± 0.54	6.34 ± 0.51	6.36 ± 0.37
WW-4252, 4253	Jun, 2000	H-3	705.40 ± 114.10	718.90 ± 114.60	712.15 ± 80.86
TSWU-4283, 4284	Jun, 2000	Gr. Beta	3.24 ± 0.63	3.11 ± 0.62	3.18 ± 0.44
F-4438, 4439	Jun, 2000	Gr. Beta	2.25 ± 0.06	2.13 ± 0.06	2.19 ± 0.04
SW-4459, 4460	Jun, 2000	H-3	532.20 ± 108.10	670.50 ± 112.90	601.35 ± 78.15
WW-4480, 4481	Jun, 2000	H-3	601.50 ± 99.50	573.10 ± 108.50	587.30 ± 73.61
SW-4375, 4376	Jun, 2000	Gr. Beta	4.53 ± 1.59	4.43 ± 1.54	4.48 ± 1.11
SW-4375, 4376	Jun, 2000	Cs-137	-0.09 ± 1.61	-0.43 ± 1.39	-0.26 ± 1.06
AP-,	Jun, 2000	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.07 ± 0.01
AP-4712, 4713	Jun, 2000	Be-7	0.07 ± 0.02	0.09 ± 0.02	0.08 ± 0.01
SW-4537, 4538	Jun, 2000	H-3	584.10 ± 108.80	599.20 ± 109.30	591.65 ± 77.11
SL-4636, 4637	Jul, 2000	Be-7	0.93 ± 0.18	0.56 ± 0.12	0.75 ± 0.11
SL-4636, 4637	Jul, 2000	Gr. Beta	2.41 ± 0.32	2.69 ± 0.32	2.55 ± 0.23
SL-4636, 4637	Jul, 2000	K-40	1.25 ± 0.24	1.13 ± 0.30	1.19 ± 0.19
SL-4636, 4637	Jul, 2000	Sr-90	0.04 ± 0.02	0.05 ± 0.03	0.05 ± 0.02
G-4667, 4668	Jul, 2000	Be-7	0.93 ± 0.20	0.98 ± 0.31	0.96 ± 0.18
G-4667, 4668	Jul, 2000	Gr. Beta	6.16 ± 0.13	6.68 ± 0.14	6.42 ± 0.10
G-4667, 4668	Jul, 2000	K-40	7.72 ± 0.51	8.43 ± 0.83	8.08 ± 0.49
WW-4818, 4819	Jul, 2000	H-3	13.30 ± 77.10	29.70 ± 77.90	21.50 ± 54.80
MI-4839, 4840	Jul, 2000	K-40	1,313.00 ± 173.00	1,398.00 ± 161.00	1,355.50 ± 118.16
MI-4949, 4950	Jul, 2000	K-40	1,307.00 ± 56.00	1,346.00 ± 58.00	1,326.50 ± 40.31
LW-4991, 4992	Jul, 2000	Gr. Beta	2.78 ± 0.66	2.22 ± 0.55	2.50 ± 0.43
MI-4903, 4904	Jul, 2000	K-40	1,383.10 ± 193.20	1,328.00 ± 153.10	1,355.55 ± 123.25
MI-4881, 4882	Jul, 2000	K-40	1,538.40 ± 103.00	1,438.00 ± 125.30	1,488.20 ± 81.10
MI-4881, 4882	Jul, 2000	Sr-90	1.01 ± 0.37	1.38 ± 0.42	1.19 ± 0.28
G-5388, 5389	Jul, 2000	Be-7	1.64 ± 0.16	1.52 ± 0.21	1.58 ± 0.13
G-5388, 5389	Jul, 2000	K-40	5.51 ± 0.33	5.86 ± 0.49	5.69 ± 0.30
G-5388, 5389	Jul, 2000	Gr. Beta	5.64 ± 0.15	5.81 ± 0.15	5.73 ± 0.11
SWU-5473, 5474	Jul, 2000	Gr. Beta	3.50 ± 0.67	3.17 ± 0.61	3.34 ± 0.45
SW-5410, 5411	Jul, 2000	Gr. Beta	1.95 ± 0.81	1.89 ± 1.04	1.92 ± 0.66
PW-5550, 5551	Jul, 2000	Gr. Beta	0.71 ± 1.15	2.50 ± 1.49	1.61 ± 0.94
WW-5623, 5624	Jul, 2000	H-3	22,713.90 ± 429.00	22,265.50 ± 424.90	22,489.70 ± 301.90
MI-5529, 5530	Aug, 2000	K-40	1,396.80 ± 103.80	1,278.20 ± 117.50	1,337.50 ± 78.39
VE-,	Aug, 2000	K-40	1.66 ± 0.32	1.93 ± 0.33	1.80 ± 0.23

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
MI-5808, 5809	Aug, 2000	K-40	1,261.90 ± 124.40	1,234.40 ± 152.80	1,248.15 ± 98.52
CW-6514, 6515	Aug, 2000	Gr. Beta	1.42 ± 0.37	1.44 ± 0.41	1.43 ± 0.28
MI-5933, 5934	Aug, 2000	Calcium	0.88 ± 0.09	0.89 ± 0.09	0.89 ± 0.06
MI-5933, 5934	Aug, 2000	Sr-90	3.29 ± 0.51	1.72 ± 0.47	2.51 ± 0.35
VE-6002, 6003	Aug, 2000	Sr-90	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
VE-6002, 6003	Aug, 2000	K-40	1.44 ± 0.23	1.78 ± 0.18	1.61 ± 0.14
PW-6209, 6210	Aug, 2000	H-3	528.20 ± 112.70	578.50 ± 114.50	553.35 ± 80.33
SW-6291, 6292	Aug, 2000	Gr. Beta	4.14 ± 1.58	1.95 ± 1.32	3.05 ± 1.03
WW-6312, 6313	Aug, 2000	H-3	7,804.20 ± 262.70	7,221.70 ± 253.80	7,512.95 ± 182.64
WW-5981, 5982	Aug, 2000	Gr. Beta	4.85 ± 0.78	5.87 ± 0.79	5.36 ± 0.56
PW-6341, 6342	Aug, 2000	Gr. Beta	2.45 ± 1.42	2.63 ± 1.37	2.54 ± 0.99
CW-6514, 6515	Aug, 2000	H-3	5,600.10 ± 226.80	5,434.30 ± 223.90	5,517.20 ± 159.35
MI-6409, 6410	Sep, 2000	I-131	-0.04 ± 0.23	0.19 ± 0.24	0.08 ± 0.17
MI-6409, 6410	Sep, 2000	K-40	1,367.80 ± 111.40	1,368.60 ± 107.50	1,368.20 ± 77.41
MI-6409, 6410	Sep, 2000	Sr-90	1.19 ± 0.35	0.80 ± 0.30	1.00 ± 0.23
MI-6542, 6543	Sep, 2000	K-40	1,298.00 ± 140.10	1,470.60 ± 139.70	1,384.30 ± 98.92
MI-6450, 6451	Sep, 2000	K-40	1,237.20 ± 102.10	1,328.10 ± 108.30	1,282.65 ± 74.42
MI-7102, 7103	Sep, 2000	I-131	-0.11 ± 0.23	-0.02 ± 0.25	-0.07 ± 0.17
MI-7102, 7103	Sep, 2000	K-40	1,473.10 ± 101.40	1,400.70 ± 168.60	1,436.90 ± 98.37
SWT-7262, 7263	Sep, 2000	Gr. Beta	3.45 ± 0.66	2.32 ± 0.57	2.89 ± 0.44
SWU-7283, 7284	Sep, 2000	Gr. Beta	2.75 ± 0.55	2.87 ± 0.56	2.81 ± 0.39
SWU-7283, 7284	Sep, 2000	H-3	197.76 ± 94.07	172.31 ± 93.00	185.04 ± 66.14
SW-7081, 7082	Sep, 2000	H-3	89.32 ± 92.99	42.38 ± 90.37	65.85 ± 64.83
AP-7685, 7686	Sep, 2000	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
AP-7706, 7707	Sep, 2000	Be-7	0.06 ± 0.01	0.05 ± 0.01	0.05 ± 0.01
SW-7482, 7483	Sep, 2000	Gr. Beta	5.31 ± 1.75	6.70 ± 1.85	6.01 ± 1.27
SP-7347, 7348	Sep, 2000	Gr. Alpha	6.12 ± 1.54	5.68 ± 1.49	5.90 ± 1.07
SW-7436, 7437	Sep, 2000	H-3	40.60 ± 79.90	72.00 ± 81.40	56.30 ± 57.03
CW-7748, 7749	Sep, 2000	Gr. Alpha	0.47 ± 0.28	0.65 ± 0.36	0.56 ± 0.23
CW-7748, 7749	Sep, 2000	Gr. Beta	2.35 ± 0.39	2.02 ± 0.38	2.19 ± 0.27
SL-7304, 7305	Oct, 2000	Gr. Beta	2.94 ± 0.23	2.90 ± 0.23	2.92 ± 0.17
SL-7304, 7305	Oct, 2000	K-40	1.14 ± 0.36	1.73 ± 0.58	1.44 ± 0.34
BS-7369, 7370	Oct, 2000	Cs-137	10.79 ± 4.96	20.04 ± 9.40	15.41 ± 5.31
SO-7950, 7951	Oct, 2000	Ac-228	0.66 ± 0.10	0.77 ± 0.10	0.72 ± 0.07
SO-7950, 7951	Oct, 2000	Bi-214	0.42 ± 0.06	0.57 ± 0.07	0.49 ± 0.05
SO-7950, 7951	Oct, 2000	Cs-137	0.20 ± 0.31	0.21 ± 0.04	0.20 ± 0.16
SO-7950, 7951	Oct, 2000	Gr. Beta	29.22 ± 1.98	28.02 ± 1.98	28.62 ± 1.40

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

Lab Codes	Sample Date	Analysis	Concentration in pCi/L[a] First Result	Second Result	Averaged Result
SO-7950, 7951	Oct, 2000	K-40	21.36 ± 0.93	21.77 ± 0.89	21.56 ± 0.64
SO-7950, 7951	Oct, 2000	Pb-212	0.72 ± 0.12	0.92 ± 0.12	0.82 ± 0.09
SO-7950, 7951	Oct, 2000	Ra-226	1.21 ± 0.33	1.30 ± 0.31	1.26 ± 0.22
SO-7950, 7951	Oct, 2000	Tl-208	0.21 ± 0.04	0.25 ± 0.03	0.23 ± 0.02
VE-7554, 7555	Oct, 2000	Gr. Beta	0.73 ± 0.02	0.74 ± 0.02	0.74 ± 0.01
MI-7622, 7623	Oct, 2000	K-40	1,505.90 ± 142.70	1,453.60 ± 172.00	1,479.75 ± 111.74
F-8219, 8220	Oct, 2000	K-40	2.94 ± 0.22	3.39 ± 0.38	3.16 ± 0.22
WW-7844, 7845	Oct, 2000	H-3	-68.13 ± 74.09	84.23 ± 81.38	8.05 ± 55.03
WW-8240, 8241	Oct, 2000	Gr. Beta	0.35 ± 1.89	1.61 ± 2.28	0.98 ± 1.48
WW-8240, 8241	Oct, 2000	H-3	72.46 ± 92.95	38.87 ± 91.51	55.66 ± 65.22
BS-8170, 8171	Oct, 2000	Gr. Beta	11.96 ± 2.55	11.30 ± 2.39	11.63 ± 1.75
BS-8170, 8171	Oct, 2000	K-40	8.36 ± 0.46	8.76 ± 0.47	8.56 ± 0.33
MI-8085, 8086	Oct, 2000	Calcium	0.94	0.94	0.94
MI-8085, 8086	Oct, 2000	Sr-90	1.04 ± 0.35	0.75 ± 0.31	0.90 ± 0.24
MI-8149, 8150	Oct, 2000	K-40	1,358.10 ± 95.81	1,341.80 ± 178.00	1,349.95 ± 101.07
SO-8967, 8968	Oct, 2000	Be-7	1.25 ± 0.37	1.27 ± 0.35	1.26 ± 0.26
SO-8967, 8968	Oct, 2000	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.02
SO-8967, 8968	Oct, 2000	K-40	4.53 ± 0.66	4.46 ± 0.58	4.50 ± 0.44
MI-8522, 8523	Oct, 2000	I-131	-0.05 ± 0.23	0.18 ± 0.25	0.07 ± 0.17
SWU-8894, 8895	Oct, 2000	Gr. Beta	3.63 ± 0.62	2.45 ± 0.61	3.04 ± 0.43
MI-8802, 8803	Nov, 2000	I-131	-0.22 ± 0.24	-0.25 ± 0.26	-0.24 ± 0.18
MI-8802, 8803	Nov, 2000	K-40	1,340.50 ± 113.80	1,453.50 ± 100.50	1,397.00 ± 75.91
MI-8802, 8803	Nov, 2000	Sr-89	0.19 ± 1.31	0.61 ± 1.34	0.40 ± 0.94
MI-8802, 8803	Nov, 2000	Sr-90	1.10 ± 0.39	0.90 ± 0.38	1.00 ± 0.27
LW-8823, 8824	Nov, 2000	Gr. Beta	2.13 ± 0.55	1.59 ± 0.52	1.86 ± 0.38
VE-9014, 9015	Nov, 2000	Gr. Alpha	0.10 ± 0.06	0.15 ± 0.07	0.12 ± 0.05
VE-9014, 9015	Nov, 2000	Gr. Beta	5.59 ± 0.17	5.90 ± 0.19	5.74 ± 0.13
PW-9991, 9992	Nov, 2000	Gr. Beta	2.50 ± 0.01	3.49 ± 1.18	3.00 ± 0.59
SW-9991, 9992	Nov, 2000	Co-60	1.16 ± 1.70	-2.94 ± 3.39	-0.89 ± 1.89
SW-9991, 9992	Nov, 2000	Cs-134	-0.07 ± 1.85	2.27 ± 3.73	1.10 ± 2.08
SW-9991, 9992	Nov, 2000	Cs-137	-0.88 ± 1.67	3.84 ± 3.45	1.48 ± 1.92
DW-9682, 9683	Dec, 2000	Gr. Beta	1.61 ± 1.02	2.10 ± 0.94	1.86 ± 0.69
MI-9749, 9750	Dec, 2000	K-40	1,562.40 ± 118.70	1,495.90 ± 168.30	1,529.15 ± 102.97
AP-10782, 10783	Dec, 2000	Be-7	0.21 ± 0.10	0.31 ± 0.14	0.26 ± 0.09
AP-10824, 10825	Dec, 2000	Be-7	0.06 ± 0.02	0.07 ± 0.01	0.06 ± 0.01
WW-10424, 10425	Dec, 2000	H-3	1,690.87 ± 137.81	1,551.48 ± 1,339.42	1,621.18 ± 673.25

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration[b] Laboratory result[c]	MAPEP Result[d] 1s, N=1	Control Limits
STSO-882	SOIL	Jan, 2000	Am-241	64.90 ± 6.49	61.10	42.77 - 79.43
STSO-882	SOIL	Jan, 2000	Co-57	721.10 ± 83.80	949.00	664.30 - 1,233.70
The MAPEP soil sample (STSO-882), as received, did not closely match a standard gamma geometry. The results for gamma-emitting isotopes are reanalyses, with a reduced sample size.						
STSO-882	SOIL	Jan, 2000	Co-60	1,264.40 ± 78.60	1,180.00	826.00 - 1,534.00
STSO-882	SOIL	Jan, 2000	Cs-134	969.30 ± 76.90	1,047.00	732.90 - 1,361.10
STSO-882	SOIL	Jan, 2000	Cs-137	944.00 ± 92.00	930.00	651.00 - 1,209.00
STSO-882	SOIL	Jan, 2000	K-40	811.70 ± 79.90	652.00	456.40 - 847.60
STSO-882	SOIL	Jan, 2000	Mn-54	1,103.30 ± 64.20	1,023.00	716.10 - 1,329.90
STSO-882	SOIL	Jan, 2000	Ni-63	711.00 ± 71.10	960.00	672.00 - 1,248.00
STSO-882	SOIL	Jan, 2000	Pu-239/40	67.90 ± 6.79	74.40	52.08 - 96.72
STSO-882	SOIL	Jan, 2000	Sr-90	345.00 ± 34.50	304.00	212.80 - 395.20
STSO-882	SOIL	Jan, 2000	U-233/4	62.90 ± 6.29	90.00	63.00 - 117.00
Incomplete dissolution of the sample is suspected. Results of reanalysis: U-233/234 67.3 ± 3.3 pCi/g, U-238 68.1 ± 8.9 pCi/g.						
STSO-882	SOIL	Jan, 2000	U-238	63.20 ± 6.32	93.00	65.10 - 120.90
STSO-882	SOIL	Jan, 2000	Zn-65	1,544.30 ± 61.50	1,540.00	1,078.00 - 2,002.00

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

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

[c] Unless otherwise indicated, laboratory results are given as the mean ± 1 standard deviations for three determinations.

