ATTACHMENT

Consumers Power Company
Palisades Plant
Docket 50-255

1992 RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

April 28, 1993

I. Introduction

The 1992 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 1992 reporting period. Reporting requirements are detailed in Palisades Offsite Dose Calculation Manual, Appendix A, sections III.J and IV.B, tables E-1 thru E-3, and table F-1.

Palisades was off-line February 7 to April 19 for reactor refueling. The plant was off-line July 1 to July 4 and July 24 to July 29 due to Turbine Control System problems. The plant was off-line August 14 to August 17 due to a failed air line to a feedwater regulating valve and problems with the Turbine Control System. The plant was taken back off-line August 17 to August 18 due to a turbine hydraulic fluid leak. The plant was off-line August 25 to August 27 due to a failed solenoid in the preferred AC bus powering enineering safeguards system electrical loads coupled with an undetected blown fuse. The plant was taken off-line September 19 to September 28 for the investigation of a personnel injury accident. The plant was off-line again October 30 to November 8 due to Turbine Control System problems.

There are no remaining 1992 laboratory sample analyses pending completion for inclusion into this report. The results of all environmental samples collected are evaluated as follows:

A. Air iodine and particulates, TLDs (monthly and quarterly), and milk data were statistically evaluated at the 95% confidence level (using SAS program) by the methodology detailed in Palisades Procedure HP 10.4. The data was compared against two criteria: the first criterion is the statistical difference which determines if sample results from near sites are significantly greater than those from control sites. The second criterion is the evaluation level (twice the statistical difference) which is the minimum detectable difference that exceeds zero at the 95% confidence level. 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 Technical Specification limits.

II. Reportable Event

None

III. Discussion and Interpretation of Results

A. Air Sample

Comparison of the gross beta airborne particulate sample data between near-site and control locations did not exceed the statistical difference. In many instances, control location sample values were greater. There was no I-131 activity reported above LLD. A total of 625 air samples were collected and analyzed during 1992. Five sample results were not included in the statistical evaluation. Refer to Enclosure A for specific reasons for sample rejection. The samples deleted constitute 0.8 percent

of the Iodine-131 and air particulate gross beta total. Palisades ODCM, Appendix A, sensitivities were met on all samples other than those noted.

Air iodine/particulate samples are collected on a weekly basis from twelve (12) air sampling locations. Air is metered into the sampling unit at a continuous 1 cfm flow rate through a Gelman 47mm air filter (air particulate) and a Scott air iodine cartridge. Both filters are in-line with each other and housed within the same filter holder.

The 1992 air sampler results are consistent with actual effluent releases and site-specific meteorology.

B. Lake Water

A total of 36 individual monthly lake water composite samples were collected from three (3) locations during 1992. Lake water samples from the Palisades Lake-in (intake), the South Haven Municipal Water system intake (raw water), and Ludington Lake-in (intake) are collected daily and composited into monthly samples.

Evaluation of the monthly lake water analytical results was based on a data means comparison between the Palisades Lake-in (indicator), the South Haven Municipal raw water (indicator) and Ludington Lake-in (control) locations. The lake water results were also evaluated against the Palisades Technical Specification reporting limits.

Gross beta analyses are required for all lake water samples. The Palisades Lake-in, South Haven Municipal raw water, and Ludington Lake-in samples were below the required LLDs for gross beta. Monthly gross alpha and tritium analyses were also performed on the Palisades Lake-in and Ludington samples for comparison data against the Lake-out (discharge) sample results. Results of the gross alpha and tritium analyses were below LLD. No Palisades ODCM reporting limits were exceeded.

Although the lake-out (discharge) sample is not used as an indicator in the Radiological Environmental Monitoring Program it is monitored for activity. Four times during 1992 the tritium activity for the discharge was above the ODCM action level of 1000 pCi/L. These elevated levels were all correlated to liquid effluent discharges 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 two gallons each of South Haven Municipal water and Ludington Lake-in water are sent to Teledyne Isotopes 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 the South Haven Municipal Water System and Ludington Pump Storage Water System during 1992. The South Haven samples are obtained from two collection points: South Haven Municipal Water System intake (raw water) and South Haven

Municipal Water System treated water. The Ludington samples were collected from one collection point, the tap from well water. Samples are collected daily for composite into a monthly sample, for the South Haven raw and treated water samples, and a monthly grab sample is obtained for the Ludington well water sample. The South Haven samples are used as indicating locations and the Ludington samples serve as controls.

Evaluation of the drinking water analytical results was based on historical data and a data means comparison between raw water and treated water, as well as a comparison to the Palisades ODCM reporting limits. The evaluated data was also trend plotted against the Palisades Lake-in gross beta results.

The indicator and control drinking water samples require both gross beta and tritium analysis except for the South Haven Municipal raw water sample, which only requires a gross beta analysis. For all samples, including Ludington, the analytical results were below LLD for gross beta and tritium. No special or supplemental analyses were required during 1992.

A two-gallon quantity of each sample is sent to Teledyne Isotopes for analysis. No treatment of the water samples with a preservative is required.

D. Well Water

A total of 96 monthly well water samples were collected from eight (8) locations during 1992. The Palisades site well (indicator) is collected daily and composited into a monthly sample. The State Park and Covert Township Park well water samples (controls) are collected as monthly grab samples only. From five other site area wells (indicators), one (1) sample is collected from the warehouse building (WH), one (1) sample is collected from the outage building (OB) and one (1) sample each is collected from the monitoring wells #14, #15 and #16 which were installed to monitor the groundwater around the Steam Generator Storage Facility. The twelve drinking water samples from the Ludington site well (32-LP) also serve as controls. These six (6) sample points (WH, OB, #14, #15, #16 and 32-LP) are sampled once a month by grab sample.

Evaluation of the well water analytical results was based on a data means comparison between the six (6) indicator locations and the three control locations as well as with the Palisades ODCM reporting limits.

Tritium and gross beta analyses are required for the well water samples. Analytical results were below LLD for tritium at all locations and below LLD for gross beta at the Palisades site, the State Park, Covert Township Park, the Outage Building and Ludington Pump Storage which are drinking water wells.

The Warehouse well had a mean of 5.3 pCi/L gross beta, and monitoring wells #14, #15, and #16 had means of 4.8 pCi/L, 5.4 pCi/L and 4.7 pCi/L, respectively. The means for these four wells are slightly above the 4.0 pCi/L gross beta LLD and are consistent with the mean data for 1991. It should be noted that the Warehouse well and monitoring wells #14, #15, and #16 are not used for drinking.

No Palisades ODCM reporting limits were exceeded for the 1992 well samples. The December site well #14 sample exceeded the gross beta ODCM action level of 10 pCi/L. The December result was 11.2 pCi/L. The result was verified by re-analysis and the necessary supplementary analysis were completed except for an I-131 analysis. The supplementary analyses were all less than LLD. An I-131 analysis is a HP 10.1 procedural requirement not a Palisades ODCM requirement. This deviation was documented by Palisades corrective action system Deviation Report D-PAL-93-026. Site well #14 typically trends around 4 to 8 pCi/L and it is not unusuaal for it to exceed the 10 pCi/L action level. A similar trend in the gross beta activity level for site well #14 was observed at about the same time last year.

One (1) one-gallon quantity from the on-site well and two (2) one-gallon quantities of sample for each of the other wells are sent to Teledyne isotopes for analysis. No treatment of the water samples with a preservative is necessary.

E. Milk

A total of 48 individual monthly milk samples were collected from 4 different dairy farms (stations 26-FC, 27-KK, 28-GH and 29-WS) during 1992. The milk samples are obtained as grab samples (from dairy milk holding tanks).

With the exception of Sr-90, all isotopic results listed in Table 10.4-2 were less than LLD. SAS evaluation of the Sr-90 activity between indicator (26-FC, 27-KK, and 28-GH) and control (29-WS) locations revealed a statistical difference between the indicators and controls, but the difference did not exceed the evaluation level. The indicator location (26-FC) had the highest annual Sr-90 mean for 1992 of 3.7 pCi/L. The control location (29-WS) had an annual mean of 2.3 pCi/L. These results are relatively unchanged from 1990 and 1991 results. The difference is not considered significant at these very low values. No special or supplemental analyses were required, nor were any Palisades ODCM reporting limits exceeded.

Milk samples are required monthly (usually collected the 1st week of the month) from each designated location (4 total). 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 Teledyne Isotopes.

F. TLDs - Gamma Dose

There were a total of 344 monthly, 114 quarterly and 26 annual TLDs collected and analyzed during 1992. Four (4) monthly TLDs, two (2) quarterly TLDs, and three (3) annual TLD were reported missing. Refer to Enclosure A for further details.

The Palisades gamma assessment program consists of 30 locations: 1 directly on-site, 9 inner ring and 6 Steam Generator Storage Facility TLDs for a total of 15 site boundary, 10 outer ring (1.0 to 5.5 miles out), 3 control (30 to 55 miles out) and 1 TLD control placed in a lead storage cave. For 1992, the average monthly gamma readings were: 3.8 mR for the inner ring TLD's (site boundary) 4.7 mR for the outer ring TLD's (1.0 to 5.5 miles

out), and 4.5 mR for the control TLD locations. The results are consistent with actual effluent releases. The one (1) on-site TLD location (ST-1) serves as an individual reference TLD, however it was evaluated along with the inner ring (site boundary) TLD's in the SAS program.

The monthly and quarterly SAS statistical TLD data evaluation were accomplished by comparing the inner ring TLDs (site boundary locations ST-01, ST 13-21 and ST 33-38) and the outer ring TLDs (locations St-02 thru ST-09, ST-23 and ST-24) against the control TLD locations (ST-10 thru ST-12). The annual TLD data evaluation was done by direct comparison of data points only. No monthly or quarterly statistical differences were exceeded.

In comparing the inner ring TLDs to the control TLDs ST-11 (Kalamazoo, 34mi SSE) had the greatest monthly mean of 4.8 mR. ST-35 (ENE Site Boundary) had the greatest quarterly and annual exposure of 13.6 mR and 59.0 mR, respectively. When the same comparison was made between the outer ring and control location TLDs, ST-02 (Tower Hill, 5 mi. S) had the greatest monthly, quarterly and annual data mean for any indicator location of 5.6 mR, 17.2 mR and 69.9 mR, respectively.

Environmental gamma doses are measured monthly, quarterly and annually by placement of 3 TLD badges per designated location. Each Teledyne TLD badge contains a 4-zone $CaSO_4$ wafer (the wafer also includes an additional backup/reserve readout zone). Sensitivity for the multi-zone TLDs are 0.5 mR with a linear response of 0.1 mR to 1000 R.

G. Crops

The collection of food crops and vegetation samples (when available and in season) is a requirement of the Palisades Radiological Environmental Monitoring Program. 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.

During 1992, 10 crop samples were collected from two stations (6 samples from station ST-04, 3.5 mi SE and 4 samples from station 5-PR, 3.5 mi ESE). Evaluation of sample analytical results was direct. There was no control location used.

Of the isotopic analyses listed on Table HP 10.4-2, only the gross beta resulted in any specific activity (slightly above LLD). All other analyses were less than LLD. The crop samples at station ST-04 had the greatest individual means for gross beta activity of all 10 samples taken.

No Palisades ODCM action or reporting levels were exceeded, nor were any special/supplemental analyses required during 1992.

Food crop samples are required to be collected when available and in season. When collected, approximately 1 Kg of sample is placed in a sealable plastic bag for shipment to Teledyne Isotopes. No special treatment of the samples with a preservative is necessary.

H. Sediment

A total of 11 individual sediment samples were collected from 5 locations during 1992. Eight (8) sediment samples were obtained from Palisades (discharge, ½ mi South of discharge, ½ mi North of discharge and South Haven Beach locations) and three (3) samples from the Ludington Control Station.

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 Technical Specification reporting limits. The individual Palisades sample locations were combined into one indicator (site) location for comparison purposes; however if any one individual sample location had a greater specific isotopic annual mean than the other location(s), then that location is identified on Table HP 10.4-2.

Of the isotopic analyses listed on Table HP 10.4-2, only gross beta activity was detected at levels above the required LLD level. Location 25-SH (South Haven Beach) had the greatest mean for gross beta. No Palisades ODCM action or reporting levels were exceeded, nor were any special/supplemental analyses required during 1992.

Sediment samples are collected semi-annually from each designated location. A one (1) liter quantity grab sample usually is obtained off-shore. No treatment of the samples with a preservative is necessary prior to shipment to Teledyne Isotopes.

I. Aquatic Biota - Algae

No algae was collected for analysis during 1992. Algae was not available in sufficient sample quantities during 1992 to warrant collection and analysis. The Palisades Radiological Environmental Monitoring Program does not require alage to be collected, althouth it has been collected in the past when available.

One (1) liter quantities of algae (if available) are prepared for shipment to Teledyne isotopes by treating each sample with 10 ml of a 10% formaldehyde solution for preservation.

J. Fish

A total of 21 individual fish samples were collected from two (2) locations during two (2) separate sample collections in 1992. Eleven (11) fish samples were obtained from Palisades (discharge) and ten (10) samples from the Ludington Control Station.

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. Of the isotopic analyses listed on Table HP 10.4-2, only gross beta activity was greater than LLD. No Palisades ODCM action levels or reporting levels were exceeded nor were any special analyses requested for 1992.

As a minimum, at least two (2) different fish species (ie, forage, sport fish, etc) per designated location per year are collected. When caught, a one (1) liter quantity of fish sample is prepared for shipment to Teledyne Isotopes. Each sample is treated with 10 ml of a 10% formaldehyde solution for preservation.

K. Broad Lead Vegetation

No broad leaf vegetation samples were collected from the surrounding Palisades environs during 1992. 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 1992 reporting year.

L. Non-Routine Samples

None

M. Gaseous and Liquid Radwaste Effluent Composite Samples

Although not a direct reporting component in the Palisades Annual Radiological Environmental Monitoring 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 results are compared against Palisades ODCM radioactive effluent LLDs. All isotopic LLDs were met.

Both the gaseous and liquid radwaste effluent composite samples are collected monthly and sent to Teledyne Isotopes for analysis. The liquid effluent composite sample is based on a specific ratioed volume amount of sample collected per total batch volume release. The gaseous radwaste effluent composite sample results are based on analyzing four (4) or five (5) weekly stack gas filters. No special sample treatment with a preservative is required prior to laboratory analysis.

III. Assessment of Palisades Operation Environmental Impact

In reviewing the 1992 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. Since the Chinese stopped open atmospheric testing of nuclear devices in late 1981-82, environmental background radiation levels continue to decrease. The effect of the Chernobyl fallout (April 1986) on milk, aquatic biota and fish also appears to have had no lasting results. 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.

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 1992
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 Approx 1 CFM	All: Stations 1-st thru 12-DG	625	Gross Beta, I-131	Weekly
Lake Water	1 Gallon Composite	Intake, South Haven Raw & Ludington	36	Gross Beta, *Gross Alpha, *Tritium	Monthly
Drinking Water	1 Gallon Composite/Grab	South Haven Municipal Treated and Raw, & Ludington	36	Gross Beta, *Tritium	Monthly
Well Water	1 Gallon Grab	Site, TP, SP, OB, WH, Ludington, MV#14, #15, #16	96	Gross Beta, Tritium	Monthly
Milk	2 Gallon Grab	WS, FC, GH, KK	48	I-131, Sr-89 and Sr-90, Cs-137, Other Gamma	Monthly
TLD	Continuous	All: Stations ST-01 thru ST-24 and ST-33 thru ST-38	344 114 26	Gamma	Monthly Quarterly Annual
Crops	Grab	JS, PR	10	Gross Beta, Sr-89 and Sr-90, Cs-137, Other Gamma	In Season
Sediment	Grab	Discharge, 0.5 mi N & S Site Boundary South Haven Beach Ludington Control	11	Gross Beta, Sr-89 and Sr-90, Cs-137, Other Gamma	Semi-Annual
Aquatic Biota	Grab	Discharge, 0.5 mi South of Discharge, Ludington Control	0	Gross beta, Sr-89, Sr-90 Other Gamma	As requested
Fish	Grab	Discharge, South, Ludington Control	21	Gross Beta, Sr-89, Sr-90 Other Gamma	Semi-Annual

*NOTE: Not required for South Haven Municipal raw water.

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 1992
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/m^3)	I-131 620/625	0.07	465/468 LLD	LLD		155/157 LLD	None
	Gross Beta 620/625	0.01	465/468 0.019 (0.004-0.039)	ST-12 (Control-Dowagiac 30 mi SSE)	0.025 (0.016-0.052)	0.021 (0.006-0.052)	None
Lake Water (pCi/L)	Gross Alpha(f) 24/24	1.0	12/12 LLD	LLD		12/12 LLD	None
	Gross Beta 36/36	4.0	24/24 LLD	LLD		12/12 LLD	None
	Tritium(f) 24/24	500.0	12/12 LLD	LLD		12/12 LLD	None
Drinking Water (pCi/L)	Gross Beta 36/36	4.0	24/24 LLD	LLD		12/12 LLD	None
	Tritium(f) 24/24	500.0	12/12 LLD	LLD		12/12 LLD	None
Well Water (pCi/L)	Gross Beta 96/96	4.0	72/72 LLD	ST-42 (Site Monitoring Well #15)	5.4 (3.3-7.6)	36/36(1) LLD	None
	Tritium 96/96	500.0	72/72 LLD	LLD		36/36(1) LLD	None
Milk (pCi/L)	I-131 48/48	1.0	36/36 LLD	LLD		12/12 LLD	None
	Sr-89 48/48	5.0	36/36 LLD	LLD		12/12 LLD	None
	Sr-90 48/48	1.0	36/36 3.2 (2.0-6.3)	ST-26 (F. Crnkovich, 7.5 mi NE)	3.7 (2.2-6.3)	12/12 2.3 (1.5-3.1)	None
	Cs-137 48/48	18.0	36/36 LLD	LLD		12/12 LLD	None
	Other Gamma 48/48	15.0	36/36 LLD	LLD		12/12 LLD	None

(1) 12 of these control samples were from the drinking water media control locations.

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 1992
Table HP 10.4-2
Sample Data Summary

Medium or Pathway Sampled	Analyses Evaluated/ Analyses Performed	Lower Limit of Detection(a)	All Indicator Locations		Location With Greatest Annual Mean		All Control Locations		Nonroutine Reports(c)
TLD (gamma mR) Inner Ring (Site Boundary)	TLD (monthly) (e) 225/225	10.0	191/191	3.8 (1.9-5.6)	ST-11 (Control-Kalamazoo 35 mi SSE)	4.8 (3.2-5.5)	34/34	4.5 (3.2-5.6)	None
	TLD (quarterly) (e) 75/75	10.0	64/64	11.3 (9.4-14.2)	ST-35 (ENE Site Boundary)	13.6 (13.1-14.2)	11/11	12.7 (10.4-15.5)	None
	TLD (annual) 17/17	10.0	15/15	48.1 (42.0-59.0)	ST-35 (ENE Site Boundary)	59.0	2/2	54.6 (52.8-56.4)	None
TLD (gamma mR) Outer Ring	TLD (monthly)(e) 119/119	10.0	119/119	4.7 (2.7-7.0)	ST-02 (Tower Hill Farm, 5 mi S)	5.6 (4.3-7.0)	34/34(2)	4.5 (3.2-5.6)	None
	TLD (quarterly)(e) 39/39	10.0	39/39	13.7 (10.0-19.2)	ST-02 (Tower Hill Farm, 5 mi S)	17.2 (15.4-19.2)	11/11(2)	12.7 (10.4-15.5)	None
	TLD (annual) 9/9	10.0	9/9	57.7 (47.9-69.9)	ST-02 (Tower Hill Farm, 5 mi S)	69.9	2/2(2)	54.6 (52.8-56.4)	None
Crops (pCi/g wet)	Gross Beta 10/10	1.0	10/10	1.06 (0.35-1.77)	ST-04 (Jerry Sarno, 3.5 mi. SE)	1.18 (0.62-1.77)	N/A		None
	Sr-89 10/10	0.025	10/10	LLD			N/A		None
	Sr-90 10/10	0.005	10/10	LLD			N/A		None
	I-131 10/10	0.06	10/10	LLD			N/A		None
	Other Gamma 10/10	0.05-0.10	10/10	LLD			N/A		None

(2) Same control TLDs as Inner Ring.

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 1992
Table HP 10.4-2
Sample Data Summary

Medium or Pathway Sampled	Analyses Evaluated/ Analyses Performed		Lower Limit of Detection(a)	All Indicator Locations		Location With Greatest Annual Mean		All Control Locations		Nonroutine Reports (c)
Sediment (pCi/g dry)	Gross Beta	11/11	1.0	8/8	6.13 (3.8-8.49)	ST-25 (South Haven, 5.5 mi. NNE)	8.14 (7.78-8.49)	3/3	9.51 (4.64-12.06)	None
	Sr-89	11/11	0.025	8/8	LLD	LLD		3/3	LLD	None
	Sr-90	11/11	0.005	8/8	LLD	LLD		3/3	LLD	None
	Cs-137	11/11	0.18	8/8	LLD	LLD		3/3	LLD	None
	Other Gamma	11/11	0.05-0.15	8/8	LLD	LLD		3/3	LLD	None
Algae (pCi/g wet)	Gross Beta		1.0	No Samples Collected						
	Sr-89		0.025							
	Sr-90		0.005							
	Cs-137		0.15							
	Other Gamma		0.10-0.26							
Fish (pCi/g wet)	Gross Beta	21/21	1.0	11/11	2.23 (0.93-2.90)	ST-01 (Palisades Plant Site)	2.23 (0.93-2.90)	10/10	2.84 (1.57-3.81)	None
	Sr-89	21/21	0.025	11/11	LLD	LLD		10/10	LLD	None
	Sr-90	21/21	0.005	11/11	LLD	LLD		10/10	LLD	None
	Other Gamma	21/21	0.10-0.26	11/11	LLD	LLD		10/10	LLD	None
Broadleaf Vegetation(d) (pCi/g wet)	Gross Beta		1.0	No Samples Collected						
	I-131		0.06							
	Sr-89		0.025							
	Sr-90		0.005							
	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 and/or vendor laboratory LLDs.
(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 South Haven Municipal raw water.

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 1992
Table HP 10.4-3
Greatest Mean Sampling Location

Medium	Type of Analysis	Location	High	Low	Mean
Air (pCi/m^3)	Gross Beta	ST-12 (Control-Dowagiac, 30 mi SSE)	0.052	0.016	0.025
	I-131		-----	-----	<0.07
Lake Water (pCi/L)	Gross Alpha	LLD	-----	-----	<1.0
	Gross Beta	LLD	-----	-----	<4.0
	Tritium	LLD	-----	-----	<500.0
Drinking Water (pCi/L)	Gross Beta	LLD	-----	-----	<4.0
	Tritium	LLD	-----	-----	<500.0
Well Water (pCi/L)	Gross Beta	ST-42 (Site Monitoring Well#15)	7.6	3.3	5.4
	Tritium	LLD	-----	-----	<500.0
Milk (pCi/L)	I-131	LLD	-----	-----	<1.0
	Sr-89	LLD	-----	-----	<5.0
	Sr-90	ST-26 (F. Crnkovich, 7.5 mi NE)	6.3	2.2	3.7
	Cs-137	LLD	-----	-----	<18.0
	Other Gamma	LLD	-----	-----	<15.0
TLD (Gamma-mR)	TLD (Monthly)	ST-11 (Control-Kalamazoo, 35 mi SSE)	5.5	3.2	4.8
Inner Ring	TLD (Quarterly)	ST-35 (ENE Site Boundary)	14.2	13.1	13.6
(site boundary)	TLD (Annual)	ST-35 (ENE Site Boundary)	-----	-----	59.0
TLD (Gamma-mR)	TLD (Monthly)	ST-02 (Tower Hill Farm, 5 mi S)	7.0	4.3	5.6
Outer Ring	TLD (Quarterly)	ST-02 (Tower Hill Farm, 5 mi S)	19.2	15.4	17.2
	TLD (Annual)	ST-02 (Tower Hill Farm, 5 mi S)	-----	-----	69.9

Palisades Nuclear Plant, Van Buren County, Mi. Docket 50-255
Annual Radiological Environmental Operating Report
January 1 to December 31, 1992
Table HP 10.4-3
Greatest Mean Sampling Location

Medium	Type of Analysis	Location	High	Low	Mean
Crops (pCi/g wet)	Gross Beta	ST-04 (Jerry Sarno, 3.5 mi SE)	1.77	0.62	1.18
	Sr-89	LLD	-----	-----	<0.025
	Sr-90	LLD	-----	-----	<0.005
	Cs-137	LLD	-----	-----	<0.08
	I-131	LLD	-----	-----	<0.06
	Other Gamma	LLD	-----	-----	<0.05-0.10
Sediment (pCi/g dry)	Gross Beta	ST-25 (South Haven, 5.5 mi NNE)	8.49	7.78	8.14
	Sr-89	LLD	-----	-----	<0.025
	Sr-90	LLD	-----	-----	0.005
	Other Gamma	LLD	-----	-----	<0.05-0.15
Algae (pCi/g wet)	Gross Beta	No Samples Collected	-----	-----	
	Sr-89		-----	-----	
	Sr-90		-----	-----	
	Co-60		-----	-----	
	Cs-137		-----	-----	
	Other Gamma		-----	-----	
Fish (pCi/g wet)	Gross Beta	ST-01 (Palisades Plant Site)	2.90	0.93	2.23
	Sr-89	LLD	-----	-----	<0.025
	Sr-90	LLD	-----	-----	<0.005
	Other Gamma	LLD	-----	-----	<0.10-0.26
Broad Leaf Veg (pCi/g wet)	Gross Beta	No Samples Collected			
	I-131				
	Sr-89				
	Sr-90				
	Other Gamma				

Enclosures

A. Sample Collection Anomalies

B. Palisades 1992 Land use Census

C. Health Physics Procedure HP 10.10, "Palisades Radiological Environmental Program Sample Collection and Shipment Procedure" (with sample locations, maps, etc).

D. Palisades 1992 (Annual) Radiological Environmental Monitoring Program Data as provided by Teledyne Isotopes Midwest Laboratory, Northbrook, IL.

E. Teledyne Isotopes Midwest Laboratory EPA Interlaboratory Comparison Program Results

F. Data Graphs

1. Palisades Air Particulate (gross beta) 1992 Trending and Palisades Air Particulate (gross beta) Operational Comparison Graphs, 1968-1969 (pre-op) and 1987-1992.

2. Palisades Lake Water/Drinking Water (gross beta) 1992 Trending and Palisades (gross beta) Operations Comparison Graphs, 1987-1992.

3. Palisades Well Water (gross beta) 1992 Trending and Palisades Operational Comparison Graphs 1968-1969 (pre-op) and 1987-1992.

4. Palisades Milk (Sr-90) 1992 Trending and Palisades Operational Comparison Graphs (Sr-90 and Cs-137); 1968-1969 (pre-op) and 1987-1992.

5. Palisades TLD (gamma) 1992 Trending and Palisades Operational Comparison graphs (monthly, quarterly and annual); 1968-1969 (pre-op monthly) and 1987-1992.

6. Palisades Sediment (gross beta) 1987-1992 Trending and Palisades Operational Comparison Graphs; 1987-1992.

7. Palisades Fish (gross beta and Sr-90) Trending and Palisades Operational Comparison Graphs (gross beta, Sr-90 and Cs-137); 1968-1969 (pre-op, Sr-90 and Cs-137) and 1987-1992.

Enclosure A

Sample Collection Anomalies

Sample Type Affected	Location	Date	Problem	Evaluation
AP/I-131	2TH	12-27-92	Weelky air sample volume low - values not included in statistical analysis	Loss of power to pump location
AP/I-131	4JS	3-08-92	Filter paper very light - results not included in statistical analysis	Filter not properly installed into filter holder
AP/I-131	7SD	1-19-92	Filter paper very light - results not included in statistical analysis	Filter not properly installed into filter holder
AP/I-131	11KZ	8-19-92	Filter paper very light - results not included in statistical analysis	Filter not properly installed into filter holder
AP/I-131	12DG	1-08-92	Weelky air sample volume low - values not included in statistical analysis	Filter changed out pre-matually not enough sample volume
TLD	ST11	5-30-92	May TLD missing at time of collection	May monthly TLD lost - no TLD data available for month
TLD	ST33	6-28-92	June monthly TLD and annual TLD missing at time of collection	TLDs lost possibly due to high winds no monthly TLD data available - annual TLD replaced
TLD	ST10 ST24	10-04-92	September monthly, quarterly, and annual TLD missing at time of collection	TLDs vandalized, no monthly, quarterly or annual TLD data available.
TLD	ST33	1-03-93	Annual TLD missing at time of collection	Annual TLD lost - no TLD data

To KMHaas, Palisades

From TLPopp, Palisades TLPopp

Date October 5, 1992

Subject PALISADES PLANT -
1992 LAND USE CENSUS

CC GASturm, Palisades
TPNeal, Palisades
DCC:950/72*10*03/LP

CONSUMERS POWER COMPANY

Internal Correspondence

TLP92*011

The attached tables and map are the results of the Palisades Land Use Census conducted by TLPopp and LDDine on August 27, 1992. 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.

Both the Van Buren County Agricultural Extension Office and Consumers Power Company Southern Region - District Manager's Office (Kalamazoo) were contacted as required in Procedure HP 10.11. The Critical Receptor for goats changed from 3.80 miles to 2.50 miles in the ENE sector. The X/Q (sec/m^3) subsequently changed from 6.9E-08 to 1.3E-07 for this item. The Critical Receptor for a garden changed from the South sector at 0.50 miles to the NE sector at 0.90 miles. The X/Q subsequently changed from 1.0E-06 to 7.3E-07 for this item.

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.

Revised and Authorized MDMennucci 10-6-92

MDMennucci, HP Technical Supervisor Date

1992 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
N	>5 mi	>5 mi	>5 mi	>5 mi	>5 mi
NNE	1.1 mi	1.6 mi	>5 mi	>5 mi	>5 mi
NE	.9 mi	.9 mi	>5 mi	>5 mi	>5 mi
ENE	1.3 mi	1.5 mi	4.0 mi	4.0 mi	2.5 mi
E	1.0 mi	1.0 mi	3.5 mi	>5 mi	>5 mi
ESE	1.0 mi	1.1 mi	3.1 mi	4.0 mi	>5 mi
SE	1.0 mi	1.0 mi	3.8 mi	4.3 mi	>5 mi
SSE	.75 mi	1.5 mi	>5 mi	>5 mi	>5 mi
S	.5 mi	1.5 mi	>5 mi	>5 mi	>5 mi
SSW	.75 mi	1.5 mi	>5 mi	>5 mi	>5 mi

1992 PALISADES LAND USE CENSUS

TABLE 10.11-2

Verification of Items

Sector	Location Description	Item	Number/Comment
NNE Ruggles Road	L. Kern-State Park Manager	Residence	1
NNE	20th & Fire Lane O, intersection (West side of road).	Garden	1
NE Blue Star Hwy	L. Swetay, Route 3, Box 133, South Haven-(East side of hwy).	Residence Garden	1 1
ENE 24th Avenue, dead end	Trailer-West 24th Avenue, dead end at sand dune.	Residence	1
ENE 24th & 76th Ave	76776 - 24th Avenue, NW on intersection of 24th & 76th Ave	Garden	1
ENE 72nd Street	Cecil Hodge, 16971 72nd St 3/8 mile South of 16th Ave and 72nd St intersection (West side of 72nd St).	Cattle	2-Dairy Cow 7-Dairy Cow
E 77th Street dead end	77th St - 1 mile North of 77th St and 28th Avenue intersection.	Residence Garden	1 1
ENE	24th & M-140 intersection West side	Goats	2

1992 PALISADES LAND USE CENSUS

TABLE 10.11-2 (Cont'd)

E 72nd Street	C. Mims, 26200 72nd St intersection of 72nd St and 26th Ave (Northwest corner of intersection).	Cattle	2-Beef
ESE 77 1/2 Street	O. Ashley - Northwest corner of 77 1/2th St and 28th Ave intersection (28008).	Residence	1
ESE	77th & 28th intersection (1/10, mi West of)	Garden	1
ESE 34th Ave	Herchy House, 72753 34th Ave	Cattle	25-Dairy Cow
ESE 30th Ave	Newell, 73419 30th Avenue	Cattle	3-Beef
ESE 69th Street	Dairy Farm, 69th St, 1/2 mile North of 69th St and 34th Avenue intersection (approximately 1/2 mile outside of 5 mile limit zone).	Cattle	15-Dairy Cows 10-Beef
SE 28th Ave.	77550 28th Ave.	Residence Garden	1 1
SE 34th Avenue	L. Burrows - 1/2 mile East of 34th Ave and M-140 intersection (South side of 34th Ave).	Cattle	15-Beef
SE 36th Avenue	G. Miller, Route 1, Box 20, Covert - 1/2 mile West of 36th Ave and 72nd St intersection (South side of 36th St).	Cattle	1-Dairy Cow

1992 PALISADES LAND USE CENSUS

TABLE 10.11-2 (Cont'd

SSE 29th Avenue	L. Burrows - Route 1, Box 167, Covert - Southwest corner of 29th Ave and Blue Star Hwy intersection.	Residence	1
SSE 77 1/2 St	Charles Dunson residence half way between 30th and 32nd Ave (West side on 77 1/2th St).	Garden	1
SSE CR 376	Marshall - Southwest corner of CR 376 and M-140 intersection (owner of cattle is J. Donald leasing Marshall property - at edge of 5 mile limit zone).	Cattle	8-Beef 4-Goats
S 29th Avenue	Residence - Palisades Park; 3/4 mile West of 29th Ave. and Blue Star Hwy intersection (North side of 29th Ave).	Residence	1
S 32nd Avenue	Northwest corner of 32nd Ave and Blue Star Hwy.	Garden	1
SSW 20th Avenue dead end	R. James - 29th Ave, dead end, Palisades Park.	Residence	1
SSW 32nd Avenue	Dead end of dirt road, 1/2 mile West from 32nd Ave and Blue Star Hwy intersection.	Garden	1

1992 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	1.4E-06
S	0.50	Residence, Palisades Park; 3/4 mile West of 29th Avenue and Blue Star intersection.	Residence	1.0E-06
NE	0.90	L.Swetway, Rt 3, Box 133 Blue Star Hwy, East side	Garden	7.3E-07
ESE	3.10	Newell, 73419 30th Ave Covert (South side of road)	Beef Cattle	7.4E-08
ENE	4.00	Cecil Hodge, 16971 72nd Street, 3/8 mile South of 16th Avenue and 72nd Street intersection (West side of 72nd Street).	Dairy Cow	6.4E-08
ENE	2.50	24th & M-140 intersection, West side	Goat	1.3E-07

Note:

*Based on Palisades 5 year composite meteorological data, 1983-1987.

TABLE 1.4

1992 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
N	>5 mi	>5 mi	>5 mi	>5 mi	>5 mi
NNE	1.1 mi	1.6 mi	>5 mi	>5 mi	>5 mi
NE	.9 mi	.9 mi	>5 mi	>5 mi	>5 mi
ENE	1.3 mi	1.5 mi	4.0 mi	4.0 mi	2.5 mi
E	1.0 mi	1.0 mi	3.5 mi	>5 mi	>5 mi
ESE	1.0 mi	1.1 mi	3.1 mi	4.0 mi	>5 mi
SE	1.0 mi	1.0 mi	3.8 mi	4.3 mi	>5 mi
SSE	.75 mi	1.5 mi	>5 mi	>5 mi	>5 mi
S	.5 mi	1.5 mi	>5 mi	>5 mi	>5 mi
SSW	.75 mi	1.5 mi	>5 mi	>5 mi	>5 mi

TABLE 1.4a

1992 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	1.4E-06
S	0.50	Residence, Palisades Park; 3/4 mile West of 29th Avenue and Blue Star intersection.	Residence	1.0E-06
NE	0.90	L.Swetway, Rt 3, Box 133 Blue Star Hwy, East side	Garden	7.3E-07
ESE	3.10	Newell, 73419 30th Ave Covert (South side of road)	Beef Cattle	7.4E-08
ENE	4.00	Cecil Hodge, 16971 72nd Street, 3/8 mile South of 16th Avenue and 72nd Street intersection (West side of 72nd Street).	Dairy Cow	6.4E-08
ENE	2.50	24th & M-140 intersection, West side	Goat	1.3E-07

Note:

*Based on Palisades 5 year composite meteorological data, 1983-1987.

TELEDYNE
ISOTOPES

MIDWEST LABORATORY
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FINAL
MONTHLY PROGRESS REPORT
TO
CONSUMERS POWER COMPANY
JACKSON, MICHIGAN

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

PREPARED AND SUBMITTED
BY
TELEDYNE ISOTOPES MIDWEST LABORATORY
PROJECT NO. 8022

Reporting Period: January-December, 1992

Reviewed and
Approved by: L G Huebner Date 2-22-93
L. G. Huebner
General Manager

Distribution: M. Mennucci (1 copy)

TABLE OF CONTENTS

Section		Page
	List of Tables	iii
1.0	INTRODUCTION	1
2.0	LISTING OF MISSED SAMPLES	2

Appendices

A	Interlaboratory Comparison Program Results	A-1
B	Data Reporting Conventions	B-1

PALISADES

LIST OF TABLES

No.		Page
1	Airborne Particulates and Iodine-131	
	Location 1ST	4
	Location 2TH	5
	Location 3HS	6
	Location 4JS	7
	Location 5PR	8
	Location 6RB	9
	Location 7SD	10
	Location 8SP	11
	Location 9TP	12
	Location 10GR	13
	Location 11KZ	14
	Location 12DG	15
2	Gamma Radiation, as Measured by TLDs, Monthly Exposure	16
3	Gamma Radiation, as Measured by TLDs, Quarterly Exposure	20
4	Gamma Radiation, as Measured by TLDs, Annual Exposure	21
5	Lake Water, Intake and Discharge	22
6	Drinking Lake Water	24
7	Well Water	25
8	In-Plant Water	37
9	Milk	41
10	Food Crops	45
11	Fish	48
12	Algae	51
13	Bottom Sediments	52
14	Special Samples	
	14.1 Liquid Radwaste	55
	14.2 Stack Filters	59
	14.3 NRC Split Samples	60
	14.4 Reactor Water	60
	14.5 Steam Generator Blowdown	60

PALISADES

1.0 INTRODUCTION

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

Data obtained in the program are well within the ranges previously encountered in the program and to be expected in the environmental media sampled.

For all gamma isotopic analyses, the 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 occurring gamma-emitters, such as K-40 and Ra daughters, are frequently detected but not listed here. Data listed as "<" are at the 4.66 sigma level, others are 2 sigma. Unless noted otherwise, the less than value ("<") reported under "Other Gammas" is for Co-60 and may be higher or lower for other radionuclides.

All concentrations, except 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
Liquid Radwaste	Palisades	January	Sample not collected.
Liquid Radwaste	Palisades	February	Sample not collected.
TLD	ST-11	May	TLD not received.
TLD	Control-1	May	TLD lost in the field.
Liquid Radwaste	Palisades	May	Sample not collected.
Liquid Radwaste	Palisades	July	Sample not collected.
Liquid Radwaste	Palisades	August	Sample not collected.
Liquid Radwaste	Palisades	September	Sample not collected.
TLD	ST-10	September	TLD lost in the field.
TLD	ST-24	September	TLD lost in the field.
TLD	ST-10	3rd Qtr.	TLD lost in the field.
TLD	ST-24	3rd Qtr.	TLD lost in the field.
Liquid Radwaste	Palisades	October	Sample not collected.
TLD	ST-10	Annual	TLD lost in the field.
TLD	ST-24	Annual	TLD lost in the field.
TLD	ST-33	Annual	TLD lost in the field.

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PALISADES

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 1ST - Palisades

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	295	0.023±0.004	<0.028	07-05-92	275	0.016±0.003	<0.010
01-12-92	300	0.021±0.004	<0.037	07-12-92	278	0.019±0.004	<0.009
01-19-92	314	0.021±0.003	<0.025	07-19-92	280	0.014±0.003	<0.011
01-26-92	306	0.032±0.004	<0.034	07-26-92	283	0.013±0.003	<0.010
02-02-92	314	0.026±0.003	<0.033	08-02-92	278	0.015±0.003	<0.011
02-09-92	300	0.024±0.003	<0.033	08-09-92	278	0.014±0.002	<0.010
02-16-92	309	0.021±0.003	<0.035	08-16-92	278	0.013±0.003	<0.017
02-23-92	303	0.024±0.002	<0.035	08-23-92	280	0.019±0.003	<0.012
03-01-92	306	0.019±0.003	<0.035	08-30-92	295	0.014±0.003	<0.007
03-08-92	289	0.029±0.004	<0.039	09-06-92	278	0.021±0.003	<0.010
03-15-92	306	0.026±0.004	<0.030	09-13-92	280	0.015±0.003	<0.008
03-22-92	309	0.021±0.003	<0.031	09-20-92	283	0.025±0.004	<0.011
03-29-92	306	0.016±0.003	<0.027	09-27-92	286	0.017±0.004	<0.011
1st Qtr. mean ± s.d.		0.023±0.004	<0.039	3rd Qtr. mean ± s.d.		0.016±0.004	<0.017
04-05-92	295	0.014±0.003	<0.035	10-04-92	286	0.021±0.004	<0.021
04-12-92	297	0.017±0.002	<0.022	10-11-92	283	0.016±0.003	<0.011
04-19-92	300	0.013±0.003	<0.026	10-18-92	286	0.012±0.003	<0.013
04-26-92	297	0.013±0.003	<0.025	10-26-92	331	0.035±0.004	<0.008
05-03-92	297	0.023±0.004	<0.020	11-01-92	246	0.018±0.004	<0.011
05-10-92	292	0.018±0.003	<0.030	11-08-92	275	0.010±0.003	<0.023
05-17-92	289	0.024±0.003	<0.019	11-15-92	280	0.020±0.003	<0.010
05-24-92	292	0.014±0.003	<0.009	11-22-92	292	0.018±0.003	<0.016
05-31-92	300	0.012±0.003	<0.010	11-29-92	292	0.013±0.003	<0.015
06-07-92	283	0.017±0.004	<0.011	12-06-92	289	0.025±0.004	<0.011
06-14-92	278	0.012±0.003	<0.009	12-13-92	295	0.018±0.003	<0.015
06-21-92	286	0.012±0.003	<0.019	12-20-92	295	0.019±0.003	<0.011
06-28-92	286	0.014±0.002	<0.011	12-27-92	289	0.033±0.004	<0.010
2nd Qtr. mean ± s.d.		0.016±0.004	<0.035	4th Qtr. mean ± s.d.		0.020±0.007	<0.023

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 2TH - Coloma (5 miles SSE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	272	0.027±0.004	<0.031	07-05-92	269	0.015±0.004	<0.011
01-12-92	286	0.025±0.004	<0.038	07-12-92	266	0.017±0.004	<0.010
01-19-92	136	0.022±0.006	<0.058	07-19-92	269	0.018±0.003	<0.012
01-26-92	289	0.030±0.004	<0.036	07-26-92	278	0.010±0.003	<0.011
02-02-92	300	0.024±0.003	<0.035	08-02-92	272	0.014±0.003	<0.012
02-09-92	286	0.025±0.004	<0.035	08-09-92	269	0.015±0.002	<0.011
02-16-92	295	0.020±0.003	<0.037	08-16-92	266	0.010±0.003	<0.018
02-23-92	289	0.024±0.003	<0.036	08-23-92	266	0.018±0.003	<0.013
03-01-92	295	0.019±0.003	<0.036	08-30-92	283	0.014±0.003	<0.007
03-08-92	283	0.030±0.004	<0.040	09-06-92	258	0.021±0.004	<0.011
03-15-92	292	0.023±0.004	<0.031	09-13-92	266	0.013±0.003	<0.009
03-22-92	295	0.023±0.004	<0.032	09-20-92	269	0.027±0.004	<0.012
03-29-92	286	0.016±0.003	<0.029	09-27-92	275	0.008±0.003	<0.012
1st Qtr. mean ± s.d.		0.024±0.004	<0.058	3rd Qtr. mean ± s.d.		0.015±0.005	<0.018
04-05-92	289	0.014±0.003	<0.035	10-04-92	272	0.024±0.004	<0.022
04-12-92	289	0.018±0.002	<0.023	10-11-92	280	0.017±0.003	<0.011
04-19-92	283	0.014±0.003	<0.027	10-18-92	283	0.016±0.003	<0.013
04-26-92	286	0.010±0.003	<0.026	10-26-92	329	0.034±0.004	<0.008
05-03-92	286	0.019±0.004	<0.020	11-01-92	238	0.013±0.004	<0.011
05-10-92	280	0.018±0.003	<0.031	11-08-92	283	0.007±0.002	<0.022
05-17-92	280	0.023±0.003	<0.020	11-15-92	289	0.013±0.003	<0.009
05-24-92	278	0.017±0.003	<0.009	11-22-92	292	0.014±0.003	<0.016
05-31-92	283	0.022±0.003	<0.010	11-29-92	289	0.014±0.002	<0.015
06-07-92	278	0.016±0.004	<0.012	12-06-92	297	0.027±0.004	<0.011
06-14-92	266	0.014±0.003	<0.009	12-13-92	295	0.015±0.003	<0.015
06-21-92	258	0.010±0.003	<0.021	12-20-92	292	0.017±0.003	<0.011
06-28-92	269	0.012±0.002	<0.012	12-27-92	31[a]	0.035±0.024	<0.090[b]
2nd Qtr. mean ± s.d.		0.016±0.004	<0.035	4th Qtr. mean ± s.d.		0.019±0.009	<0.022

[a] Low volume due to no electricity at pump.
[b] LLD for I-131 not met due to low volume; result not uncluded in mean ± s.d. calculation.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 3HS - Covert (5 miles SE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	295	0.024±0.004	<0.028	07-05-92	275	0.015±0.003	<0.010
01-12-92	303	0.018±0.003	<0.036	07-12-92	275	0.012±0.003	<0.010
01-19-92	314	0.022±0.003	<0.025	07-19-92	275	0.010±0.003	<0.012
01-26-92	312	0.028±0.004	<0.033	07-26-92	278	0.010±0.003	<0.011
02-02-92	317	0.025±0.003	<0.033	08-02-92	272	0.014±0.003	<0.012
02-09-92	306	0.025±0.003	<0.032	08-09-92	275	0.020±0.003	<0.010
02-16-92	283	0.019±0.003	<0.039	08-16-92	275	0.013±0.003	<0.017
02-23-92	309	0.021±0.002	<0.034	08-23-92	275	0.020±0.003	<0.012
03-01-92	314	0.019±0.003	<0.034	08-30-92	289	0.016±0.003	<0.007
03-08-92	300	0.026±0.003	<0.038	09-06-92	266	0.026±0.004	<0.010
03-15-92	312	0.021±0.003	<0.029	09-13-92	275	0.015±0.003	<0.008
03-22-92	314	0.016±0.003	<0.03	09-20-92	278	0.023±0.004	<0.011
03-29-92	303	0.016±0.003	<0.028	09-27-92	280	0.010±0.003	<0.012
1st Qtr. mean ± s.d.		0.022±0.004	<0.039	3rd Qtr. mean ± s.d.		0.016±0.005	<0.017
04-05-92	306	0.016±0.003	<0.033	10-04-92	278	0.025±0.004	<0.022
04-12-92	303	0.016±0.002	<0.022	10-11-92	286	0.017±0.003	<0.011
04-19-92	300	0.017±0.003	<0.026	10-18-92	283	0.015±0.003	<0.013
04-26-92	300	0.010±0.003	<0.025	10-26-92	331	0.035±0.004	<0.008
05-03-92	300	0.020±0.004	<0.019	11-01-92	241	0.019±0.004	<0.011
05-10-92	295	0.019±0.003	<0.029	11-08-92	286	0.010±0.003	<0.002
05-17-92	295	0.023±0.003	<0.019	11-15-92	286	0.022±0.003	<0.009
05-24-92	292	0.014±0.003	<0.009	11-22-92	289	0.018±0.003	<0.016
05-31-92	300	0.016±0.003	<0.010	11-29-92	292	0.012±0.003	<0.015
06-07-92	283	0.016±0.003	<0.011	12-06-92	297	0.029±0.004	<0.011
06-14-92	269	0.015±0.003	<0.009	12-13-92	297	0.016±0.003	<0.015
06-21-92	275	0.010±0.003	<0.020	12-20-92	295	0.019±0.003	<0.011
06-28-92	275	0.014±0.002	<0.012	12-27-92	297	0.038±0.004	<0.009
2nd Qtr. mean ± s.d.		0.016±0.004	<0.033	4th Qtr. mean ± s.d.		0.021±0.008	<0.022

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 4JS - Covert (3.5 miles ESE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	272	0.026±0.004	<0.031	07-05-92	263	0.019±0.004	<0.011
01-12-92	280	0.027±0.004	<0.039	07-12-92	266	0.018±0.004	<0.010
01-19-92	286	0.020±0.003	<0.028	07-19-92	272	0.004±0.003	<0.012
01-26-92	280	0.022±0.003	<0.037	07-26-92	272	0.012±0.003	<0.011
02-02-92	297	0.025±0.004	<0.035	08-02-92	263	0.016±0.004	<0.012
02-09-92	283	0.030±0.004	<0.035	08-09-92	269	0.016±0.002	<0.011
02-16-92	292	0.019±0.003	<0.038	08-16-92	263	0.014±0.003	<0.018
02-23-92	286	0.024±0.003	<0.037	08-23-92	266	0.018±0.003	<0.013
03-01-92	295	0.021±0.003	<0.036	08-30-92	278	0.016±0.003	<0.007
03-08-92	280	0.006±0.002[a]	<0.040	09-06-92	249	0.027±0.004	<0.011
03-15-92	289	0.024±0.004	<0.032	09-13-92	263	0.011±0.003	<0.009
03-22-92	292	0.022±0.004	<0.032	09-20-92	272	0.027±0.004	<0.012
03-29-92	286	0.018±0.003	<0.029	09-27-92	269	0.014±0.004	<0.012
1st Qtr. mean ± s.d.		0.022±0.006	<0.040	3rd Qtr. mean ± s.d.		0.016±0.006	<0.018
04-05-92	283	0.012±0.003	<0.036	10-04-92	272	0.019±0.004	<0.022
04-12-92	283	0.021±0.002	<0.023	10-11-921	269	0.018±0.003	<0.012
04-19-92	283	0.016±0.003	<0.027	10-18-92	272	0.019±0.003	<0.014
04-26-92	283	0.011±0.003	<0.026	10-26-92	320	0.039±0.004	<0.008
05-03-92	278	0.023±0.004	<0.021	11-01-92	232	0.021±0.004	<0.011
05-10-92	283	0.016±0.003	<0.030	11-08-92	269	0.009±0.003	<0.023
05-17-92	275	0.020±0.003	<0.020	11-15-92	272	0.022±0.003	<0.010
05-24-92	275	0.014±0.003	<0.009	11-22-92	272	0.018±0.004	<0.017
05-31-92	283	0.018±0.003	<0.010	11-29-92	275	0.014±0.002	<0.016
06-07-92	269	0.019±0.004	<0.012	12-06-92	269	0.029±0.004	<0.012
06-14-92	272	0.022±0.004	<0.009	12-13-92	278	0.021±0.003	<0.016
06-21-92	252	0.011±0.003	<0.021	12-20-92	278	0.019±0.003	<0.011
06-28-92	272	0.014±0.002	<0.012	12-27-92	275	0.038±0.004	<0.010
2nd Qtr. mean ± s.d.		0.017±0.004	<0.036	4th Qtr. mean ± s.d.		0.022±0.009	<0.023

[a] Filter light.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 5PR - Covert (3 miles E)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	280	0.028±0.004	<0.030	07-05-92	261	0.015±0.003	<0.011
01-12-92	289	0.025±0.004	<0.038	07-12-92	263	0.021±0.004	<0.010
01-19-92	297	0.021±0.003	<0.027	07-19-92	266	0.012±0.003	<0.012
01-26-92	295	0.032±0.004	<0.035	07-26-92	269	0.016±0.004	<0.011
02-02-92	303	0.025±0.003	<0.035	08-02-92	263	0.017±0.004	<0.012
02-09-92	292	0.028±0.004	<0.034	08-09-92	261	0.017±0.003	<0.011
02-16-92	297	0.018±0.003	<0.037	08-16-92	263	0.014±0.003	<0.018
02-23-92	280	0.018±0.002	<0.037	08-23-92	263	0.019±0.004	<0.013
03-01-92	300	0.020±0.003	<0.035	08-30-92	283	0.015±0.003	<0.009
03-08-92	275	0.024±0.004	<0.041	09-06-92	249	0.024±0.004	<0.011
03-15-92	295	0.025±0.004	<0.031	09-13-92	261	0.012±0.003	<0.009
03-22-92	297	0.021±0.004	<0.032	09-20-92	266	0.022±0.004	<0.012
03-29-92	292	0.018±0.003	<0.029	09-27-92	266	0.014±0.004	<0.022
1st Qtr. mean ± s.d.		0.023±0.004	<0.041	3rd Qtr. mean ± s.d.		0.017±0.004	<0.022
04-05-92	289	0.011±0.003	<0.035	10-04-92	266	0.024±0.004	<0.023
04-12-92	286	0.018±0.002	<0.023	10-11-92	266	0.015±0.003	<0.012
04-19-92	286	0.015±0.003	<0.027	10-18-92	269	0.015±0.003	<0.014
04-26-92	286	0.011±0.003	<0.026	10-26-92	314	0.033±0.004	<0.008
05-03-92	283	0.022±0.004	<0.021	11-01-92	229	0.018±0.004	<0.011
05-10-92	286	0.017±0.003	<0.030	11-08-92	263	0.010±0.003	<0.024
05-17-92	280	0.023±0.003	<0.020	11-15-92	266	0.018±0.003	<0.010
05-24-92	278	0.015±0.003	<0.009	11-22-92	278	0.016±0.003	<0.017
05-31-92	286	0.017±0.003	<0.010	11-29-92	278	0.012±0.002	<0.016
06-07-92	272	0.017±0.004	<0.012	12-06-92	275	0.031±0.004	<0.012
06-14-92	269	0.018±0.003	<0.009	12-13-92	280	0.018±0.003	<0.016
06-21-92	249	0.009±0.003	<0.022	12-20-92	283	0.017±0.003	<0.011
06-28-92	272	0.014±0.002	<0.012	12-27-92	278	0.036±0.004	<0.010
2nd Qtr. mean ± s.d.		0.016±0.004	<0.035	4th Qtr. mean ± s.d.		0.020±0.008	<0.024

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 6RB - South Haven (4.75 mi NE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	283	0.026±0.004	<0.030	07-05-92	263	0.015±0.004	<0.011
01-12-92	286	0.021±0.004	<0.038	07-12-92	269	0.014±0.003	<0.018
01-19-92	295	0.021±0.003	<0.027	07-19-92	272	0.016±0.003	<0.012
01-26-92	297	0.031±0.004	<0.035	07-26-92	272	0.013±0.003	<0.018
02-02-92	303	0.023±0.003	<0.035	08-02-92	269	0.013±0.003	<0.012
02-09-92	289	0.020±0.003	<0.034	08-09-92	269	0.014±0.002	<0.012
02-16-92	295	0.022±0.003	<0.037	08-16-92	269	0.014±0.003	<0.018
02-23-92	283	0.025±0.003	<0.037	08-23-92	275	0.018±0.003	<0.012
03-01-92	289	0.021±0.004	<0.037	08-30-92	289	0.017±0.003	<0.009
03-08-92	269	0.029±0.004	<0.042	09-06-92	255	0.022±0.004	<0.022
03-15-92	280	0.027±0.004	<0.033	09-13-92	278	0.006±0.003	<0.019
03-22-92	283	0.021±0.004	<0.033	09-20-92	275	0.027±0.004	<0.011
03-29-92	278	0.015±0.003	<0.030	09-27-92	278	0.014±0.004	<0.021
1st Qtr. mean ± s.d.		0.023±0.004	<0.042	3rd Qtr. mean ± s.d.		0.016±0.005	<0.022
04-05-92	269	0.012±0.004	<0.038	10-04-92	76[a]	0.015±0.010	<0.049
04-12-92	272	0.017±0.002	<0.024	10-11-92	229	0.022±0.004	<0.014
04-19-92	283	0.016±0.003	<0.027	10-18-92	286	0.018±0.003	<0.013
04-26-92	286	0.010±0.003	<0.026	10-26-92	331	0.034±0.004	<0.008
05-03-92	283	0.022±0.004	<0.021	11-01-92	244	0.016±0.004	<0.011
05-10-92	283	0.017±0.003	<0.030	11-08-92	269	0.009±0.003	<0.025
05-17-92	286	0.019±0.003	<0.019	11-15-92	286	0.016±0.003	<0.009
05-24-92	283	0.015±0.003	<0.009	11-22-92	289	0.021±0.004	<0.016
05-31-92	289	0.018±0.003	<0.010	11-29-92	295	0.012±0.002	<0.015
06-07-92	272	0.012±0.003	<0.012	12-06-92	289	0.025±0.004	<0.012
06-14-92	275	0.019±0.003	<0.009	12-13-92	295	0.018±0.003	<0.010
06-21-92	244	0.009±0.003	<0.022	12-20-92	292	0.020±0.003	<0.011
06-28-92	275	0.012±0.002	<0.012	12-27-92	278	0.036±0.004	<0.010
2nd Qtr. mean ± s.d.		0.015±0.004	<0.038	4th Qtr. mean ± s.d.		0.020±0.008	<0.049

[a] Low volume due to sample pump failure.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 7SD - South Haven (7.5 miles NNE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	178	0.028±0.005	<0.047	07-05-92	261	0.011±0.003	<0.009
01-12-92	255	0.027±0.004	<0.043	07-12-92	263	0.020±0.004	<0.018
01-19-92	278	<0.004[a]	<0.028	07-19-92	261	0.011±0.003	<0.012
01-26-92	266	0.031±0.004	<0.039	07-26-92	269	0.014±0.003	<0.018
02-02-92	269	0.026±0.004	<0.039	08-02-92	263	0.012±0.003	<0.012
02-09-92	255	0.027±0.004	<0.039	08-09-92	263	0.012±0.002	<0.012
02-16-92	249	0.017±0.004	<0.044	08-16-92	263	0.014±0.003	<0.005
02-23-92	269	0.024±0.003	<0.039	08-23-92	263	0.015±0.003	<0.023
03-01-92	286	0.023±0.004	<0.037	08-30-92	283	0.014±0.003	<0.009
03-08-92	263	0.029±0.004	<0.043	09-06-92	249	0.023±0.004	<0.023
03-15-92	278	0.024±0.004	<0.033	09-13-92	266	0.015±0.003	<0.020
03-22-92	278	0.018±0.004	<0.034	09-20-92	269	0.023±0.004	<0.012
03-29-92	278	0.017±0.003	<0.030	09-27-92	269	0.014±0.004	<0.022
1st Qtr. mean ± s.d.		0.024±0.005	<0.047	3rd Qtr. mean ± s.d.		0.015±0.004	<0.023
04-05-92	278	0.013±0.004	<0.037	10-04-92	275	0.020±0.004	<0.014
04-12-92	283	0.018±0.002	<0.023	10-11-92	272	0.017±0.003	<0.012
04-19-92	275	0.017±0.004	<0.028	10-18-92	280	0.016±0.003	<0.013
04-26-92	278	0.011±0.003	<0.027	10-26-92	323	0.031±0.004	<0.008
05-03-92	278	0.021±0.004	<0.021	11-01-92	235	0.020±0.004	<0.011
05-10-92	278	0.017±0.003	<0.031	11-08-92	275	0.007±0.003	<0.024
05-17-92	275	0.023±0.003	<0.020	11-15-92	283	0.020±0.003	<0.017
05-24-92	278	0.018±0.003	<0.009	11-22-92	289	0.016±0.003	<0.007
05-31-92	286	0.014±0.003	<0.010	11-29-92	283	0.013±0.002	<0.009
06-07-92	272	0.016±0.004	<0.012	12-06-92	283	0.026±0.004	<0.012
06-14-92	269	0.020±0.003	<0.009	12-13-92	283	0.019±0.003	<0.010
06-21-92	258	0.013±0.003	<0.021	12-20-92	289	0.016±0.003	<0.011
06-28-92	272	0.013±0.002	<0.012	12-27-92	283	0.037±0.004	<0.010
2nd Qtr. mean ± s.d.		0.016±0.004	<0.037	4th Qtr. mean ± s.d.		0.020±0.008	<0.024

[a] Filter improperly installed.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 8SP - State Park (1 mile N)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	286	0.022±0.004	<0.029	07-05-92	263	0.020±0.004	<0.009
01-12-92	289	0.023±0.004	<0.038	07-12-92	263	0.020±0.004	<0.018
01-19-92	306	0.017±0.003	<0.026	07-19-92	266	0.012±0.003	<0.012
01-26-92	300	0.030±0.004	<0.035	07-26-92	272	0.012±0.003	<0.018
02-02-92	309	0.026±0.003	<0.034	08-02-92	263	0.014±0.004	<0.012
02-09-92	295	0.026±0.004	<0.034	08-09-92	263	0.016±0.002	<0.012
02-16-92	303	0.018±0.003	<0.036	08-16-92	263	0.017±0.004	<0.005
02-23-92	297	0.024±0.002	<0.035	08-23-92	266	0.020±0.004	<0.023
03-01-92	309	0.024±0.003	<0.034	08-30-92	283	0.016±0.003	<0.009
03-08-92	283	0.026±0.004	<0.040	09-06-92	252	0.026±0.004	<0.023
03-15-92	303	0.025±0.004	<0.030	09-13-92	275	0.014±0.003	<0.019
03-22-92	303	0.020±0.003	<0.031	09-20-92	258	0.025±0.004	<0.012
03-29-92	300	0.017±0.003	<0.028	09-27-92	269	0.011±0.004	<0.022
1st Qtr. mean ± s.d.		0.023±0.004	<0.040	3rd Qtr. mean ± s.d.		0.017±0.005	<0.023
04-05-92	292	0.011±0.003	<0.035	10-04-92	269	0.027±0.004	<0.014
04-12-92	295	0.017±0.002	<0.022	10-11-92	266	0.016±0.003	<0.012
04-19-92	297	0.014±0.003	<0.026	10-18-92	343	0.012±0.003	<0.011
04-26-92	292	0.012±0.003	<0.026	10-26-92	326[a]	0.039±0.004	<0.008
05-03-92	292	0.023±0.004	<0.020	11-01-92	238	0.018±0.004	<0.011
05-10-92	289	0.016±0.003	<0.030	11-08-92	272	0.009±0.003	<0.025
05-17-92	275	0.021±0.003	<0.020	11-15-92	283	0.020±0.003	<0.017
05-24-92	278	0.017±0.003	<0.009	11-22-92	286	0.020±0.004	<0.007
05-31-92	286	0.018±0.003	<0.010	11-29-92	289	0.013±0.002	<0.009
06-07-92	269	0.016±0.004	<0.012	12-06-92	286	0.027±0.004	<0.012
06-14-92	272	0.017±0.003	<0.009	12-13-92	289	0.015±0.003	<0.010
06-21-92	241	0.009±0.003	<0.022	12-20-92	295	0.017±0.003	<0.011
06-28-92	269	0.014±0.002	<0.012	12-27-92	289	0.038±0.004	<0.010
2nd Qtr. mean ± s.d.		0.016±0.004	<0.035	4th Qtr. mean ± s.d.		0.021±0.009	<0.025

[a] Collection sheet data in error; corrected meter reading.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 9TP - Covert Township Park (1.5 miles S)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-05-92	286	0.030±0.004	<0.029	07-05-92	278	0.017±0.004	<0.008
01-12-92	295	0.023±0.004	<0.037	07-12-92	280	0.018±0.003	<0.017
01-19-92	303	0.020±0.003	<0.026	07-19-92	280[b]	0.015±0.003	<0.011
01-26-92	300	0.031±0.004	<0.035	07-26-92	283	0.012±0.003	<0.017
02-02-92	312	0.028±0.004	<0.034	08-02-92	278	0.017±0.004	<0.011
02-09-92	297	0.024±0.003	<0.033	08-09-92	275	0.014±0.002	<0.011
02-16-92	303	0.022±0.003	<0.036	08-16-92	278	0.013±0.003	<0.005
02-23-92	300	0.024±0.002	<0.035	08-23-92	280	0.020±0.003	<0.022
03-01-92	312	0.020±0.003	<0.034	08-30-92	295	0.015±0.003	<0.008
03-08-92	286	0.027±0.004	<0.040	09-06-92	266	0.027±0.004	<0.022
03-15-92	297	0.016±0.003	<0.031	09-13-92	280	0.012±0.003	<0.019
03-22-92	306	0.020±0.003	<0.031	09-20-92	283	0.027±0.004	<0.011
03-29-92	306	0.015±0.003	<0.027	09-27-92	286	0.012±0.003	<0.021
1st Qtr. mean ± s.d.		0.023±0.005	<0.040	3rd Qtr. mean ± s.d.		0.017±0.005	<0.022
04-05-92	292	0.011±0.003	<0.035	10-04-92	289	0.024±0.004	<0.013
04-12-92	300	0.016±0.002	<0.022	10-11-92	283	0.018±0.003	<0.011
04-19-92	300	0.015±0.003	<0.026	10-18-92	286	0.015±0.003	<0.013
04-26-92	297	0.010±0.003	<0.025	10-26-92	337	0.034±0.004	<0.008
05-03-92	297	0.022±0.004	<0.020	11-01-92	246	0.015±0.004	<0.011
05-10-92	292	0.019±0.003	<0.030	11-08-92	280	0.008±0.003	<0.024
05-17-92	292	0.022±0.003	<0.019	11-09-92	292	0.024±0.003	<0.016
05-24-92	292	0.019±0.003	<0.009	11-22-92	292	0.021±0.004	<0.007
05-31-92	303	0.014±0.003	<0.009	11-29-92	300	0.011±0.002	<0.008
06-07-92	283	0.014±0.003	<0.011	12-06-92	289	0.025±0.004	<0.012
06-14-92	278	0.015±0.003	<0.009	12-13-92	300	0.016±0.003	<0.009
06-21-92	170[a]	0.010±0.005	<0.032	12-20-92	297	0.022±0.003	<0.011
06-28-92	289	0.013±0.002	<0.011	12-27-92	303	0.005±0.002	<0.009
2nd Qtr. mean ± s.d.		0.015±0.004	<0.035	4th Qtr. mean ± s.d.		0.018±0.008	<<0.024

[a] 5 day collection; power out for two days.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 10GR - Grand Rapids (55 mi NNE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-08-92	246	0.023±0.004	<0.010	07-08-92	280	0.012±0.003	<0.012
01-15-92	289	0.024±0.003	<0.054	07-15-92	283	0.010±0.003	<0.015
01-22-92	295	0.025±0.004	<0.045	07-22-92	278	0.016±0.003	<0.011
01-29-92	292	0.018±0.003	<0.049	07-29-92	272	0.018±0.003	<0.016
02-05-92	289	0.024±0.003	<0.047	08-05-92	278	0.014±0.004	<0.014
02-12-92	295	0.017±0.003	<0.051	08-12-92	283	0.016±0.004	<0.006
02-19-92	289	0.022±0.003	<0.046	08-19-92	283	0.017±0.003	<0.029
02-26-92	286	0.014±0.003	<0.033	08-26-92	272	0.020±0.004	<0.026
03-04-92	286	0.020±0.003	<0.047	09-02-92	275	0.015±0.003	<0.013
03-11-92	286	0.015±0.003	<0.044	09-09-92	272	0.012±0.004	<0.015
03-18-92	289	0.019±0.003	<0.034	09-16-92	272	0.022±0.004	<0.011
03-25-92	289	0.018±0.004	<0.038	09-23-92	269	0.016±0.004	<0.011
04-01-92	280	0.014±0.003	<0.053	09-30-92	280	0.016±0.003	<0.022
1st Qtr. mean ± s.d.		0.019±0.004	<0.053	3rd Qtr. mean ± s.d.		0.016±0.003	<0.029
04-08-92	280	0.016±0.003	<0.043	10-07-92	275	0.020±0.004	<0.017
04-15-92	201	0.023±0.004	<0.062	10-14-92	283	0.017±0.003	<0.017
04-22-92	280	0.006±0.003	<0.034	10-21-92	275	0.017±0.003	<0.015
04-29-92	289	0.010±0.003	<0.028	10-28-92	278	0.025±0.004	<0.031
05-06-92	283	0.016±0.003	<0.042	11-04-92	280	0.009±0.003	<0.014
05-13-92	286	0.017±0.003	<0.028	11-11-92	280	0.014±0.003	<0.024
05-20-92	286	0.017±0.003	<0.012	11-18-92	289	0.017±0.003	<0.009
05-27-92	289	0.020±0.003	<0.013	11-25-92	283	0.010±0.003	<0.013
06-04-92	323	0.018±0.003	<0.022	12-02-92	286	0.028±0.004	<0.019
06-10-92	238	0.016±0.004	<0.014	12-09-92	297	0.023±0.003	<0.013
06-17-92	269	0.023±0.004	<0.015	12-16-92	286	0.012±0.003	<0.011
06-24-92	280	0.016±0.003	<0.011	12-23-92	283	0.035±0.004	<0.014
07-01-92	278	0.018±0.004	<0.011	12-30-92	283	0.018±0.003	<0.015
2nd Qtr. mean ± s.d.		0.017±0.005	<0.062	4th Qtr. mean ± s.d.		0.019±0.007	<0.024

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 11 KZ - Kalamazoo (35 miles E)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-08-92	255	0.031±0.004	<0.010	07-08-92	278	0.018±0.003	<0.012
01-16-92	337	0.024±0.003	<0.047	07-15-92	278	0.016±0.004	<0.015
01-22-92	266	0.031±0.004	<0.050	07-22-92	275	0.018±0.003	<0.011
01-29-92	292	0.029±0.004	<0.049	07-29-92	289	0.016±0.003	<0.015
02-05-92	300	0.026±0.003	<0.046	08-06-92	306	0.013±0.003	<0.013
02-12-92	309	0.019±0.003	<0.049	08-12-92	241	0.019±0.004	<0.008
02-19-92	295	0.020±0.003	<0.045	08-19-92	343	0.005±0.002[a]	<0.024
02-26-92	300	0.021±0.003	<0.032	08-26-92	218	0.028±0.005	<0.033
03-04-92	295	0.025±0.004	<0.045	09-02-92	278	0.018±0.003	<0.013
03-11-92	278	0.015±0.003	<0.046	09-09-92	280	0.015±0.004	<0.014
03-20-92	399	0.023±0.003	<0.006	09-18-92	346	0.017±0.003	<0.008
03-25-92	221	0.024±0.004	<0.050	09-23-92	204	0.017±0.004	<0.015
04-01-92	286	0.015±0.003	<0.052	10-01-92	331	0.016±0.003	<0.019
1st Qtr. mean ± s.d.		0.023±0.005	<0.052	3rd Qtr. mean ± s.d.		0.017±0.005	<0.033
04-09-92	340	0.016±0.003	<0.035	10-07-92	252	0.026±0.004	<0.018
04-15-92	258	0.022±0.004	<0.048	10-14-92	292	0.021±0.002	<0.017
04-22-92	286	0.011±0.003	<0.033	10-21-92	303	0.021±0.003	<0.014
04-29-92	297	0.017±0.003	<0.028	10-28-92	286	0.039±0.004	<0.030
05-06-92	286	0.017±0.003	<0.042	11-04-92	300	0.018±0.003	<0.013
05-14-92	323	0.014±0.003	<0.025	11-11-92	348	0.014±0.003	<0.019
05-21-92	289	0.021±0.003	<0.012	11-18-92	252	0.019±0.004	<0.011
05-27-92	238	0.017±0.004	<0.016	11-25-92	303	0.014±0.003	<0.012
06-08-92	479	0.007±0.002	<0.006	12-02-92	295	0.009±0.002	<0.018
06-10-92	79	0.028±0.009	<0.042	12-09-92	323	0.020±0.003	<0.012
06-17-92	278	0.025±0.004	<0.014	12-16-92	295	0.016±0.003	<0.011
06-23-92	246	0.017±0.004	<0.012	12-23-92	300	0.036±0.004	<0.013
07-01-92	320	0.021±0.003	<0.010	12-30-92	312	0.025±0.003	<0.014
2nd Qtr. mean ± s.d.		0.018±0.006	<0.048	4th Qtr. mean ± s.d.		0.021±0.009	<0.030

[a] Disk placed off-center in filter holder.