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

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]
STSO-870	SOIL	Mar, 2000	Ac-228	98.300 ± 7.100	97.600	0.79 - 1.75
STSO-870	SOIL	Mar, 2000	Bi-212	98.500 ± 15.100	106.000	0.42 - 1.22
STSO-870	SOIL	Mar, 2000	Bi-214	88.000 ± 3.800	86.700	0.75 - 1.42
STSO-870	SOIL	Mar, 2000	Cs-137	324.000 ± 5.000	339.000	0.83 - 1.32
STSO-870	SOIL	Mar, 2000	K-40	872.000 ± 34.000	811.000	0.78 - 1.53
STSO-870	SOIL	Mar, 2000	Pb-212	93.700 ± 2.700	97.300	0.74 - 1.33
STSO-870	SOIL	Mar, 2000	Pb-214	100.100 ± 3.700	86.500	0.65 - 1.45
STSO-870	SOIL	Mar, 2000	Pu-238	19.800 ± 3.000	18.600	0.52 - 2.84
STSO-870	SOIL	Mar, 2000	Pu-239/40	8.100 ± 1.700	7.000	0.69 - 1.74
STSO-870	SOIL	Mar, 2000	Sr-90	13.600 ± 3.100	20.200	0.60 - 3.66
STVE-871	VEGETATION	Mar, 2000	Am-241	9.800 ± 0.900	10.400	0.68 - 2.70
STVE-871	VEGETATION	Mar, 2000	Co-60	46.500 ± 2.100	52.800	0.69 - 1.46
STVE-871	VEGETATION	Mar, 2000	Cs-137	1,872.000 ± 46.000	1,380.000	0.80 - 1.40
STVE-871	VEGETATION	Mar, 2000	K-40	506.400 ± 28.000	521.000	0.79 - 1.42
STVE-871	VEGETATION	Mar, 2000	Pu-239/40	14.300 ± 1.500	15.500	0.68 - 1.59
STVE-871	VEGETATION	Mar, 2000	Sr-90	1,198.000 ± 85.000	1,780.000	0.50 - 1.33
STAP-872	AIR FILTER	Mar, 2000	Co-57	5.900 ± 0.100	5.310	0.65 - 1.39
STAP-872	AIR FILTER	Mar, 2000	Co-60	5.900 ± 0.100	5.320	0.75 - 1.32
STAP-872	AIR FILTER	Mar, 2000	Cs-137	7.500 ± 0.100	6.100	0.73 - 1.37
STAP-872	AIR FILTER	Mar, 2000	Gr. Alpha	3.300 ± 0.100	3.020	0.50 - 1.55
STAP-872	AIR FILTER	Mar, 2000	Gr. Beta	2.700 ± 0.100	2.420	0.72 - 1.67
STAP-872	AIR FILTER	Mar, 2000	Mn-54	31.800 ± 0.300	27.200	0.76 - 1.33
STAP-872	AIR FILTER	Mar, 2000	Pu-238	0.060 ± 0.030	0.080	0.74 - 1.40
STAP-872	AIR FILTER	Mar, 2000	Pu-239/40	0.090 ± 0.010	0.089	0.76 - 1.44
STAP-872	AIR FILTER	Mar, 2000	Ru-106	3.500 ± 1.000	2.010	0.59 - 1.30
Result within activity ± error margin.						
STAP-872	AIR FILTER	Mar, 2000	Sr-90	0.310 ± 0.160	0.242	0.61 - 1.93
STAP-872	AIR FILTER	Mar, 2000	Uranium	0.120 ± 0.010	0.126	0.80 - 3.35
STW-874	WATER	Mar, 2000	Am-241	1.700 ± 0.220	1.950	0.75 - 1.49
STW-874	WATER	Mar, 2000	Co-60	51.000 ± 1.200	48.900	0.80 - 1.20

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]
STW-874	WATER	Mar, 2000	Cs-137	108.600 ± 1.800	103.000	0.80 - 1.26
STW-874	WATER	Mar, 2000	Fe-55	33.000 ± 1.200	33.100	0.44 - 1.53
STW-874	WATER	Mar, 2000	Gr. Alpha	1,217.000 ± 35.000	1,700.000	0.61 - 1.32
STW-874	WATER	Mar, 2000	Gr. Beta	792.000 ± 25.000	690.000	0.55 - 1.54
STW-874	WATER	Mar, 2000	H-3	147.000 ± 26.000	79.400	0.71 - 1.79
Analysis was repeated; result of reanalysis; 97.5 ± 11.6 Bq/l.						
STW-874	WATER	Mar, 2000	Ni-63	101.000 ± 6.000	112.000	0.25 - 1.75
STW-874	WATER	Mar, 2000	Pu-238	0.750 ± 0.170	0.944	0.78 - 1.25
STW-874	WATER	Mar, 2000	Pu-239/40	0.990 ± 0.090	0.918	0.80 - 1.39
STW-874	WATER	Mar, 2000	Sr-90	4.460 ± 0.990	3.390	0.75 - 1.50
STW-874	WATER	Mar, 2000	Uranium	0.270 ± 0.020	0.995	0.67 - 1.42
Result reported was for U-234. Result for U (total); 0.58 ± 0.02 pCi/L.						
STSO-885	SOIL	Sep, 2000	Ac-228	78.000 ± 1.500	80.200	0.80 - 1.50
STSO-885	SOIL	Sep, 2000	Bi-212	73.000 ± 3.300	80.500	0.45 - 1.23
STSO-885	SOIL	Sep, 2000	Bi-214	91.000 ± 4.000	83.300	0.78 - 1.50
STSO-885	SOIL	Sep, 2000	Cs-137	925.700 ± 14.200	1,020.000	0.80 - 1.29
STSO-885	SOIL	Sep, 2000	K-40	713.600 ± 7.100	713.000	0.80 - 1.37
STSO-885	SOIL	Sep, 2000	Pb-212	66.100 ± 4.300	79.300	0.74 - 1.36
STSO-885	SOIL	Sep, 2000	Pb-214	100.100 ± 3.700	86.300	0.76 - 1.53
STSO-885	SOIL	Sep, 2000	Pu-239/40	18.400 ± 0.400	16.800	0.71 - 1.33
STSO-885	SOIL	Sep, 2000	Sr-90	39.900 ± 5.300	50.400	0.61 - 3.91
STSO-885	SOIL	Sep, 2000	Th-234	154.700 ± 9.300	148.000	0.68 - 2.36
STSO-885	SOIL	Sep, 2000	Uranium	254.300 ± 13.000	327.000	0.62 - 1.35
STW-886	WATER	Sep, 2000	Am-241	1.300 ± 0.200	1.190	0.76 - 1.48
STW-886	WATER	Sep, 2000	Co-60	71.900 ± 7.200	73.700	0.80 - 1.20
STW-886	WATER	Sep, 2000	Cs-137	62.700 ± 6.300	67.000	0.80 - 1.24
STW-886	WATER	Sep, 2000	H-3	92.300 ± 8.900	91.300	0.74 - 2.29
STW-886	WATER	Sep, 2000	Pu-238	0.700 ± 0.100	0.786	0.74 - 1.22
STW-886	WATER	Sep, 2000	Pu-239/40	0.600 ± 0.100	0.591	0.75 - 1.26
STW-886	WATER	Sep, 2000	Sr-90	4.600 ± 0.400	4.530	0.64 - 1.50

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]
STW-886	WATER	Sep, 2000	Uranium	0.800 ± 0.100	0.916	0.73 - 1.37
STW-887	WATER	Sep, 2000	Gr. Alpha	1,113.700 ± 17.900	1,070.000	0.58 - 1.26
STW-887	WATER	Sep, 2000	Gr. Beta	1,129.400 ± 16.700	950.000	0.56 - 1.50
STAP-888	AIR FILTER	Sep, 2000	Am-241	0.060 ± 0.010	0.032	0.69 - 2.40
STAP-888	AIR FILTER	Sep, 2000	Co-57	16.500 ± 0.600	14.500	0.69 - 1.37
STAP-888	AIR FILTER	Sep, 2000	Co-60	9.200 ± 0.400	8.430	0.79 - 1.30
STAP-888	AIR FILTER	Sep, 2000	Cs-137	8.800 ± 0.500	7.410	0.78 - 1.35
STAP-888	AIR FILTER	Sep, 2000	Mn-54	50.200 ± 2.300	43.200	0.80 - 1.36
STAP-888	AIR FILTER	Sep, 2000	Pu-238	0.033 ± 0.010	0.045	0.66 - 1.35
STAP-888	AIR FILTER	Sep, 2000	Pu-239/40	0.080 ± 0.010	0.074	0.69 - 1.29
STAP-888	AIR FILTER	Sep, 2000	Sr-90	3.300 ± 0.100	1.640	0.55 - 2.05
STAP-888	AIR FILTER	Sep, 2000	U-233/4	0.034 ± 0.001	0.040	0.80 - 1.92
STAP-888	AIR FILTER	Sep, 2000	U-238	0.032 ± 0.010	0.041	0.80 - 1.59
Result within activity ± error margin.						
STAP-888	AIR FILTER	Sep, 2000	Uranium	0.070 ± 0.010	0.083	0.80 - 2.54
STAP-889	AIR FILTER	Sep, 2000	Gr. Alpha	2.840 ± 0.010	2.350	0.57 - 1.47
STAP-889	AIR FILTER	Sep, 2000	Gr. Beta	2.080 ± 0.020	1.520	0.76 - 1.52
STVE-890	VEGETATION	Sep, 2000	Am-241	5.900 ± 1.200	5.600	0.72 - 2.34
STVE-890	VEGETATION	Sep, 2000	Cm-244	3.200 ± 0.100	3.600	0.61 - 1.61
STVE-890	VEGETATION	Sep, 2000	Co-60	29.400 ± 0.400	32.800	0.75 - 1.51
STVE-890	VEGETATION	Sep, 2000	Cs-137	739.300 ± 23.000	867.000	0.80 - 1.37
STVE-890	VEGETATION	Sep, 2000	K-40	597.500 ± 49.300	639.000	0.78 - 1.43
STVE-890	VEGETATION	Sep, 2000	Pu-239/40	4.500 ± 0.200	9.600	0.67 - 1.49
No reason for deviation was found with original result. The result of reanalysis; 12.1 ±1.1 Bq/kg.						
STVE-890	VEGETATION	Sep, 2000	Sr-90	1,201.500 ± 117.300	1,150.000	0.52 - 1.23

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration [b] Laboratory result[c]	EML Result[d]	Control Limits[e]

[a] The Environmental Measurements Laboratory provides the following nuclear species : Air Filters, Soil, Vegetation and Water.

[b] Results are reported in Bq/L with the following exceptions: Air Filter results are reported in Bq/Filter, Soil results are reported in Bq/Kg, Vegetation results are reported in Bq/Kg.

[c] Laboratory results are reported as the mean of three determinations ± standard deviation.

[d] The EML result listed is the mean of replicate determinations for each nuclide±the standard error of the mean.

[e] The control limits are reported by EML as the ratio of Reported Value / EML value.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

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

2.0. Single Measurements

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

where: x = value of the measurement;

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

In cases where the activity is less than the lower limit of detection L, it is reported as: <L, where L = the lower limit of detection based on 4.66s uncertainty for a background sample.

3.0. Duplicate analyses

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

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

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

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

4.0. Computation of Averages and Standard Deviations

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

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

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

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

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

4.5 In rounding off, the following rules are followed:

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

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

ENCLOSURE F

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

PALISADES NUCLEAR PLANT
2000 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

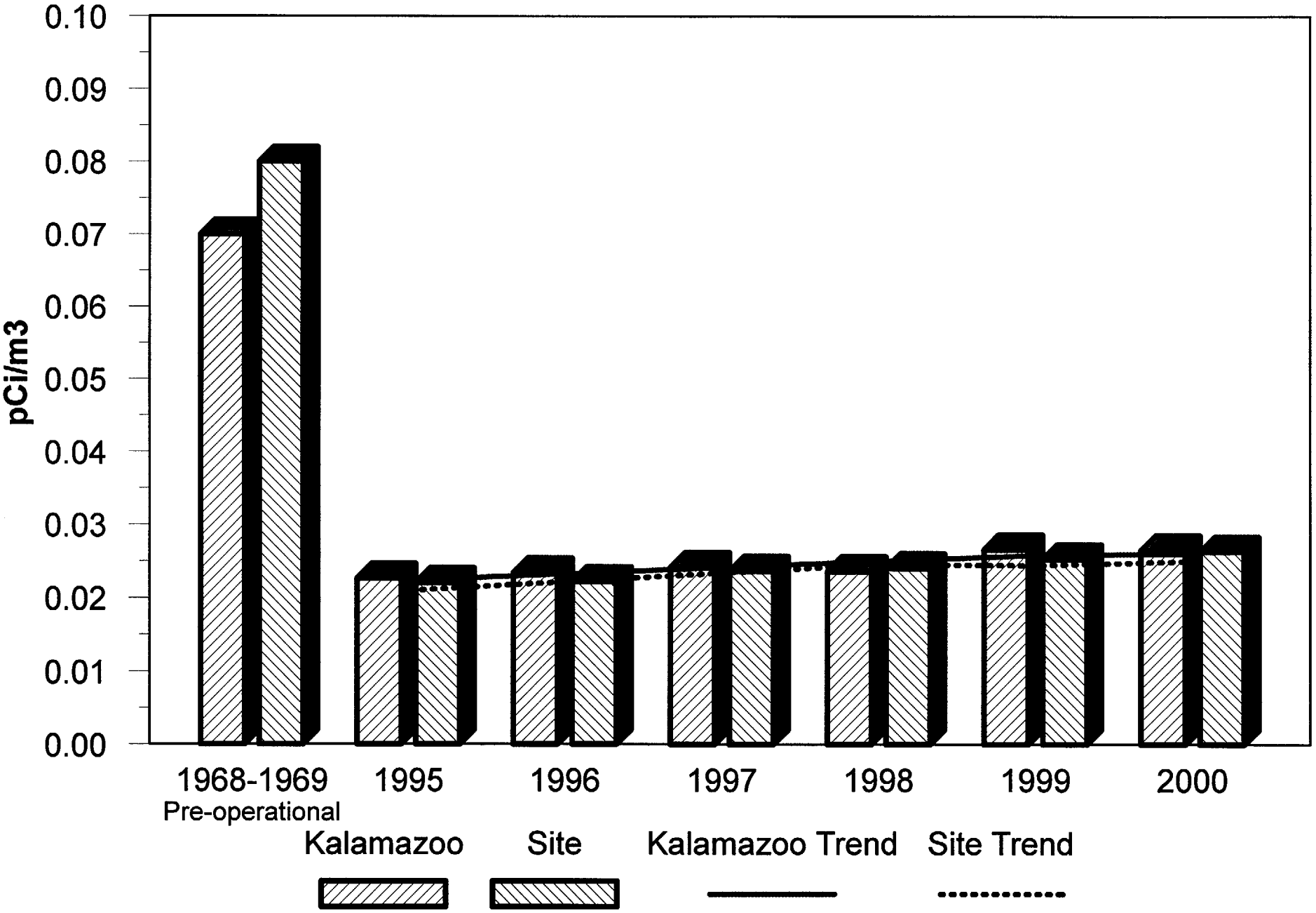
DATA GRAPHS

26 PAGES

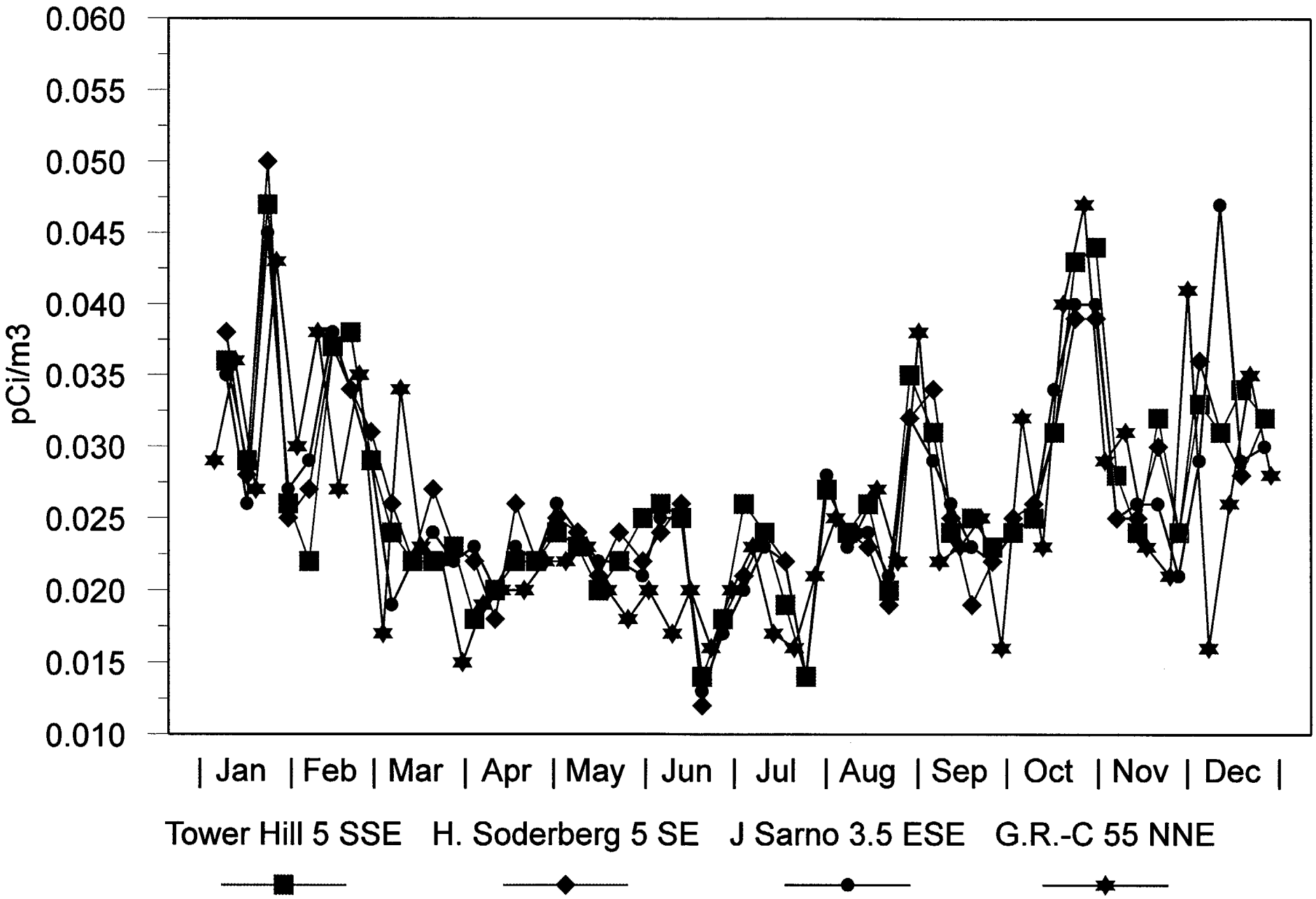
Palisades Air Particulate

Gross Beta

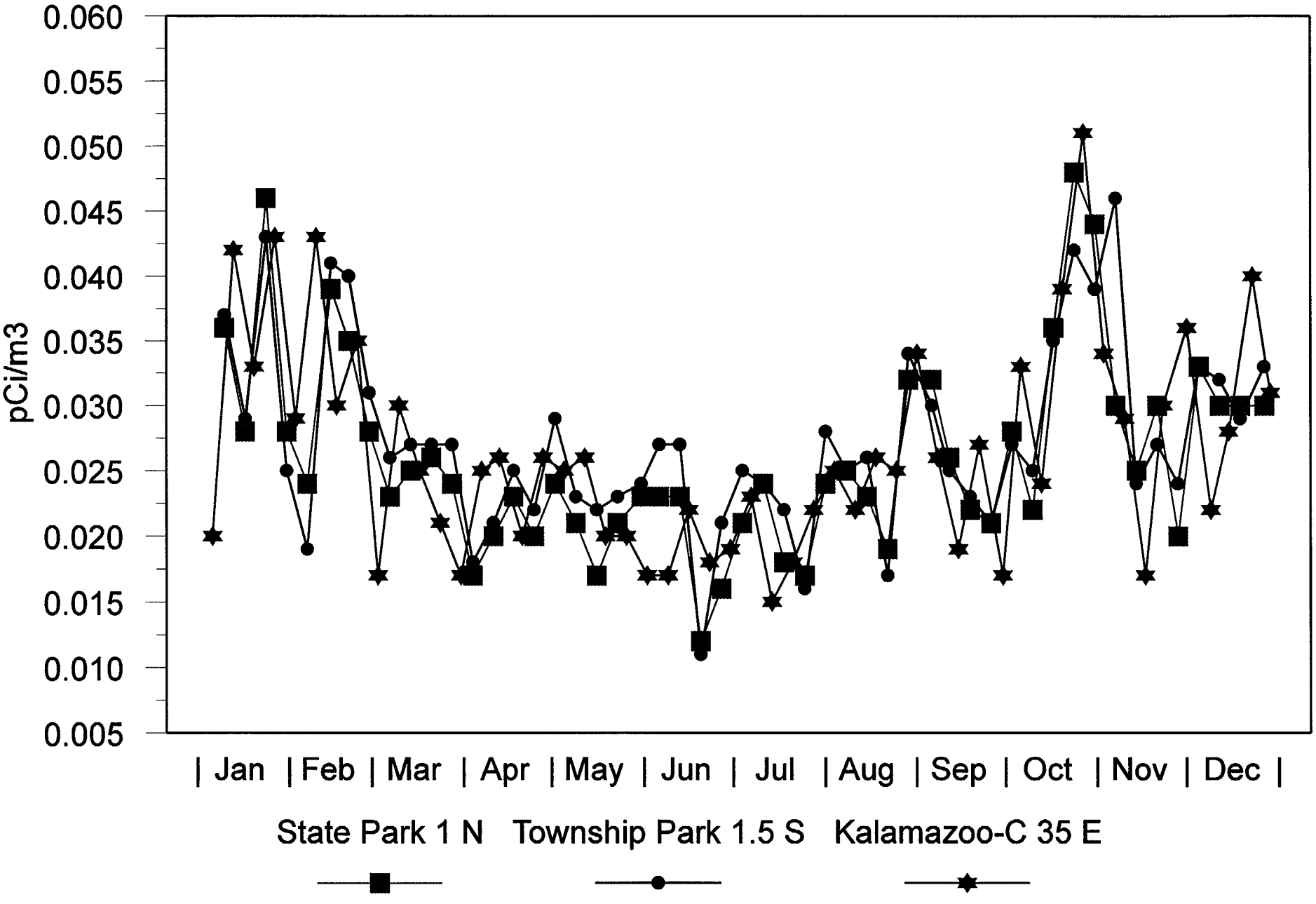
Pre-Operational vs. Operational



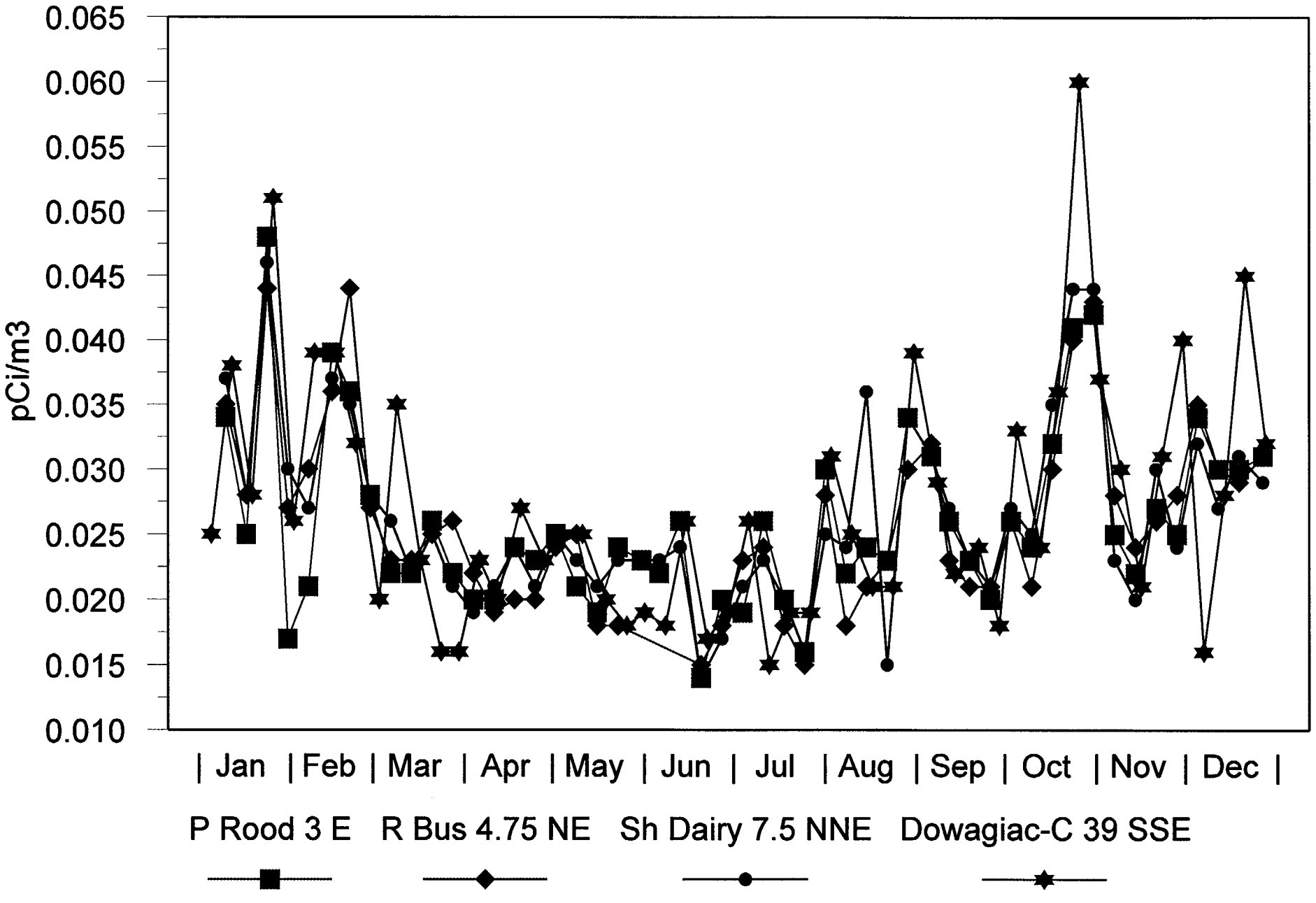
2000 PALISADES AIR PARTICULATE
Weekly Gross Beta
Grand Rapids-Control vs Tower Hill, H Soderberg, J Sarno