Table 1. Airborne particulates and iodine-131
Collection: Weekly
Units: pCi/m^3
Location: 12DG - Dowagiac (30 miles SSE)

Date Collected	Volume (m^3)	Gross Beta	I-131	Date Collected	Volume (m^3)	Gross Beta	I-131
01-06-92	413	0.034±0.003	<0.006	07-08-92	229	0.018±0.004	<0.015
01-08-92	71	0.045±0.012	<0.030	07-15-92	235	0.019±0.004	<0.016
01-15-92	246	0.029±0.004	<0.064	07-22-92	246	0.016±0.003	<0.012
01-22-92	255	0.037±0.005	<0.052	07-29-92	204	0.024±0.005	<0.021
01-29-92	249	0.027±0.004	<0.058	08-05-92	229	0.016±0.004	<0.017
02-05-92	249	0.028±0.004	<0.055	08-12-92	229	0.024±0.005	<0.008
02-12-92	252	0.022±0.004	<0.060	08-19-92	232	0.017±0.004	<0.035
02-19-92	244	0.024±0.004	<0.054	08-26-92	232	0.030±0.005	<0.031
02-26-92	244	0.020±0.004	<0.039	09-02-92	224	0.026±0.004	<0.016
03-04-92	244	0.028±0.004	<0.055	09-09-92	235	0.020±0.004	<0.017
03-11-92	244	0.024±0.004	<0.052	09-16-92	227	0.024±0.005	<0.013
03-18-92	246	0.023±0.004	<0.040	09-23-92	235	0.030±0.005	<0.013
03-25-92	249	0.026±0.004	<0.044	09-30-92	232	0.024±0.004	<0.027
04-01-92	241	0.016±0.004	<0.062				
1st Qtr. mean ± s.d.		0.027±0.007	<0.064	3rd Qtr. mean ± s.d.		0.022±0.005	<0.035
04-08-92	244	0.019±0.004	<0.049	10-07-92	232	0.032±0.005	<0.020
04-15-92	244	0.022±0.004	<0.051	10-14-92	235	0.026±0.004	<0.021
04-22-92	238	0.020±0.004	<0.040	10-21-92	241	0.029±0.004	<0.017
04-29-92	241	0.022±0.004	<0.034	10-28-92	232	0.048±0.005	<0.037
05-06-92	238	0.021±0.004	<0.050	11-04-92	232	0.018±0.004	<0.017
05-13-92	178	0.027±0.005	<0.045	11-11-92	238	0.017±0.004	<0.028
05-20-92	235	0.024±0.004	<0.015	11-19-92	207	0.028±0.004	<0.013
05-27-92	224	0.024±0.004	<0.017	11-25-92	224	0.021±0.004	<0.016
06-04-92	263	0.019±0.004	<0.027	12-02-92	224	0.032±0.004	<0.024
06-10-92	195	0.018±0.004	<0.017	12-09-92	229	0.031±0.004	<0.017
06-17-92	224	0.026±0.004	<0.018	12-16-92	224	0.023±0.004	<0.014
06-24-92	235	0.021±0.004	<0.013	12-23-92	249	0.052±0.005	<0.016
07-01-92	227	0.027±0.004	<0.014	12-30-92	269	0.033±0.004	<0.016
2nd Qtr. mean ± s.d.		0.022±0.003	<0.051	4th Qtr. mean ± s.d.		0.030±0.010	<0.037

Table 2. Gamma Radiation, as measured by TLDs
Exposure: Monthly
Units: mR/30 days net[a]

Location	January	February	March
Date Placed	12-29-91	02-02-92	03-01-92
Date Removed	02-02-92	03-01-92	03-29-92
In-Transit (mR)	3.8±0.2	2.0±0.2	4.4±0.3
ST-01	3.2±0.3	4.6±0.2	3.8±0.5
ST-02	4.3±0.4	5.2±0.2	6.7±0.4
ST-03	3.9±0.3	4.4±0.3	5.2±0.8
ST-04	4.2±0.4	6.2±0.3	6.7±0.3
ST-05	3.9±0.4	4.5±0.3	5.6±0.6
ST-06	5.1±0.5	4.7±0.2	6.3±0.4
ST-07A	3.7±0.3	4.8±0.2	5.7±0.6
ST-08	3.7±0.4	4.4±0.2	2.9±0.3[e]
ST-09	3.2±0.3	3.9±0.3	4.4±0.4
ST-10	5.6±0.5[b]	5.0±0.2[c]	4.0±0.7[f]
ST-11	5.4±0.6[b]	4.5±0.3[d]	4.5±0.2[g]
ST-12	3.8±0.5	5.0±0.2	5.0±0.6
ST-13	3.1±0.3	4.7±0.2	4.1±0.6
ST-14	2.3±0.2	3.6±0.2	3.4±0.5
ST-15	2.9±0.3	3.6±0.2	3.7±0.5
ST-16	2.0±0.3	4.0±0.2	2.7±0.3
ST-17	3.5±0.3	4.0±0.2	4.2±0.4
ST-18	3.0±0.3	4.4±0.2	4.3±0.7
ST-19	3.9±0.3	4.0±0.4	5.6±0.5
ST-20	3.5±0.2	4.0±0.2	5.0±0.9
ST-21	3.4±0.2	3.9±0.2	4.9±0.8
ST-22	2.2±0.2	2.1±0.2	3.0±0.3[h]
ST-23	3.9±0.3	4.3±0.2	5.5±0.7
ST-24	3.4±0.3	3.5±0.2	4.1±0.4
ST-33	2.5±0.2	3.4±0.2	3.6±0.3
ST-34	2.7±0.3	3.5±0.2	3.2±0.5
ST-35	3.4±0.2	4.7±0.2	4.5±0.3
ST-36	2.6±0.2	3.6±0.2	5.2±0.3
ST-37	2.9±0.2	4.0±0.2	4.0±0.4
ST-38	2.4±0.3	3.7±0.2	3.4±0.4
Mean ± s.d.	3.4±0.9	4.2±0.7	4.5±1.1
Control 1	2.0±0.2	2.1±0.2	1.9±0.3[h]
Control 2	1.9±0.2	2.2±0.2	1.9±0.3[h]

[a] In-transit exposure has been subtracted from total exposure.
[b] Placed 01-02-92; removed 01-31-92.
[c] Placed 01-31-92; removed 02-26-92.
[d] Placed 01-31-92; removed 02-27-92.
[e] Placed 03-01-92; removed 04-15-92.
[f] Placed 02-26-92; removed 04-01-92.
[g] Placed 02-27-92; removed 04-15-92.
[h] Removed 04-01-92.

Table 2. Gamma Radiation, as measured by TLDs (continued)
Exposure: Monthly
Units: mR/30 days net[a]

	April	May	June
Date Placed	03-29-92	05-03-92	05-30-92
Date Removed	05-03-92	05-30-92	06-28-92
In-Transit (mR)	3.8±0.2	4.3±0.2	4.1±0.2
Location			
ST-01	3.4±0.3	3.6±0.3	4.1±0.7
ST-02	4.8±0.2	5.5±1.0	5.9±0.4
ST-03	4.3±0.3	4.5±0.4	5.5±0.3
ST-04	4.5±0.3	5.2±0.3	5.1±0.3
ST-05	4.2±0.2	4.6±0.4	5.1±0.3
ST-06	4.9±0.2	5.3±0.6	5.4±0.3
ST-07A	3.8±0.2	4.0±0.4	5.3±0.2
ST-08	4.0±0.2	4.1±0.5	4.4±0.4
ST-09	3.4±0.2	3.6±0.3	4.0±0.5
ST-10	3.7±0.3[b]	3.7±0.5[e]	3.7±0.4[h]
ST-11	4.7±0.4[c]	ND[f]	4.6±0.3[h]
ST-12	3.7±0.3	4.2±0.4	4.3±0.3
ST-13	3.6±0.3	3.3±0.4	3.9±0.5
ST-14	2.9±0.2	2.5±0.2	3.4±0.2
ST-15	3.0±0.2	3.1±0.3	3.9±0.3
ST-16	3.8±0.2	1.9±0.3	4.1±0.3
ST-17	3.8±0.5	3.0±0.3	4.0±0.2
ST-18	3.5±0.2	3.5±0.5	4.2±0.3
ST-19	3.7±0.3	4.0±0.3	4.7±0.3
ST-20	3.6±0.3	4.8±0.3	4.2±0.4
ST-21	3.6±0.3	3.3±0.3	4.2±0.4
ST-22	4.3±0.5	2.1±0.3	2.7±0.3
ST-23	4.0±0.2	4.4±0.3	4.5±0.3
ST-24	2.7±0.2	4.2±0.3	4.0±0.2
ST-33	3.3±0.2	3.0±0.3	ND[g]
ST-34	3.3±0.3	2.2±0.3	3.6±0.3
ST-35	4.4±0.3	4.0±0.3	4.4±0.3
ST-36	3.6±0.3	2.5±0.2	3.5±0.2
ST-37	3.2±0.2	3.2±0.3	4.0±0.5
ST-38	3.5±0.2	2.4±0.3	3.6±0.3
Mean ± s.d.	3.8±0.6	3.6±1.0	4.3±0.7
Control 1	2.3±0.2[d]	ND[g]	2.1±0.2
Control 2	2.2±0.3[d]	2.4±0.3	2.1±0.2

[a] In-transit exposure has been subtracted from total exposure.
[b] Placed 04-02-92; removed 04-29-92.
[c] Placed 04-01-92; removed 05-04-92.
[d] Placed 04-01-92; removed 05-03-92.
[e] Placed 04-29-92; removed 05-28-92.
[f] ND = no data; wrong TLD collected.
[g] ND = no data; TLD lost in the field.
[h] ND = placed 05-28-92; removed 07-1-92

Table 2. Gamma Radiation, as measured by TLDs (continued)
Exposure: Monthly Units: mR/30 days net[a]

Location	July	August	September
Date Placed	06-28-92	08-02-92	08-30-92
Date Removed	08-02-92	08-30-92	10-04-92
In-Transit (mR)	1.8±0.2	4.0±0.2	4.0±0.3
ST-01	4.3±0.2	4.5±0.4	3.5±0.3
ST-02	6.6±0.3	5.8±0.4	7.0±0.4
ST-03	5.0±0.3	4.9±0.3	4.7±0.4
ST-04	5.3±0.2	5.3±0.2	4.6±0.4
ST-05	5.3±0.3	5.0±0.3	5.0±0.6
ST-06	5.6±0.3	5.9±0.3	5.6±0.3
ST-07A	4.9±0.2	5.1±0.4	4.3±0.4
ST-08	5.3±0.3	4.8±0.4	4.1±0.3
ST-09	4.5±0.2	3.9±0.2	4.6±0.4
ST-10	5.3±0.3[b]	4.6±0.3[d]	ND[c]
ST-11	3.2±0.1[c,g]	5.2±0.2[e]	5.2±0.5[f]
ST-12	5.2±0.3	4.9±0.5	5.3±0.6
ST-13	4.1±0.2	4.2±0.3	3.6±0.3
ST-14	3.9±0.2	3.9±0.4	3.5±0.3
ST-15	4.0±0.3	4.4±0.4	3.7±0.4
ST-16	3.7±0.3	4.5±0.3	3.4±0.3
ST-17	4.3±0.3	4.6±0.3	3.9±0.3
ST-18	4.5±0.2	4.5±0.3	3.7±0.3
ST-19	5.2±0.2	4.8±0.3	4.3±0.3
ST-20	5.2±0.3	4.6±0.3	4.3±0.6
ST-21	4.7±0.3	4.7±0.3	4.4±0.3
ST-22	3.0±0.3	2.9±0.2	2.3±0.3
ST-23	5.4±0.3	5.4±0.2	5.3±0.5
ST-24	4.9±0.2	4.6±0.3	ND[c]
ST-33	4.9±0.3	4.2±0.2	3.4±0.3
ST-34	4.0±0.3	4.2±0.2	3.0±0.2
ST-35	5.3±0.2	5.2±0.4	4.3±0.4
ST-36	4.1±0.2	4.1±0.3	4.0±0.3
ST-37	4.1±0.2	3.7±0.3	3.9±0.4
ST-38	3.8±0.2	4.2±0.3	3.7±0.3
Mean ± s.d.	4.7±0.7	4.6±0.6	4.2±0.9
Control 1	1.3±0.2	2.0±0.2	0.9±0.3
Control 2	2.2±0.2	2.1±0.2	2.1±0.3

[a] In-transit exposure has been subtracted from total exposure.
[b] Placed 07-01-92; removed 07-31-92.
[c] ND= No Data, TLD lost in the field.
[d] Placed 7-31-92; removed 9-2-92.
[e] Placed 7-28-92; removed 9-2-92.
[f] Placed 09-02-92; removed 10-05-
[g] TLD found. Placed 07-01-92; removed 10-05-92; 96 days in the field; result prorated for 30 days.

Table 2. Gamma Radiation, as measured by TLDs (continued)
Exposure: Monthly Units: mR/30 days net[a]

Location	October	November	December
Date Placed	10-04-92	11-01-92	11-29-92
Date Removed	11-01-92	11-29-92	01-03-93
In-Transit (mR)	3.6±0.2	4.2±0.2	5.2±0.2
ST-01	3.9±0.7	3.8±0.2	3.1±0.3
ST-02	4.4±0.3	5.5±0.3	4.9±0.2
ST-03	4.4±0.5	4.6±0.3	4.6±0.2
ST-04	4.0±0.3	5.2±0.3	4.9±0.2
ST-05	4.1±0.5	5.1±0.4	4.8±0.4
ST-06	4.5±0.3	5.4±0.2	4.6±0.3
ST-07A	4.1±0.4	4.0±0.2	4.6±0.2
ST-08	5.9±0.4	4.2±0.2	4.6±0.4
ST-09	4.4±0.4	3.7±0.2	3.9±0.2
ST-10	3.8±0.3[b]	3.3±0.2[d]	4.8±0.3[g]
ST-11	4.7±0.4[c]	4.7±0.3[e]	5.5±0.4[g]
ST-12	4.0±0.6	4.0±0.3	4.6±0.3
ST-13	3.3±0.3	4.4±0.3	3.8±0.2
ST-14	3.0±0.3	2.7±0.3	3.3±0.2
ST-15	3.1±0.3	3.9±0.3	3.7±0.2
ST-16	3.3±0.3	4.7±0.4	4.0±0.2
ST-17	2.9±0.2	4.1±0.2	3.3±0.3
ST-18	3.2±0.3	3.6±0.2	4.1±0.2
ST-19	3.5±0.3	5.0±0.3	4.3±0.4
ST-20	3.3±0.3	4.4±0.3	4.1±0.3
ST-21	3.5±0.3	4.2±0.2	4.2±0.3
ST-22	1.6±0.3	3.4±0.4	2.5±0.4
ST-23	4.4±0.4	4.9±0.4	3.4±0.3
ST-24	3.5±0.2	3.5±0.2	4.4±0.3
ST-33	4.2±0.4	3.9±0.3	4.7±0.3
ST-34	4.0±0.5	3.9±0.3	4.1±0.2
ST-35	3.9±0.2	4.4±0.3[f]	4.3±0.2
ST-36	2.7±0.2	3.9±0.2	3.4±0.2
ST-37	4.2±0.4	4.4±0.4	3.4±0.2
ST-38	3.0±0.2	4.0±0.3	3.7±0.2
Mean ± s.d.	3.8±0.8	4.2±0.7[f]	4.1±0.7
Control 1	1.8±0.3	2.5±0.3	2.1±0.3
Control 2	1.8±0.3	2.1±0.3	2.1±0.3

[a] In-transit exposure has been subtracted from total exposure.
[b] Placed 09-30-92; removed 10-30-92.
[c] Placed 10-05-92; removed 10-29-92.
[d] Placed 10-30-92; removed 11-30-92.
[e] Placed 10-29-92; removed 11-30-92.
[f] Corrected data.
[g] Placed 11-30-92; removed 12-31-92.

Table 3. Gamma Radiation, as measured by TLDs
Exposure: Quarterly
Units: mR/91 days net[a]

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Date Placed	12-29-91	03-29-92	06-28-92	10-04-92
Date Removed	03-29-92	06-28-92	10-04-92	01-03-93
In-Transit (mR)	4.9±0.6	3.6±0.6	4.8±0.7	5.1±0.6
Location				
ST-01	12.6±0.8	11.9±0.6	12.9±0.7	10.9±0.7
ST-02	17.5±0.9	16.8±0.7	19.2±0.7	15.4±0.6
ST-03	13.6±0.7	13.3±0.6	15.3±0.6	12.9±0.7
ST-04	15.4±0.6	13.7±0.6	16.4±0.9	13.4±0.7
ST-05	15.0±0.6	13.6±0.6	16.2±0.8	12.9±0.7
ST-06	17.0±0.8	16.1±0.7	17.9±0.7	14.7±0.7
ST-07A	13.8±1.0	11.5±0.6	13.9±0.7	11.0±0.6
ST-08	10.7±0.6[b]	11.5±0.7	13.2±0.8	11.4±0.6
ST-09	13.3±1.1	10.9±0.7	13.4±0.8	10.0±0.7
ST-10	12.6±1.1[b]	11.1±0.6[d,e]	ND[g]	10.8±0.7[i]
ST-11	14.1±0.6[b]	10.4±1.0[f]	15.5±0.7[h]	13.3±0.7[j]
ST-12	13.0±0.7	12.7±0.6	14.0±0.7	12.1±0.7
ST-13	9.4±0.8	11.5±0.7	9.6±0.7	11.0±0.7
ST-14	10.7±0.7	10.5±0.6	11.3±0.6	10.0±0.6
ST-15	10.4±0.7	10.4±0.6	10.9±0.7	9.8±0.7
ST-16	10.1±0.8	10.8±0.6	11.0±0.6	10.9±0.6
ST-17	11.9±0.7	11.0±0.6	12.2±0.8	10.2±0.7
ST-18	12.0±0.7	10.6±0.7	12.6±0.7	10.0±0.7
ST-19	12.9±1.2	12.7±0.7	13.8±0.7	11.7±0.7
ST-20	12.2±0.7	12.1±0.6	13.2±0.7	11.3±0.6
ST-21	12.1±0.7	11.4±0.6	12.9±0.7	10.8±0.7
ST-22	6.7±0.7	6.2±0.6	6.2±0.8	5.7±0.7
ST-23	12.9±1.2	12.8±0.6	12.5±0.7	11.1±0.7
ST-24	12.1±0.7	11.2±0.7	ND[g]	11.1±0.7
ST-33	9.9±0.6	11.1±0.8	11.0±0.6	10.9±0.7
ST-34	10.0±0.6	10.7±0.7	10.6±0.7	10.9±0.6
ST-35	13.2±0.7	14.2±0.7	13.7±0.6	13.1±0.7
ST-36	9.6±0.7	11.4±0.7	9.9±0.7	10.8±0.7
ST-37	11.8±0.7	11.8±0.6	12.2±0.7	11.4±0.7
ST-38	10.1±0.8	11.0±0.7	10.3±0.8	10.1±0.7
Mean ± s.d.	12.2±2.3	11.8±1.9	12.9±2.7	11.3±1.8
Control 1	6.2±0.6	6.5±0.6[d]	6.7±0.7	5.9±0.7
Control 2	3.6±0.7[c]	6.5±0.7[d]	4.0±0.7	5.8±0.7

[a] In-transit exposure has been subtracted from total exposure.
[b] Placed 01-02-92; removed 04-01-92.
[c] Unreliable reading; card appears to have been damaged.
[d] Placed 04-01-92.
[e] Removed 07-01-92.
[f] Placed 04-01-92; removed 05-28-92.
[g] ND = No Data; TLD lost in the field.
[h] Placed 07-01-92; removed 10-05-92.
[i] Placed 09-30-92; removed 12-31-92.
[j] Placed 10-05-92; removed 01-16-92.

Table 4. Gamma Radiation, as measured by TLDs
Exposure: Yearly
Units: mR/365 days net[a]

Location	
Date Placed	12-29-91
Date Removed	01-03-93
In-Transit (mR)	2.3±2.5
ST-01	50.0±2.4
ST-02	69.9±2.6
ST-03	56.7±2.5
ST-04	58.1±2.4
ST-05	60.3±2.6
ST-06	66.4±2.6
ST-07A	52.6±2.5
ST-08	51.2±2.6
ST-09	47.9±2.6
ST-10	ND[a]
ST-11	56.4±2.6
ST-12	52.8±2.5
ST-13	46.8±2.5
ST-14	42.0±2.4
ST-15	42.6±2.7
ST-16	47.1±2.5
ST-17	44.3±2.5
ST-18	47.1±2.5
ST-19	51.4±2.5
ST-20	47.2±2.6
ST-21	52.5±2.5
ST-22	25.1±2.5
ST-23	56.4±2.4
ST-24	ND[b]
ST-33	ND[b]
ST-34	48.8±2.4
ST-35	59.0±2.4
ST-36	47.1±2.6
ST-37	48.8±2.6
ST-38	46.8±2.6
Mean ± s.d.	50.9±8.5
Control 1	24.6±2.4
Control 2	24.8±2.4

a In-transite exposure has been subtracted from total exposure.
b ND - TLD missing
c Placed 01-02-92; removed 01-06-93.

Table 5. Lake Water, Intake and Discharge
Collection: Monthly Composites of daily collections
Units: pCi/L

1992 Compositing Period	Lab Code	Gross Alpha	Gross Beta	Tritium
Required LLD		1.0	4.0	500
		Intake		
January	PALW-4454	<1.0	1.8±0.5	169±92
February	4770	<0.4	2.6±0.3	<180
March	5265	<0.3	2.2±0.3	<165
April	5621	<0.9	1.7±0.5	96±93
May	6015	<0.5	2.3±0.3	<170
June	6482	<0.8	2.4±0.5	155±88
July	6931	<0.3	1.9±0.3	<188
August	7275	<1.0	2.1±0.5	<185
September	7630	<0.4	2.0±0.3	<168
October	8165	0.8±0.3	2.6±0.3	103±91
November	8344	<0.1	2.0±0.6	183±91[b]
December	8778	0.4±0.3	2.2±0.3	<164
		Discharge		
January	PALW-4455	<0.9	2.4±0.6	144±91
February	4771	<0.4	2.2±0.3	<180
March	5266	<0.4	2.1±0.3	4701±199[a]
April	5622	<0.9	2.2±0.6	132±67
May	6016	<0.5	2.2±0.3	148±90
June	6483	<0.2	2.6±0.5	2148±148
July	6932	<0.4	3.2±0.3	<188
August	7276	0.6±0.3	2.3±0.3	<185
September	7631	<0.4	2.1±0.3	3152±175
October	8166	0.6±0.3	2.7±0.3	<175
November	8345	<0.4	2.2±0.3	<176
December	8779	<0.4	2.0±0.3	3203±171

[a] Analysis was repeated; result of reanalysis 5028±147 pCi/L.
[b] Corrected data.

Table 5. Lake Water (continued)
Collection: Monthly
Units: pCi/L
Location: Ludington Intake (Control)

	Sample Description and Concentration				Required LLD
Date Collected	01-31-92	02-29-92	03-31-92	04-30-92	
Lab Code	PALW-4527	PALW-4822	PALW-5370	PALW-5670	
Gross Alpha	<1.0	<0.7	<0.4	<0.5	1.0
Gross Beta	2.1±0.5	1.4±0.6	1.9±0.3	2.0±0.3	4.0
Sr-89	<0.8	<0.7	<0.7	<1.0	5.0
Sr-90	<0.5	<0.5	<0.6	<0.6	1.0
H-3	188±93	96±93	103±88	<170	500
Date Collected	05-31-92	07-01-92	07-31-92	08-31-92	
Lab Code	PALW-6010	PALW-6467	PALW-6828	PALW-7428	
Gross Alpha	<0.3	<0.6	<0.5	<0.4	1.0
Gross Beta	1.4±0.3	1.9±0.5	1.6±0.3	2.2±0.3	4.0
Sr-89	<0.9	<0.9	<0.9	<0.7	5.0
Sr-90	<0.4	0.9±0.4	0.9±0.4	<0.5	1.0
H-3	<170	155±89	114±94	105±95	500
Date Collected	09-30-92	10-31-92	11-30-92	01-04-93	
Lab Code	PALW-7636	PALW-8115	PALW-8468	PALW-8981	
Gross Alpha	<0.5	0.8±0.4	<0.5	<0.4	1.0
Gross Beta	1.9±0.3	3.5±0.4	2.1±0.3	2.1±0.3	4.0
Sr-89	<0.9	<1.3	<0.8	<0.7	5.0
Sr-90	0.9±0.3	0.6±0.4	<0.5	<0.6	1.0
H-3	<178	<175	<176	<171	500

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Table 6. Lake Water, Drinking
Collection: Monthly Composites of daily collections
Units: pCi/L

1992 Compositing Period	South Haven Municipal System				
	Treated			Raw	
	Lab Code	Gross Beta	H-3	Lab Code	Gross Beta
Required LLD		4.0	500		4.0
January	PALW-4460	2.3±0.6	158±91	PALW-4461	2.1±0.6
February	4773	1.3±0.6	<183	4774	1.6±0.6
March	5263	1.3±0.6	<165	5264	1.9±0.3
April	5619	2.2±0.6	125±94	5620	2.2±0.6
May	6012	1.7±0.5	<170	6013,4	2.1±0.4
June	6479,80	2.1±0.4	147±66	6481	2.2±0.5
July	6929	2.0±0.3	<188	6930	1.8±0.3
August	7127	2.0±0.5	174±95	7128	2.0±0.5
September	7831	2.6±0.5	<171	7832	2.0±0.5
October	8123	2.3±0.3	96±91	8124	1.8±0.6
November	8357	2.6±0.6	<168	8356	1.8±0.6
December	8874	2.4±0.4	<170	8873	2.4±0.4

Table 7. Well Water
Collection: Monthly
Units: pCi/L

1992 Collection Period	Lab Code	Gross Beta	H-3	Lab Code	Gross Beta	H-3
Required LLD		4.0	500		4.0	500
	Site Wells No. 2 and 3 (Domestic)			State Park		
January	PAWW-4456	0.9±0.5	158±91	PAWW-4186,7	0.9±0.2	<180
February	4772	<0.9	<183	4457,8	1.2±0.4	181±64
March	5267,8	0.8±0.4	148±65	4775,6	0.8±0.2	83±66
April	5623	1.6±0.6	110±94	5255	1.1±0.7	<165
May	6017	1.0±0.5	260±95	5625,6	0.8±0.3	113±66
June	6484	1.2±0.5	340±101	6020	3.5±0.5	<171
July	6933	1.1±0.3	<185	6472	3.9±0.5	<167
August	7273	2.0±0.6	<185	6922	3.4±0.3	<181
September	7632,3	1.2±0.3	163±64	7272	2.3±0.3	<185
October	8167	1.2±0.6	<175	7829	3.5±0.5	<174
November	8347,8	1.2±1.0	<176	8126	<1.3	<176
December	8780	1.1±0.3	<164	8349	<1.0	178±89
	Township Park					
January	PAWW-4188	2.3±0.3	<180			
February	4459	2.3±0.6	146±90			
March	4777	3.4±0.3	111±96			
April	5256,7	2.2±0.5	<165			
May	5627	2.1±0.5	<170			
June	6021	1.8±0.5	<171			
July	6473	1.6±0.5	<167			
August	6923	1.8±0.3	<181			
September	7125	2.4±0.3	<185			
October	7830	1.7±0.5	<174			
November	8125	1.5±0.7	<168			
December	8350	2.5±0.6	<179			

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Ludington (Control)

	Sample Description and Concentration				Required LLD
Date Collected	01-31-92	02-29-92	03-31-92	04-30-92	
Lab Code	PAWW-4528	PAWW-4823	PAWW-5371	PAWW-5671	
Gross Alpha	<0.5	<0.9	<0.5	<0.5	1.0
Gross Beta	<0.8	<0.9	<0.4	<0.4	4.0
Sr-89	<1.2	<0.8	<0.8	<1.0	5.0
Sr-90	<0.9	<0.6	<0.5	<0.6	1.0
H-3	160±92	<179	<170	<170	500
Date Collected	05-31-92	07-01-92	07-31-92	08-31-92	
Lab Code	PAWW-6011	PAWW-6468	PAWW-6829	PAWW-7429	
Gross Alpha	<0.5	0.6±0.3	<0.5	<0.6	
Gross Beta	<0.4	<1.0	<0.4	<0.4	
Sr-89	<1.2	<0.9	<0.8	<0.8	
Sr-90	<0.8	<0.6	<0.5	<0.4	
H-3	<170	<166	<180	<184	
Date Collected	09-30-92	10-31-92	11-30-92	01-04-93	
Lab Code	PAWW-7637	PAWW-8116	PAWW-8469	PAWW-8982	
Gross Alpha	<0.6	<0.6	<0.6	<0.6	1.0
Gross Beta	<0.4	0.8±0.3	<0.4	0.4±0.3	4.0
Sr-89	<1.1	<2.4	<0.9	<0.9	5.0
Sr-90	<0.5	<0.7	<0.5	<0.5	1.0
H-3	<168	<175	<176	<171	500

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Warehouse (Site Well #7)

	Sample Description and Concentration			Required LLD
Date Collected	01-14-92	02-10-92	03-04-92	
Lab Code	PAWW-4184	PAWW-4526	PAWW-4781	
Gross Beta	6.2±0.5[b]	6.6±0.6[b]	6.5±0.8[b]	4.0
Sr-89	<0.9	<0.6	<0.5	5.0
Sr-90	1.3±0.5	1.6±0.5	1.5±0.4	1.0
H-3	<180	<168	<174	500
I-131	<0.3	<0.3	<0.3	1.0
Cs-134	<7.8	<4.1	<5.0	15.0
Cs-137	<6.9	<4.1	<4.1	18.0
Other Gammas[a]	<7.5	<5.4	<4.0	15.0
Date Collected	04-06-92	05-05-92	06-08-92	
Lab Code	PAWW-5261	PAWW-5631	PAWW-6025	
Gross Beta	6.2±1.0[b]	5.4±1.0[b]	6.4±0.9[b]	4.0
Sr-89	<0.6	<0.7	<0.9	5.0
Sr-90	1.8±0.4	1.7±0.4	1.2±0.4	1.0
H-3	<165	<170	<171	500
I-131	<0.4	<0.4	<0.2	1.0
Cs-134	<4.5	<5.3	<5.1	15.0
Cs-137	<4.5	<5.2	<5.3	18.0
Other Gammas[a]	<4.8	<5.5	<5.0	15.0

[a] See Introduction.

[b] Analysis was repeated at request of Palisades: results of reanalysis

PAWW-4184	6.1±0.9	PAWW-6025	6.9±0.9
4526	4.9±0.8		
4781	7.4±1.0		
5261	5.9±0.5		
5631	6.0±0.6		

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Warehouse (Site Well #7)

	Sample Description and Concentration			Required LLD
Date Collected	07-07-92	08-11-92	09-01-92	
Lab Code	PAWW-6477	PAWW-6927	PAWW-7126	
Gross Beta	5.5±0.8[b]	5.7±0.8[b]	8.5±0.5[b]	4.0
Sr-89	<1.3	<1.0	<0.9	5.0
Sr-90	2.1±0.5	1.9±0.5	1.5±0.4	1.0
H-3	<167	115±94	132±94	500
I-131	<0.3	<0.4	<0.5	1.0
Cs-134	<6.0	<2.2	<3.1	15.0
Cs-137	<6.5	<2.1	<5.2	18.0
Other Gammas[a]	<6.3	<2.2	<5.1	15.0
Date Collected	10-06-92	11-21-92	12-02-92	
Lab Code	PAWW-7627	PAWW-8121	PAWW-8352	
Gross Beta	5.5±0.8[b]	5.4±0.8[b]	0.9±0.6[b]	4.0
Sr-89	<0.8	<0.9	<0.9	5.0
Sr-90	1.3±0.4	1.6±0.4	<0.5	1.0
H-3	<178	<180	<179	500
I-131	<1.7[c]	<0.2	<0.3	1.0
Cs-134	<4.8	<5.2	<4.6	15.0
Cs-137	<4.1	<4.9	<4.8	18.0
Other Gammas[a]	<4.1	<5.3	<4.8	15.0

[a] See Introduction.

[b] Analysis was repeated; result of reanalysis: PAWW-6477 7.1±1.0 -7627 7.4±0.9
-6927 6.6±1.0 -8121 6.2±0.9
-7126 6.6±0.9 -8352 0.9±0.3

[c] LLD not reached due to delay in sample analysis.

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Outage Building (Site Wells # 11, 12 and 13)

	Sample Description and Concentration			Required LLD
Date Collected	01-14-92	02-05-92	03-04-92	
Lab Code	PAWW-4185	PAWW-4451	PAWW-4782	
Gross Beta	1.0±0.3	<1.2	1.1±0.5	4.0
Sr-89	<0.7	<0.6	<0.5	5.0
Sr-90	<0.4	<0.5	<0.4	1.0
H-3	<180	240±93	<174	500
I-131	<0.3	<0.4	<0.3	1.0
Cs-134	<5.4	<3.3	<7.0	15.0
Cs-137	<4.5	<4.1	<6.4	18.0
Other Gammas[a]	<4.0	<3.8	<6.3	15.0
Date Collected	04-06-92	05-05-92	06-08-92	
Lab Code	PAWW-5262	PAWW-5632	PAWW-6026	
Gross Beta	1.0±0.5	1.3±0.7	<0.9	4.0
Sr-89	<0.7	<0.9	<0.8	5.0
Sr-90	<0.4	<0.5	<0.6	1.0
H-3	<165	110±94	<171	500
I-131	<0.3	<0.4	<0.2	1.0
Cs-134	<4.0	<6.3	<5.9	15.0
Cs-137	<3.7	<5.3	<5.3	18.0
Other Gammas[a]	<4.3	<7.9	<6.4	15.0

[a] See Introduction.