2000 PALISADES AIR PARTICULATE
Weekly Gross Beta
Kalamazoo-Control vs Township Park, State Park



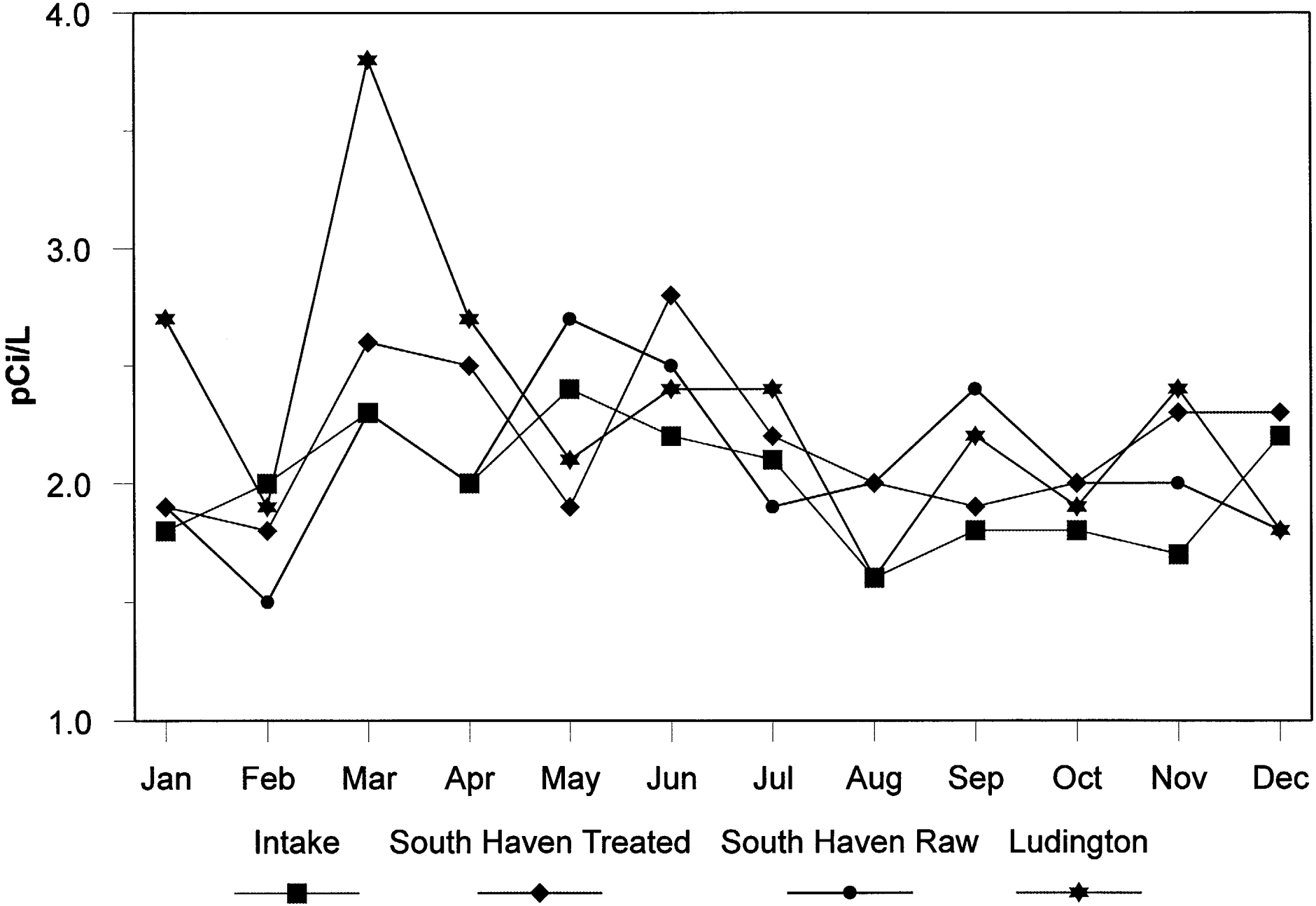
2000 PALISADES AIR PARTICULATE
Weekly Gross Beta
Dowagiac-Control vs Sherman Dairy, R Bus, P Rood



2000 Palisades Lake Water Samples

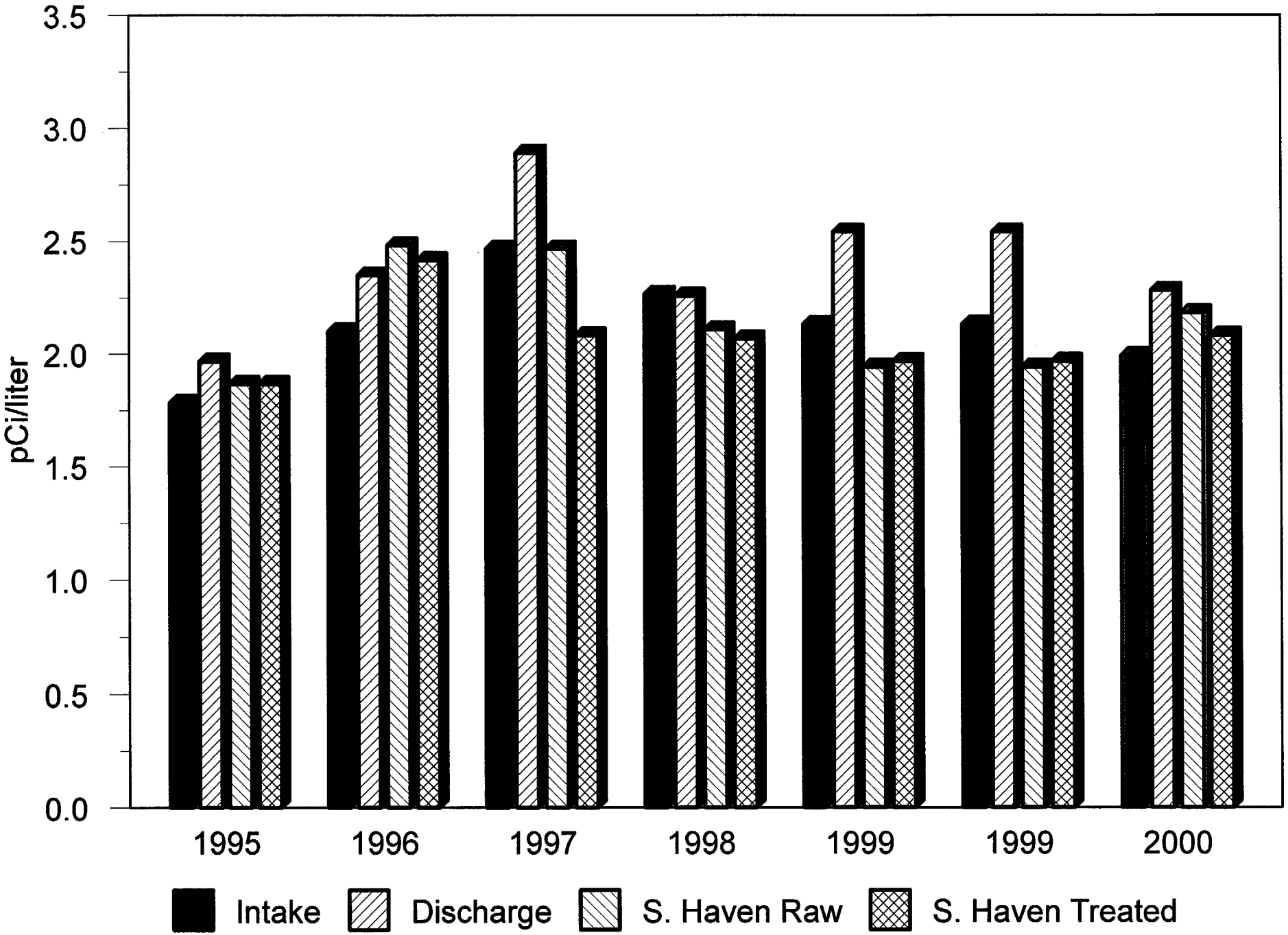
Gross Beta pCi/L

Ludington Control vs Intake, South Haven Treated & Raw



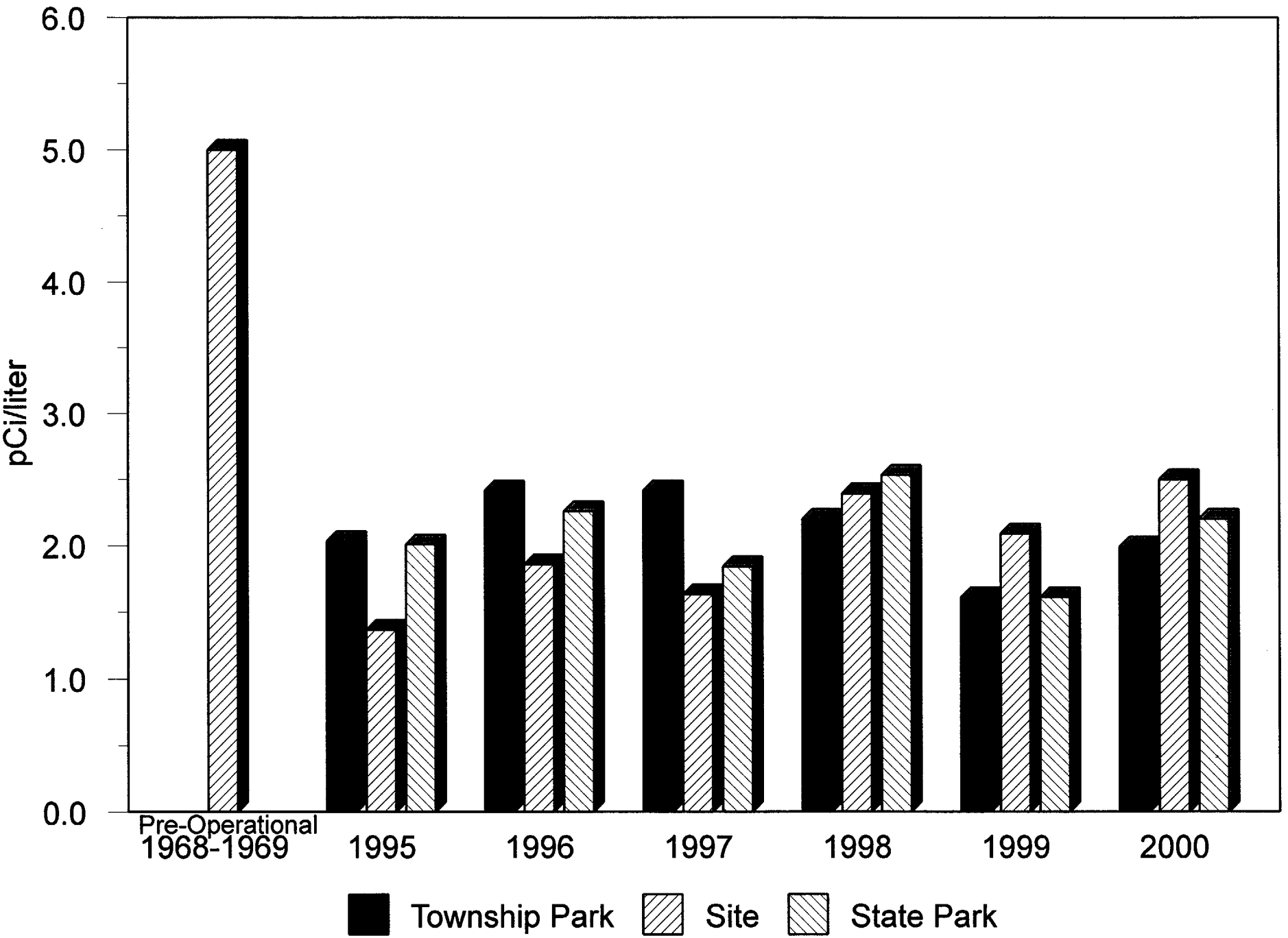
Palisades Lake Water Gross Beta

1995-2000



Palisades Well Water Gross Beta

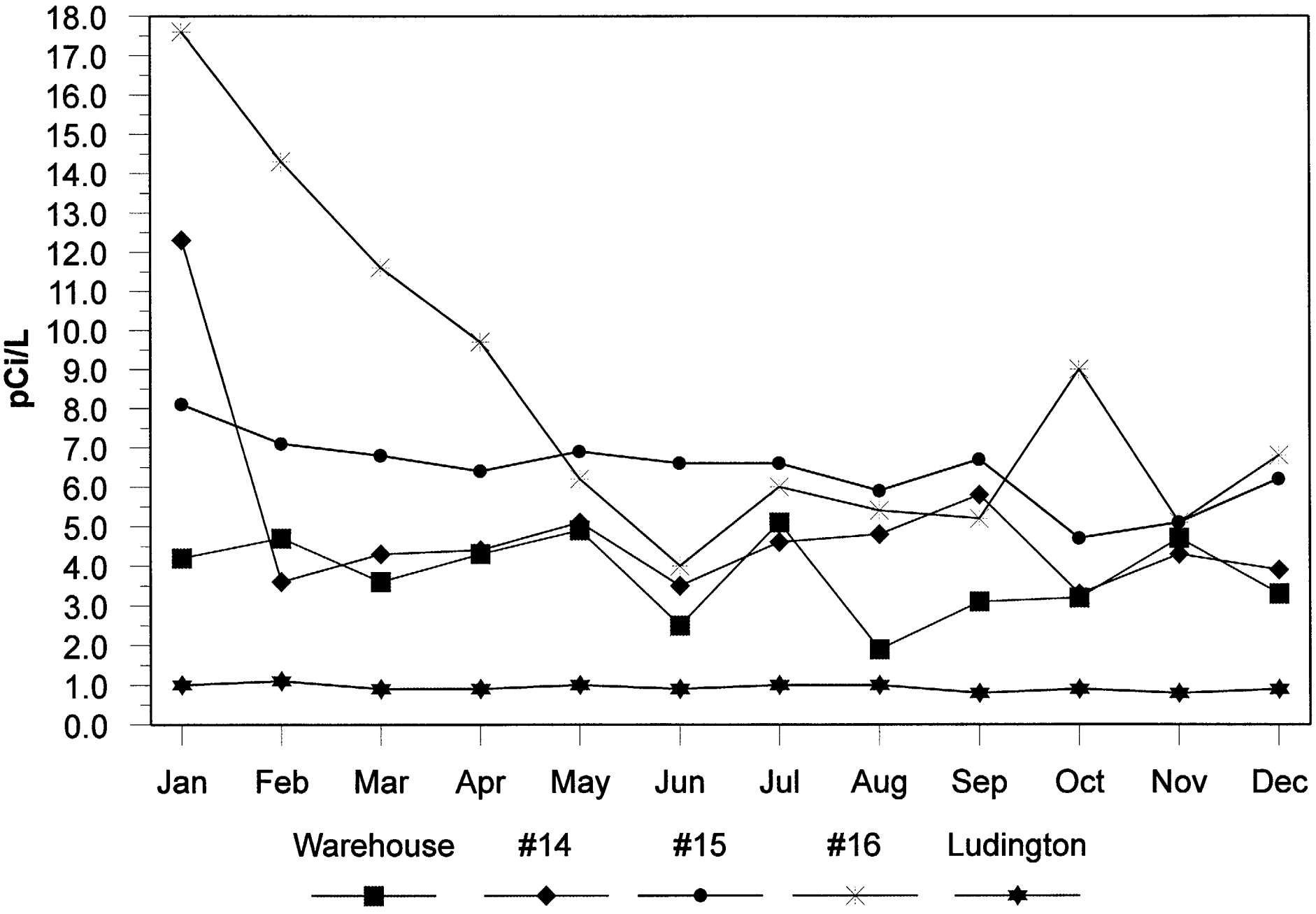
Pre-Operational vs. Operational



2000 Palisades Well Water Samples

Gross Beta pCi/L

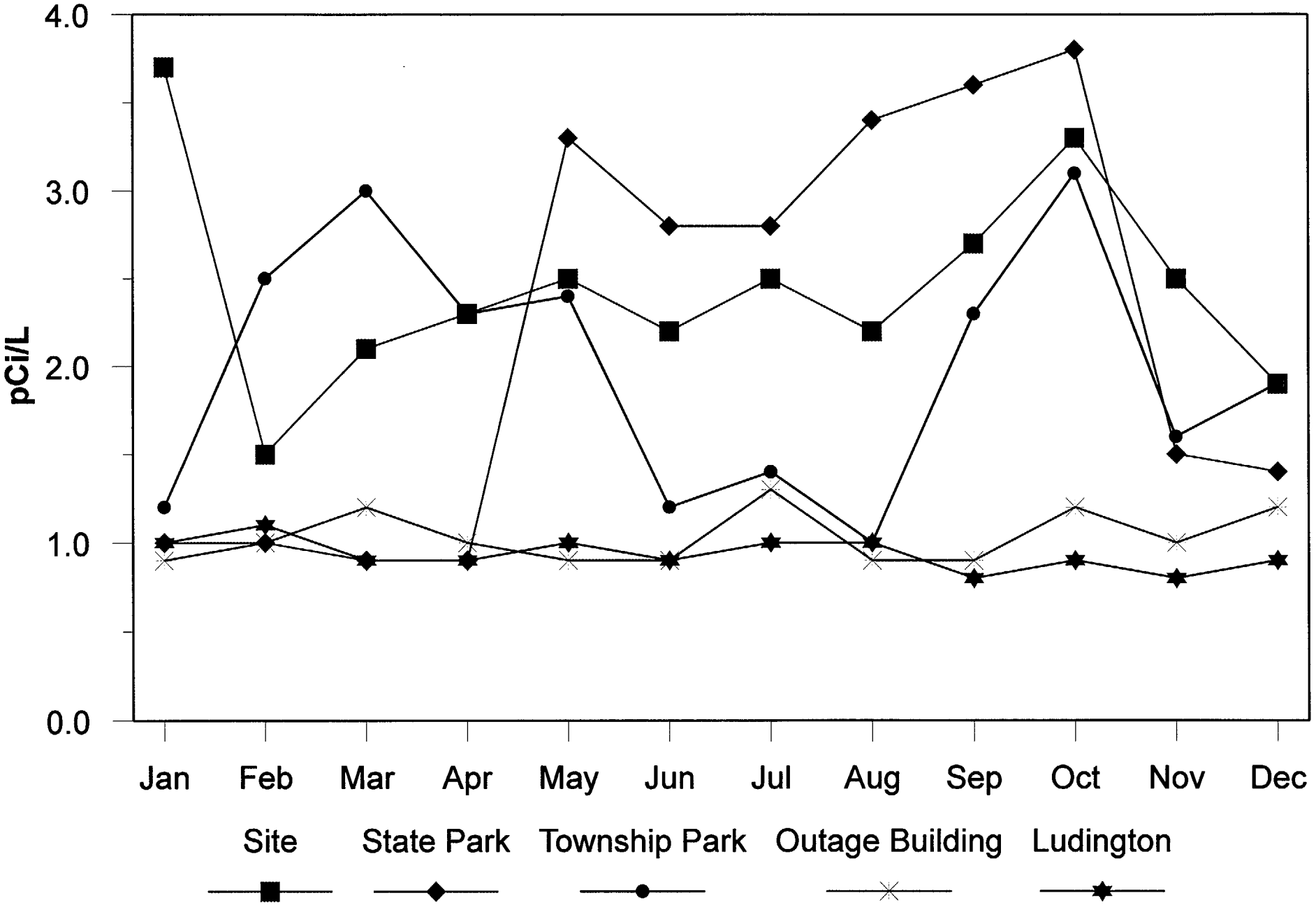
Ludington Control vs Warehouse, Well #14, Well#15 and Well #16



2000 Palisades Well Water Samples

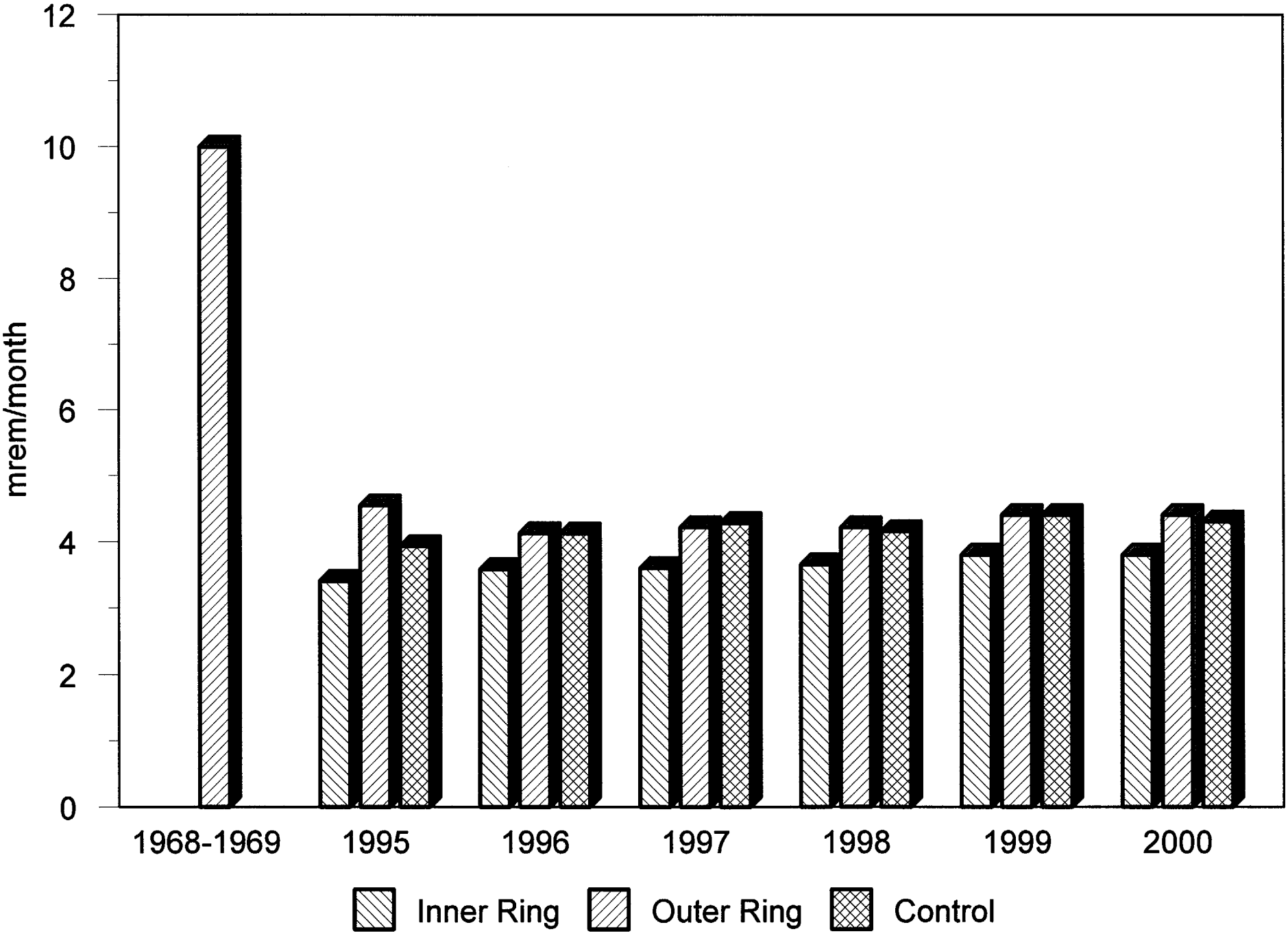
Gross Beta pCi/L

Ludington Control vs Site, Outage Building, State Park and Township Park



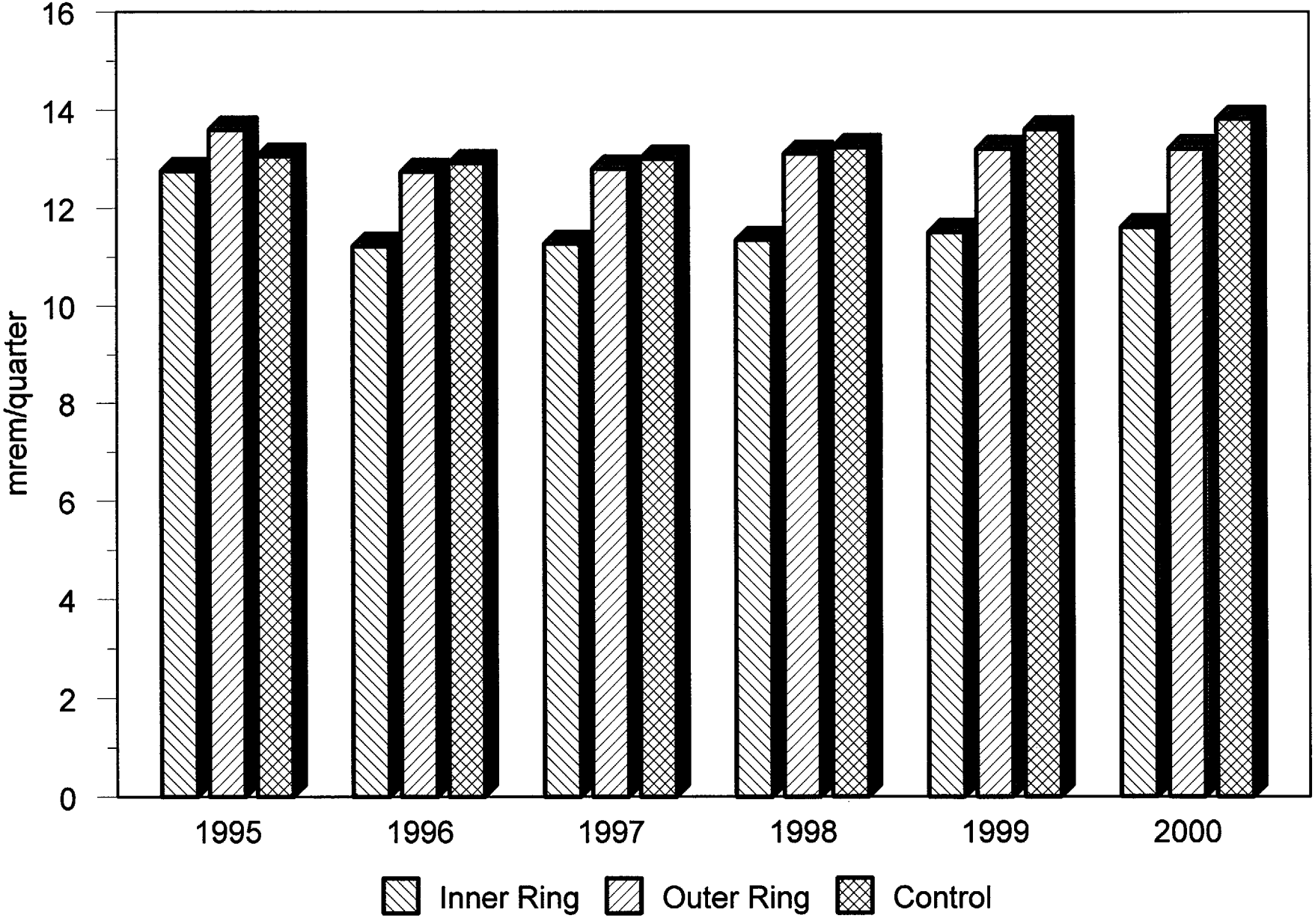
Palisades Monthly Thermoluminescent Dosimeters

Pre-Operational vs. Operational



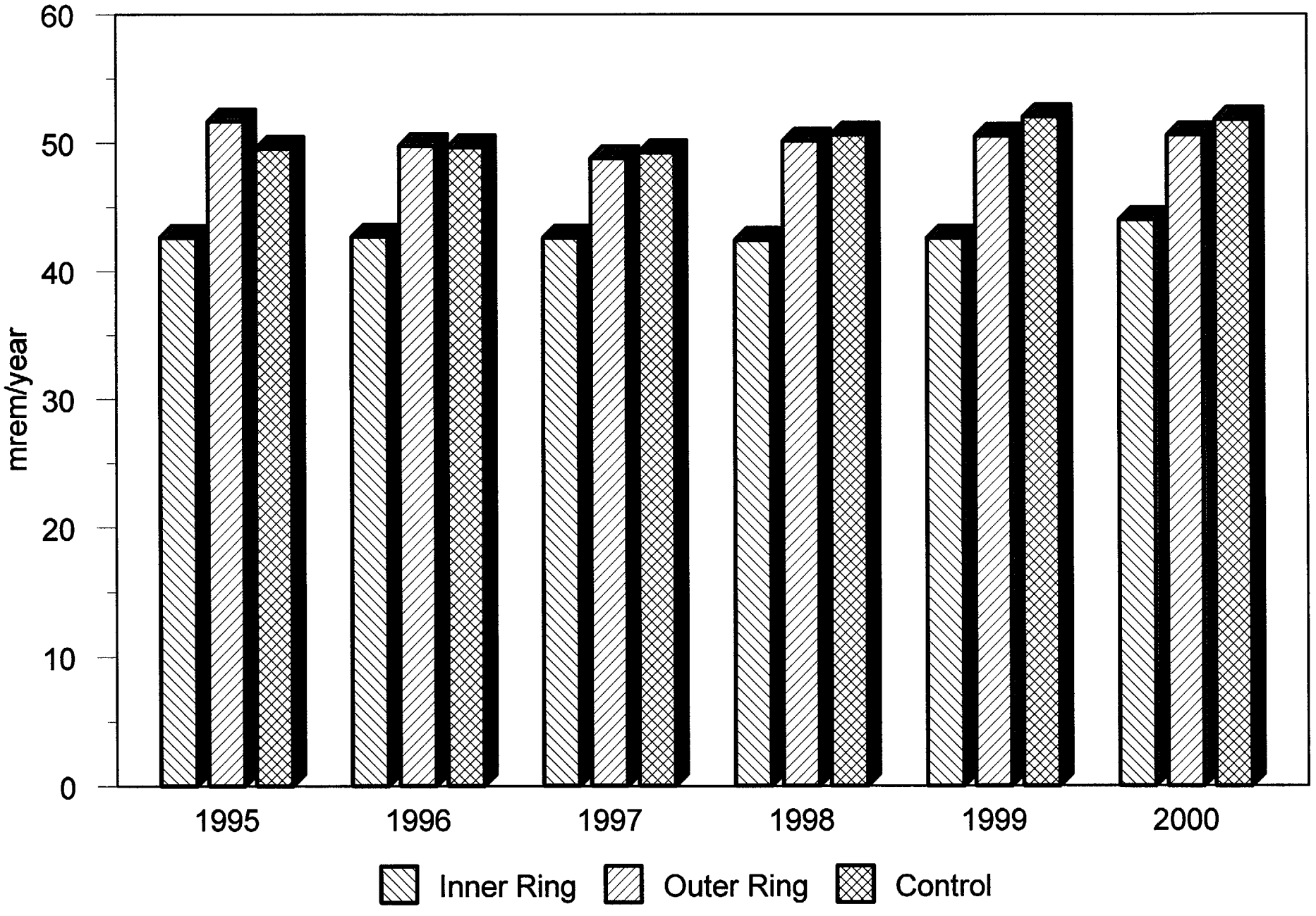
Palisades Quarterly Thermoluminescent Dosimeters