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Outage Building (Site Wells # 11, 12 and 13)

	Sample Description and Concentration			Required LLD
Date Collected	07-07-92	08-11-92	09-09-92	
Lab Code	PAWW-6478	PAWW-6928	PAWW-7271	
Gross Beta	<0.9	<0.9	<0.9	4.0
Sr-89	<1.5	<0.9	<1.5	5.0
Sr-90	<0.6	<0.4	<0.6	1.0
H-3	263±98	127±95	124±94	500
I-131	<0.3	<0.3	<0.4	1.0
Cs-134	<4.1	<1.8	<5.9	15.0
Cs-137	<4.2	<1.6	<5.0	18.0
Other Gammas[a]	<6.1	<1.6	<6.0	15.0
Date Collected	10-06-92	11-18-92	12-02-92	
Lab Code	PAWW-7826,7	PAWW-8122	PAWW-8351	
Gross Beta	<1.2	0.70±0.5	6.1±0.8[b]	4.0
Sr-89	<1.0	<1.6	<0.8	5.0
Sr-90	<0.6	<0.8	1.9±0.5	1.0
H-3	<176	<180	<179	500
I-131	<0.7	<0.2	<0.2	1.0
Cs-134	<4.0	<4.3	<3.8	15.0
Cs-137	<4.1	<4.5	<3.3	18.0
Other Gammas[a]	<4.9	<4.2	<3.6	15.0

[a] See Introduction.
[b] Analysis was repeated; result of reanalysis: PAWW-8351 6.7±0.9

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Site Well #14

	Sample Description and Concentration			Required LLD
Date Collected	01-14-92	02-10-92	03-04-92	
Lab Code	PAWW-4181	PAWW-4525	PAWW-4778	
Gross Beta	6.5±0.5[b]	4.1±0.8[b]	5.9±0.8[b]	4.0
Sr-89	<0.8	<0.6	<1.0	5.0
Sr-90	<0.5	<0.5	<0.5	1.0
H-3	<181	178±91	<174	500
Cs-134	<5.4	<6.6	<6.7	15.0
Cs-137	<4.4	<4.8	<5.8	18.0
Other Gammas[a]	<4.6	<4.0	<9.3	15.0

Date Collected	04-06-92	05-05-92	06-08-92	
Lab Code	PAWW-5258	PAWW-5628	PAWW-6022	
Gross Beta	4.5±0.7[b]	3.9±0.9	3.3±0.7	4.0
Sr-89	<0.6	<0.9	<0.9	5.0
Sr-90	0.6±0.3	<0.5	<0.6	1.0
H-3	<165	<170	<171	500
Cs-134	<3.7	<4.6	<4.0	15.0
Cs-137	<3.8	<4.7	<4.0	18.0
Other Gammas[a]	<4.2	<4.1	<5.5	15.0

[a] See Introduction.

[b] Analysis was repeated at request of Palisades: results of reanalysis

PAWW-4181	5.4±0.8	PAWW-5258	4.2±0.4
4525	3.6±0.9		
4778	4.0±0.8		

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Site Well #14

	Sample Description and Concentration			Required LLD
Date Collected	07-07-92	08-11-92	09-09-92	
Lab Code	PAWW-6474	PAWW-6924	PAWW-7268	
Gross Beta	5.7±0.7[b]	6.9±0.8[b]	2.9±0.6	4.0
Sr-89	<0.8	<0.9	<1.7	5.0
Sr-90	<0.5	<0.4	<0.6	1.0
H-3	<167	178±95	185	500
Cs-134	<4.7	<4.7	<5.9	15.0
Cs-137	<4.4	<4.7	<6.0	18.0
Other Gammas[a]	<4.0	<4.2	<6.4	15.0
Date Collected	10-06-92	11-18-92	12-02-92	
Lab Code	PAWW-7828	PAWW-8117	PAWW-8353	
Gross Beta	1.6±0.7	1.3±0.9[c]	11.2±1.0[b]	4.0
Sr-89	<1.4	<1.0	<1.4	5.0
Sr-90	<0.7	<0.5	<0.6	1.0
H-3	<174	<178	<178	500
Cs-134	<5.0	<3.8	<4.9	15.0
Cs-137	<4.4	<3.8	<4.6	18.0
Other Gammas[a]	<4.8	<3.9	<5.3	15.0

[a] See Introduction.

[b] Analysis was repeated; result of reanalysis: PAWW-6474 3.6±0.8
-6924 6.7±0.9
-8353 11.6±0.9

[c] Average of two repeated analysis.

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Site Well #15

	Sample Description and Concentration			Required LLD
Date Collected	01-14-92	02-05-92	03-04-92	
Lab Code	PAWW-4182	PAWW-4449	PAWW-4779	
Gross Beta	3.8±0.4	5.0±0.9[b]	5.6±0.8[b]	4.0
Sr-89	<0.8	<0.7	<0.6	5.0
Sr-90	<0.5	<0.5	0.8±0.3	1.0
H-3	<181	<169	<174	500
Cs-134	<8.0	<6.2	<6.6	15.0
Cs-137	<7.0	<5.2	<6.4	18.0
Other Gammas[a]	<8.2	<4.9	<7.9	15.0

Date Collected	04-06-92	05-05-92	06-08-92	
Lab Code	PAWW-5259	PAWW-5629	PAWW-6023	
Gross Beta	5.0±0.9[b]	3.3±0.8	5.1±0.8[b]	4.0
Sr-89	<0.4	<0.9	<0.6	5.0
Sr-90	<0.4	0.9±0.4	<0.4	1.0
H-3	<165	<170	<171	500
Cs-134	<5.0	<4.2	<3.7	15.0
Cs-137	<4.8	<5.0	<3.9	18.0
Other Gammas[a]	<4.3	<5.9	<4.7	15.0

[a] See Introduction.

[b] Analysis was repeated at request of Palisades: results of reanalysis

PAWW-4449	3.9±0.7	PAWW-6023	4.4±0.7
4779	4.8±0.8		
5259	4.8±0.4		

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Site Well #15

	Sample Description and Concentration			Required LLD
Date Collected	07-07-92	08-11-92	09-09-92	
Lab Code	PAWW-6475	PAWW-6925	PAWW-7269	
Gross Beta	6.8±0.7[b]	4.0±0.7	5.6±0.7[b]	4.0
Sr-89	<1.4	<0.9	<1.0	5.0
Sr-90	0.9±0.4	<0.4	<0.5	1.0
H-3	<167	<188	<185	500
Cs-134	<4.3	<4.3	<6.3	15.0
Cs-137	<4.1	<4.1	<6.3	18.0
Other Gammas[a]	<4.3	<3.9	<7.4	15.0
Date Collected	10-06-92	11-18-92	12-02-92	
Lab Code	PAWW-7628	PAWW-8118	PAWW-8354	
Gross Beta	7.2±0.5[b]	6.2±1.3[c]	7.6±0.9[b]	4.0
Sr-89	<1.2	<1.0	<1.1	5.0
Sr-90	0.8±0.4	<0.5	1.2±0.5	1.0
H-3	<178	<178	<179	500
Cs-134	<4.0	<5.9	<4.9	15.0
Cs-137	<4.2	<6.7	<5.1	18.0
Other Gammas[a]	<3.9	<6.4	<5.0	15.0

[a] See Introduction.
[b] Analysis was repeated; result of reanalysis: PAWW-6475 6.0±0.8
-7269 3.5±0.6
-7628 7.0±0.5
-8354 6.8±0.5
[c] Average of two repeated analysis.

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Site Well #16

	Sample Description and Concentration			Required LLD
Date Collected	01-14-92	02-05-92	03-04-92	
Lab Code	PAWW-4183	PAWW-4450	PAWW-4780	
Gross Beta	5.3±0.4[b]	4.2±0.8[b]	5.2±0.7[b]	4.0
Sr-89	<0.7	<0.7	<0.8	5.0
Sr-90	<0.5	<0.6	<0.6	1.0
H-3	<181	<169	<174	500
Cs-134	<6.1	<6.1	<6.4	15.0
Cs-137	<7.1	<6.6	<6.4	18.0
Other Gammas[a]	<7.8	<7.1	<7.8	15.0
Date Collected	04-06-92	05-05-92	06-08-92	
Lab Code	PAWW-5260	PAWW-5630	PAWW-6024	
Gross Beta	4.8±0.8[b]	4.5±0.9[b]	4.7±0.7[b]	4.0
Sr-89	<0.6	<0.9	<0.7	5.0
Sr-90	<0.5	<0.6	<0.5	1.0
H-3	95±90	<170	<171	500
Cs-134	<3.5	<4.9	<3.9	15.0
Cs-137	<4.0	<4.0	<4.1	18.0
Other Gammas[a]	<4.9	<4.7	<4.4	15.0

[a] See Introduction.

[b] Analysis was repeated at request of Palisades: results of reanalysis

PAWW-4183	3.7±0.7	PAWW-5630	3.7±0.5
4450	4.0±0.9	6024	3.6±0.4
4780	5.3±1.0		
5260	3.9±0.4		

Table 7. Well Water (continued)
Collection: Monthly
Units: pCi/L
Location: Site Well #16

	Sample Description and Concentration			Required LLD
Date Collected	07-07-92	08-11-92	09-09-92	
Lab Code	PAWW-6476	PAWW-6926	PAWW-7270	
Gross Beta	5.1±0.7[b]	4.0±0.7	3.9±0.7	4.0
Sr-89	<1.7	<1.1	<0.9	5.0
Sr-90	<0.7	<0.5	<0.5	1.0
H-3	<167	<188	<185	500
Cs-134	<5.6	<2.1	<4.7	15.0
Cs-137	<5.8	<2.1	<5.6	18.0
Other Gammas[a]	<5.4	<2.2	<6.2	15.0

Date Collected	10-06-92	11-21-92	12-02-92	
Lab Code	PAWW-7629	PAWW-8119,20	PAWW-8355	
Gross Beta	4.5±0.7	5.3±1.0[b]	4.6±0.8	4.0
Sr-89	<1.0	<0.9	<1.0	5.0
Sr-90	0.6±0.3	0.3±0.4	<0.7	1.0
H-3	<178	<168	<177	500
Cs-134	<4.6	<5.9	<3.7	15.0
Cs-137	<4.4	<6.0	<4.7	18.0
Other Gammas[a]	<4.4	<6.5	<3.8	15.0

[a] See Introduction.

[b] Analysis was repeated; result of reanalysis: PAWW-6476 3.7±0.7
-8119,20 5.0±1.0

Table 8. In-Plant Water
Collection: Monthly Composite
Units: pCi/L
Location: Turbine Sump

	Sample Description and Concentration			Required LLD
Collection Period	January	February	March	
Lab Code	PACW-4452	PACW-4768	PACW-5269	
Gross Alpha	<0.8	<0.3	<0.5	1.0
Gross Beta	2.0±0.5	2.5±0.3	3.6±0.3	1.0
Sr-89	<0.6	<0.8	<0.8	5.0
Sr-90	0.6±0.3	<0.6	<0.5	1.0
H-3	1466±134	1156±129	1505±133	500
Cs-137	<2.2	<2.6	<4.0	10
Other Gammas[a]	<2.2	<3.3	<3.6	10
Collection Period	April	May	June	
Lab Code	PACW-5669	PACW-6019	PACW-6486	
Gross Alpha	<0.3	<0.4	1.0±0.4	1.0
Gross Beta	1.7±0.3	0.9±0.4	2.0±0.6	1.0
Sr-89	<1.0	<0.9	<1.5	5.0
Sr-90	<0.6	<0.5	<0.7	1.0
H-3	30301±337[b]	9899±277	4782±204	500
Cs-137	<3.7	<2.2	<1.8	10
Other Gammas[a]	<4.0	<2.1	<1.8	10

[a] See Introduction.
[b] Analysis was repeated; result of reanalysis 33432±1961 pCi/L.

Table 8. In-Plant Water
Collection: Monthly Composite
Units: pCi/L
Location: Turbine Sump

	Sample Description and Concentration			Required LLD
Collection Period	July	August	September	
Lab Code	PACW-6935	PACW-7277,8	PACW-7635	
Gross Alpha	0.5±0.2	<0.3	0.5±0.2	1.0
Gross Beta	1.4±0.3	1.9±0.2	2.6±0.3	1.0
Sr-89	<1.5	<0.6	<1.0	5.0
Sr-90	<0.6	<0.3	<0.5	1.0
H-3	3227±178	2226±110	2115±152	500
Cs-137	<1.3	<2.6	<4.5	10
Other Gammas[a]	<1.4	<2.7	<4.4	10
Collection Period	October	November	December	
Lab Code	PACW-8169,70	PACW-8343	PACW-8782	
Gross Alpha	0.5±0.1	<0.6	<0.2	1.0
Gross Beta	1.3±0.2	3.7±0.6	1.0±0.2	1.0
Sr-89	<1.8	<0.8	<0.9	5.0
Sr-90	<0.7	<0.5	<0.8	1.0
H-3	2436±111	2268±152	2375±153	500
Cs-137	<3.3	<4.2	<4.1	10
Other Gammas[a]	<3.8	<4.4	<4.2	10

[a] See Introduction.

Table 8. In-Plant Water
Collection: Monthly Composite
Units: pCi/L
Location: Service Water

	Sample Description and Concentration			Required LLD
Collection Period	January	February	March	
Lab Code	PACW-4453	PACW-4769	PACW-5270	
Gross Alpha	<0.7	<0.5	<0.6	1.0
Gross Beta	0.9±0.4	2.1±0.3	0.9±0.3	1.0
Sr-89	<0.8	<0.6	<0.8	5.0
Sr-90	<0.6	0.6±0.3	<0.5	1.0
H-3	120±90	<183	97±90	500
Cs-137	<1.9	<2.6	<3.2	10
Other Gammas[a]	<1.8	<2.6	<3.4	10

Collection Period	April	May	June	
Lab Code	PACW-5624	PACW-6018	PACW-6485	
Gross Alpha	<0.4	<1.0	<0.7	1.0
Gross Beta	2.5±0.3	2.2±0.5	2.9±0.6	1.0
Sr-89	<1.0	<0.6	<1.1	5.0
Sr-90	1.2±0.4	0.5±0.2	<0.5	1.0
H-3	<170	167±91	208±96	500
Cs-137	<2.3	<2.1	<2.8	10
Other Gammas[a]	<2.6	<2.9	<2.6	10

[a] See Introduction.

Table 8. In-Plant Water
Collection: Monthly Composite
Units: pCi/L
Location: Service Water

	Sample Description and Concentration			Required LLD
Collection Period Lab Code	July PACW-6934	August PACW-7274	September PACW-7634	
Gross Alpha	0.7±0.3	<0.4	<0.4	1.0
Gross Beta	2.1±0.3	2.3±0.3	2.7±0.3	1.0
Sr-89	<1.0	<0.9	<0.9	5.0
Sr-90	1.0±0.4	<0.5	<0.5	1.0
H-3	<188	<185	<178	500
Cs-137	<1.7	<3.3	<2.9	10
Other Gammas[a]	<2.1	<3.0	<3.0	10

Collection Period Lab Code	October PACW-8168	November PACW-8346	December PACW-8781	
Gross Alpha	<0.4	<0.4	<0.4	1.0
Gross Beta	2.3±0.3	2.3±0.3	2.3±0.3	1.0
Sr-89	<1.8	<1.2	<0.8	5.0
Sr-90	<0.6	<0.5	<0.7	1.0
H-3	<175	<166	<164	500
Cs-137	<4.5	<2.7	<3.7	10
Other Gammas[a]	<3.7	<3.0	<3.7	10

[a] See Introduction.

Table 9. Milk
Collection: Monthly
Units: pCi/L
Location: GH - Glen Hessey Farm

	Sample Description and Concentration				Required LLD
Date Collected	01-14-92	02-04-92	03-04-92	04-07-92	
Lab Code	PAMI-7353	PAMI-7414	PAMI-7483	PAMI-7574	
I-131	<0.2	<0.2	<0.2	<0.3	1.0
Sr-89	<0.5	<0.6	<0.5	<0.6	5.0
Sr-90	3.1±0.6	2.6±0.5	2.0±0.5	3.4±0.6	1.0
K-40	1320±140	1260±110	1220±150	1340±150	–
Cs-134	<4.3	<4.4	<6.2	<6.7	15.0
Cs-137	<3.9	<4.7	<8.1	<7.0	18.0
Ba-La-140	<4.5	<5.1	<6.0	<8.0	15.0
Date Collected	05-05-92	06-07-92	07-06-92	08-11-92	
Lab Code	PAMI-7662	PAMI-7838	PAMI-8017	PAMI-8243	
I-131	<0.3	<0.3	<0.2	<0.5	1.0
Sr-89	<0.5	<1.0	<0.9	<1.6	5.0
Sr-90	2.8±0.5	2.5±0.7	2.8±0.6	3.8±1.2	1.0
K-40	1260±130	1390±120	1190±150	1320±100	–
Cs-134	<5.5	<4.2	<6.8	<4.3	15.0
Cs-137	<5.6	<4.6	<7.2	<4.4	18.0
Ba-La-140	<10.8	<7.1	<12.7	<11.3	15.0
Date Collected	09-02-92	10-06-92	11-09-92	12-02-92	
Lab Code	PAMI-8322	PAMI-8534	PAMI-8695	PAMI-8731	
I-131	<0.4	<0.4	<0.2	<0.2	1.0
Sr-89	<1.7	<0.9	<0.8	<0.9	5.0
Sr-90	3.4±0.9	2.8±0.6	3.4±0.6	3.1±0.7	1.0
K-40	1290±150	1250±140	1396±120	1380±160	–
Cs-134	<4.4	<4.9	<4.4	<3.6	15.0
Cs-137	<5.2	<5.3	<4.9	<5.3	18.0
Ba-La-140	<7.7	<10.1	<7.7	<7.1	15.0

Table 9. Milk
Collection: Monthly
Units: pCi/L
Location: KK - Kenneth Kemp Farm

	Sample Description and Concentration				Required LLD
Date Collected	01-13-92	02-03-92	03-04-92	04-07-92	
Lab Code	PAMI-7355	PAMI-7412,3	PAMI-7479,80	PAMI-7575	
I-131	<0.2	<0.2	<0.2	<0.3	1.0
Sr-89	<0.5	<0.6	<0.5	<0.6	5.0
Sr-90	4.8±0.7	3.2±0.4	2.5±0.3	2.9±0.7	1.0
K-40	1240±140	1300±100	1280±70	1240±150	–
Cs-134	<6.0	<7.1	<4.1	<6.7	15.0
Cs-137	<7.6	<7.5	<4.2	<8.1	18.0
Ba-La-140	<8.8	<8.2	<5.7	<8.9	15.0
Date Collected	05-04-92	06-05-92	07-06-92	08-11-92	
Lab Code	PAMI-7665	PAMI-7835	PAMI-8014	PAMI-8246	
I-131	<0.2	<0.3	<0.3	<0.5	1.0
Sr-89	<0.6	<0.8	<0.8	<1.1	5.0
Sr-90	2.8±0.6	2.0±0.7	3.0±0.6	2.9±0.6	1.0
K-40	1270±110	1130±140	1400±160	1170±110	–
Cs-134	<5.2	<4.6	<6.2	<4.9	15.0
Cs-137	<5.6	<5.7	<7.3	<5.0	18.0
Ba-La-140	<9.8	<10.5	<8.9	<13.4	15.0
Date Collected	09-02-92	10-05-92	11-09-92	12-02-92	
Lab Code	PAMI-8320	PAMI-8531	PAMI-8693	PAMI-8729	
I-131	<0.4	<0.3	<0.2	<0.2	1.0
Sr-89	<1.6	<0.8	<0.9	<0.8	5.0
Sr-90	2.4±1.1	2.3±0.6	4.0±0.7	2.7±0.6	1.0
K-40	1210±150	1330±130	1287±142	1380±130	–
Cs-134	<4.4	<8.4	<3.6	<5.9	15.0
Cs-137	<6.0	<6.1	<5.5	<6.9	18.0
Ba-La-140	<8.6	<9.5	<10.5	<9.7	15.0

Table 9. Milk
Collection: Monthly
Units: pCi/L
Location: WS - William Shine Farm

	Sample Description and Concentration				Required LLD
Date Collected	01-14-92	02-04-92	03-04-92	04-07-92	
Lab Code	PAMI-7352	PAMI-7415	PAMI-7482	PAMI-7572	
I-131	<0.2	<0.2	<0.2	<0.3	1.0
Sr-89	<0.5	<0.8	<0.6	<0.5	5.0
Sr-90	2.4±0.5	2.0±0.5	2.4±0.5	1.5±0.5	1.0
K-40	1220±140	1300±160	1240±110	1390±140	–
Cs-134	<5.0	<5.3	<4.8	<4.9	15.0
Cs-137	<5.1	<5.2	<4.7	<6.0	18.0
Ba-La-140	<4.6	<6.0	<5.6	<4.7	15.0
Date Collected	05-05-92	06-07-92	07-06-92	08-11-92	
Lab Code	PAMI-7663	PAMI-7837	PAMI-8016	PAMI-8244	
I-131	<0.2	<0.3	<0.3	<0.4	1.0
Sr-89	<0.5	<0.9	<1.3	<0.9	5.0
Sr-90	1.5±0.4	2.3±0.8	2.0±0.8	2.5±0.7	1.0
K-40	1140±150	1360±110	1200±150	1380±120	–
Cs-134	<7.0	<5.0	<6.7	<5.3	15.0
Cs-137	<6.5	<4.8	<7.0	<6.4	18.0
Ba-La-140	<13.8	<7.8	<7.1	<14.0	15.0
Date Collected	09-02-92	10-06-92	11-09-92	12-02-92	
Lab Code	PAMI-8321	PAMI-8533	PAMI-8694	PAMI-8730	
I-131	<0.4	<0.4	<0.2	<0.2	1.0
Sr-89	<0.8	<0.9	<1.2	<0.8	5.0
Sr-90	3.1±0.7	1.8±0.5	2.9±0.6	2.7±0.6	1.0
K-40	1180±140	1190±140	1417±107	1420±160	–
Cs-134	<5.5	<4.2	<4.0	<4.2	15.0
Cs-137	<5.6	<5.5	<4.8	<5.6	18.0
Ba-La-140	<11.7	<8.1	<9.5	<7.0	15.0

Table 9. Milk
Collection: Monthly
Units: pCi/L
Location: FC - Frank Crnkovich Farm

	Sample Description and Concentration				Required LLD
Date Collected	01-14-92	02-04-92	03-04-92	04-07-92	
Lab Code	PAMI-7354	PAMI-7416	PAMI-7481	PAMI-7573	
I-131	<0.2	<0.2	<0.3	<0.3	1.0
Sr-89	<0.5	<0.7	<0.8	<0.5	5.0
Sr-90	3.9±0.6	3.5±0.5	2.3±0.5	2.4±0.5	1.0
K-40	1280±100	1180±120	1120±130	1160±100	–
Cs-134	<3.4	<5.2	<4.5	<4.6	15.0
Cs-137	<4.6	<5.6	<5.4	<4.4	18.0
Ba-La-140	<4.0	<5.7	<4.9	<3.9	15.0
Date Collected	05-05-92	06-07-92	07-06-92	08-11-92	
Lab Code	PAMI-7664	PAMI-7836	PAMI-8015	PAMI-8245	
I-131	<0.2	<0.3	<0.2	<0.5	1.0
Sr-89	<0.6	<0.8	<0.8	<1.0	5.0
Sr-90	2.2±0.5	3.5±1.0	4.0±0.6	2.9±0.7	1.0
K-40	1160±120	1300±110	1440±160	1340±50	–
Cs-134	<5.6	<3.8	<6.8	<1.6	15.0
Cs-137	<5.6	<4.4	<6.9	<1.8	18.0
Ba-La-140	<8.6	<6.7	<10.7	<10.7	15.0
Date Collected	09-02-92	10-06-92	11-09-92	12-02-92	
Lab Code	PAMI-8323	PAMI-8532	PAMI-8696	PAMI-8732	
I-131	<0.4	<0.3	<0.2	<0.2	1.0
Sr-89	<1.1	<0.9	<0.8	<0.6	5.0
Sr-90	3.8±1.1	3.4±0.8	6.3±0.8	5.6±0.8	1.0
K-40	1020±140	1410±160	1006±121	1560±130	–
Cs-134	<4.4	<6.4	<3.6	<3.8	15.0
Cs-137	<5.8	<6.9	<5.0	<5.1	18.0
Ba-La-140	<6.0	<11.0	<7.7	<4.3	15.0

PALISADES

Table 10. Food Crops. Collection: Semiannually at time of harvest. Units: pCi/g wet

	Sample Description and Concentration				Required LLD
Location	Jerry Sarno Farm	Jerry Sarno Farm	Jerry Sarno Farm	Jerry Sarno Farm	
Date Collected	08-24-92	08-24-92	08-24-92	08-24-92	
Sample Collected	Peaches	Pears	Apples	Plums	
Lab Code	PAVE-1422	PAVE-1423	PAVE-1424	PAVE-1425	
Gross Beta	1.43±0.06	0.99±0.04	0.62±0.02	1.60±0.07	1.0
Sr-89	<0.002	<0.001	<0.001	<0.003	0.025
Sr-90	0.002±0.001	<0.001	0.002±0.001	<0.002	0.005
I-131	<0.031	<0.019	<0.028	<0.026	0.06
Mn-54	<0.016	<0.012	<0.019	<0.014	0.08
Co-58	<0.018	<0.013	<0.018	<0.014	0.08
Co-60	<0.015	<0.012	<0.021	<0.013	0.05
Fe-59	<0.038	<0.036	<0.041	<0.028	0.1
Zn-65	<0.043	<0.026	<0.042	<0.028	0.1
Zr-Nb-95	<0.030	<0.019	<0.026	<0.023	0.1
Cs-134	<0.018	<0.010	<0.013	<0.014	0.08
Cs-137	<0.017	<0.012	<0.015	<0.012	0.08
Ba-La-140	<0.022	<0.011	<0.028	<0.016	0.1
Location	Jerry Sarno Farm	Paul Rood Farm	Paul Rood Farm	Paul Rood Farm	
Date Collected	08-26-92	09-09-92	09-15-92	09-15-92	
Sample Collected	Blueberries	Blueberries	Apples	Plums	
Lab Code	PAVE-1468	PAVE-1478	PAVE-1479	PAVE-1480	
Gross Beta	0.68±0.02	0.67±0.03	0.35±0.02	1.57±0.06	1.0
Sr-89	<0.002	<0.003	<0.004	<0.002	0.025
Sr-90	0.003±0.001	0.004±0.001	<0.001	<0.001	0.005
I-131	<0.033	<0.059	<0.056	<0.039	0.06
Mn-54	<0.008	<0.008	<0.010	<0.012	0.08
Co-58	<0.009	<0.008	<0.012	<0.012	0.08
Co-60	<0.007	<0.007	<0.010	<0.017	0.05
Fe-59	<0.020	<0.022	<0.027	<0.030	0.1
Zn-65	<0.016	<0.016	<0.024	<0.032	0.1
Zr-Nb-95	<0.016	<0.015	<0.020	<0.024	0.1
Cs-134	<0.006	<0.005	<0.011	<0.011	0.08
Cs-137	<0.008	<0.007	<0.010	<0.012	0.08
Ba-La-140	<0.020	<0.015	<0.027	<0.039	0.1

PALISADES

Table 10. Food Crops. Collection: Semiannually at time of harvest. Units: pCi/g wet

	Sample Description and Concentration		Required LLD
Location	Paul Rood Farm	Jerry Sarno Farm	
Date Collected	09-15-92	10-06-92	
Sample Collected	Pears	Grapes	
Lab Code	PAVE-1481,2	PAVE-1511	
Gross Beta	0.88±0.02	1.77±0.08	1.0
Sr-89	<0.003[a]	<0.002	0.025
Sr-90	0.002±0.001[a]	0.003±0.001	0.005
I-131	<0.054	<0.015	0.06
Mn-54	<0.008	<0.014	0.08
Co-58	<0.010	<0.013	0.08
Co-60	<0.008	<0.016	0.05
Fe-59	<0.029	<0.035	0.1
Zn-65	<0.018	<0.039	0.1
Zr-Nb-95	<0.017	<0.026	0.1
Cs-134	<0.006	<0.012	0.08
Cs-137	<0.007	<0.014	0.08
Ba-La-140	<0.034	<0.021	0.1
Location			
Date Collected			
Sample Collected			
Lab Code			
Gross Beta			1.0
Sr-89			0.025
Sr-90			0.005
I-131			0.06
Mn-54			0.08
Co-58			0.08
Co-60			0.05
Fe-59			0.1
Zn-65			0.1
Zr-Nb-95			0.1
Cs-134			0.08
Cs-137			0.08
Ba-La-140			0.1

NOTE: Page 47 is intentionally left out.

[a] Result of single analysis; not enough sample to duplicate.

Table 11. Fish
Collection: Semiannually
Units: pCi/g wet

Sample Description and Concentration						Required LLD
Location	Ludington Pumped Storage Plant (Control)					
Date Collected	07-28-92	07-28-92	07-28-92	07-28-92	07-28-92	
Sample Type	Shiners	Sucker	Alewives	Brown Trout	Perch	
Lab Code	PAF-1830	PAF-1831	PAF-1832	PAF-1833	PAF-1834	
Gross Beta	2.17±0.12	2.99±0.11	2.41±0.12	3.00±0.09	1.57±0.13	1.0
Sr-89	<0.006	<0.008	<0.002	<0.007	<0.007	0.025
Sr-90	0.007±0.002	<0.004	<0.001	<0.003	0.007±0.002	0.005
Mn-54	<0.012	<0.016	<0.017	<0.014	<0.020	0.13
Co-58	<0.023	<0.030	<0.027	<0.026	<0.030	0.13
Co-60	<0.011	<0.016	<0.016	<0.009	<0.020	0.13
Fe-59	<0.072	<0.094	<0.094	<0.11	<0.12	0.26
Zn-65	<0.039	<0.049	<0.045	<0.037	<0.049	0.26
Zr-Nb-95	<0.050	<0.053	<0.054	<0.041	<0.062	0.1
Cs-134	<0.012	<0.015	<0.018	<0.011	<0.015	0.13
Cs-137	<0.010	<0.014	<0.015	0.058±0.019	0.035±0.015	0.15
Ba-La-140	<0.012[a]	<0.013[a]	<0.013[a]	<0.011[a]	<0.016[a]	0.1
Location	Ludington Pumped Storage Plant (Control)					
Date Collected	07-28-92	11-06-92	11-06-92	11-06-92	11-06-92	
Sample Type	Perch	Rainbow Trout	Rainbow Trout	Sucker	Brown Trout	
Lab Code	PAF-1835,6	PAF-1958	PAF-1959	PAF-1960	PAF-1961,2	
Gross Beta	3.13±0.10	2.83±0.10	3.81±0.12	2.71±0.10	3.77±0.11	1.0
Sr-89	<0.008[b]	<0.006	<0.004	<0.005	<0.005[b]	0.025
Sr-90	0.008±0.003[b]	<0.002	<0.002	<0.002	<0.002[b]	0.005
Mn-54	<0.019	<0.009	<0.025	<0.007	<0.006	0.13
Co-58	<0.026	<0.011	<0.030	<0.010	<0.007	0.13
Co-60	<0.015	<0.010	<0.023	<0.008	<0.007	0.13
Fe-59	<0.10	<0.035	<0.080	<0.028	<0.022	0.26
Zn-65	<0.037	<0.023	<0.054	<0.020	<0.016	0.26
Zr-Nb-95	<0.049	<0.022	<0.060	<0.017	<0.014	0.1
Cs-134	<0.013	<0.008	<0.020	<0.007	<0.006	0.13
Cs-137	0.070±0.013	0.040±0.006	<0.021	0.014±0.005	0.075±0.016	0.15
Ba-La-140	<0.010[a]	<0.087	<0.1	<0.073	<0.052	0.1

[a] LLD at time of counting.

[b] Result of single analysis; not enough sample to duplicate.

Table 11. Fish (continued)

Sample Description and Concentration				Required LLD
Location		Palisades Discharge		
Date Collected	07-15-92	07-15-92	07-15-92	
Sample Type	Carp	Steelhead	Shad	
Lab Code	PAF-1799	PAF-1800	PAF-1801	
Gross Beta	2.05±0.07	1.82±0.08	2.08±0.10	1.0
Sr-89	<0.007	<0.008	<0.014	0.025
Sr-90	<0.003	<0.004	<0.005	0.005
Mn-54	<0.026	<0.020	<0.030	0.13
Co-58	<0.025	<0.030	<0.037	0.13
Co-60	<0.028	<0.028	<0.035	0.13
Fe-59	<0.087	<0.074	<0.095	0.26
Zn-65	<0.072	<0.064	<0.060	0.26
Zr-Nb-95	<0.050	<0.048	<0.032	[illegible]
Cs-134	<0.023	<0.020	<0.026	[illegible]
Cs-137	<0.031	0.052±0.018	<0.030	0.15
Ba-La-140	<0.067	<0.10	<0.049	0.1
Location		Palisades Discharge		
Date Collected	07-15-92	07-15-92	07-15-92	
Sample Type	Sucker	Freshwater Drum	Shiners	
Lab Code	PAF-1802	PAF-1803	PAF-1804	
Gross Beta	2.40±0.09	2.31±0.09	1.92±0.10	1.0
Sr-89	<0.012	<0.006	<0.020	0.025
Sr-90	<0.005	<0.002	0.007±0.005	0.005
Mn-54	<0.028	<0.022	<0.023	0.13
Co-58	<0.033	<0.026	<0.029	0.13
Co-60	<0.040	<0.028	<0.023	0.13
Fe-59	<0.083	<0.083	<0.062	0.26
Zn-65	<0.065	<0.056	<0.053	0.26
Zr-Nb-95	<0.060	<0.041	<0.047	0.1
Cs-134	<0.028	<0.021	<0.020	0.13
Cs-137	<0.027	<0.027	<0.020	0.15
Ba-La-140	<0.053	<0.10	<0.098	0.1

NOTE: Page 50 is intentionally left out.