1995 - 2000



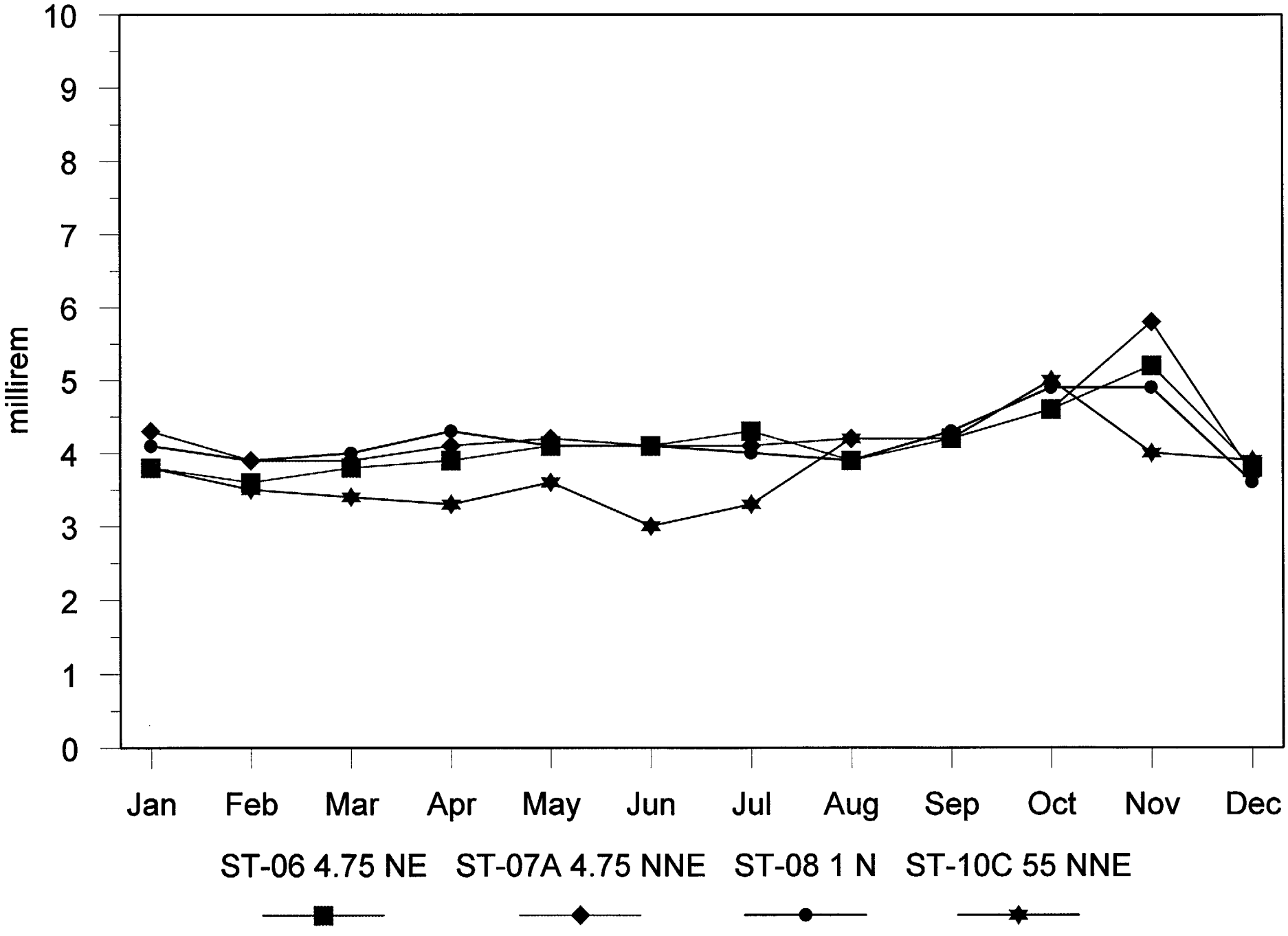
Palisades Annual Thermoluminescent Dosimeters

1995-2000



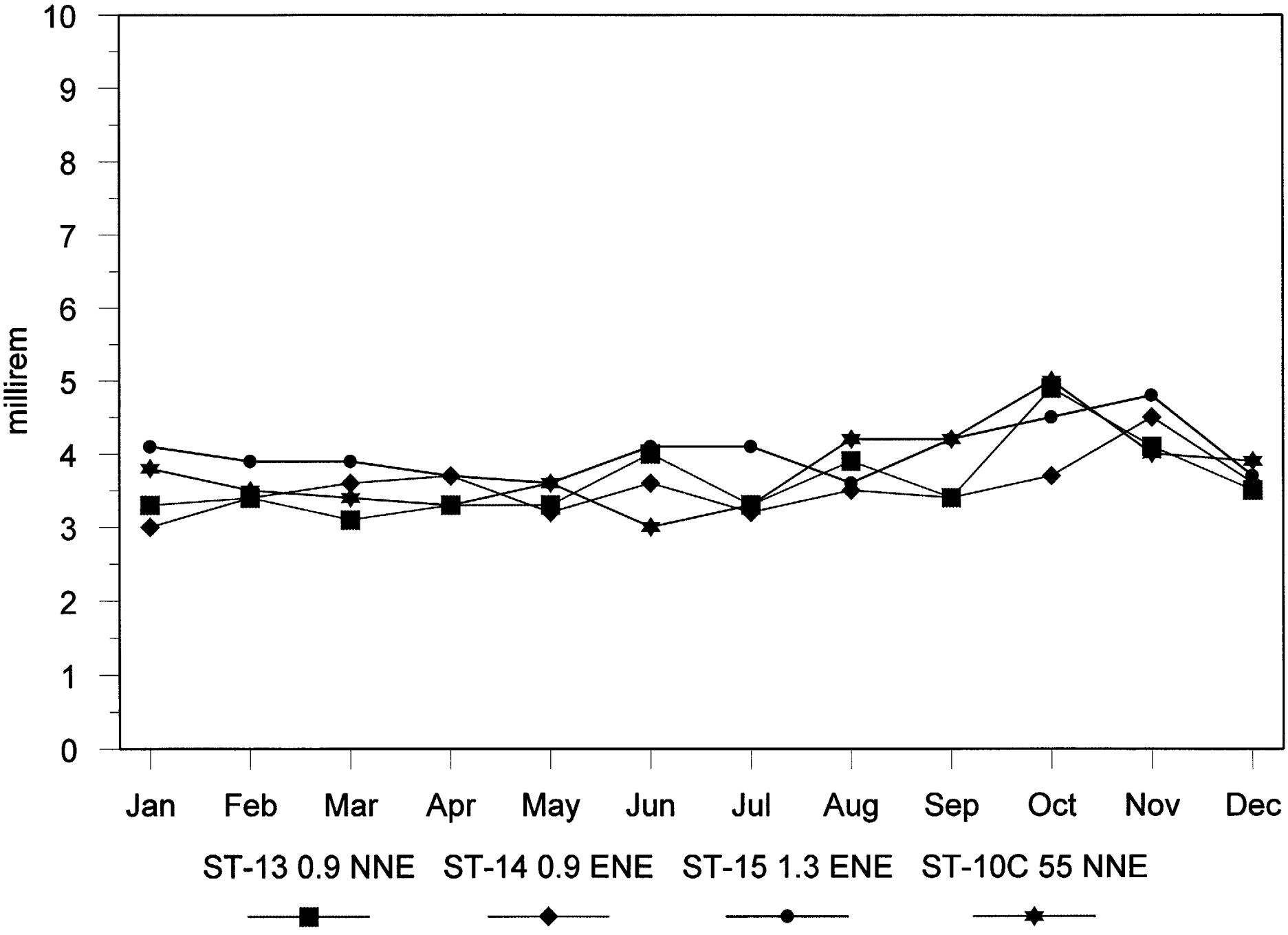
2000 Palisades TLDs

ST10 Control vs ST06, ST07A, ST08



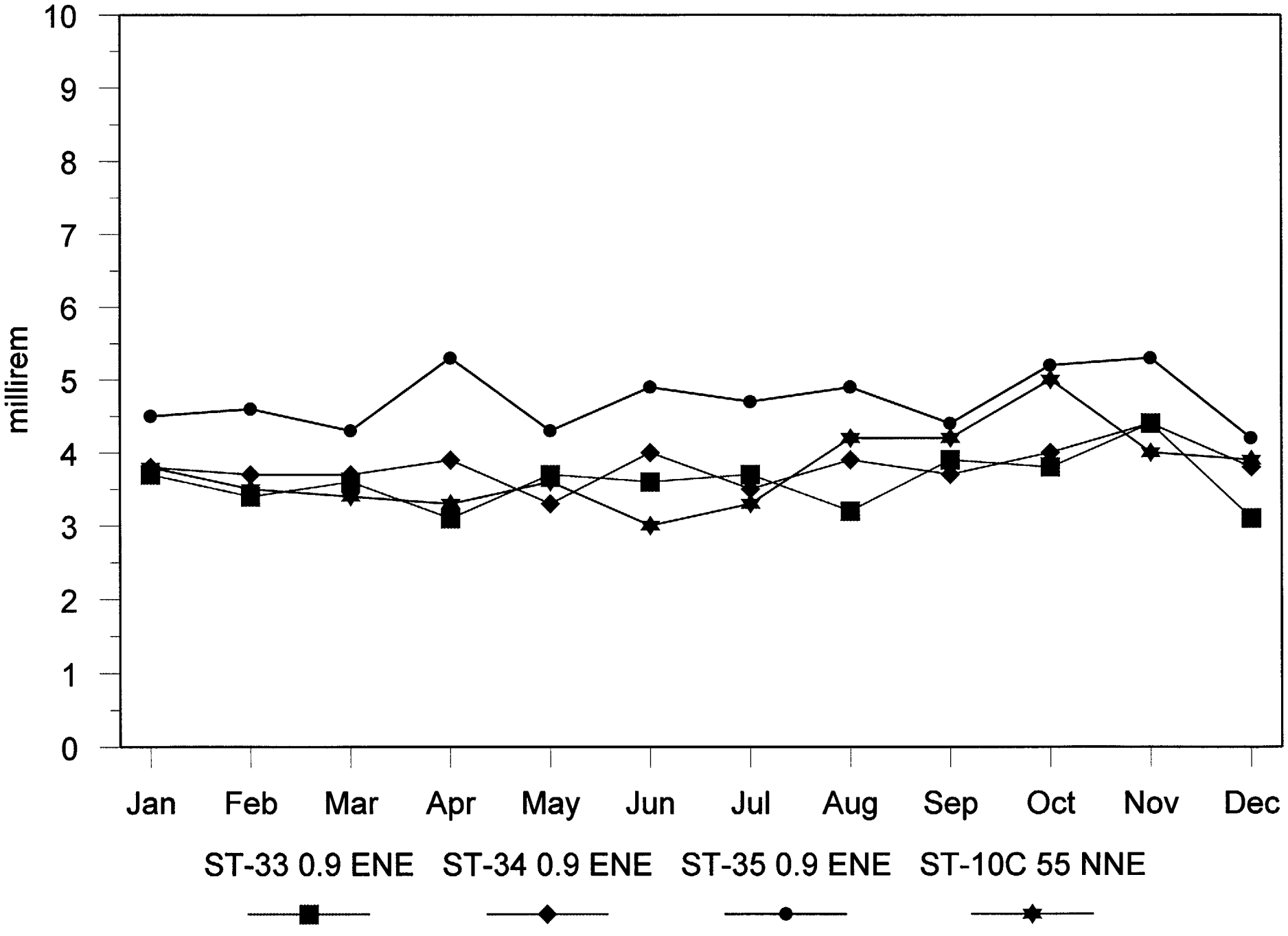
2000 Palisades TLDs

ST10 Control vs ST13, ST14, ST15



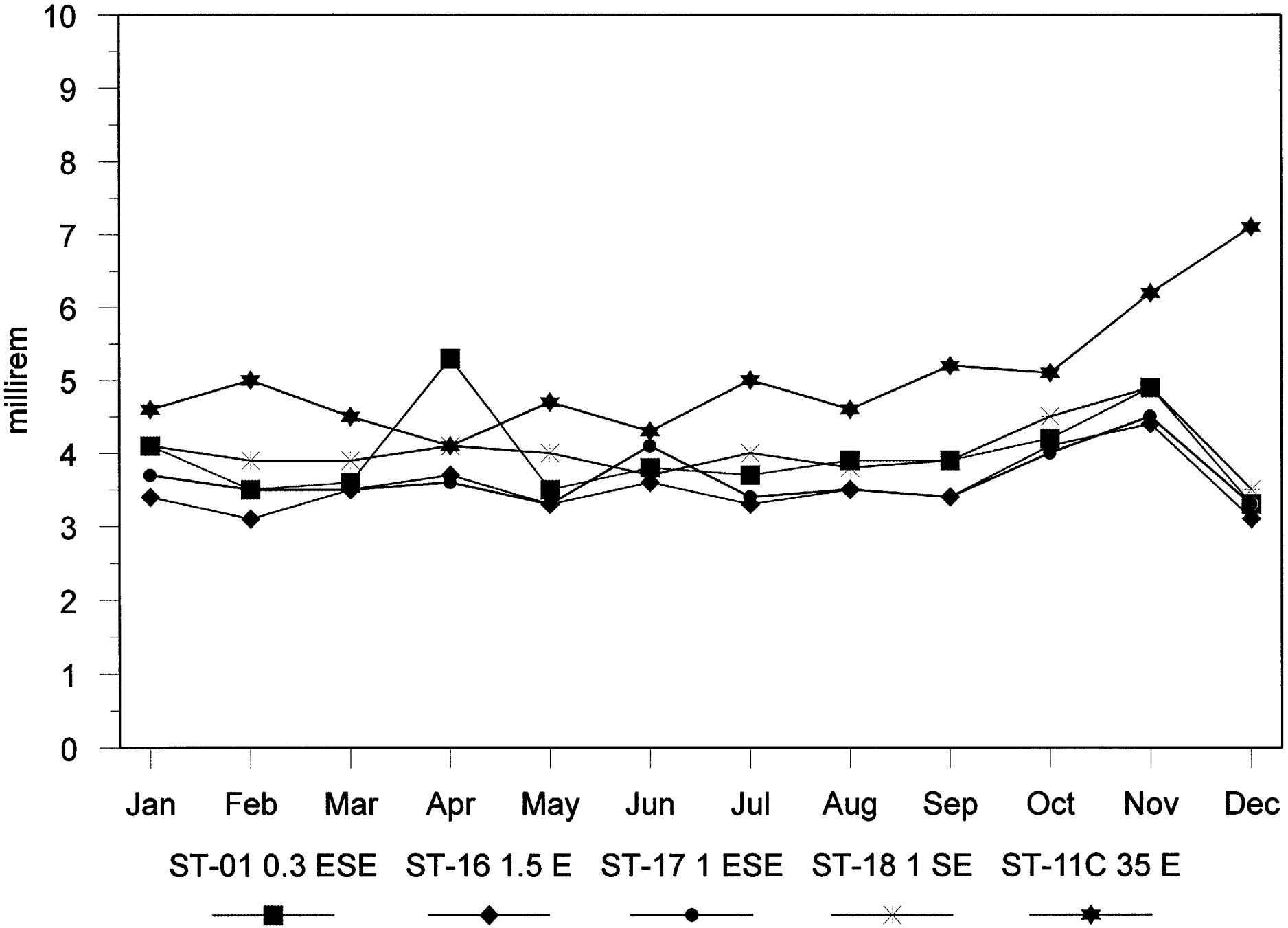
2000 Palisades TLDs

ST10 Control vs ST33, ST34, ST35



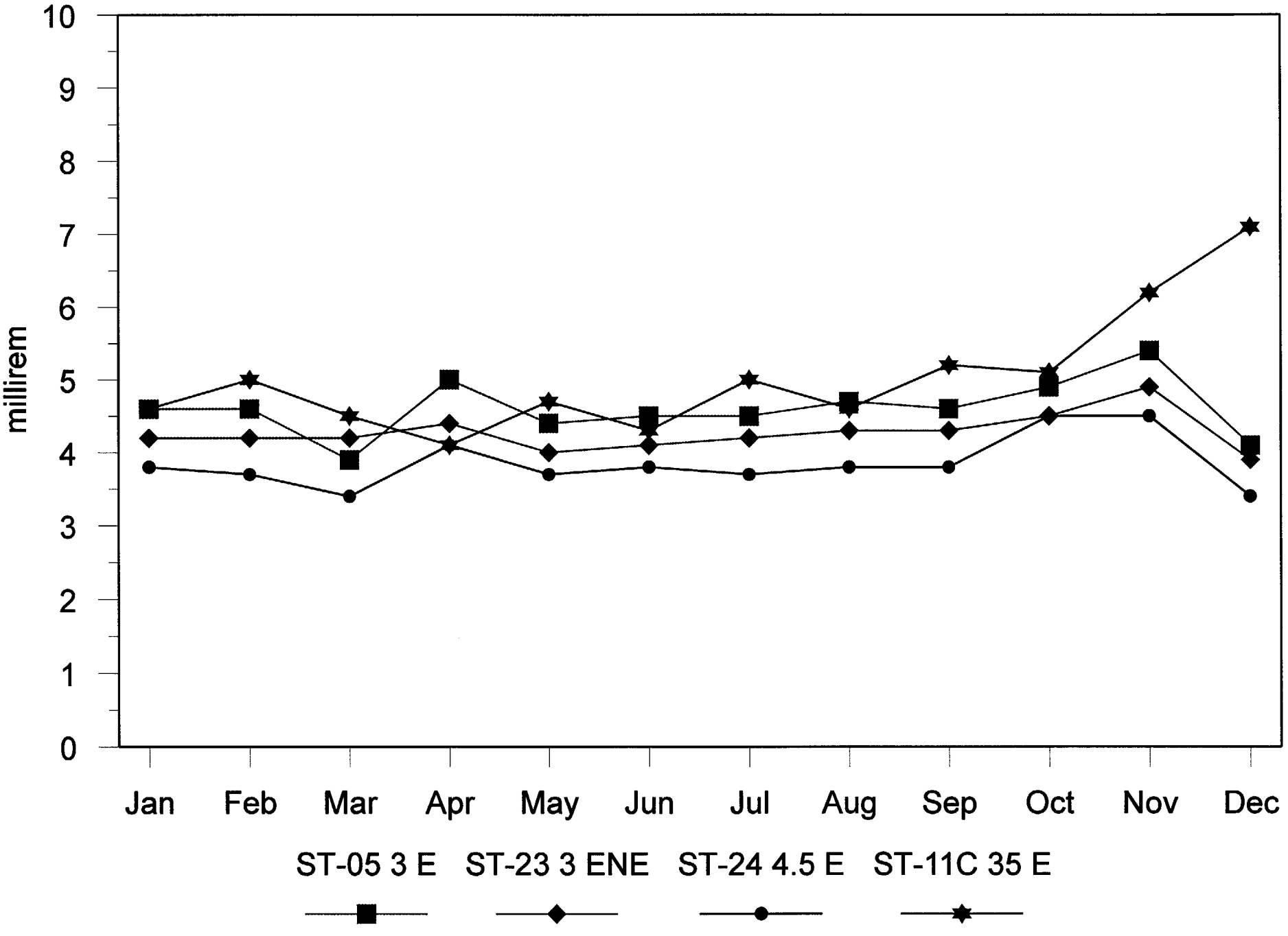
2000 Palisades TLDs

ST11 Control vs ST01, ST16, ST17, ST18



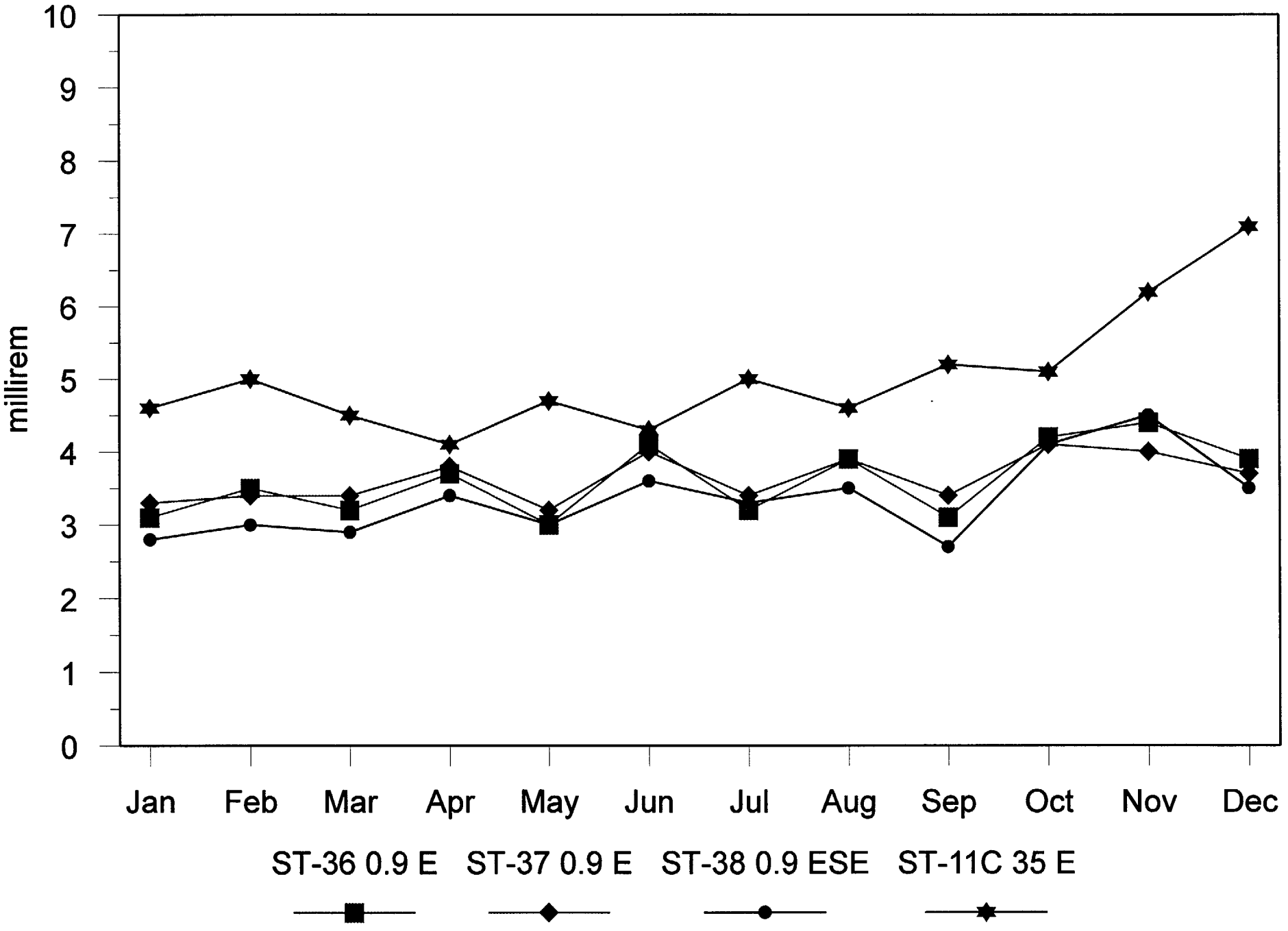
2000 Palisades TLDs

ST11 Control vs ST05, ST23, ST24



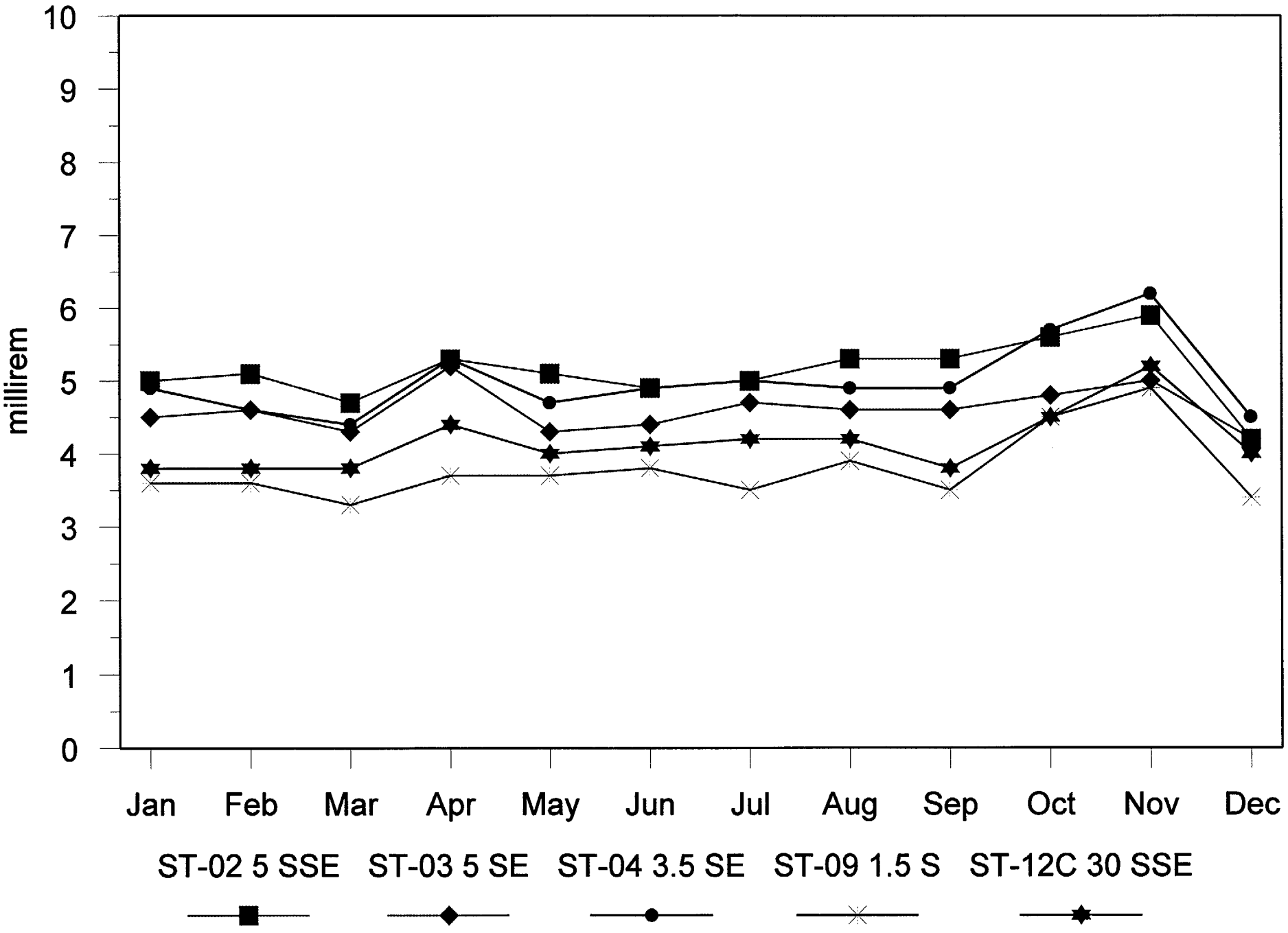
2000 Palisades TLDs