Table 11. Fish (continued)

Sample Description and Concentration					Required LLD
Location		Palisades Discharge			
Date Collected	10-28-92	10-28-92	10-28-92	10-28-92	
Sample Type	Lake Trout	White Sucker	Steelhead	Coho Salmon	
Lab Code	PAF-1947	PAF-1948	PAF-1949	PAF-1950	
Gross Beta	2.86±0.10	2.52±0.09	2.90±0.13	2.79±0.09	1.0
Sr-89	<0.012	<0.003	<0.004	<0.004	0.025
Sr-90	0.007±0.004	<0.004	<0.003	<0.002	0.005
Mn-54	<0.009	<0.010	<0.008	<0.007	0.13
Co-58	<0.011	<0.012	<0.010	<0.009	0.13
Co-60	<0.010	<0.010	<0.008	<0.007	0.13
Fe-59	<0.028	<0.029	<0.026	<0.022	0.26
Zn-65	<0.026	<0.028	<0.021	<0.020	0.26
Zr-Nb-95	<0.021	<0.020	<0.018	<0.016	0.1
Cs-134	<0.009	<0.008	<0.008	<0.008	0.13
Cs-137	0.082±0.009	<0.009	0.050±0.006	0.057±0.006	0.15
Ba-La-140	<0.029	<0.031	<0.027	<0.020	0.1

Date Collected	10-28-92	
Sample Type	Walleye	
Lab Code	PAF-1951	
Gross Beta	0.93±0.06	1.0
Sr-89	<0.006	0.025
Sr-90	0.004±0.002	0.005
Mn-54	<0.016	0.13
Co-58	<0.019	0.13
Co-60	<0.017	0.13
Fe-59	<0.043	0.26
Zn-65	<0.043	0.26
Zr-Nb-95	<0.033	0.1
Cs-134	<0.018	0.13
Cs-137	<0.016	0.15
Ba-La-140	<0.048	0.1

Table 12. Algae
Collection: Semiannually
Units : pCi/g wet

Sample Description and Concentration			Required LLD
Location	Ludington (Control)		
Date Collected	07-28-92	11-05-92	
Lab Code	PASL-338	PASL-363	
Gross Beta	3.88±0.44	1.30±0.13	1.0
Sr-89	<0.018	<0.008	0.025
Sr-90	<0.005	0.0087±0.0024	0.005
Mn-54	<0.021	<0.031	0.13
Co-58	<0.022	<0.039	0.13
Co-60	<0.020	<0.034	0.13
Fe-59	<0.055	<0.093	0.26
Zn-65	<0.050	<0.071	0.26
Zr-Nb-95	<0.041	<0.056	0.1
Cs-134	<0.018	<0.028	0.13
Cs-137	<0.018	<0.029	0.15
Ba-La-140	<0.058	<0.032[a]	0.1
Location	Palisades Discharge		
Date Collected			
Lab Code			
Gross Beta			1.0
Sr-89			0.025
Sr-90			0.005
Mn-54			0.13
Co-58			0.13
Co-60			0.13
Fe-59			0.26
Zn-65			0.26
Zr-Nb-95			0.1
Cs-134			0.13
Cs-137			0.15
Ba-La-140			0.1

[a] LLD at time of counting.

Table 13. Bottom Sediments
Collection: Semiannually
Units: pCi/g dry

	Sample Description and Concentration			Required LLD
Location	Ludington (Control)			
Date Collected	07-28-92	11-06-92	11-06-92	
Lab Code	PABS-1167	PABS-1245	PABS-1246	
Gross Beta	4.64±2.71	12.06±1.38	11.84±1.46	1.0
Sr-89	<0.008	<0.011	<0.010	0.025
Sr-90	<0.004	<0.004	<0.005	0.005
Mn-54	<0.007	<0.014	<0.011	0.08
Co-58	<0.010	<0.018	<0.016	0.08
Co-60	<0.009	<0.018	<0.014	0.05
Fe-59	<0.029	<0.054	<0.045	0.1
Zn-65	<0.017	<0.033	<0.028	0.1
Zr-Nb-95	<0.017	<0.033	<0.030	0.1
Cs-134	<0.005	<0.011	<0.009	0.15
Cs-137	0.12±0.008	0.025±0.012	0.029±0.009	0.18
Ba-La-140	<0.045	<0.099	<0.083	0.1
Location	South Haven			
Date Collected	07-15-92	10-28-92		
Lab Code	PABS-1153	PABS-1226		
Gross Beta	7.78±1.43	8.49±1.77		1.0
Sr-89	<0.012	<0.012		0.025
Sr-90	<0.004	<0.004		0.005
Mn-54	<0.006	<0.007		0.08
Co-58	<0.009	<0.008		0.08
Co-60	<0.008	<0.010		0.05
Fe-59	<0.032	<0.024		0.1
Zn-65	<0.018	<0.020		0.1
Zr-Nb-95	<0.018	<0.015		0.1
Cs-134	<0.005	<0.007		0.15
Cs-137	0.019±0.005	<0.006		0.18
Ba-La-140	<0.093	<0.051		0.1

Table 13. Bottom Sediments (continued)

	Sample Description and Concentration		Required LLD
Location	South Property (0.8 mi.)		
Date Collected	07-15-92	10-28-92	
Lab Code	PABS-1155	PABS-1228	
Gross Beta	3.8±1.6	5.12±1.72	1.0
Sr-89	<0.009	<0.009	0.025
Sr-90	<0.004	<0.004	0.005
Mn-54	<0.016	<0.006	0.08
Co-58	<0.020	<0.007	0.08
Co-60	<0.018	<0.007	0.05
Fe-59	<0.056	<0.016	0.1
Zn-65	<0.032	<0.013	0.1
Zr-Nb-95	<0.036	<0.013	0.1
Cs-134	<0.012	<0.004	0.15
Cs-137	0.026±0.013	0.019±0.006	0.18
Ba-La-140	<0.10	<0.021	0.1
Location	North Property (0.8 mi.)		
Date Collected	07-15-92	10-28-92	
Lab Code	PABS-1154	PABS-1227	
Gross Beta	5.57±1.31	6.21±1.29	1.0
Sr-89	<0.013	<0.012	0.025
Sr-90	<0.004	<0.005	0.005
Mn-54	<0.004	<0.008	0.08
Co-58	<0.006	<0.010	0.08
Co-60	<0.005	<0.010	0.05
Fe-59	<0.021	<0.026	0.1
Zn-65	<0.010	<0.020	0.1
Zr-Nb-95	<0.011	<0.016	0.1
Cs-134	<0.003	<0.006	0.15
Cs-137	0.012±0.005	0.020±0.007	0.18
Ba-La-140	<0.081	<0.026	0.1

Table 13. Bottom Sediments (continued)

	Sample Descrtiption and Concentration		Required LLD
Location	Palisades Discharge		
Date Collected	07-15-92	10-28-92	
Lab Code	PABS-1156,7	PABS-1229	
Gross Beta	5.08±0.84	6.96±0.87	1.0
Sr-89	<0.013	<0.014	0.025
Sr-90	<0.004	<0.005	0.005
Mn-54	<0.004	<0.005	0.08
Co-58	<0.007	<0.006	0.08
Co-60	<0.005	<0.007	0.05
Fe-59	<0.022	<0.015	0.1
Zn-65	<0.013	<0.015	0.1
Zr-Nb-95	<0.013	<0.011	0.1
Cs-134	<0.005	<0.007	0.15
Cs-137	0.014±0.003	0.017±0.003	0.18
Ba-La-140	<0.087	<0.036	0.1
Location			
Date Collected			
Sample Type			
Lab Code			
Gross Beta			1.0
Sr-89			0.025
Sr-90			0.005
Mn-54			0.08
Co-58			0.08
Co-60			0.05
Fe-59			0.1
Zn-65			0.1
Zr-Nb-95			0.1
Cs-134			0.15
Cs-137			0.18
Ba-La-140			0.1

Table 14.1. Liquid Radwaste
Collection: Monthly Composite
Units: μCi/ml, except Pu-239 (pCi/L)

Sample Description and Concentration			
Collection Period	January	February	March
Lab Code	NS[a]	NS	PARW-444
Gross alpha	–	–	<1.1 E-09
Sr-89	–	–	6.8±2.4 E-09
Sr-90	–	–	2.8±0.8 E-09
H-3	–	–	4.0 E-02
Pu-239	–	–	<0.2
Cr-51	–	–	<6.4 E-08
Mn-54	–	–	3.6±0.1 E-07
Fe-59	–	–	<1.6 E-08
Co-58	–	–	1.3±0.1 E-07
Co-60	–	–	4.6±0.1 E-07
Zn-65	–	–	<1.5 E-08
Zr-95	–	–	<1.3 E-08
Nb-95	–	–	<8.3 E-09
Ag-110m	–	–	4.3±0.6 E-08
Sb-124	–	–	<7.3 E-09
Cs-134	–	–	1.1±0.6 E-08
Cs-137	–	–	3.2±0.1 E-07
Ba-140	–	–	<3.8 E-08
La-140	–	–	<5.8 E-09
Ce-141	–	–	<1.3 E-08
Ce-144	–	–	<4.6 E-08

[a] NS = no sample; sample not collected.

Table 14.1.. Liquid Radwaste (continued)

Sample Description and Concentration			
Collection Period	April	May	June
Lab Code	PARW-446	NS[a]	PARW-461
Gross alpha	<0.6 E-09	–	<1.1 E-09
Sr-89	<3.1 E-09	–	<1.3 E-09
Sr-90	3.4±1.3 E-09	–	9.3±1.7 E-09
H-3	2.0±0.1 E-05	–	1.1±0.1 E-01
Pu-239	<0.1	–	<0.1
Cr-51	<6.3 E-08	–	<1.7 E-07
Mn-54	2.4±0.1 E-07	–	6.8±0.2 E-07
Fe-59	<1.5 E-08	–	<3.6 E-08
Co-58	<7.3 E-09	–	1.5±0.1 E-06
Co-60	2.2±0.1 E-07	–	1.2±0.1 E-06
Zn-65	<1.1 E-08	–	<2.5 E-08
Zr-95	<1.1 E-08	–	<2.4 E-08
Nb-95	<7.8 E-09	–	<1.7 E-08
Ag-110m	<5.4 E-09	–	<3.2 E-08
Sb-124	<8.4 E-09	–	<1.7 E-08
Cs-134	<4.8 E-09	–	1.4±0.1 E-07
Cs-137	1.4±0.4 E-08	–	1.7±0.1 E-06
Ba-140	<4.6 E-08	–	<2.2 E-07
La-140	<7.6 E-09	–	<2.8 E-08
Ce-141	<1.3 E-08	–	<2.4 E-08
Ce-144	<4.1 E-08	–	<5.6 E-08

[a] NS = no sample; sample not collected.

Table 14.1 Liquid Radwaste (continued)

Sample Description and Concentration			
Collection Period	July	August	September
Lab Code	NS[a]	NS[a]	NS[a]
Gross alpha	-	-	–
Sr-89	-	-	–
Sr-90	-	-	–
H-3	-	-	–
	-	-	–
Pu-239	-	-	–
Cr-51	-	-	–
Mn-54	-	-	–
Fe-59	-	-	–
Co-58	-	-	–
Co-60	-	-	–
Zn-65	-	-	–
Zr-95	-	-	–
Nb-95	-	-	–
Ag-110m	-	-	–
Sb-124	-	-	–
Cs-134	-	-	–
Cs-137	-	-	–
Ba-140	-	-	–
La-140	-	-	–
Ce-141	-	-	–
Ce-144	-	-	–

a NS= no sample; sample not collected.

Table 14.1 Liquid Radwaste (continued)

Sample Description and Concentration			
Collection Period	October	November	December
Lab Code	NS[a]	NS[a]	PARW-485
Gross alpha	-	-	<1.3 E-09
Sr-89	-	-	<1.7 E-09
Sr-90	-	-	1.3±0.2 E-09
H-3	-	-	1.5±0.1 E-01
Pu-239	-	-	<0.3
Cr-51	-	-	<8.4 E-08
Mn-54	-	-	3.2±1.0 E-08
Fe-59	-	-	<2.2 E-08
Co-58	-	-	6.5±0.2 E-07
Co-60	-	-	8.8±2.3 E-07
Zn-65	-	-	<2.2 E-08
Zr-95	-	-	<1.6 E-08
Nb-95	-	-	<1.0 E-08
Ag-110m	-	-	1.6±0.9 E-08
Sb-124	-	-	<1.3 E-08
Cs-134	-	-	1.5±0.1 E-07
Cs-137	-	-	2.0±0.3 E-06
Ba-140	-	-	<5.9 E-08
La-140	-	-	<1.0 E-08
Ce-141	-	-	<1.2 E-08
Ce-144	-	-	<4.4 E-08

a NS= no sample; sample not collected.

Table 14.2 Stack Filters
Collection: Monthly Composite
Units: pCi/composite

1992 Collection Period	Lab Code	Gross Alpha	Sr-89	Sr-90	Pu-239
January	PASP-436	10.7±1.1	3.2±2.4	<1.8	<0.5
February	439	2.3±0.6	<2.7	4.6±1.5	<0.2
March	445	7.9±1.2	<5.7	<3.8	<0.9
April	447	3.8±0.6	<4.5	7.0±2.1	<0.2
May	455	4.2±1.0	<6.0	<4.0	<0.1
June	460	1.9±0.5	<3.6	<3.6	<0.3
July	464	2.8±0.6	<4.0	5.6±1.8	<0.1
August	465	1.7±0.5	<2.9	<2.3	<0.1
September	470	2.5±0.6	9.3±5.5	<2.4	<0.3
October	477	2.2±0.5	3.4±2.9	<1.9	<0.3
November	479	1.5±0.5	18.0±4.9	5.9±1.8	<0.2
December	484	2.4±0.5	<2.2	<1.9	<0.2

Table 14.3. Special Samples - NRC Split Samples
Units: Strontium - pCi/L
Fe-55 - pCi/mL
Tritium -pCi/mL

Sample Description	Collection Date	Lab Code	Sr-89	Sr-90
T-91				

Table 14.4. Special Samples - Reactor Water
Units: uCi/mL

Description	Collection Date	Lab Code	Sr-89	Sr-90
E-Bar PCS	05-28-92	456	<1.0 E-06	<7.0 E-07
	11-30-92	480	8.7±1.8 E-06	3.6±0.7 E-07

Table 14.5. Special Samples - Steam Generator Blowdown
Units: pCi/L

Sample Description	Collection Date	Lab Code	Gross Alpha	Sr-89	Sr-90
Hot Well					
A S/G + B S/G					
Hot Well					
A S/G + B S/G					

APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: TIML participates in intercomparison studies administered by U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. The results are reported in Appendix A. Also reported are results of in-house spikes and blanks. Appendix A is updated twice a year; the complete Appendix is included in January and July monthly reports only. Please refer to January and July reports for information.

January, 1993

Appendix A

Interlaboratory Comparison Program Results

Teledyne Isotopes Midwest Laboratory (formerly Hazleton Environmental Sciences) has participated in interlaboratory comparison (crosscheck) programs since the formulation of its 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 the laboratory's analytical procedures and to alert it to 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, air filters, and food samples during the period January 1988 through December 1992. This program has been conducted by the U.S. Environmental Protection Agency Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada.

The results in Table A-2 were obtained for thermoluminescent dosimeters (TLDs) during the period 1976, 1977, 1979, 1980, 1984, and 1985-86 through participation in the Second, Third, Fourth, Fifth, Seventh, and Eighth International Intercomparison of Environmental Dosimeters under the sponsorships listed in Table A-2. Also Teledyne testing results are listed.

Table A-3 lists results of the analyses on in-house spiked samples.

Table A-4 lists results of the analyses on in-house "blank" samples.

Attachment B lists acceptance criteria for "spiked" samples.

Addendum to Appendix A provides explanation for out-of-limit results.

Table A-1. U.S. Environmental Protection Agency's crosscheck program, comparison of EPA and Teledyne Isotopes Midwest Laboratory results for milk, water, air filters, and food samples, 1988 through 1992.[a]

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-521	Water	Jan 1988	Sr-89	27.3±5.0	30.0±5.0	21.3-38.7
			Sr-90	15.3±1.2	15.0±1.5	12.4-17.6
STW-523	Water	Jan 1988	Gr. alpha	2.3±1.2	4.0±5.0	0.0-12.7
			Gr. beta	7.7±1.2	8.0±5.0	0.0-16.7
STF-524	Food	Jan 1988	Sr-89	44.0±4.0	46.0±5.0	37.3-54.7
			Sr-90	53.0±2.0	55.0±2.8	50.2-59.8
			I-131	102.3±4.2	102.0±10.2	84.3-119.7
			Cs-137	95.7±6.4	91.0±5.0	82.3-99.7
			K	1011±158	1230±62	1124-1336
STW-525	Water	Feb 1988	Co-60	69.3±2.3	69.0±5.0	60.3-77.7
			Zn-65	99.0±3.4	94.0±9.4	77.7-110.3
			Ru-106	92.7±14.4	105.0±10.5	86.8-123.2
			Cs-134	61.7±8.0	64.0±5.0	55.3-72.7
			Cs-137	99.7±3.0	94.0±5.0	85.3-102.7
STW-526	Water	Feb 1988	H-3	3453±103	3327±362	2700-3954
STW-527	Water	Feb 1988	Uranium	3.0±0.0	3.0±6.0	0.0-13.4
STM-528	Milk	Feb 1988	I-131	4.7±1.2	4.0±0.4	3.3-4.7
STW-529	Water	Mar 1988	Ra-226	7.1±0.6	7.6±1.1	5.6-9.6
			Ra-228	NA[e]	7.7±1.2	5.7-9.7
STW-530	Water	Mar 1988	Gr. alpha	4.3±1.2	6.0±5.0	0.0-14.7
			Gr. beta	13.3±1.3	13.0±5.0	4.3-21.7
STAF-531	Air Filter	Mar 1988	Gr. alpha	21.0±2.0	20.0±5.0	11.3-28.7
			Gr. beta	48.0±0.0	50.0±5.0	41.3-58.7
			Sr-90	16.7±1.2	17.0±1.5	14.4-19.6
			Cs-137	18.7±1.3	16.0±5.0	7.3-24.7
STW-532	Water	Apr 1988	I-131	9.0±2.0	7.5±0.8	6.2-8.8

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-533 534	Water (Blind)	Apr 1988				
	Sample A		Gr. alpha	ND[f]	46.0±11.0	27.0-65.0
			Ra-226	ND	6.4±1.0	4.7-8.1
			Ra-228	ND	5.6±0.8	4.2-7.0
			Uranium	6.0±6.0	6.0±6.0	0.0-16.4
	Sample B		Gr. beta	ND	57.0±5.0	48.3-65.7
			Sr-89	3.3±1.2	5.0±5.0	0.0-13.7
			Sr-90	5.3±1.2	5.0±1.5	2.4-7.6
			Co-60	63.3±1.3	50.0±5.0	41.3-58.7
			Cs-134	7.7±1.2	7.0±5.0	0.0-15.7
			Cs-137	8.3±1.2	7.0±5.0	0.0-15.7
STU-535	Urine	Apr 1988	H-3	6483±155	6202±620	5128-7276
STW-536	Water	Apr 1988	Sr-89	14.7±1.3	20.0±5.0	11.3-28.7
			Sr-90	20.0+2.0	20.0±1.5	17.4-22.6
STW-538	Water	Jun 1988	Cr-51	331.7±13.0	302.0±30.0	250.0-354.0
			Co-60	16.0±2.0	15.0±5.0	6.3-23.7
			Zn-65	107.7±11.4	101.0±10.0	83.7-118.3
			Ru-106	191.3±11.0	195.0±20.0	60.4-229.6
			Cs-134	18.3±4.6	20.0±5.0	11.3-28.7
			Cs-137	26.3±1.2	25.0±5.0	16.3-33.7
STW-539	Water	Jun 1988	H-3	5586±92	5565±557	4600-6530
STM-541	Milk	Jun 1988	Sr-89	33.7±11.4	40.0±5.0	31.3-48.7
			Sr-90	55.3±5.8	60.0±3.0	54.8-65.2
			I-131	103.7±3.1	94.0±9.0	78.4-109.6
			Cs-137	52.7±3.1	51.0±5.0	42.3-59.7
			K	1587±23	1600±80	1461-1739
STW-542	Water	Jul 1988	Gr. alpha	8.7±4.2	15.0±5.0	6.3-23.7
			Gr. beta	5.3±1.2	4.0±5.0	0.0-12.7
STF-543	Food	Jul 1988	Sr-89	ND[f]	33.0±5.0	24.3-41.7
			Sr-90	ND	34.0±2.0	30.5-37.5
			I-131	115.0±5.3	107.0±11.0	88.0-126.0
			Cs-137	52.7±6.4	49.0±5.0	40.3-57.7
			K	1190±66	1240±62	1133-1347

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-544	Water	Aug 1988	I-131	80.0±0.0	76.0±8.0	62.1-89.9
STW-545	Water	Aug 1988	Pu-239	11.0±0.2	10.2±1.0	8.5-11.9
STW-546	Water	Aug 1988	Uranium	6.0±0.0	6.0±6.0	0.0-16.4
STAF-547	Air Filter	Aug 1988	Gr. alpha	8.0±0.0	8.0±5.0	0.0-16.7
			Gr. beta	26.3±1.2	29.0±5.0	20.3-37.7
			Sr-90	8.0±2.0	8.0±1.5	5.4-10.6
			Cs-137	13.0±2.0	12.0±5.0	3.3-20.7
STW-548	Water	Sep 1988	Ra-226	9.3±0.5	8.4±2.6	6.2-10.6
			Ra-228	5.8±0.4	5.4±1.6	4.0-6.8
STW-549	Water	Sep 1988	Gr. alpha	7.0±2.0	8.0±5.0	0.0-16.7
			Gr. beta	11.3±1.2	10.0±5.0	1.3-18.7
STW-550	Water	Oct 1988	Cr-51	252.0±14.0	251.0±25.0	207.7-294.3
			Co-60	26.0±2.0	25.0±5.0	16.3-33.7
			Zn-65	158.3±10.2	151.0±15.0	125.0-177.0
			Ru-106	153.0±9.2	152.0±15.0	126.0-178.0
			Cs-134	28.7±5.0	25.0±5.0	16.3-33.7
			Cs-137	16.3±1.2	15.0±5.0	6.3-23.7
STW-551	Water	Oct 1988	H-3	2333±127	2316±350	1710-2927
STW-552 553	Water (Blind)	Oct 1988				
	Sample A		Gr. alpha	38.3±8.0	41.0±10.0	23.7-58.3
			Ra-226	4.5±0.5	5.0±0.8	3.6-6.4
			Ra-228	4.4±0.6	5.2±0.8	3.6-6.4
			Uranium	4.7±1.2	5.0±6.0	0.0-15.4
	Sample B		Gr. beta	51.3±3.0	54.0±5.0	45.3-62.7
			Sr-89	3.7±1.2	11.0±5.0	2.3-19.7
			Sr-90	10.7±1.2	10.0±1.5	7.4-12.6
			Cs-134	15.3±2.3	15.0±5.0	6.3-23.7
			Cs-137	16.7±1.2	15.0±5.0	6.3-23.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STM-554	Milk	Oct 1988	Sr-89	40.3±7.0	40.0±5.0	31.3-48.7
			Sr-90	51.0±2.0	60.0±3.0	54.8-65.2
			I-131	94.0±3.4	91.0±9.0	75.4-106.6
			Cs-137	45.0±4.0	50.0±5.0	41.3-58.7
			K	1500±45	1600±80	1461-1739
STU-555	Urine	Nov 1988	H-3	3030±209	3025±359	2403-3647
STW-556	Water	Nov 1988	Gr. alpha	9.0±3.5	9.0±5.0	0.3-17.7
			Gr. beta	9.7±1.2	9.0±5.0	0.3-17.7
STW-557	Water	Dec 1988	I-131	108.7±3.0	115.0±12.0	94.2-135.8
STW-559	Water	Jan 1989	Sr-89	40.0±8.7	40.0±5.0	31.3-48.7
			Sr-90	24.3±3.1	25.0±1.5	22.4-27.6
STW-560	Water	Jan 1989	Pu-239	5.8±1.1	4.2±0.4	3.5-4.9
STW-561	Water	Jan 1989	Gr. alpha	7.3±1.2	8.0±5.0	0.0-16.7
			Gr. beta	5.3±1.2	4.0±5.0	0.0-12.7
STW-562	Water	Feb 1989	Cr-51	245±46	235±24	193.4-276.6
			Co-60	10.0±2.0	10.0±5.0	1.3-18.7
			Zn-65	170±10	159±16	139.2-186.7
			Ru-106	181±7.6	178±18	146.8-209.2
			Cs-134	9.7±3.0	10.0±5.0	1.3-18.7
			Cs-137	11.7±1.2	10.0±5.0	1.3-18.7
STW-563	Water	Feb 1989	I-131	109.0±4.0	06.0±11.0	86.9-125.1
STW-564	Water	Feb 1989	H-3	2820±20	2754±356	2137-3371
STW-565	Water	Mar 1989	Ra-226	4.2±0.3	4.9±0.7	3.7-6.1
			Ra-228	1.9±1.0	1.7±0.3	1.2-2.2
STW-566	Water	Mar 1989	U	5.0±0.0	5.0±6.0	0.0-15.4
STAF-567	Air Filter	Mar 1989	Gr. alpha	21.7±1.2	21.0±5.0	12.3-29,7
			Gr. beta	68.3±4.2	62.0±5.0	53.3-70.7
			Sr-90	20.0±2.0	20.0±1.5	17.4-22.6
			Cs-137	21.3±1.2	20.0±5.0	11.3-28.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-568 569	Water (Blind)	Apr 1989				
	Sample A		Gr. alpha	22.7±2.3	29.0±7.0	16.9-41.2
			Ra-226	3.6±0.6	3.5±0.5	2.6-4.4
			Ra-228	2.6±1.0	3.6±0.5	2.7-4.5
			U	3.0±0.0	3.0±6.0	0.0-13.4
	Sample B		Gr. beta	52.3±6.1	57.0±5.0	43.3-65.7
			Sr-89	9.3±5.4	8.0±5.0	0.0-16.7
			Sr-90	7.0±0.0	8.0±1.5	5.4-10.6
			Cs-134	21.0±5.2	20.0±5.0	11.3-28.7
			Cs-137	23.0±2.0	20.0±5.0	11.3-28.7
STM-570	Milk	Apr 1989	Sr-89	26.0±10.0	39.0±5.0	30.3-47.7
			Sr-90	45.7±4.2	55.0±3.0	49.8-60.2
			Cs-137	54.0±6.9	50.0±5.0	41.3-58.7
			K-40	1521±208	1600±80	1461-1739
STW-571[g]	Water	May 1989	Sr-89	<0.7	6.0±5.0	0.0-14.7
			Sr-90	5.0±1.0	6.0±1.5	3.4-8.6
STW-572	Water	May 1989	Gr. alpha	24.0±2.0	30.0±8.0	16.1-43.9
			Gr. beta	49.3±15.6	50.0±5.0	41.3-58.7
STW-573	Water	Jun 1989	Ba-133	50.7±1.2	49.0±5.0	40.3-57.7
			Co-60	31.3±2.3	31.0±5.0	22.3-39.7
			Zn-65	167±10	165±17	135.6-194.4
			Ru-106	123±9.2	128±13	105.5-150.5
			Cs-134	40.3±1.2	39±5	30.3-47.7
			Cs-137	22.3±1.2	20±5	11.3-28.7
STW-574	Water	Jun 1989	H-3	4513±136	4503±450	3724-5282
STW-575	Water	Jul 1989	Ra-226	16.8±3.1	17.7±2.7	13.0-22.4
			Ra-228	13.8±3.7	18.3±2.7	13.6-23.0
STW-576	Water	Jul 1989	U	40.3±1.2	41.0±6.0	30.6±51.4
STW-577	Water	Aug 1989	I-131	84.7±5.8	83.0±8.0	69.1-96.9
STAF-579	Air Filter	Aug 1989	Gr. alpha	6.0±0.0	6.0±5.0	0.0-14.7
			Cs-137	10.3±2.3	10.0±5.0	1.3-18.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-580	Water	Sep 1989	Sr-89	14.7±1.2	14.0±5.0	5.3-22.7
			Sr-90	9.7±1.2	10.0±1.5	7.4-12.6
STW-581	Water	Sep 1989	Gr. alpha	5.0±0.0	4.0±5.0	0.0-12.7
			Gr. beta	8.7±2.3	6.0±5.0	0.0-14.7
STW-583	Water	Oct 1989	Ba-133	60.3±10.0	59.0±6.0	48.6-69.4
			Co-60	29.0±4.0	30.0±5.0	21.1-38.7
			Zn-65	132.3±6.0	129.0±13.0	106.5-151.5
			Ru-106	155.3±6.1	161.0±16.0	133.3-188.7
			Cs-134	30.7±6.1	29.0±5.0	20.3-37.7
			Cs-137	66.3±4.6	59.0±5.0	50.3-67.7
STW-584	Water	Oct 1989	H-3	3407±150	3496±364	2866-126
STW-585 586	Water (Blind)	Oct 1989				
	Sample A		Gr. alpha	41.7±9.4	49.0±12.0	28.2-69.8
			Ra-226	7.9±0.4	8.4±1.3	6.2-10.6
			Ra-228	4.4±0.8	4.1±0.6	3.1-5.1
			U	12.0±0.0	12.0±6.0	1.6-22.4
	Sample B		Gr. beta	31.7±2.3	32.0±5.0	23.3-40.7
			Sr-89	13.3±4.2	15.0±5.0	6.3-23.7
			Sr-90	7.0±2.0	7.0±3.0	4.4-9.6
			Cs-134	5.0±0.0	5.0±5.0	0.0-13.7
			Cs-137	7.0±0.0	5.0±5.0	0.0-13.7
STW-587	Water	Nov 1989	Ra-226	7.9±0.4	8.7±1.3	6.4-11.0
			Ra-228	8.9±1.2	9.3±1.2	6.9-11.7
STW-588	Water	Nov 1989	U	15.0±0.0	15.0±6.0	4.6-25.4
STW-589	Water	Jan 1990	Sr-89	22.7±5.0	25.0±5.0	16.3-33.7
			Sr-90	17.3±1.2	20.0±1.5	17.4-22.6
STW-591	Water	Jan 1990	Gr. alpha	10.3±3.0	12.0±5.0	3.3-20.7
			Gr. beta	12.3±1.2	12.0±5.0	3.3-20.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-592	Water	Jan 1990	Co-60	14.7±2.3	15±5.0	6.3-23.7
			Zn-65	135.0±6.9	139.0±14.0	114.8-163.2
			Ru-106	133.3±13.4	139.0±14.0	114.8-163.2
			Cs-134	17.3±1.2	18.0±5.0	9.3-26.7
			Cs-137	19.3±1.2	18.0±5.0	9.3-26.7
			Ba-133	78.0±0.0	74.0±7.0	61.9-86.1
STW-593	Water	Feb 1990	H-3	4827±83	4976±498	4113-5839
STW-594	Water	Mar 1990	Ra-226	5.0±0.2	4.9±0.7	4.1-5.7
			Ra-228	13.5±0.7	12.7±1.9	9.4-16.0
STW-595	Water	Mar 1990	U	4.0±0.0	4.0±6.0	0.0-14.4
STAF-596	Air Filter	Mar 1990	Gr. alpha	7.3±1.2	5.0±5.0	0.0-13.7
			Gr. beta	34.0±0.0	31.0±5.0	22.3-39.7
			Sr-90	10.0±0.0	10.0±1.5	7.4-12.6
			Cs-137	9.3±1.2	10.0±5.0	1.3-18.7
STW-597 598	Water (Blind)	Apr 1990				
	Sample A		Gr. alpha	81.0±3.5	90.0±23.0	50.1-129.9
			Ra-226	4.9±0.4	5.0±0.8	3.6-6.4
			Ra-228	10.6±0.3	10.2±1.5	7.6-12.8
			U	18.7±3.0	20.0±6.0	9.6-30.4
	Sample B		Gr. beta	51.0±10.1	52.0±5.0	43.3-60.7
			Sr-89	9.3±1.2	10.0±5.0	1.3-18.7
			Sr-90	10.3±3.1	10.0±1.5	8.3-11.7
			Cs-134	16.0±0.0	15.0±5.0	6.3-23.7
			Cs-137	19.0±2.0	15.0±5.0	6.3-23.7
STM-599	Milk	Apr 1990	Sr-89	21.7±3.1	23.0±5.0	14.3-31.7
			Sr-90	21.0±7.0	23.0±5.0	14.3-31.7
			I-131	98.7±1.2	99.0±10.0	81.7-116.3
			Cs-137	26.0±6.0	24.0±5.0	15.3-32.7
			K	1300.0±69.2	1550.0±78.0	1414.7-1685.3
STW-600	Water	May 1990	Sr-89	6.0±2.0	7.0±5.0	0.0-15.7
			Sr-90	6.7±1.2	7.0±5.0	0.0-15.7
STW-601	Water	May 1990	Gr. alpha	11.0±2.0	22.0±6.0	11.6-32.4
			Gr. beta	12.3±1.2	15.0±5.0	6.3-23.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-602	Water	Jun 1990	Co-60	25.3±2.3	24.0±5.0	15.3-32.7
			Zn-65	155.0±10.6	148.0±15.0	130.6-165.4
			Ru-106	202.7±17.2	210.0±21.0	173.6-246.4
			Cs-134	23.7±1.2	24.0±5.0	18.2-29.8
			Cs-137	27.7±3.1	25.0±5.0	16.3-33.7
			Ba-133	100.7±8.1	99.0±10.0	81.7-116.3
STW-603	Water	Jun 1990	H-3	2927±306	2933±358	2312-3554
STW-604	Water	Jul 1990	Ra-226	11.8±0.9	12.1±1.8	9.0-15.2
			Ra-228	4.1±1.4	5.1±1.3	2.8-7.4
STW-605	Water	Jul 1990	U	20.3±1.7	20.8±3.0	15.6-26.0
STW-606	Water	Aug 1990	I-131	43.0±1.2	39.0±6.0	28.6-49.4
STW-607	Water	Aug 1990	Pu-239	10.0±1.7	9.1±0.9	7.5-10.7
STAF-608	Air Filter	Aug 1990	Gr. alpha	14.0±0.0	10.0±5.0	1.3-18.7
			Gr. beta	65.3±1.2	62.0±5.0	53.3-70.7
			Sr-90	19.0±6.9	20.0±5.0	11.3-28.7
			Cs-137	19.0±2.0	20.0±5.0	11.3-28.7
STW-609	Water	Sep 1990	Sr-89	9.0±2.0	10.0±5.0	1.3-18.7
			Sr-90	9.0±2.0	9.0±5.0	0.3-17.7
STW-610	Water	Sep 1990	Gr. alpha	8.3±1.2	10.0±5.0	1.3-18.7
			Gr. beta	10.3±1.2	10.0±5.0	1.3-18.7
STM-611	Milk	Sep 1990	Sr-89	11.7±3.1	16.0±5.0	7.3-24.7
			Sr-90	15.0±0.0	20.0±5.0	11.3-28.7
			I-131	63.0±6.0	58.0±6.0	47.6-68.4
			Cs-137	20.0±2.0	20.0±5.0	11.3-28.7
			K	1673.3±70.2	1700.0±85.0	1552.5-1847.5
STW-612	Water	Oct 1990	Co-60	20.3±3.1	20.0±5.0	11.3-28.7
			Zn-65	115.3±12.2	115.0±12.0	94.2-135.8
			Ru-106	152.0±8.0	151.0±15.0	125.0-177.0
			Cs-134	11.0±0.0	12.0±5.0	3.3-20.7
			Cs-137	14.0±2.0	12.0±5.0	3.3-20.7
			Ba-133	116.7±9.9	110.0±11.0	90.9-129
STW-613	Water	Oct 1990	H-3	7167±330	7203±720	5954-8452