ST11 Control vs ST36, ST37, ST38



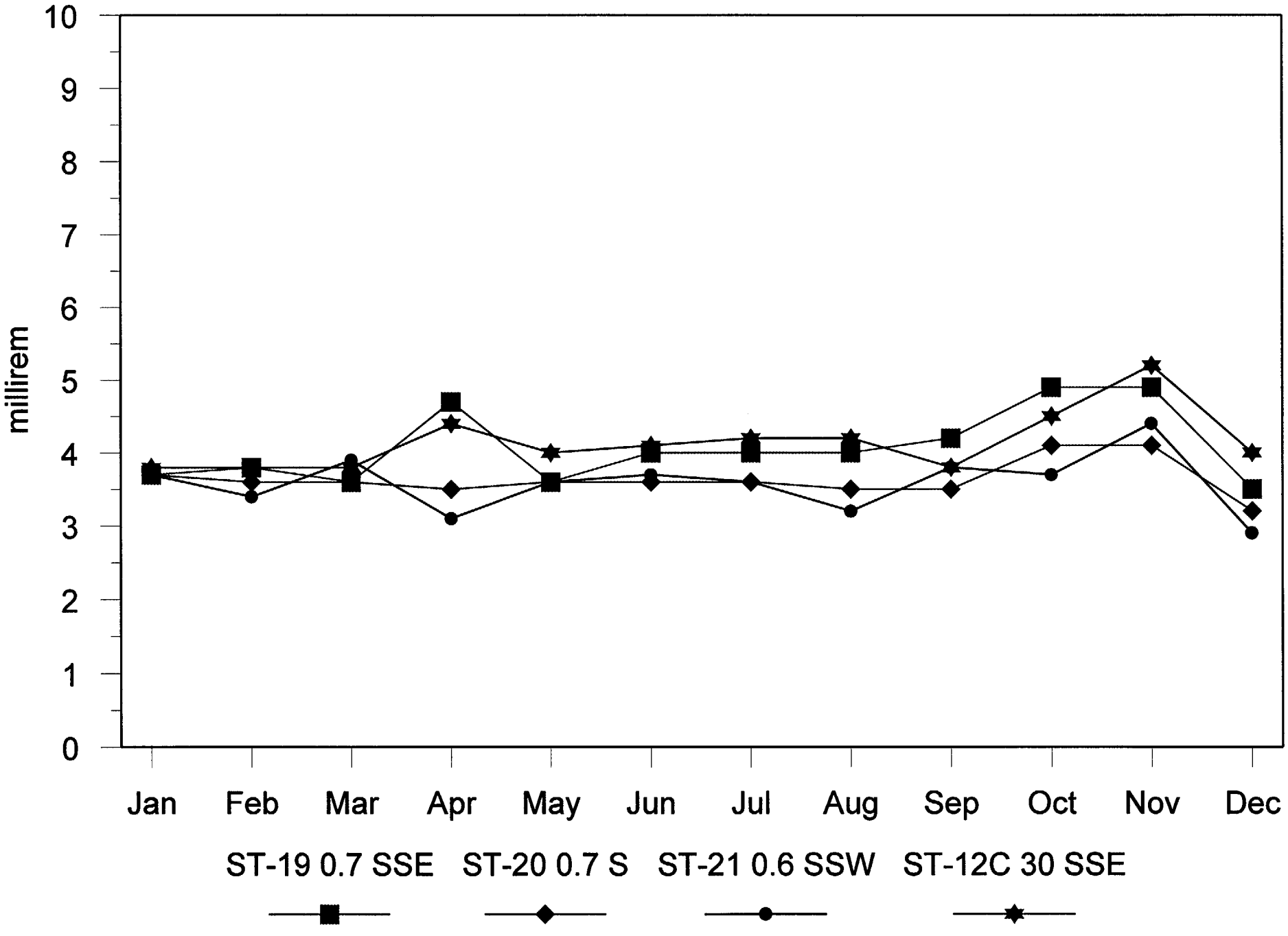
2000 Palisades TLDs

ST12 Control vs ST02, ST03, ST04, ST09



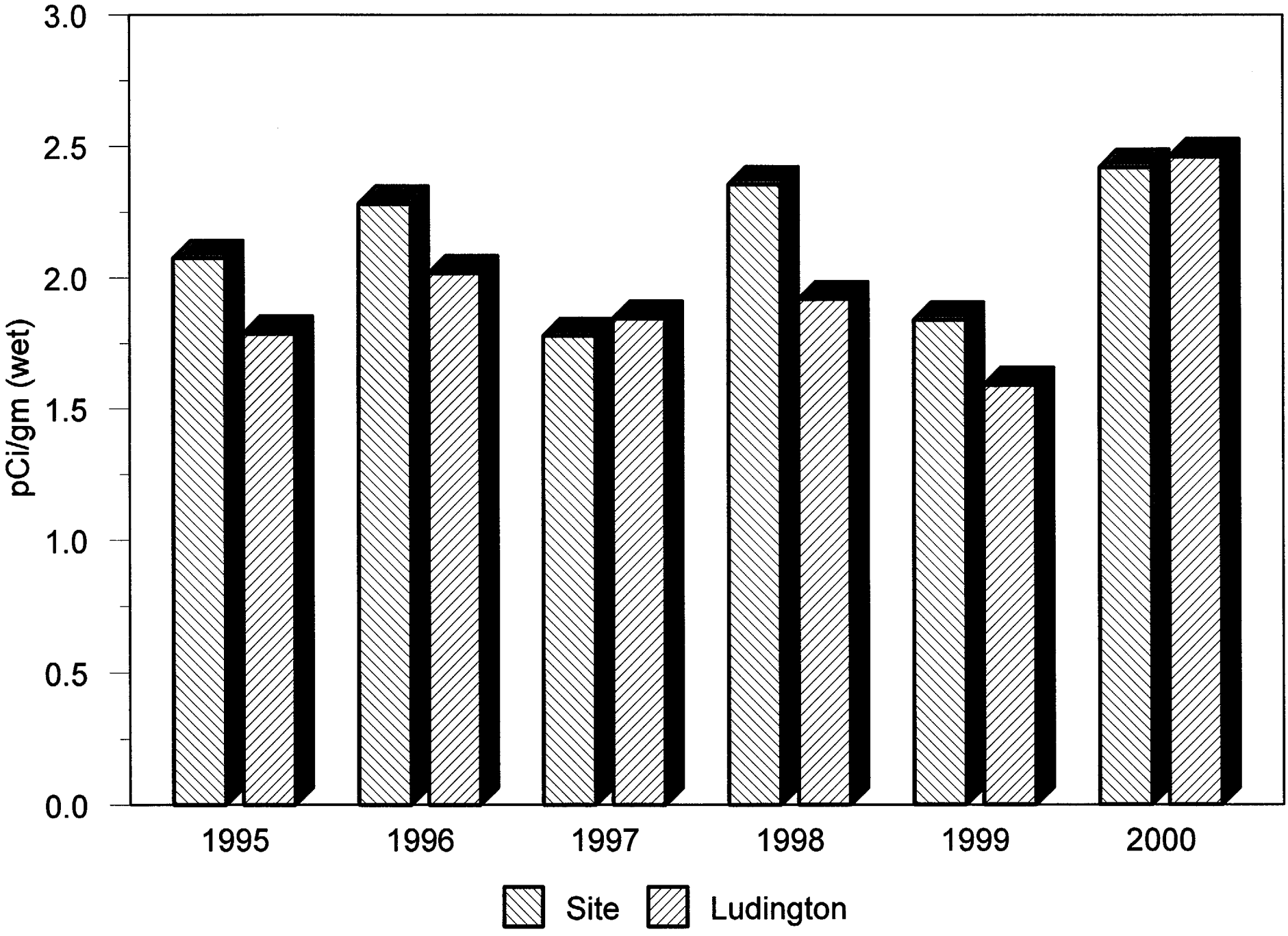
2000 Palisades TLDs

ST12 Control vs ST19, ST20, ST21



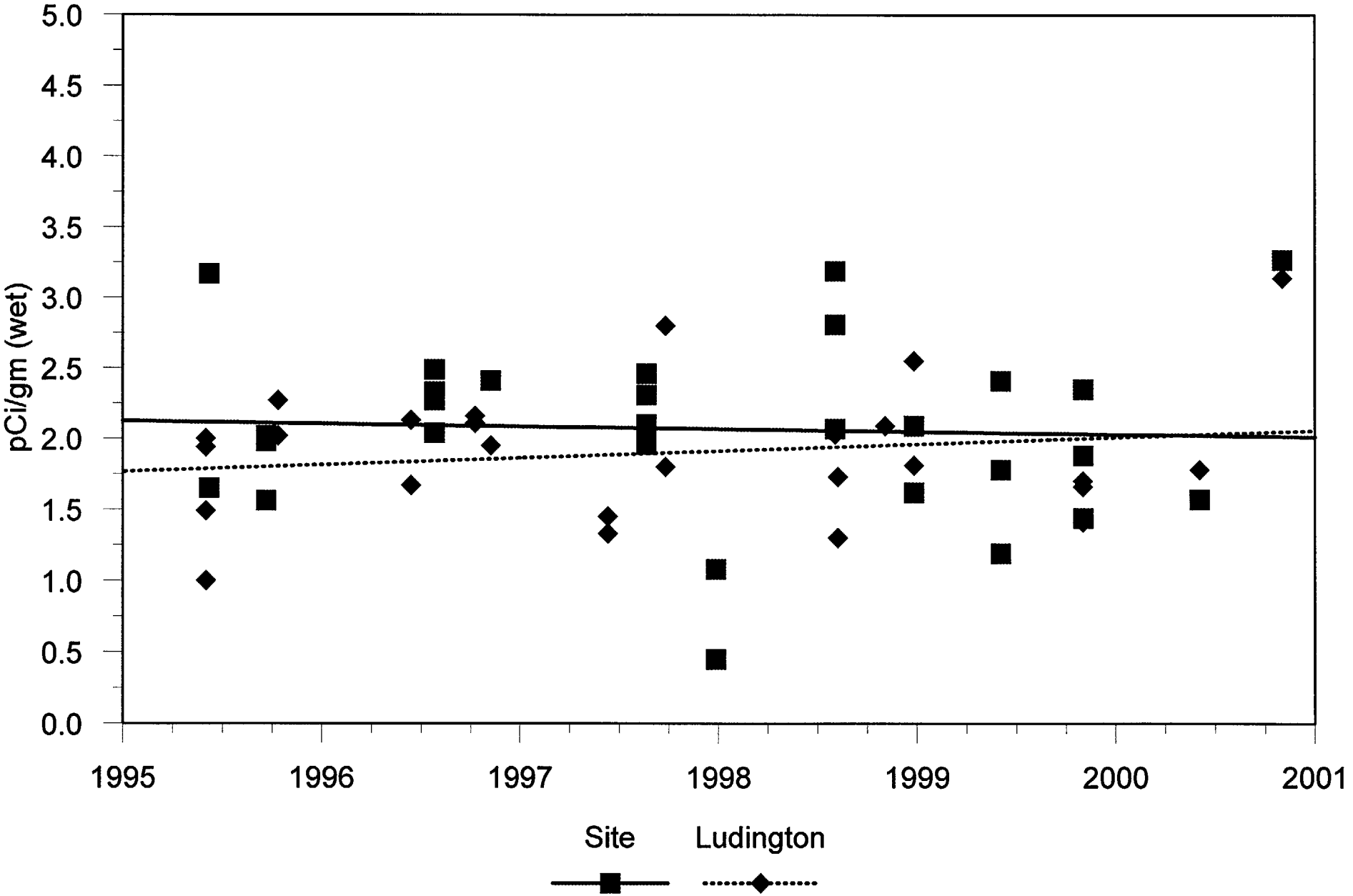
Palisades Fish Gross Beta

1995-2000



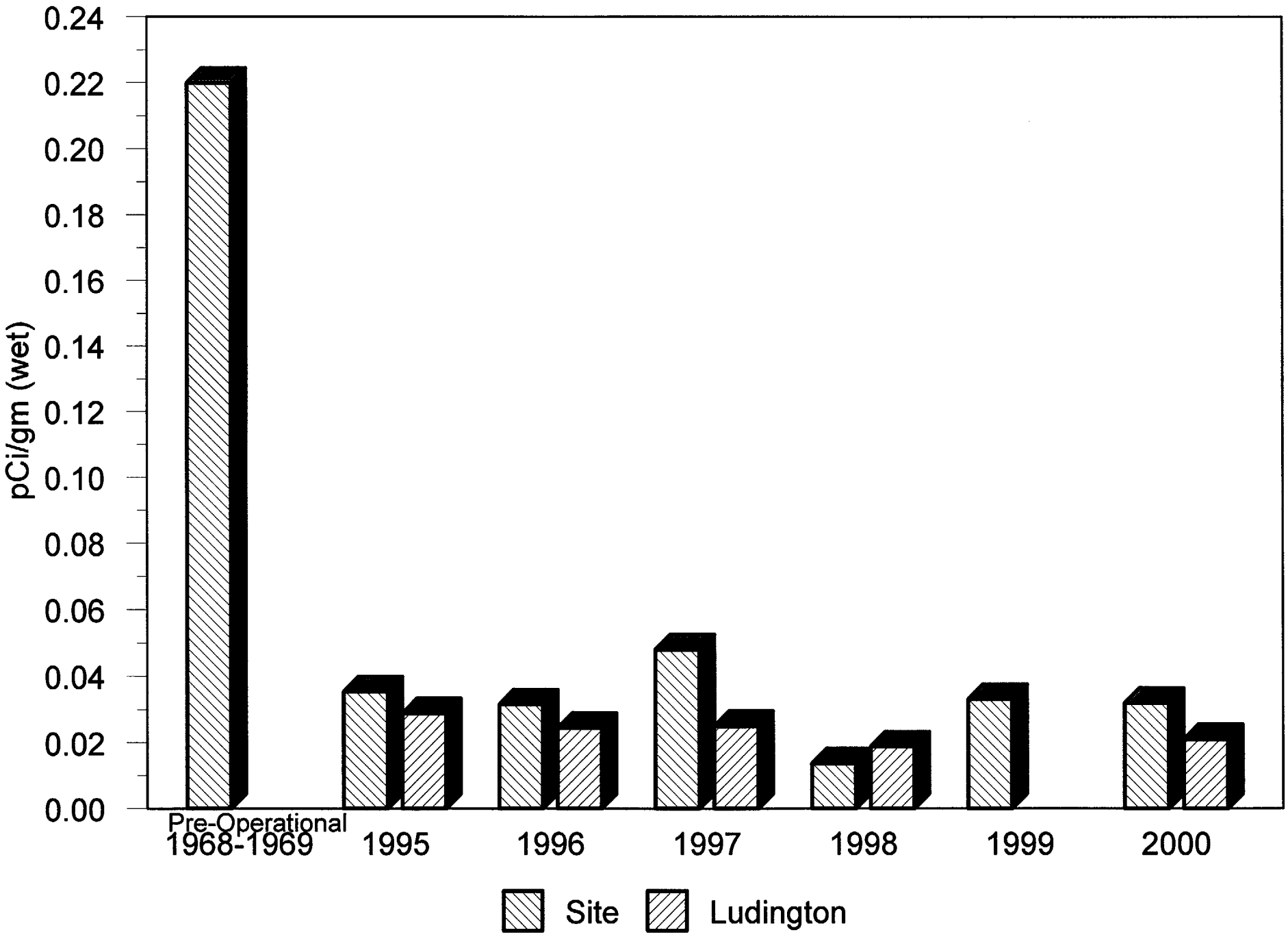
Palisades Fish Gross Beta

1995-2000



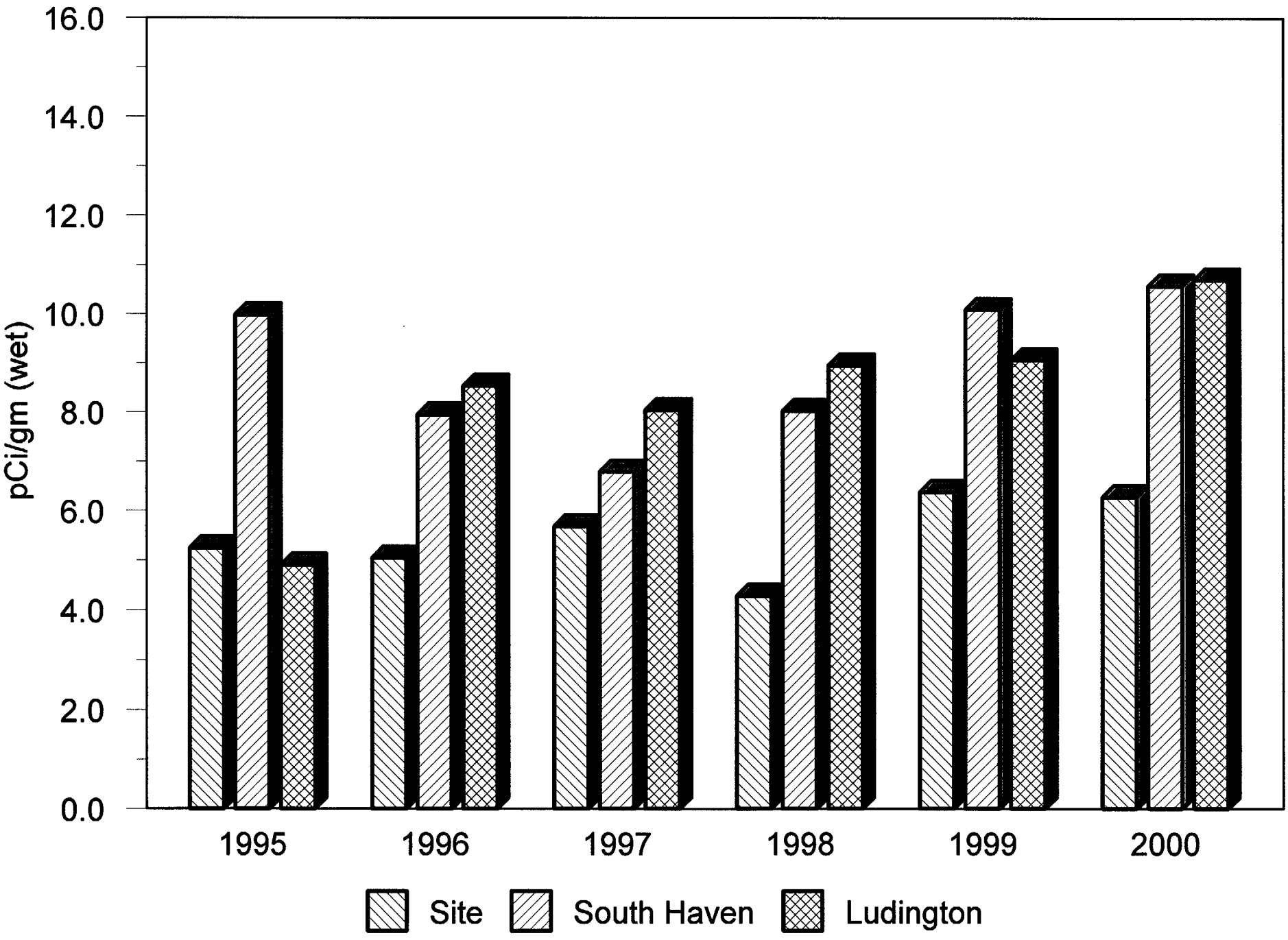
Palisades Fish Cs-137

Pre-Operational vs. Operational



Palisades Sediment Gross Beta

1995-2000



Palisades Sediment Gross Beta

1995-2000