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-614 615	Water	Oct 1990				
	Sample A		Gr. alpha	68.7±7.2	62.0±16.0	34.2-89.8
			Ra-226	12.9±0.3	13.6±2.0	10.1-17.1
			Ra-228	4.2±0.6	5.0±1.3	2.7-7.3
			U	10.4±0.6	10.2±3.0	5.0-15.4
	Sample B		Gr. beta	55.0±8.7	53.0±5.0	44.3-61.7
			Sr-89	15.7±2.9	20.0±5.0	11.3-28.7
			Sr-90	12.0±2.0	15.0±5.0	6.3-23.7
			Cs-134	9.0±1.7	7.0±5.0	0.0-15.7
			Cs-137	7.7±1.2	5.0±5.0	0.0-13.7
STW-616	Water	Nov 1990	Ra-226	6.8±1.0	7.4±1.1	5.5-9.3
			Ra-228	5.3±1.7	7.7±1.9	4.4-11.0
STW-617[g]	Water	Nov 1990	U	35.0±0.4	35.5±3.6	29.3-41.7
STW-618	Water	Jan 1991	Sr-89	4.3±1.2	5.0±5.0	0.0 -13.7
			Sr-90	4.7±1.2	5.0±5.0	0.0-13.7
STW-619	Water	Jan 1991	Pu-239	3.6±0.2	3.3±0.3	2.8-3.8
STW-620	Water	Jan 1991	Gr. alpha	6.7±3.0	5.0±5.0	0.0-13.7
			Gr. beta	6.3±1.2	5.0±5.0	0.0-13.7
STW-621	Water	Feb 1991	Co-60	41.3±8.4	40.0±5.0	31.3-48.7
			Zn-65	166.7±19.7	149.0±15.0	123.0-175.0
			Ru-106	209.7±18.6	186.0±19.0	153.0-219.0
			Cs-134	9.0±2.0	8.0±5.0	0.0-16.7
			Cs-137	9.7±1.2	8.0±5.0	0.0-16.7
			Ba-133	85.7±9.2	75.0±8.0	61.1-88.9
STW-622	Water	Feb 1991	I-131	81.3±6.1	75.0±8.0	61.1-88.9
STW-623	Water	Feb 1991	H-3	4310.0±144.2	4418.0±442.0	3651.2-5184.8
STW-624	Water	Mar 1991	Ra-226	31.4±3.2	31.8±4.8	23.5-40.1
			Ra-228	ND[h]	21.1±5.3	11.9-30.3
STW-625	Water	Mar 1991	U	6.7±0.4	7.6±3.0	2.4-12.8

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STAF-626	Air Filter	Mar 1991	Gr. alpha	38.7±1.2	25.0±6.0	14.6-35.4
			Gr. beta	130.0±4.0	124.0±6.0	113.6-134.4
			Sr-90	35.7±1.2	40.0±5.0	31.3-48.7
			Cs-137	33.7±4.2	40.0±5.0	31.3-48.7
STW-627 628	Water	Apr 1991				
	Sample A		Gr. alpha	51.0±6.0	54.0±14.0	29.7-78.3
			Ra-226	7.0±0.8	8.0±1.2	5.9-10.1
			Ra-228	9.7±1.9	15.2±3.8	8.6-21.8
			U	27.7±2.4	29.8±3.0	24.6-35.0
	Sample B		Gr. beta	93.3±6.4	115.0±17.0	85.5-144.5
			Sr-89	21.0±3.5	28.0±5.0	19.3-36.7
			Sr-90	23.0±0.0	26.0±5.0	17.3-34.7
			Cs-134	27.3±1.2	24.0±5.0	15.3-32.7
			Cs-137	29.0±2.0	25.0±5.0	16.3-33.7
STM-629	Milk	Apr 1991	Sr-89	24.0±8.7	32.0±5.0	23.3-40.7
			Sr-90	28.0±2.0	32.0±5.0	23.3-40.7
			I-131	65.3±14.7	60.0±6.0	49.6-70.4
			Cs-137	54.7±11.0	49.0±5.0	40.3-57.7
			K	1591.7±180.1	1650.0±83.0	1506.0-1794.0
STW-630	Water	May 1991	Sr-89	40.7±2.3	39.0±5.0	30.3-47.7
			Sr-90	23.7±1.2	24.0±5.0	15.3-32.7
STW-631	Water	May 1991	Gr. alpha	27.7±5.8	24.0±6.0	13.6-34.4
			Gr. beta	46.0±0.0	46.0±5.0	37.3-54.7
STW-632	Water	Jun 1991	Co-60	11.3±1.2	10.0±5.0	1.3-18.7
			Zn-65	119.3±16.3	108.0±11.0	88.9-127.1
			Ru-106	162.3±19.0	149.0±15.0	123.0-175.0
			Cs-134	15.3±1.2	15.0±5.0	6.3-23.7
			Cs-137	16.3±1.2	14.0±5.0	5.3-22.7
			Ba-133	74.0±6.9	62.0±6.0	51.6-72.4
STW-633	Water	Jun 1991	H-3	13470.0±385.8	12480.0±1248.0	10314.8-14645.2
STW-634	Water	Jul 1991	Ra-226	14.9±0.4	15.9±2.4	11.7-20.1
			Ra-228	17.6±1.8	16.7±4.2	9.4-24.0

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-635	Water	Jul 1991	U	12.8±0.1	14.2±3.0	9.0-19.4
STW-636	Water	Aug 1991	I-131	19.3±1.2	20.0±6.0	9.6-30.4
STW-637	Water	Aug 1991	Pu-239	21.4±0.5	19.4±1.9	16.1-22.7
STAF-638	Air Filter	Aug 1991	Gr. alpha	33.0±2.0	25.0±6.0	14.6-35.4
			Gr. beta	88.7±1.2	92.0±10.0	80.4-103.6
			Sr-90	27.0±4.0	30.0±5.0	21.3-38.7
			Cs-137	26.3±1.2	30.0±5.0	21.3-38.7
STW-639	Water	Sep 1991	Sr-89	47.0±10.4	49.0±5.0	40.3-57.7
			Sr-90	24.0±2.0	25.0±5.0	16.3-33.7
STW-640	Water	Sep 1991	Gr. alpha	12.0±4.0	10.0±5.0	1.3-18.7
			Gr. beta	20.3±1.2	20.0±5.0	11.3-28.7
STM-641	Milk	Sep 1991	Sr-89	20.3±5.0	25.0±5.0	16.3-33.7
			Sr-90	19.7±3.1	25.0±5.0	16.3-33.7
			I-131	130.7±16.8	108.0±11.0	88.9-127.1
			Cs-137	33.7±3.2	30.0±5.0	21.3-38.7
			K	1743.3±340.8	1740.0±87.0	1589.1-1890.9
STW-642	Water	Oct 1991	Co-60	29.7±1.2	29.0±5.0	20.3-37.7
			Zn-65	75.7±8.3	73.0±7.0	60.9-85.1
			Ru-106	196.3±15.1	199.0±20.0	164.3-233.7
			Cs-134	9.7±1.2	10.0±5.0	1.3-18.7
			Cs-137	11.0±2.0	10.0±5.0	1.3-18.7
			Ba-133	94.7±3.1	98.0±10.0	80.7-115.3
STW-643	Water	Oct 1991	H-3	2640.0±156.2	2454.0±352.0	1843.3-3064.7
STW-644	Water	Oct 1991				
645	Sample A		Gr. alpha	73.0±13.1	82.0±21.0	45.6-118.4
			Ra-226	20.9±2.0	22.0±3.3	16.3-27.7
			Ra-228	19.6±2.3	22.2±5.6	12.5-31.9
			U	13.5±0.6	13.5±3.0	8.3-18.7
	Sample B		Gr. beta	55.3±3.1	65.0±10.0	47.7-82.3
			Sr-89	9.7±3.1	10.0±5.0	1.3-18.7
			Sr-90	8.7±1.2	10.0±5.0	1.3-18.7
			Co-60	20.3±1.2	20.0±5.0	11.3-28.7
			Cs-134	9.0±5.3	10.0±5.0	1.3-18.7
			Cs-137	14.7±5.0	11.0±5.0	2.3-19.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-646	Water	Nov 1991	Ra-226	5.6±1.2	6.5±1.0	4.8-8.2
			Ra-228	9.6±0.5	8.1±2.0	4.6-11.6
STW-647	Water	Nov 1991	U	24.7±2.3	24.9±3.0	19.7-30.1
STW-648	Water	Jan 1992	Sr-89	42.7±6.4	51.0±5.0	42.3-59.7
			Sr-90	18.3±3.1	20.0±5.0	11.3-28.7
STW-649	Water	Jan 1992	Pu-239	16.1±0.8	16.8±1.7	13.9-19.7
STW-650	Water	Jan 1992	Gr. alpha	23.7±9.2	30.0±8.0	16.1-43.9
			Gr. beta	27.7±4.2	30.0±5.0	21.3-38.7
STW-651	Water	Feb 1992	I-131	60.3±4.2	59.0±6.0	48.6-69.4
STW-652	Water	Feb 1992	Co-60	40.3±5.0	40.0±5.0	31.3-48.7
			Zn-65	148.0±15.0	150.7±6.1	122.0-174.0
			Ru-106	188.7±28.8	203.0±20.0	168.3-237.7
			Cs-134	31.7±4.2	31.0±5.0	22.3-39.7
			Cs-137	51.0±3.4	49.0±5.0	40.3-57.7
			Ba-133	79.0±3.4	76.0±8.0	62.1-89.9
STW-653	Water	Feb 1992	H-3	7714.0±119.6	7904.0±790.0	6533.4-9274.6
STW-654	Water	Mar 1992	Ra-226	9.0±0.4	10.1±1.5	7.5-12.7
			Ra-228	18.8±0.6	15.5±3.9	8.7-22.3
STW-655	Water	Mar 1992	Ru-222[i]			
STW-656	Water	Mar 1992	U	25.1±1.9	25.3±3.0	20.1-30.5
STW-657	Water	Mar 1992	Ru-222[i]			
STAF-658	Air Filter	Mar 1992	Gr. alpha	7.0±0.0	7.0±5.0	0.0-15.7
			Gr. beta	39.3±1.6	41.0±5.0	32.3-49.7
			Sr-90	13.7±1.6	15.0±5.0	6.3-23.7
			Cs-137	10.0±0.0	10.0±5.0	1.3-18.7
STW-659	Water	Apr 1992				
660	Sample A		Gr. alpha	35.7±6.1	40.0±10.0	22.7-57.3
			Ra-226	12.7±1.2	14.9±2.2	11.1-18.7
			Ra-228	14.5±2.1	14.0±3.5	7.9-20.1
			U	3.9±0.2	4.0±3.0	0.0-9.2

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-659	Water	Apr 1992				
660	Sample B		Gr. beta	113.0±7.2	140.0±21.0	103.6-176.4
			Sr-89	12.3±4.2	15.0±5.0	6.3-23.7
			Sr-90	15.0±1.2	17.0±5.0	8.3-25.7
			Co-60	61.0±4.0	56.0±5.0	47.3-64.7
			Cs-134	24.3±1.2	24.0±5.0	15.3-32.7
			Cs-137	24.0±2.0	22.0±5.0	13.3-30.7
STM-661	Milk	Apr 1992	Sr-89	25.3±7.6	38.0±5.0	29.3-46.7
			Sr-90	24.3±3.1	29.0±5.0	20.3-37.7
			I-131	78.7±9.5	78.0±8.0	64.1-91.9
			Cs-137	39.3±2.3	39.0±5.0	30.3-47.7
			K	1610.0±72.1	1710.0±86.0	1560.8-1859.2
STW-662	Water	May 1992	Sr-89	24.0±4.0	29.0±5.0	20.3-37.7
			Sr-90	6.7±1.2	8.0±5.0	0.0-16.7
STM-663	Water	May 1992	Gr. alpha	12.3±2.1	15.0±5.0	6.3-23.7
			Gr. beta	46.0±5.0	44.0±5.0	35.3-52.7
STW-664	Water	Jun 1992	Co-60	20.3±1.2	20.0±5.0	11.3-28.7
			Zn-65	103.3±10.6	99.0±10.0	81.7-116.3
			Ru-106	142.7±23.7	141.0±14.0	116.7-165.3
			Cs-134	14.3±2.3	15.0±5.0	6.3-23.7
			Cs-137	15.0±2.0	15.0±5.0	6.3-23.7
			Ba-133	92.7±11.0	98.0±10.0	80.7-115.3
STW-665	Water	Jun 1992	H-3	2153.3±144.6	2125.0±347.0	1523.0-2727.0
STW-666	Water	July 1992	Ra-226	22.3±2.2	24.9±3.7	18.5-31.3
			Ra-228	16.7±3.1	16.7±4.2	9.4-24.0
STW-667	Water	July 1992	U	3.6±0.3	4.0±3.0	0.0-9.2
STW-668	Water	August 1992	I-131	47.0±3.5	45.0±6.0	34.6-55.4
STW-669	Water	August 1992	Pu-239	8.5±0.9	9.0±0.9	7.4-10.6
STAF-670	Air Filter	August 1992	Gr. alpha	25.7±1.2	30.0±8.0	16.1-43.9
			Gr. beta	69.0±2.0	69.0±10.0	51.7-86.3
			Sr-90	26.0±4.0	25.0±5.0	16.3-33.7
			Cs-137	16.0±0.0	18.0±5.0	9.3-26.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-671	Water	Sept. 1992	Sr-89	16.0±4.0	20.0±5.0	11.3-28.7
			Sr-90	14.3±3.1	15.0±5.0	6.3-23.7
STW-672	Water	Sept. 1992	Gr. alpha	43.0±13.1	45.0±11.0	25.9-64.1
			Gr. beta	41.3±18.6	50.0±5.0	41.3-58.7
STM-673	Milk	Sept. 1992	Sr-89	11.0±3.5	15.0±5.0	6.3-23.7
			Sr-90	12.7±1.2	15.0±5.0	6.3-23.7
			I-131	109.7±19.4	100.0±10.0	82.7-117.3
			Cs-137	14.0±3.5	15.0±5.0	6.3-23.7
			K	1540.0±103.9	1750.0±88.0	1597.3-1902.7
STW-674	Water	Oct. 1992	Co-60	11.3±2.3	10.0±5.0	1.3-18.7
			Zn-65	169.7±25.0	148.0±15.0	122.0-174.0
			Ru-106	170.1±2.3	175.0±18.0	143.8-206.2
			Cs-134	9.7±2.3	8.0±5.0	0.0-16.7
			Cs-137	9.7±1.2	8.0±5.0	0.0-16.7
			Ba-133	80.3±9.0	74.0±7.0	61.9-86.1
STW-675	Water	Oct. 1992	H-3	5896.7±136.2	5962.0±596.0	4928.0-6996.0
STW-676 -677	Water	Oct. 1992				
	Sample A		Gr. alpha	24.7±5.0	29.0±7.0	16.9-41.1
			Ra-226	7.1±0.4	7.4±1.1	5.5-9.3
			Ra-228	11.5±1.0	10.0±2.5	5.7-14.3
			U	9.7±0.5	10.2±3.0	5.0-15.4
	Sample B		Gr. beta	42.7±8.1	53.0±10.0	35.7-70.3
			Sr-89	6.7±1.2	8.0±5.0	0.0-16.7
			Sr-90	10.0±2.0	10.0±5.0	1.3-18.7
			Co-60	15.0±2.0	15.0±5.0	6.3-23.7
			Cs-134	5.7±1.2	5.0±5.0	0.0-13.7
			Cs-137	8.0±2.0	8.0±5.0	0.0-16.7

Table A-1. (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L[b] TIML Result ±2σ[c]	EPA Result[d] 1s, N=1	Control Limits
STW-678	Water	Nov. 1992	Ra-226	7.5±0.8	7.5±1.1	5.6-9.4
			Ra-228	5.8±0.7	5.0±1.3	2.7-7.3
STW-679	Water	Nov. 1992	U	15.5±1.1	15.2±3.0	10.0-20.4

[a] Results obtained by Teledyne Isotopes Midwest Laboratory as a participant in the environmental sample crosscheck program operated by the Intercomparison and Calibration Section, Quality Assurance Branch, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (EPA), Las Vegas, Nevada.

[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; and food, which is in mg/kg.

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

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

[e] NA = Not analyzed.

[f] ND = No data; not analyzed due to relocation of lab.

[g] Sample was analyzed but the results not submitted to EPA because deadline was missed (all data on file).

[h] ND = No data; sample lost during analyses.

[i] ND = No data; special EPA testing.

Table A-2. Crosscheck program results, thermoluminescent dosimeters (TLDs).

Lab Code	TLD Type	Measurement	mR: Teledyne Result ±2σ[a]	mR: Known Value	mR: Average ±2σ[d] (All Participants)
2nd International Intercomparison[b]					
115-2	CaF_2:Mn Bulb	Field	17.0±1.9	17.1	16.4±7.7
		Lab	20.8±4.1	21.3	18.8±7.6
3rd International Intercomparison[e]					
115-3	CaF_2:Mn Bulb	Field	30.7±3.2	34.9±4.8	31.5±3.0
		Lab	89.6±6.4	91.7±14.6	86.2±24.0
4th International Intercomparison[f]					
115-4	CaF_2:Mn Bulb	Field	14.1±1.1	14.1±1.4	16.0±9.0
		Lab (Low)	9.3±1.3	12.2±2.4	12.0±7.4
		Lab (High)	40.4±1.4	45.8±9.2	43.9±13.2
5th International Intercomparison[g]					
115-5A	CaF_2:Mn Bulb	Field	31.4±1.8	30.0±6.0	30.2±14.6
		Lab at beginning	77.4±5.8	75.2±7.6	75.8±40.4
		Lab at the end	96.6±5.8	88.4±8.8	90.7±31.2
115-5B	LiF-100 Chips	Field	30.3±4.8	30.0±6.0	30.2±14.6
		Field at beginning	81.1±7.4	75.2±7.6	75.8±40.4
		Lab at the end	85.4±11.7	88.4±8.8	90.7±31.2
7th International Comparison[h]					
115-7A	LiF-100 Chips	Field	75.4±2.6	75.8±6.0	75.1±29.8
		Lab (Co-60)	80.0±3.5	79.9±4.0	77.9±27.6
		Lab (Cs-137)	66.6±2.5	75.0±3.8	73.0±22.2

Table A-2. Crosscheck program results, thermoluminescent dosimeters (TLDs).

Lab Code	TLD Type	Measurement	mR		
			Teledyne Result ±2σ[a]	Known Value	Average ±2σ[d] (All Participants)
115-7B	CaF_2:Mn Bulbs	Field	71.5±2.6	75.8±6.0	75.1±29.8
		Lab (Co-60)	84.8±6.4	79.9±4.0	77.9±27.6
		Lab (Cs-137)	78.8±1.6	75.0±3.8	73.0±22.2
115-7C	$CaSO_4$:Dy Cards	Field	76.8±2.7	75.8±6.0	75.1±29.8
		Lab (Co-60)	82.5±3.7	79.9±4.0	77.9±27.6
		Lab (Cs-137)	79.0±3.2	75.0±3.8	73.0±22.2
8th International Intercomparison[i]					
115-8A	LiF-100 Chips	Field Site 1	29.5±1.4	29.7±1.5	28.9±12.4
		Field Site 2	11.3±0.8	10.4±0.5	10.1±9.06
		Lab (Cs-137)	13.7±0.9	17.2±0.9	16.2±6.8
115-8B	CaF_2:Mn Bulbs	Field Site 1	32.3±1.2	29,7±1.5	28.9±12.4
		Field Site 2	9.0±1.0	10.4±0.5	10.1±9.0
		Lab (Cs-137)	15.8±0.9	17.2±0.9	16.2±6.8
115-8C	$CaSO_4$:Dy Cards	Field Site 1	32.2±0.7	29.7±1.5	28.9±12.4
		Field Site 2	10.6±0.6	10.4±0.5	10.1±9.0
		Lab (Cs-137)	18.1±0.8	17.2±0.9	16.2±6.8
Teledyne Testing					
89-1	LiF-100 Chips	Lab	21.0±0.4	22.4	–
89-2	Teledyne $CaSO_4$:Dy Cards	Lab	20.9±1.0	20.3	–

Table A-2. (continued)

Lab Code	TLD Type	Measurement	mR: Teledyne Result ±2σ[a]	mR: Known Value	mR: Average ±2σ[d] (All Participants)
Teledyne Testing					
90-1[k]	Teledyne $CaSO_4$:Dy Cards	Lab	20.6±1.4	19.6	–
90-2[l]	Teledyne $CaSO_4$:Dy Cards	Lab	100.8±4.3	100.0	–
91-1[m]	Teledyne $CaSO_4$:Dy Cards	Lab	33.4±2.0	32.0	–
			55.2±4.7	58.8	–
			87.8±6.2	85.5	–
92-1[n]	LiF-100 Chips	Lab	11.1±0.2	10.7	–
			25.6±0.5	25.4	–
			46.4±0.5	46.3	–
92-2[o]	Teledyne $CaSO_4$:Dy Cards	Lab (Reader #1)	20.1±0.1	20.1	–
			40.6±0.1	40.0	–
			60.0±1.3	60.3	–
		Lab (Reader #2)	20.3±0.3	20.1	–
			39.2±0.3	40.0	–
			60.7±0.4	60.3	–

a Lab result given is the mean ±2 standard deviations of three determinations.

b Second International Intercomparison of Environmental Dosimeters conducted in April of 1976 by the Health and Safety Laboratory (HASL), New York, New York, and the School of Public Health of the University of Texas, Houston, Texas.

c Value determined by sponsor of the intercomparison using continuously operated pressurized ion chamber.

d Mean ±2 standard deviations of results obtained by all laboratories participating in the program.

e Third International Intercomparison of Environmental Dosimeters conducted in summer of 1977 by Oak Ridge National Laboratory and the School of Public Health of the University of Texas, Houston, Texas.

f Fourth International Intercomparison of Environmental Dosimeters conducted in summer of 1979 by the School of Public Health of the University of Texas Houston, Texas.

g Fifth International Intercomparison of Environmental Dosimeters conducted in fall of 1980 at Idaho Falls, Idaho and sponsored by the School of Public Health of the University of Texas, Houston, Texas and Environmental Measurements Laboratory, New York, New York, U.S. Department of Energy.

Table A-2. (continued)

Lab Code	TLD Type	Measurement	Teledyne Result ±2σ[a] (mR)	Known Value (mR)	Average ±2σ[d] (All Participants) (mR)

Footnotes (continued)

h Seventh International Intercomparison of Environmental Dosimeters conducted in the spring and summer of 1984 at Las Vegas, Nevada, and sponsored by the U.S. Department of Energy, The U.S. Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency.

i Eighth International Intercomparison of Environmental Dosimeters conducted in the fall and winter of 1985-1986 at New York, New York, and sponsored by the U.S. Department of Energy.

j Chips were submitted in September 1989 and cards were submitted in November 1989 to Teledyne Isotopes, Inc., Westwood, NJ for irradiation.

k Cards were irradiated by Teledyne Isotopes, Inc., Westwood, NJ on June 19, 1990.

l Cards were irradiated by Dosimetry Associates, Inc., Northville, MI on October 30, 1990.

m Irradiated cards were provided by Teledyne Isotopes, INC., Westwood, NJ. Irradiated on October 8, 1991.

n Chips were irradiated by Teledyne Isotopes, Inc., Westwood, NJ on February 26, 1992.

o Cards were irradiated by Teledyne Isotopes, Inc., Westwood, NJ on April 1, 1992.

Table A-3. In-house spiked samples.

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=3[a]	Known Activity	Expected Precision 1s, n=3[a]
QC-MI-16	Milk	Feb 1988	Sr-89	31.8±4.7	31.7±6.0	8.7
			Sr-90	25.5±2.7	27.8±3.5	5.2
			I-131	26.4±0.5	23.2±5.0	10.4
			Cs-134	23.8±2.3	24.2±6.0	8.7
			Cs-137	26.5±0.8	25.1±6.0	8.7
QC-MI-17	Milk	Feb 1988	I-131	10.6±1.2	14.3±1.6	10.4
QC-W-35	Water	Feb 1988	I-131	9.7±1.1	11.6±1.1	10.4
QC-W-36	Water	Mar 1988	I-131	10.5±1.3	11.6±1.0	10.4
QC-W-37	Water	Mar 1988	Sr-89	17.1±2.0	19.8±8.0	8.7
			Sr-90	18.7±0.9	17.3±5.0	5.2
QC-MI-18	Milk	Mar 1988	I-131	33.2±2.3	26.7±5.0	10.4
			Cs-134	31.3±2.1	30.2±5.0	8.7
			Cs-137	29.9±1.4	26.2±5.0	8.7
QC-W-38	Water	Apr 1988	I-131	17.1±1.1	14.2±5.0	10.4
QC-W-39	Water	Apr 1988	H-3	4439±31	4176±500	724
QC-W-40	Water	Apr 1988	Co-60	23.7±0.5	26.1±4.0	8.7
			Cs-134	25.4±2.6	29.2±4.5	8.7
			Cs-137	26.6±2.3	26.2±4.0	8.7
QC-W-41	Water	Jun 1988	Gr. alpha	12.3±0.4	13.1±5.0	8.7
			Gr. beta	22.6±1.0	20.1±5.0	8.7
QC-MI-19	Milk	Jul 1988	Sr-89	15.1±1.6	16.4±5.0	8.7
			Sr-90	18.0±0.6	18.3±5.0	5.2
			I-131	88.4±4.9	86.6±8.0	10.4
			Cs-137	22.7±0.8	20.8±6.0	8.7
QC-W-42	Water	Sep 1988	Sr-89	48.5±3.3	50.8±8.0	8.7
			Sr-90	10.9±1.0	11.4±3.5	5.2
QC-W-43	Water	Oct 1988	Co-60	20.9±3.2	21.4±3.5	8.7
			Cs-134	38.7±1.6	38.0±6.0	8.7
			Cs-137	19.0±2.4	21.0±3.5	8.7
QC-W-44	Water	Oct 1988	I-131	22.2±0.6	23.3±3.5	10.4

Table A-3. In-house spiked samples(continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=3[a]	Known Activity	Expected Precision 1s, n=3[a]
QC-W-45	Water	Oct 1988	H-3	4109±43	4153±500	724
QC-MI-20	Milk	Oct 1988	I-131	59.8±0.9	60.6±9.0	10.4
			Cs-134	49.6±1.8	48.6±7.5	8.7
			Cs-137	25.8±4.6	24.7±4.0	8.7
QC-W-46	Water	Dec 1988	Gr. alpha	11.5±2.3	15.2±5.0	8.7
			Gr. beta	26.5±2.0	25.7±5.0	8.7
QC-MI-21	Milk	Jan 1989	Sr-89	25.5±10.3	34.0±10.0	8.7
			Sr-90	28.3±3.2	27.1±3.0	5.2
			I-131	540±13	550±20	10.4
			Cs-134	24.5±2.6	22.6±5.5	8.7
			Cs-137	24.0±0.6	20.5±5.0	8.7
QC-W-47	Water	Mar 1989	Sr-89	15.2±3.8	16.1±5.0	8.7
			Sr-90	16.4±1.7	16.9±3.0	5.2
QC-MI-22	Milk	Apr 1989	I-131	36.3±1.1	37.2±5.0	10.4
			Cs-134	20.8±2.8	20.7±8.0	8.7
			Cs-137	22.2±2.4	20.4±8.0	8.7
QC-W-48	Water	Apr 1989	Co-60	23.5±2.0	25.1±8.0	8.7
			Cs-134	24.2±1.1	25.9±8.0	8.7
			Cs-137	23.6±1.2	23.0±8.0	8.7
QC-W-49	Water	Apr 1989	I-131	37.2±3.7	37.2±5.0	10.4
QC-W-50	Water	Apr 1989	H-3	3011±59	3089±500	724
QC-W-51	Water	Jun 1989	Gr. alpha	13.0±1.8	15.0±5.0	8.7
			Gr. beta	26.0±1.2	25.5±8.0	8.7
QC-MI-23	Milk	Jul 1989	Sr-89	19.4±6.5	22.0±10.0	8.7
			Sr-90	27.6±3.5	28.6±3.0	5.2
			I-131	46.8±3.2	43.4±5.0	10.4
			Cs-134	27.4±1.8	28.3±6.0	8.7
			Cs-137	24.1±1.8	20.8±6.0	8.7
QC-MI-24	Milk	Aug 1989	Sr-89	25.4±2.7	27.2±10.0	8.7
			Sr-90	46.0±1.1	47.8±9.6	5.2
QC-W-52	Water	Sep 1989	I-131	9.6±0.3	9.7±1.9	10.4

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=3[a]	Known Activity	Expected Precision 1s, n=3[a]
QC-W-53	Water	Sep 1989	I-131	19.0±0.2	20.9±4.2	10.4
QC-W-54	Water	Sep 1989	Sr-89	25.8±4.6	24.7±4.0	8.7
			Sr-90	26.5±5.3	29.7±5.0	5.2
QC-MI-25	Milk	Oct 1989	I-131	70.0±3.3	73.5±20.0	10.4
			Cs-134	22.1±2.6	22.6±8.0	8.7
			Cs-137	29.4±1.5	27.5±8.0	8.7
QC-W-55	Water	Oct 1989	I-131	33.3±1.3	35.3±10.0	10.4
QC-W-56	Water	Oct 1989	Co-60	15.2±0.9	17.4±5.0	8.7
			Cs-134	22.1±4.4	18.9±8.0	8.7
			Cs-137	27.2±1.2	22.9±8.0	8.7
QC-W-57	Water	Oct 1989	H-3	3334±22	3379±500	724
QC-W-58	Water	Nov 1989	Sr-89	10.9±1.4[d]	11.1±1.0[d]	8.7
			Sr-90	10.4±1.0[d]	10.3±1.0[d]	5.2
QC-W-59	Water	Nov 1989	Sr-89	101.0±6.0[d]	104.1±10.5[d]	18.0
			Sr-90	98.0±3.0[d]	95.0±10.0[d]	16.4
QC-W-60	Water	Dec 1989	Gr. alpha	10.8±1.1	10.6±4.0	8.7
			Gr. beta	11.6±0.5	11.4±4.0	8.7
QC-MI-26	Milk	Jan 1990	Cs-134	19.3±1.0	20.8±8.0	8.7
			Cs-137	25.2±1.2	22.8±8.0	8.7
QC-MI-27	Milk	Feb 1990	Sr-90	18.0±1.6	18.8±5.0	5.2
QC-MI-28	Milk	Mar 1990	I-131	63.8±2.2	62.6±6.0	10.8
QC-MI-61	Water	Apr 1990	Sr-89	17.9±5.5	23.1±8.7	8.7
			Sr-90	19.4±2.5	23.5±5.2	5.2
QC-MI-29	Milk	Apr 1990	I-131	90.7±9.2	82.5±8.5	10.4
			Cs-134	18.3±1.0	19.7±5.0	8.7
			Cs-137	20.3±1.0	18.2±5.0	8.7
QC-W-62	Water	Apr 1990	Co-60	8.7±0.4	9.4±5.0	8.7
			Cs-134	20.0±0.2	19.7±5.0	8.7
			Cs-137	28.7±1.4	22.7±5.0	8.7

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=3[a]	Known Activity	Expected Precision 1s, n=3[a]
QC-W-63	Water	Apr 1990	I-131	63.5±8.0	66.0±6.7	11.4
QC-W-64	Water	Apr 1990	H-3	1941±130	1826.0±350.0	724
QC-W-65	Water	Jun 1990	Ra-226	6.4±0.2	6.9±1.0	1.8
QC-W-66	Water	Jun 1990	U	6.2±0.2	6.0±6.0	10.4
QC-MI-30	Milk	Jul 1990	Sr-89	12.8±0.4	18.4±10.0	8.7
			Sr-90	18.2±1.4	18.7±6.0	5.2
			Cs-134	46.0±1.3	49.0±5.0	8.7
			Cs-137	27.6±1.3	25.3±5.0	8.7
QC-W-68	Water	Jun 1990	Gr. alpha	9.8±0.3	10.6±6.0	8.7
			Gr. beta	11.4±0.6	11.3±7.0	8.7
QC-MI-31	Milk	Aug 1990	I-131	68.8±1.6	61.4±12.3	10.4
QC-W-69	Water	Sep 1990	Sr-89	17.7±1.6	19.2±10.0	8.7
			Sr-90	13.9±1.6	17.4±10.0	5.2
QC-MI-32	Milk	Oct 1990	I-131	34.8±0.2	32.4±6.5	8.7
			Cs-134	25.8±1.2	27.3±10.0	8.7
			Cs-137	25.3±2.0	22.4±10.0	8.7
QC-W-70	Water	Oct 1990	H-3	2355±59	2276±455	605
QC-W-71	Water	Oct 1990	I-131	55.9±0.9	51.8±10.4	10.4
QC-W-73	Water	Oct 1990	Co-60	18.3±2.7	16.8±5.0	8.7
			Cs-134	28.3±2.3	27.0±5.0	8.7
			Cs-137	22.7±1.3	22.4±5.0	8.7
QC-W-74	Water	Dec 1990	Gr. alpha	21.4±1.0	26.1±6.5	11.3
			Gr. beta	25.9±1.0	22.3±5.6	8.7

[a] n=3 unless noted otherwise.
[b] n=2
[c] n=1
[d] Concentration in pCi/mL

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=1[e]	Known Activity	Expected Precision 1s, n=1[e]
QC-MI-33	Milk	Jan 1991	Sr-89	20.7±3.3	21.6±5.0	5.0
			Sr-90	19.0±1.4	23.0±3.0	3.0
			Cs-134	22.2±1.7	19.6±5.0	5.0
			Cs-137	26.1±1.6	22.3±5.0	5.0
QC-MI-34	Milk	Feb 1991	I-131	40.7±1.8	40.1±6.0	6.0
QC-W-75	Water	Mar 1991	Sr-89	18.8±1.5	23.3±5.0	5.0
			Sr-90	16.0±0.8	17.2±3.0	3.0
QC-W-76	Water	Apr 1991	I-131	56.5±1.7	59.0±5.9	5.9
QC-W-77	Water	Apr 1991	Co-60	16.4±2.2	15.7±5.0	5.0
			Cs-134	23.8±2.5	22.6±5.0	5.0
			Cs-137	25.0±2.4	21.1±5.0	5.0
QC-W-78	Water	Apr 1991	H-3	4027±188	4080±408	408
QC-MI-35	Milk	Apr 1991	I-131	48.0±0.8	49.2±6.0	6.0
			Cs-134	19.2±2.0	22.6±5.0	5.0
			Cs-137	22.8±2.2	22.1±5.0	5.0
QC-W-79	Water	Jun 1991	Gr. alpha	7.4±0.7	7.8±5.0	5.0
			Gr. beta	11.0±0.7	11.0±5.0	5.0
QC-MI-36	Milk	Jul 1991	Sr-89	28.1±2.1	34.0±10.0	5.0
			Sr-90	11.6±0.7	11.5±3.0	3.0
			I-131	14.4±1.9	18.3±5.0	5.0
			Cs-137	34.3±3.0	35.1±5.0	5.0
QC-W-80	Water	Oct 1991	Sr-89	27.4±6.9	24.4±5.0	5.0
			Sr-90	11.7±1.4	14.1±5.0	3.0
QC-W-81	Water	Oct 1991	I-131	19.1±0.7	20.6±4.2	6.0
QC-W-82	Water	Oct 1991	Co-60	22.6±2.7	22.1±5.0	5.0
			Cs-134	15.5±1.8	17.6±5.0	5.0
			Cs-137	17.5±2.1	17.6±5.0	5.0
QC-W-83	Water	Oct 1991	H-3	4639±137	4382±438	438
QC-MI-37	Milk	Oct 1991	I-131	23.6±3.2	25.8±5.0	6.0
			Cs-134	22.7±2.8	22.1±5.0	5.0
			Cs-137	38.3±3.0	35.1±5.0	5.0
QC-W-84	Water	Dec 1991	Gr. alpha	6.2±0.6	7.8±5.0	5.0
			Gr. beta	11.0±0.7	11.0±5.0	5.0

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=1[e]	Known Activity	Expected Precision 1s, n=1[e]
QC-MI-39	Milk	Jan 1992	Sr-89	21.6±6.5	31.2±10.0	5.0
			Sr-90	38.7±1.8	42.3±8.5	4.2
			I-131	76.8±0.9	83.7±16.0	8.4
			Cs-134	42.1±5.7	49.4±10.0	5.0
			Cs-137	55.2±6.4	53.0±10.0	5.0
QC-W-85	Water	Mar 1992	Sr-89	26.2±3.1	32.0±10.0	5.0
			Sr-90	24.4±1.4	28.0±6.0	3.0
QC-W-86	Water	Apr 1992	H-3	4080±190	4027±403	403
QC-W-87	Water	Apr 1992	I-131	33.5±0.6	33.2±12.0	6.0
QC-W-88	Water	Apr 1992	Co-60	17.5±2.7	19.7±10.0	5.0
			Cs-134	28.9±2.5	33.5±10.0	5.0
			Cs-137	41.0±3.0	38.9±10.0	5.0
QC-MI-40	Milk	Apr 1992	Cs-134	58.0±2.6	55.9±10.0	5.0
			Cs-137	43.7±3.0	38.9±10.0	5.0
QC-W-41	Milk	Apr 1992	I-131	50.3±0.8	55.9±11.2	5.6
QC-W-89	Water	Jun 1992	Gr. alpha	15.3±0.8	13.6±10.0	5.0
			Gr. beta	17.2±0.9	17.6±10.0	5.0
QC-MI-42	Milk	Aug. 1992	Sr-89	41.4±5.9	51.2±10.2	5.0
			Sr-90	48.9±2.5	51.9±10.4	5.2
			Cs-134	20.1±2.8	20.2±10.0	5.0
			Cs-137	26.2±2.7	26.1±10.0	5.0
QC-W-90	Water	Sept. 1992	Sr-89	6.7±3.4	12.6±10.0	5.0
			Sr-90	16.1±1.4	15.6±6.0	3.0
QC-W-91	Water	Oct. 1992	I-131	34.9±2.2	34.9±10.0	6.0
QC-W-92	Water	Oct. 1992	Co-60	11.4±1.9	9.2±10.0	5.0
			Cs-134	18.7±2.3	14.3±10.0	5.0
			Cs-137	14.1±1.8	15.0±10.0	5.0

Table A-3. In-house spiked samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration in pCi/L TIML Result 2s, n=1[e]	Known Activity	Expected Precision 1s, n=1[e]
QC-W-93	Water	Oct. 1992	H-3	3704±186	3904±390	367
QC-W-94	Water	Oct. 1992	H-3	14,925±339	15,616±1,562	1562
QC-W-95	Water	Oct. 1992	I-131	64.2±2.7	67.2±10.0	6.7
QC-MI-43	Milk	Oct. 1992	I-131	19.9±1.0	21.5±6.0	6.0
			Cs-134	14.2±3.4	12.7±10.0	5.0
			Cs-137	14.1±5.2	17.1±10.0	5.0
QC-MI-44	Milk	Oct. 1992	I-131	36.1±1.2	43.0±10.0	6.0
			Cs-134	28.2±4.0	25.4±10.0	5.0
			Cs-137	38.8±5.1	34.2±10.0	5.0

[e] Starting in January 1991, all determinations are single.

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

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Concentration (pCi/L) Acceptance Criteria (4.66 σ)
SPS-5386	Milk	Jan 1988	I-131	<0.1	<1
SPW-5448	"Dead" Water	Jan 1988	H-3	<177	<300
SPS-5615	Milk	Mar 1988	Cs-134	<2.4	<10
			Cs-137	<2.5	<10
			I-131	<0.3	<1
			Sr-89	<0.4	<5
			Sr-90	2.4±0.5[a]	<1
SPS-5650	D.I. Water	Mar 1988	Th-228	<0.3	<1
			Th-230	<0.04	<1
			Th-232	<0.05	<1
			U-234	<0.03	<1
			U-235	<0.03	<1
			U-238	<0.03	<1
			Am-241	<0.06	<1
			Cm-241	<0.01	<1
			Pu-238	<0.08	<1
			Pu-240	<0.02	<1
SPS-6090	Milk	Jul 1988	Sr-89	<0.5	<1
			Sr-90	1.8±0.5	<1
			I-131	<0.4	<1
			Cs-137	<0.4	<10
SPW-6209	Water	Jul 1988	Fe-55	<0.8	<1
SPW-6292	Water	Sep 1988	Sr-89	<0.7	<5
			Sr-90	<0.7	<1
SPS-6477	Milk	Oct 1988	I-131	<0.2	<1
			Cs-134	<6.1	<10
			Cs-137	<5.9	<10
SPW-6478	Water	Oct 1988	I-131	<0.2	<1
SPW-6479	Water	Oct 1988	Co-60	<5.7	<10
			Cs-134	<3.7	<10
			Cs-137	<4.3	<10
SPW-6480	Water	Oct 1988	H-3	<170	<300

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Concentration (pCi/L) Acceptance Criteria (4.66 σ)
SPW-6625	Water	Dec 1988	Gr. alpha	<0.7	<1
			Gr. beta	<1.9	<4
SPS-6723	Milk	Jan 1989	Sr-89	<0.6	<5
			Sr-90	1.9±0.5[a]	<1
			I-131	<0.2	<1
			Cs-134	<4.3	<10
			Cs-137	<4.4	<10
SPW-6877	Water	Mar 1989	Sr-89	<0.4	<5
			Sr-90	<0.6	<1
SPS-6963	Milk	Apr 1989	I-131	<0.3	<1
			Cs-134	<5.9	<10
			Cs-137	<6.2	<10
SPW-7561	Water	Apr 1989	H-3	<150	<300
SPW-7207	Water	Jun 1989	Ra-226	<0.2	<1
			Ra-228	<0.6	<1
SPS-7208	Milk	Jun 1989	Sr-89	<0.6	<5
			Sr-90	2.1±0.5[a]	<1
			I-131	<0.3	<1
			Cs-134	<6.4	<10
			Cs-137	<7.2	<10
SPW-7588	Water	Jun 1989	Gr. alpha	<0.2	<1
			Gr. beta	<1.0	<4
SPS-7322	Milk	Aug 1989	Sr-89	<1.4	<5
			Sr-90	4.8±1.0[a]	<1
			I-131	<0.2	<1
			Cs-134	<6.9	<10
			Cs-137	<8.2	<10
SPW-7559	Water	Sep 1989	Sr-89	<2.0	<5
			Sr-90	<0.7	<1
SPW-7560	Water	Oct 1989	I-131	<0.1	<1
SPW-7562	Water	Oct 1989	H-3	<140	<300

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Concentration (pCi/L) Acceptance Criteria (4.66 σ)
SPS-7605	Milk	Nov 1989	I-131	<0.2	<1
			Cs-134	<8.6	<10
			Cs-137	<10	<10
SPW-7971	Water	Dec 1989	Gr. alpha	<0.4	<1
			Gr. beta	<0.8	<4
SPW-8039	Water	Jan 1990	Ra-226	<0.2	<1
SPS-8040	Milk	Jan 1990	Sr-89	<0.8	<5
			Sr-90	<1.0	<1
SPS-8208	Milk	Jan 1990	Sr-89	<0.8	<5
			Sr-90	1.6±0.5[a]	<1
			Cs-134	<3.6	<10
			Cs-137	<4.7	<10
SPS-8312	Milk	Feb 1990	Sr-89	<0.3	<5
			Sr-90	1.2±0.3[a]	<1
SPW-8312A	Water	Feb 1990	Sr-89	<0.6	<5
			Sr-90	<0.7	<5
SPS-8314	Milk	Mar 1990	I-131	<0.3	<1
SPS-8510	Milk	May 1990	I-131	<0.2	<1
			Cs-134	<4.6	<10
			Cs-137	<4.8	<10
SPW-8511A	Water	May 1990	H-3	<200	<300
SPS-8600	Milk	Jul 1990	Sr-89	<0.8	<5
			Sr-90	1.7±0.6[a]	<1
			I-131	<0.3	<1
			Cs-134	<5.0	<10
			Cs-137	<7.0	<10
SPM-8877	Milk	Aug 1990	I-131	<0.2	<1
SPW-8925	Water	Aug 1990	H-3	<200	<300

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Concentration (pCi/L) Acceptance Criteria (4.66 σ)
SPW-8926	Water	Aug 1990	Gr. alpha	<0.3	<1
			Gr. beta	<0.7	<4
SPW-8927	Water	Aug 1990	U-234	<0.01	<1
			U-235	<0.02	<1
			U-238	<0.01	<1
SPW-8928	Water	Aug 1990	Mn-54	<4.0	<10
			Co-58	<4.1	<10
			Co-60	<2.4	<10
			Cs-134	<3.3	<10
			Cs-137	<3.7	<10
SPW-8929	Water	Aug 1990	Sr-89	<1.4	<5
			Sr-90	<0.6	<1
SPW-69	Water	Sep 1990	Sr-89	<1.8	<5
			Sr-90	<0.8	<1
SPW-106	Water	Oct 1990	H-3	<180	<300
			I-131	<0.3	<1
SPM-107	Milk	Oct 1990	I-131	<0.4	<1
			Cs-134	<3.3	<10
			Cs-137	<4.3	<10
SPW-370	Water	Oct 1990	Mn-54	<1.7	<10
			Co-58	<2.6	<10
			Co-60	<1.6	<10
			Cs-134	<1.7	<10
			Cs-137	<1.8	<10
SPW-372	Water	Dec 1990	Gr. alpha	<0.3	<1
			Gr. beta	<0.8	<4
SPS-406	Milk	Jan 1991	Sr-89	<0.4	<5
			Sr-90	1.8±0.4[a]	<1
			Cs-134	<3.7	<10
			Cs-137	<5.2	<10
SPS-421	Milk	Feb 1991	I-131	<0.3	<1
SPW-451	Water	Feb 1991	Ra-226	<0.1	<1
			Ra-228	<0.9	<1

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Concentration (pCi/L) Acceptance Criteria (4.66 σ)
SPW-514	Water	Mar 1991	Sr-89	<1.1	<5
			Sr-90	<0.9	<1
SPW-586	Water	Apr 1991	I-131	<0.2	<1
			Co-60	<2.5	<10
			Cs-134	<2.4	<10
			Cs-137	<2.2	<10
SPS-587	Milk	Apr 1991	I-131	<0.2	<1
			Cs-134	<1.7	<10
			Cs-137	<1.9	<10
SPW-837	Water	Jun 1991	Gr. alpha	<0.6	<1
			Gr. beta	<1.1	<4
SPM-953	Milk	Jul 1991	Sr-89	<0.7	<5
			Sr-90	0.4±0.3[a]	<1
			I-131	<0.2	<1
			Cs-137	<4.9	<10
SPM-1236	Milk	Oct 1991	I-131	<0.2	<1
			Cs-134	<3.7	<10
			Cs-137	<4.6	<10
SPW-1254	Water	Oct 1991	Sr-89	<2.8	<5
			Sr-90	<0.7	<1
SPW-1256	Water	Oct 1991	I-131	<0.4	<1
			Co-60	<3.6	<10
			Cs-134	<4.0	<10
			Cs-137	<3.6	<10
SPW-1259	Water	Oct 1991	H-3	<160	<300
SPW-1444	Water	Dec 1991	Gr. alpha	<0.4	<1
			Gr. beta	<0.8	<4
SPM-1578	Milk	Jan 1992	Sr-89	<0.5	<5
			Sr-90	1.3±0.4[a]	<1
			I-131	<0.2	<1
			Cs-134	<7.2	<10
			Cs-137	<8.0	<10

Table A-4. In-house "blank" samples (continued)

Lab Code	Sample Type	Date Collected	Analysis	Concentration (pCi/L) Results (4.66 σ)	Concentration (pCi/L) Acceptance Criteria (4.66 σ)
SPW-1860	Water	Mar 1992	Sr-89	<0.6	<5
			Sr-90	<0.4	<1
SPW-2067	Water	Apr 1992	H-3	<168	<300
SPW-2114	Water	Apr 1992	C-14	<1.0	<200
SPW-2119	Milk	Apr 1992	Co-60	<6.3	<10
			Cs-134	<4.5	<10
			Cs-137	<5.4	<10
SPW-2126	Water	Apr 1992	I-131	<0.2	<1
SPM-2133	Milk	Apr 1992	I-131	<0.2	<1
SPW-2220	Water	May 1992	Co-60	<2.1	<10
			Cs-134	<2.1	<10
			Cs-137	<2.3	<10
SPW-2369	Water	Jun 1992	Gr. alpha	<0.4	<1
			Gr. beta	<0.8	<4
SPM-2500	Milk	Aug 1992	I-131	<0.4	<1
			Sr-89	<1.2	<5
			Sr-90	<0.9	<1
SPW-2666	Water	Sept. 1992	Sr-89	<0.8	<5
			Sr-90	<0.5	<1
SPW-2828	Water	Oct. 1992	Co-60	<4.8	<10
			Cs-134	<6.0	<10
			Cs-137	<6.1	<10
			I-131	<0.3	<1
			H-3	<177	<300
SPM-2829	Milk	Oct. 1992	Co-60	<9.3	<10
			Cs-134	<6.4	<10
			Cs-137	<7.2	<10
SPW-3212	Water	Oct 1992	Ra-228	<1.0	<1
SPW-3057	Water	NOv. 1992	Ra-226	<0.03	<1
SPW-3294	Water	Dec. 1992	Gr. alpha	<0.4	<1
			Gr. beta	<0.8	<4

[a] Low level of Sr-90 concentration in milk (1-5 pCi/L) is not unusual.

ATTACHMENT B

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

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

Analysis	Level	One Standard Deviation for Single Determination
Gamma Emitters	5 to 100 pCi/liter or kg >100 pCi/liter or kg	5 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg >50 pCi/liter or kg	5 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg >30 pCi/liter or kg	3.0 pCi/liter 10% of known value
Potassium	>0.1 g/liter or kg	5% of known value
Gross alpha	<20 pCi/liter >20 pCi/liter	5 pCi/liter 25% of known value
Gross beta	<100 pCi/liter >100 pCi/liter	5 pCi/liter 5% of known value
Tritium	<4,000 pCi/liter >4,000 pCi/liter	1s = (pCi/liter) = 169.85 x (known)$^{.0933}$ 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 pCi/liter 10% of known value
Uranium-238, Nickel-64[b], Technetium-99[b]	<35 pCi/liter >35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter >100 pCi/liter	10 pCi/liter 10% of known value

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

[b] TIML limit.

ADDENDUM TO APPENDIX A

The following is an explanation of the reasons why certain samples were outside the control limit specified by the Environmental Protection Agency for the Interlaboratory Comparions Program starting January 1988.

Lab Code	Analysis	TIML Result (pCi/L)[a]	EPA Control Limit (pCi/L)[a]	Explanation
STF-524	K	1010.7±158.5[b]	1123.5-1336.5[b]	Error in transference of data. Correct data was 1105±33 mg/kg. Results in the past have been within the limits and TIML will monitor the situation in the future.
STW-532	I-131	9.0±2.0	6.2-8.8	Sample recounted after 12 days. The average result was 8.8±1.7 pCi/L (within EPA control limits). The sample was recounted in order to check the decay. Results in the past have been within the limits and TIML will continue to monitor the situation in the future.
STW-534	Co-60	63.3±1.3	41.3-58.7	High level of Co-60 was due to contamination of beaker. Beaker was discarded upon discovery of contamination and sample was recounted. Recount results were 53.2±3.6 and 50.9±2.4 pCi/L.
STM-554	Sr-90	51.0±2.0	54.8-65.2	The cause of low result was due to very high fat content of milk. It should be noted that 63% of all participants failed this test. Also, the average for all participants was 54.0 pCi/L before the Grubb and 55.8 pCi/L after the Grubb.
STW-560	Pu-239	5.8±1.1	3.5-4.9	The cause of high results is not known though it is suspected that the standard was not properly calibrated by supplier and is under investigation. New Pu-236 standard was obtained and will be used for the next test.
STW-568	Ra-228	2.6±1.0	2.7-4.5	The cause of low results is not known. Next EPA cross check results were within the control imits. No further action is planned.

Lab Code	Analysis	TIML Result (pCi/L)[a]	EPA Control Limit (pCi/L)[a]	Explanation
STM-570	Sr-89	26.0±10.0	30.3-47.7	The cause of low results was falsely high
	Sr-90	45.7±4.2	49.8-60.2	recovery due to suspected incomplete calcium removal. Since EPA sample was used up, internal spike was prepared and analyzed. The results were within control limits (See table A-3, sample QC-MI-24). No further action is planned.
STW-589	Sr-90	17.3±1.2	17.4-22.6	Sample was reanalyzed in triplicate; results of reanalyses were 18.8±1.5 pCi/L. No further action is planned.
STM-599	K	1300.0±69.2[c]	1414.7-1685.3[c]	Sample was reanalyzed in triplicate. Results of reanalyses were 1421.7±95.3 mg/L. The cause of low results was using wrong volume.
STW-601	Gr. alpha	11.0±2.0	11.6-32.4	Sample was reanalyzed in triplicat Results of reanalyses were 13.4±1 pCi/L.
STAF-626	Gr. alpha	38.7±1.2	14.6-35.4	The cause of high results is the difference in geometery between standard used in the TIML lab and EPA filter.
STW-632	Ba-133	74.0±6.9	51.6-72.4	Sample was reanalyzed. Results of the reanalyses were 63.8±6.9 pCi/L within EPA limit.
STM-641	I-131	130.7±16.8	88.9-127.1	The cause of high result is unknown. In-house spike sample was prepared with activity of I-131 68.3±6.8 pCi/L. Result of the analysis was 69.1±9.7 pCi/L.
STM-661	Sr-89	25.3±7.6	29.3-46.7	The cause of low result is unknown. Data was checked for errors. The In-house spike sample was prepared with activity of Sr-89 41.0±10.0 pCi/L. Result of the analysis was 37.2±3.6 pCi/L.

Lab Code	Analysis	TIML Result (pCi/L)[a]	EPA Control Limit (pCi/L)[a]	Explanation
STM-673	K	1540.0±103.9[c]	1597.3-1902.7	Activity was calculated using the wrong volume (3.5 L), instead of 3.25 L. Correction for volume resulted in a value of 1660.0±110.1 mg/L; within EPA control limits.

[a] Reported in pCi/L unless otherwise noted.
[c] Concentrations are reported in mg/L.

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

In cases where the activity is found to be below the lower limit of detection L it is reported as

$$<L$$

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

3.0. Duplicate analyses

3.1 Individual results: $x_1 \pm s_1$
$x_1 \pm s_2$

Reported result: $x \pm s$

where $x = (1/2)\ (x_1 \pm x_2)$

$$s = (1/2)\ \sqrt{s_1^2 + s_2^2}$$

3.2. Individual results: $<L_1$
$<L_2$

Reported result: $<L$

where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$
$<L$

Reported result: $x \pm s$ if $x \geq L$;
$<L$ otherwise

4.0. Computation of Averages and Standard Deviations

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

$$\bar{x} = \frac{1}{n} \Sigma x$$

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

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

4.3 If all of the 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.

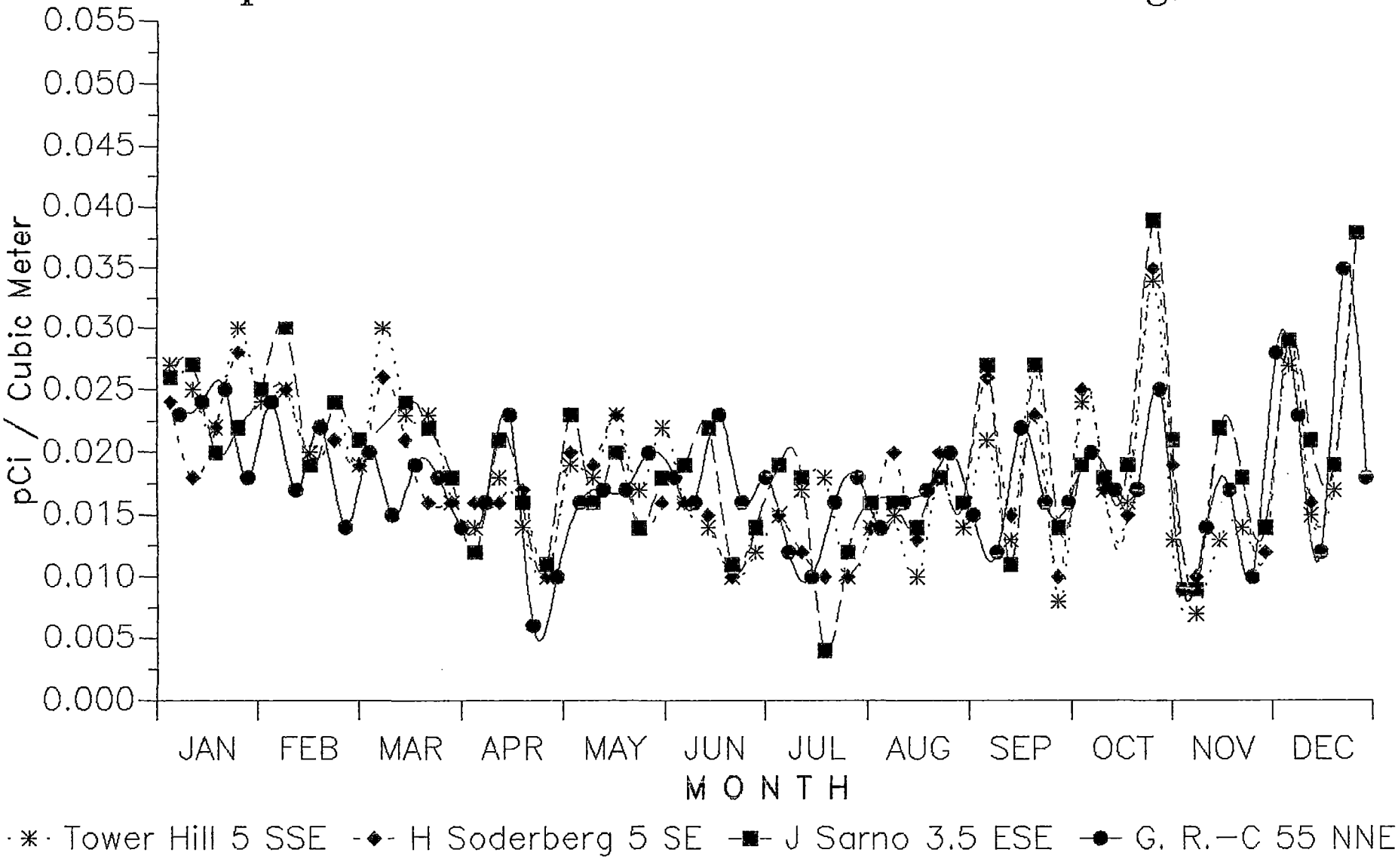
4.5.2. If the figure following those to be retained is greater than 5, the figure is dropped and the last retained figure is raised by 1. As an example, 11.446 is rounded off to 11.45.

4.5.3. If the figure following those to be retained is 5, and if there are no figures other than zeros beyond the five, the figure five is dropped, and the last-place figure retained is increased by one if it is an odd number or it is kept unchanged if an even number. As an example, 11.435 is rounded off to 11.44, while 11.425 is rounded off to 11.42.

1992 PALISADES AIR PARTICULATE

Weekly Gross Beta

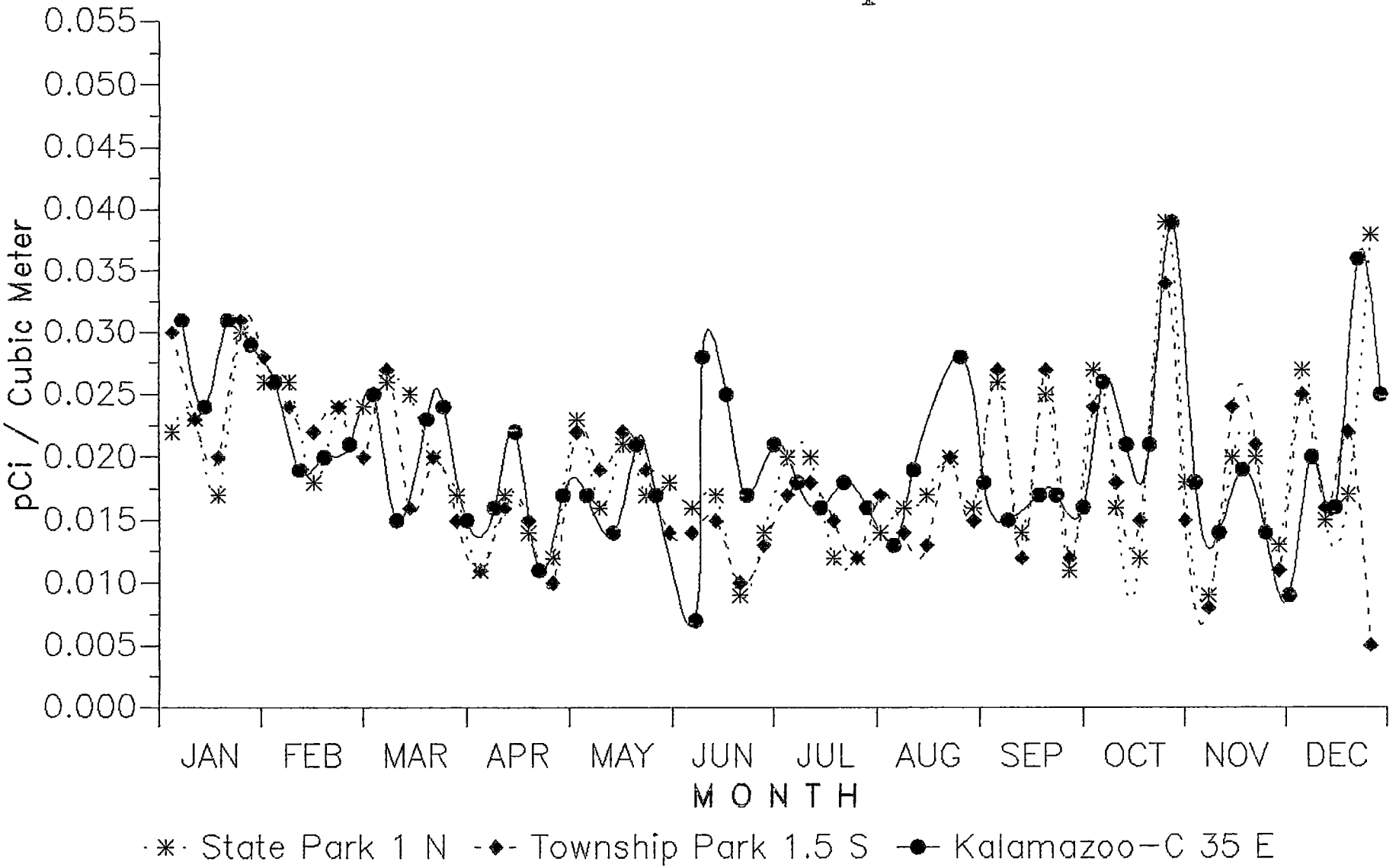
Grand Rapids–Control vs Tower Hill, H Soderberg, J Sarno



1992 PALISADES AIR PARTICULATE

Weekly Gross Beta

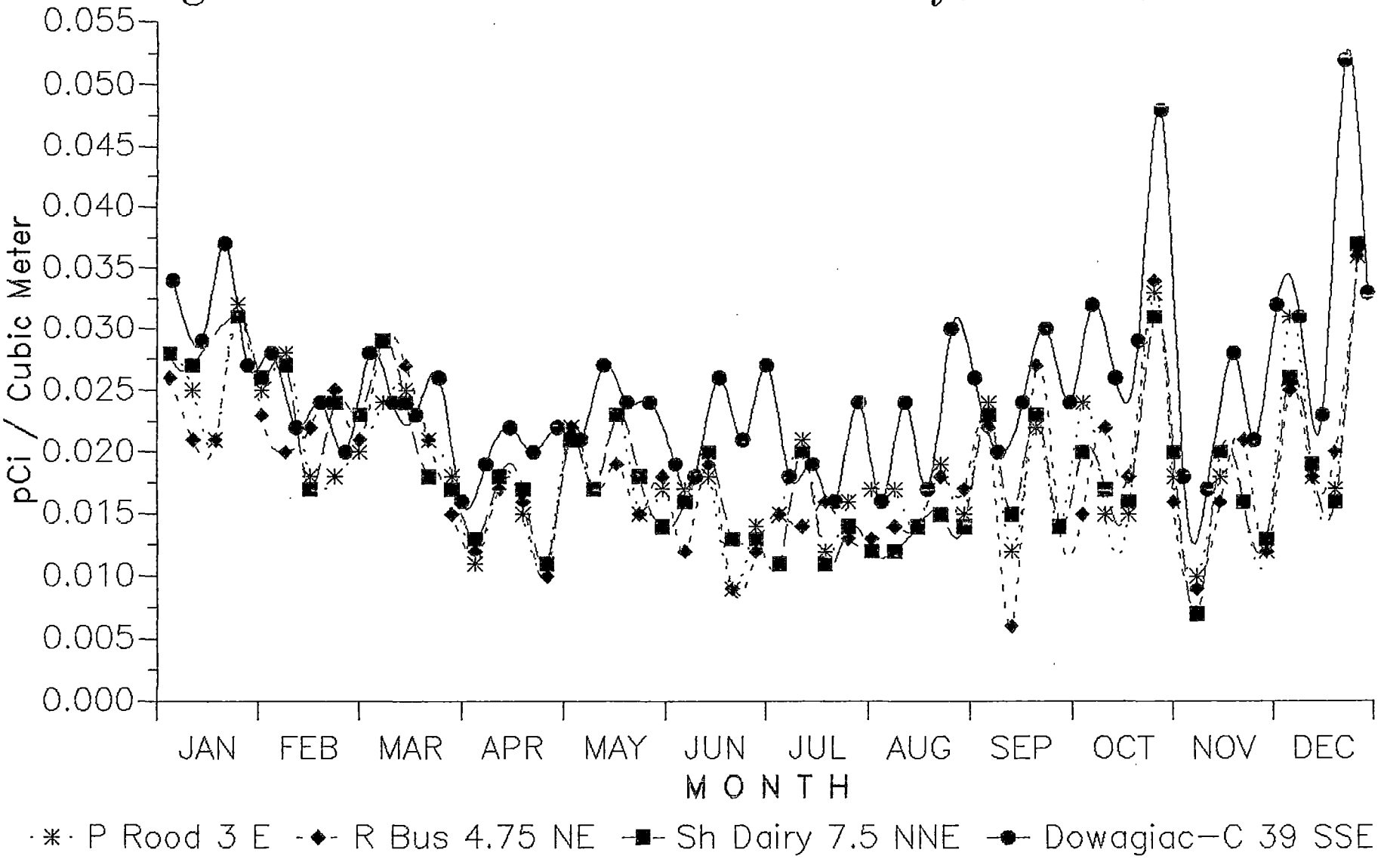
Kalamazoo-Control vs Township Park, State Park



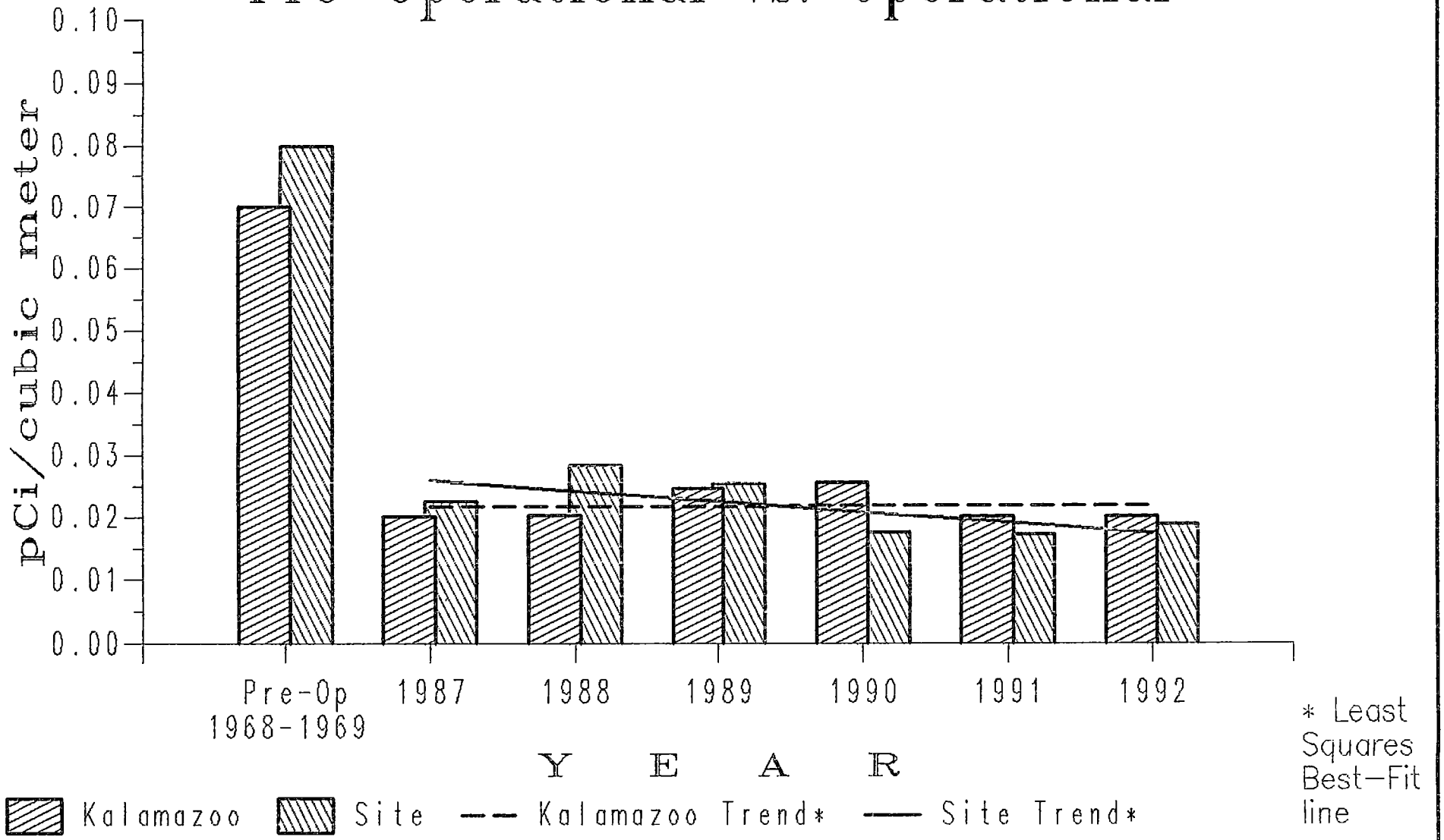
1992 PALISADES AIR PARTICULATE

Weekly Gross Beta

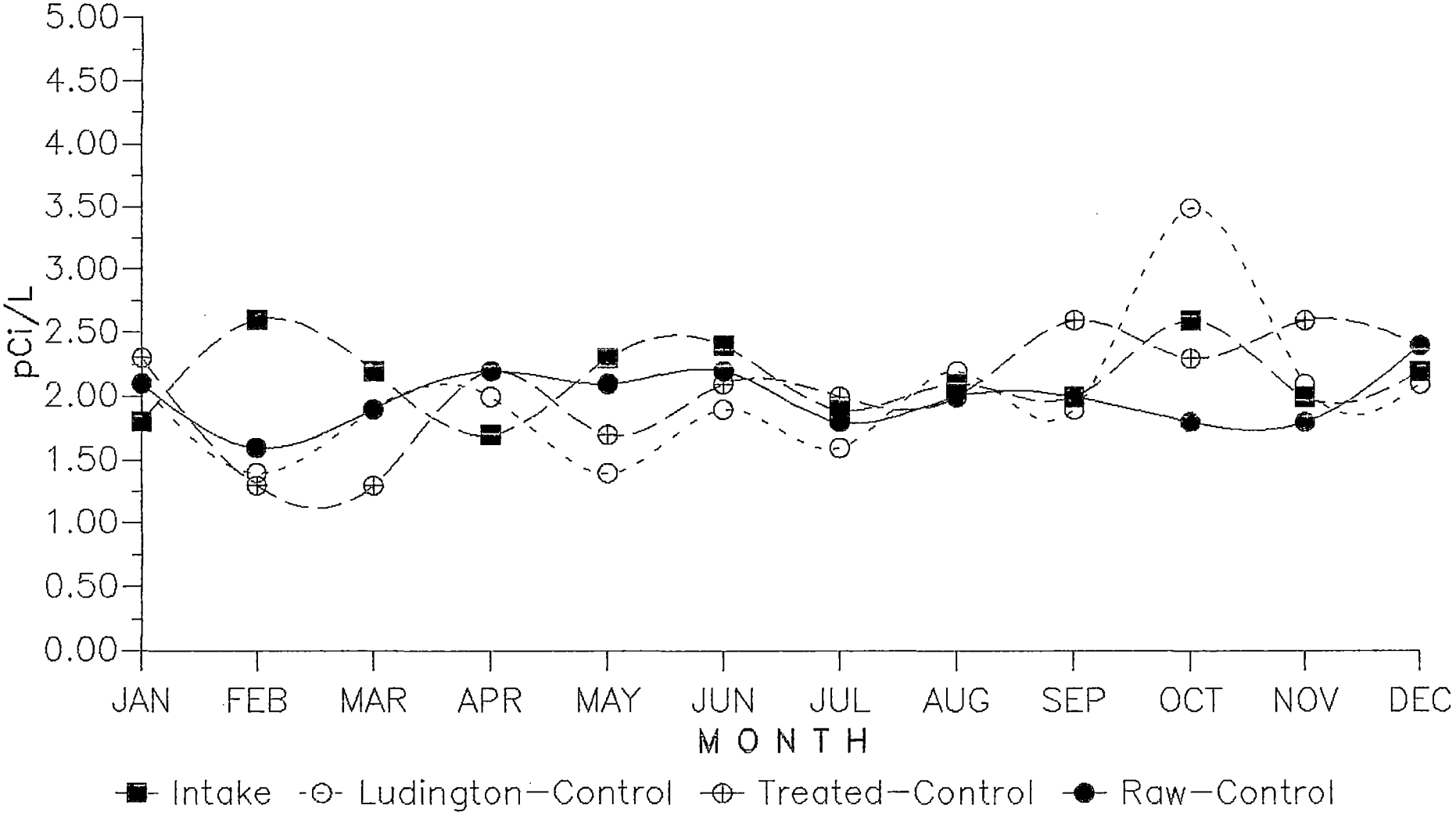
Dowagiac-Control vs Sherman Dairy, R Bus, P Rood



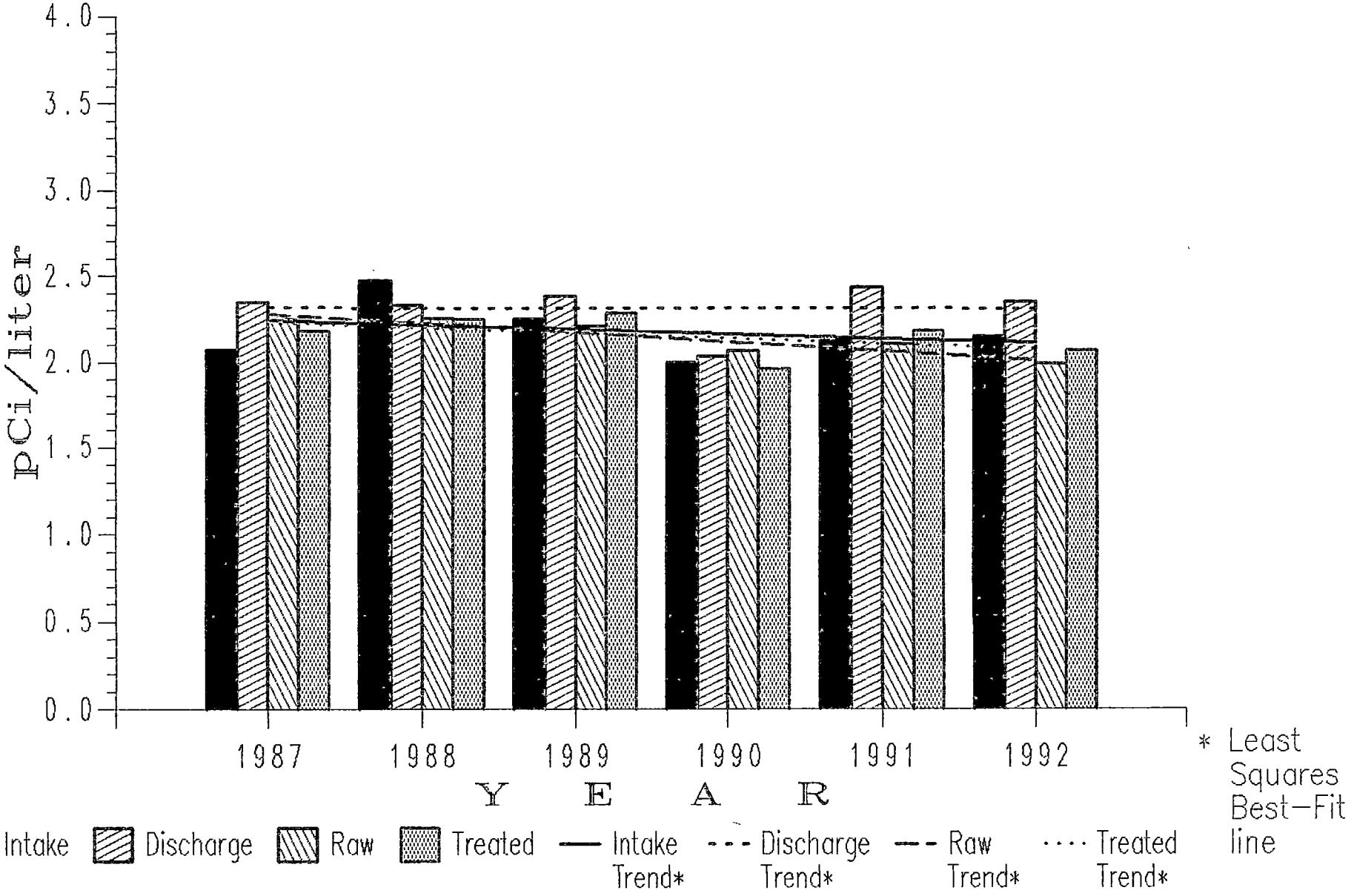
Palisades Air Particulate
Gross Beta
Pre-Operational vs. Operational



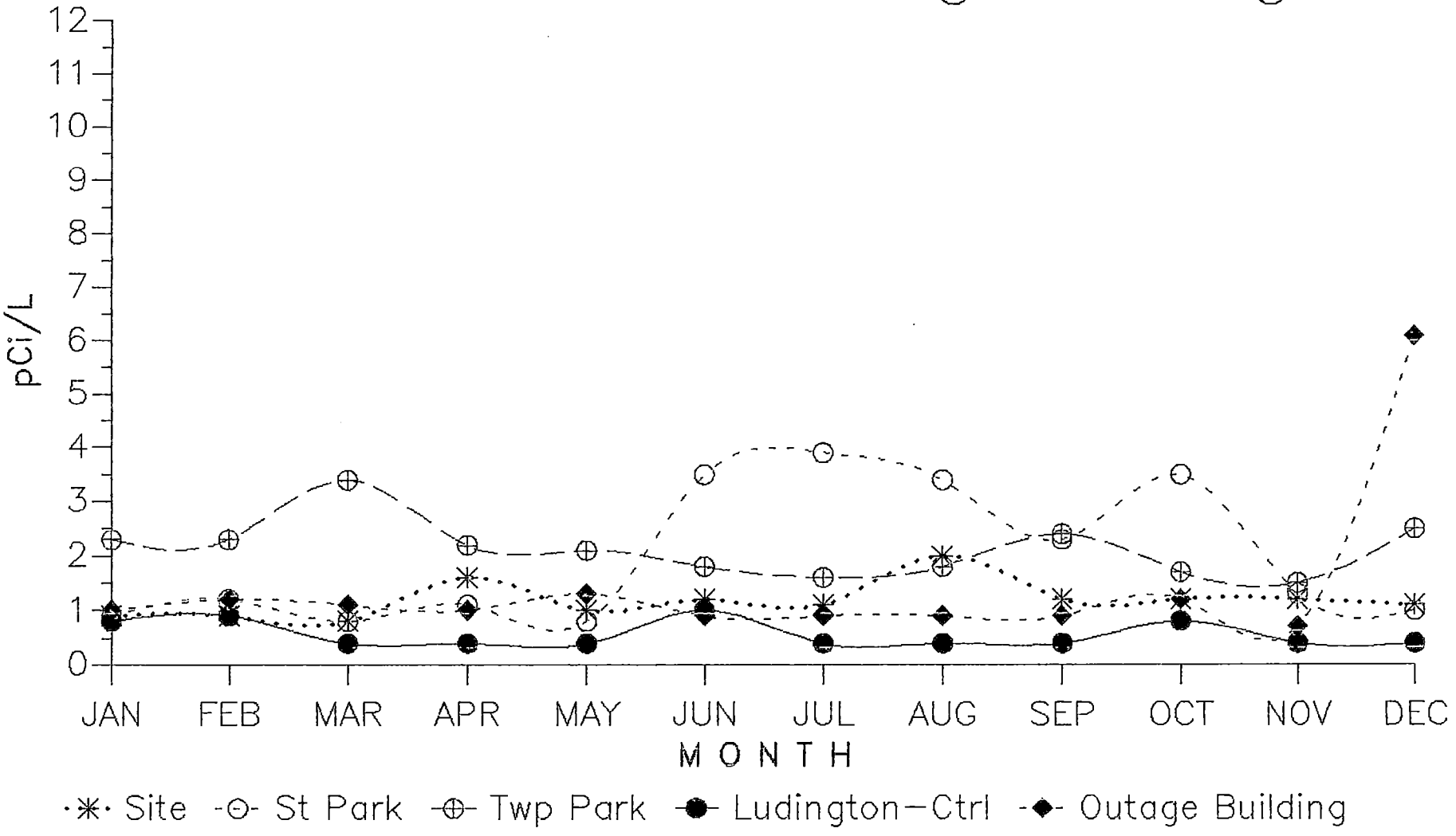
1992 PALISADES LAKE WATER SAMPLES
Gross Beta pCi/L
Ludington & South Haven
Treated & Raw–Controls vs Intake



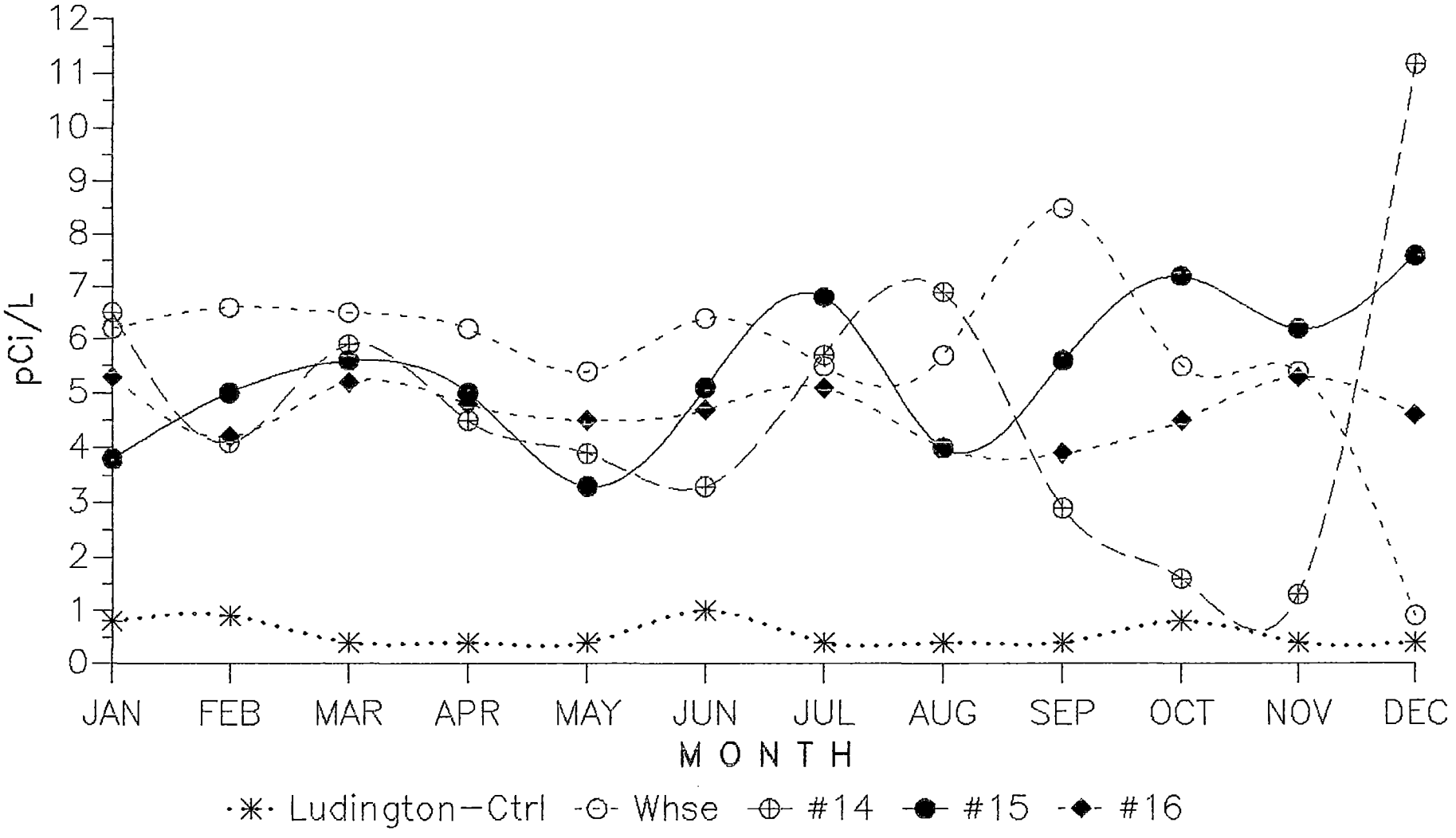
Palisades Lake Water Gross Beta
1987 - 1992



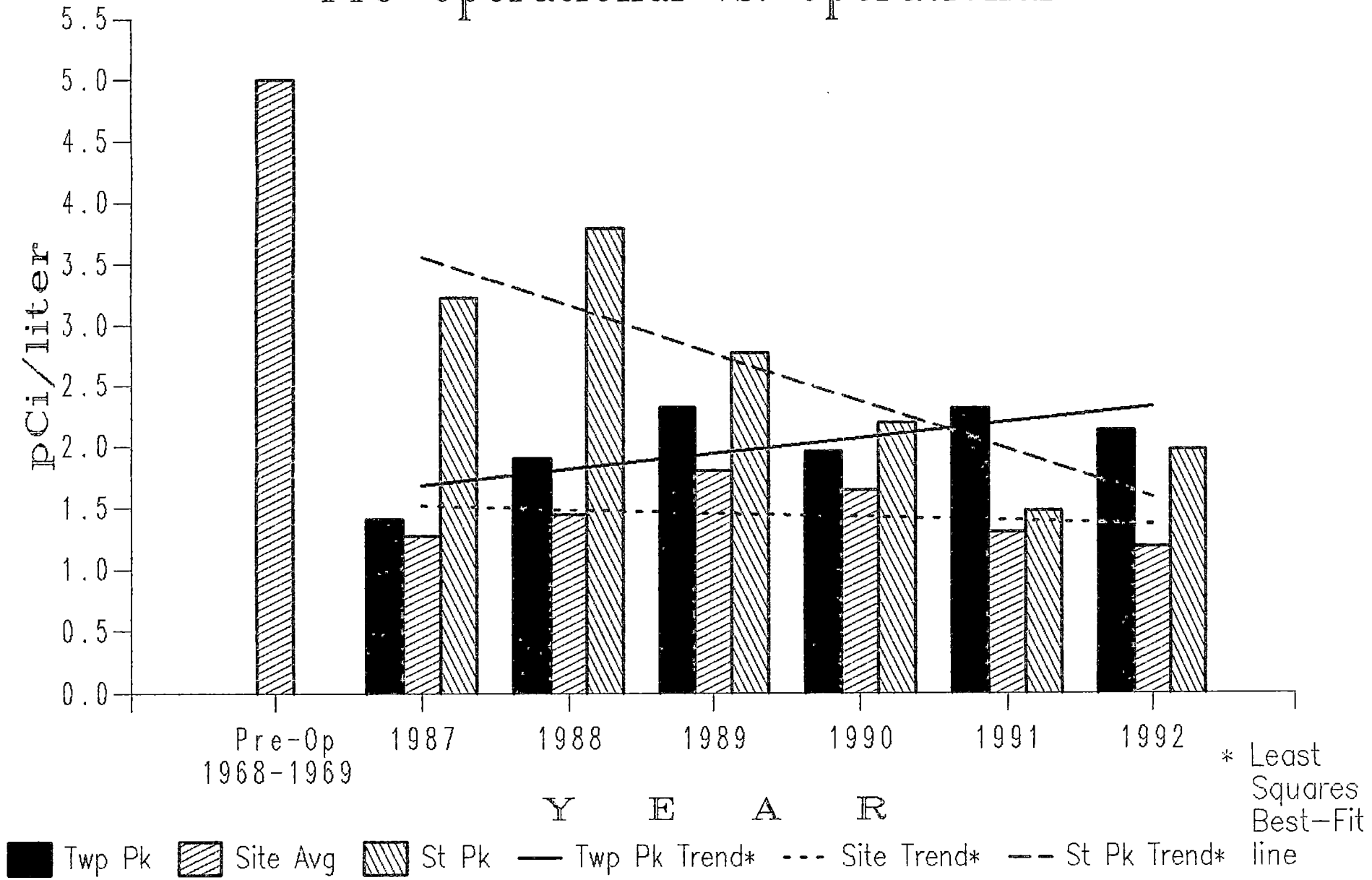
1992 PALISADES WELL WATER SAMPLES
Gross Beta pCi/L
Ludington-Control vs Township Park, State Park, Site and Outage Building



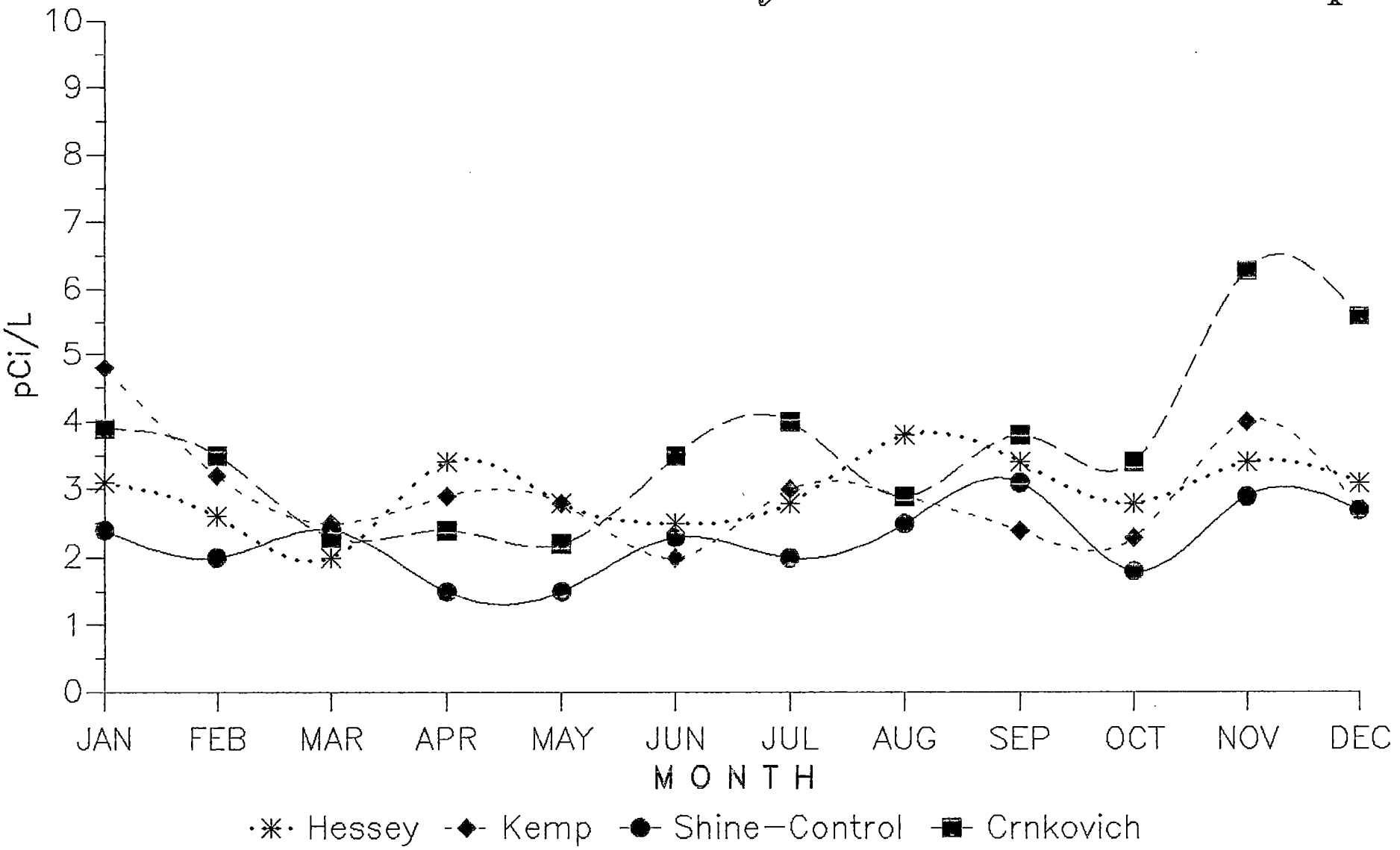
1992 PALISADES WELL WATER SAMPLES
Gross Beta pCi/L
Ludington-Control vs Warehouse, Well #14, Well #15 and Well #16



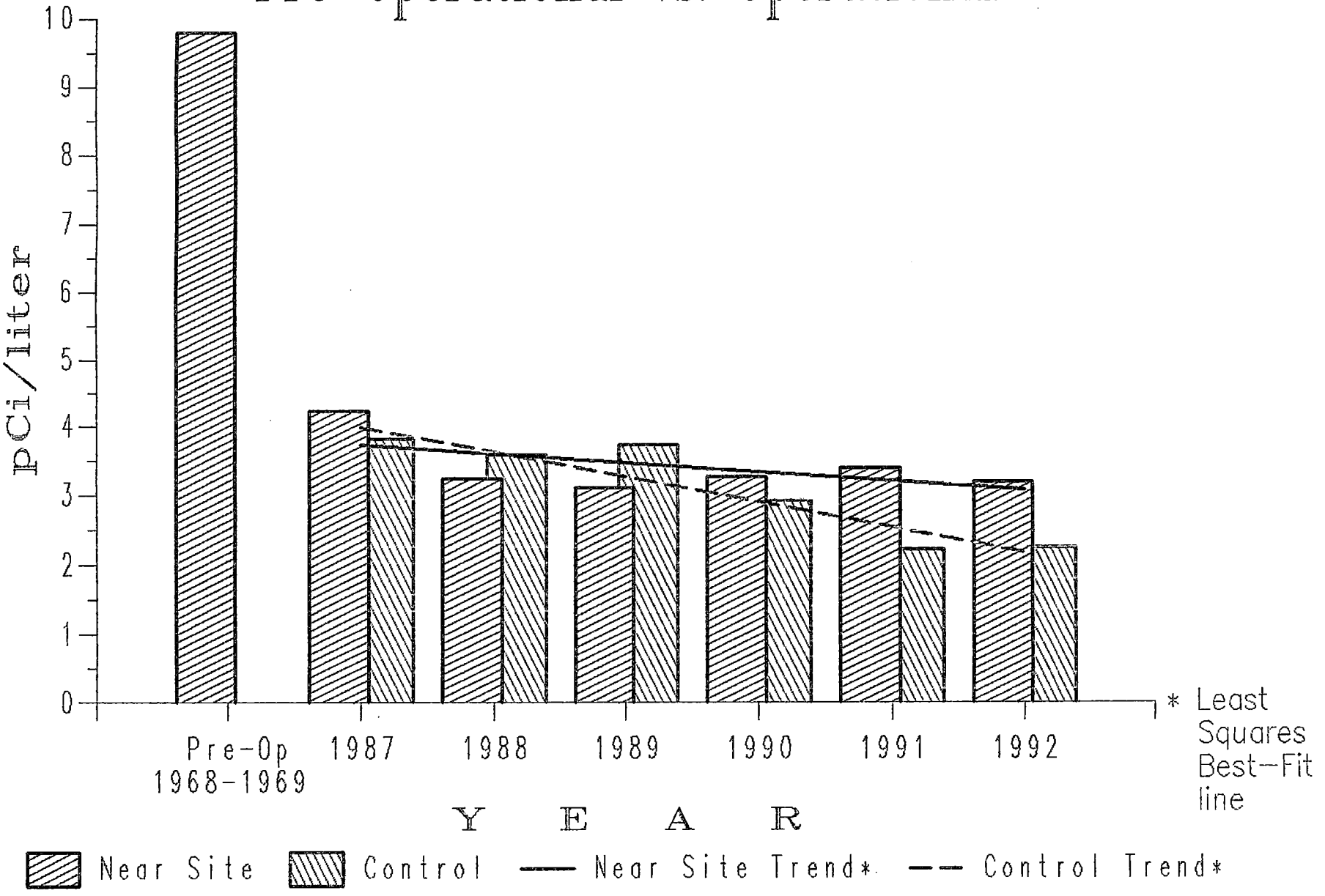
Palisades Well Water Gross Beta
Pre-Operational vs. Operational



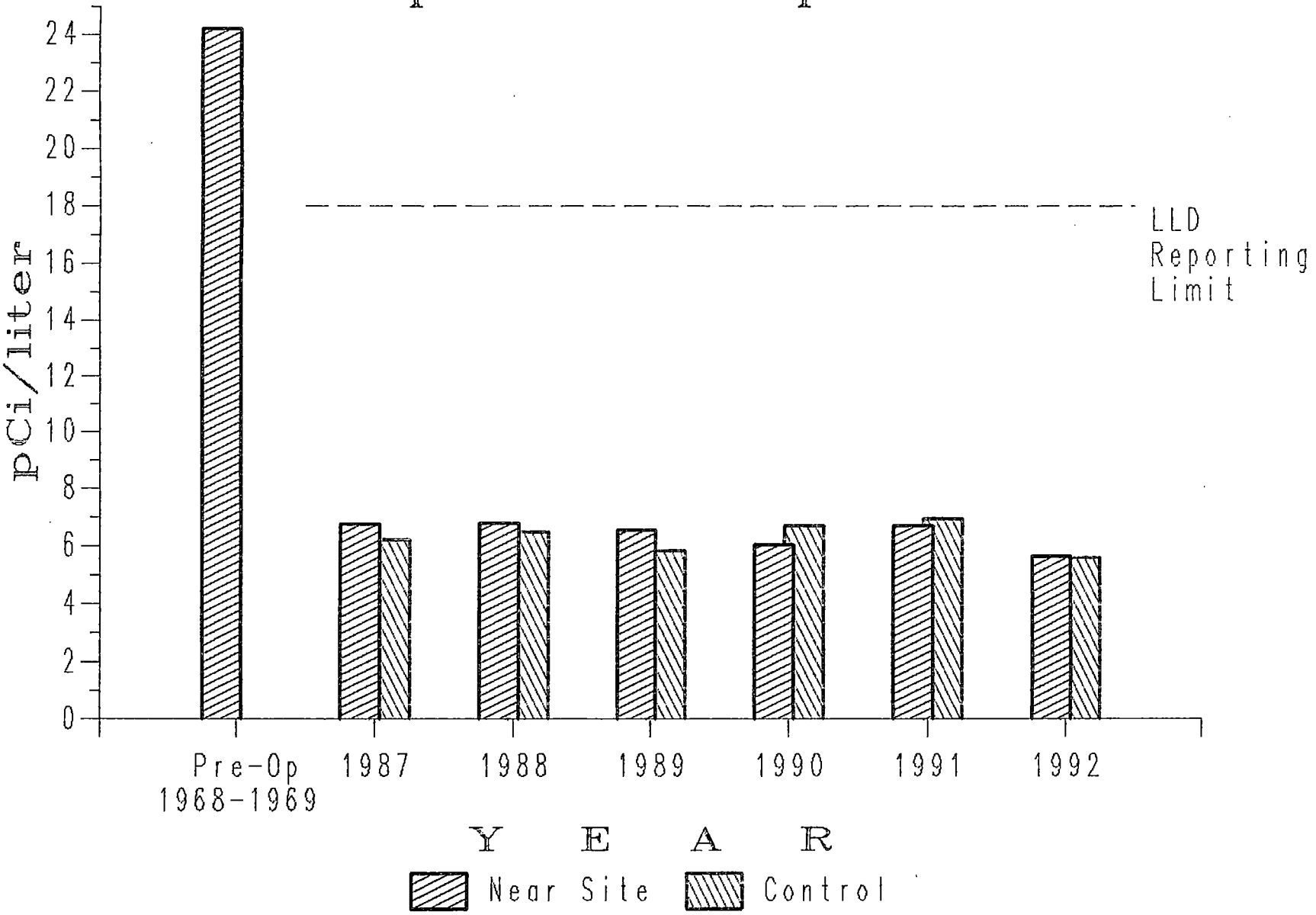
1992 PALISADES MILK SAMPLES
Sr-90 pCi/L
Shine-Control vs Hessey, Crnkovich, Kemp



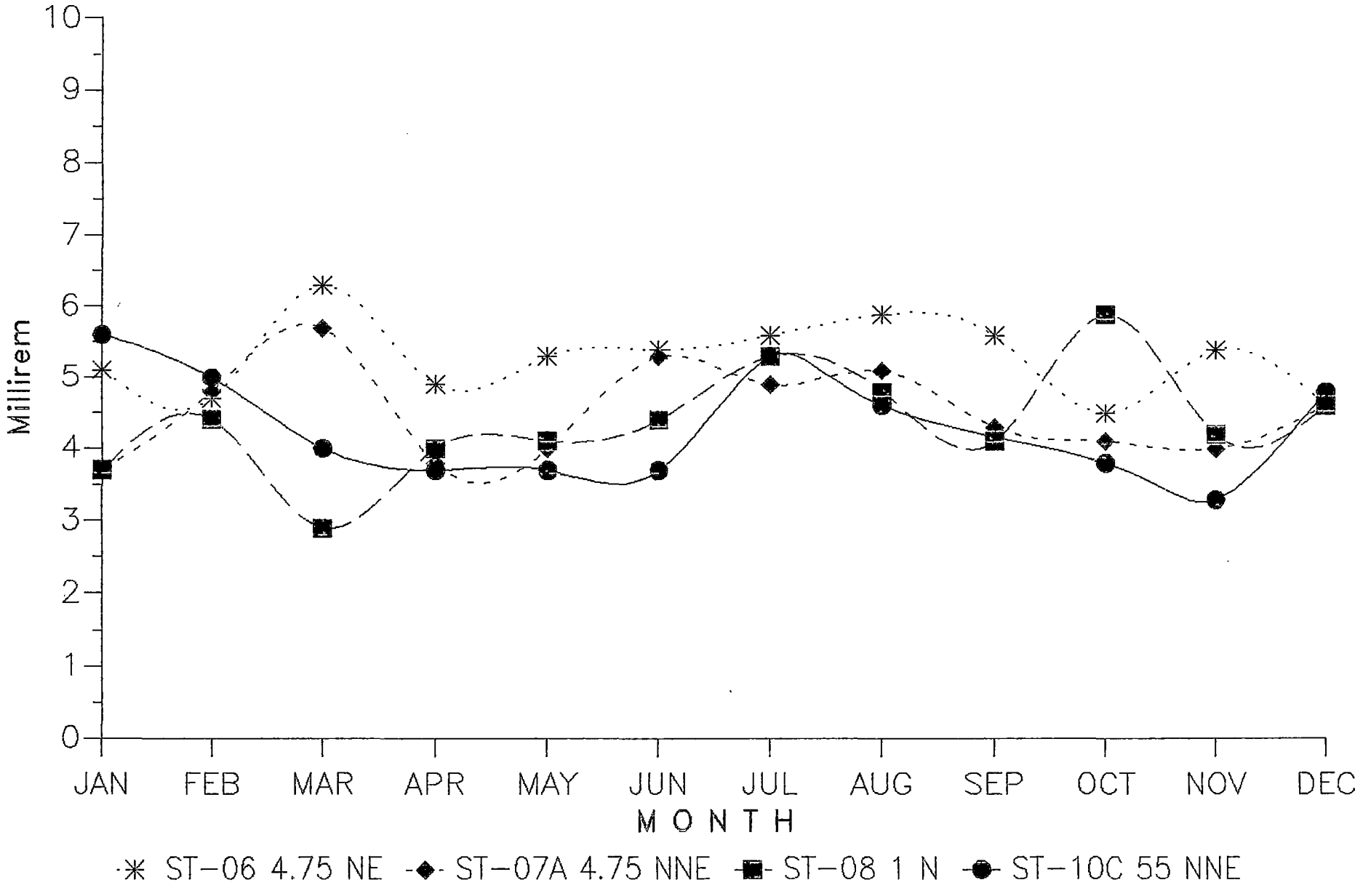
Palisades Milk Sr-90
Pre-Operational vs. Operational



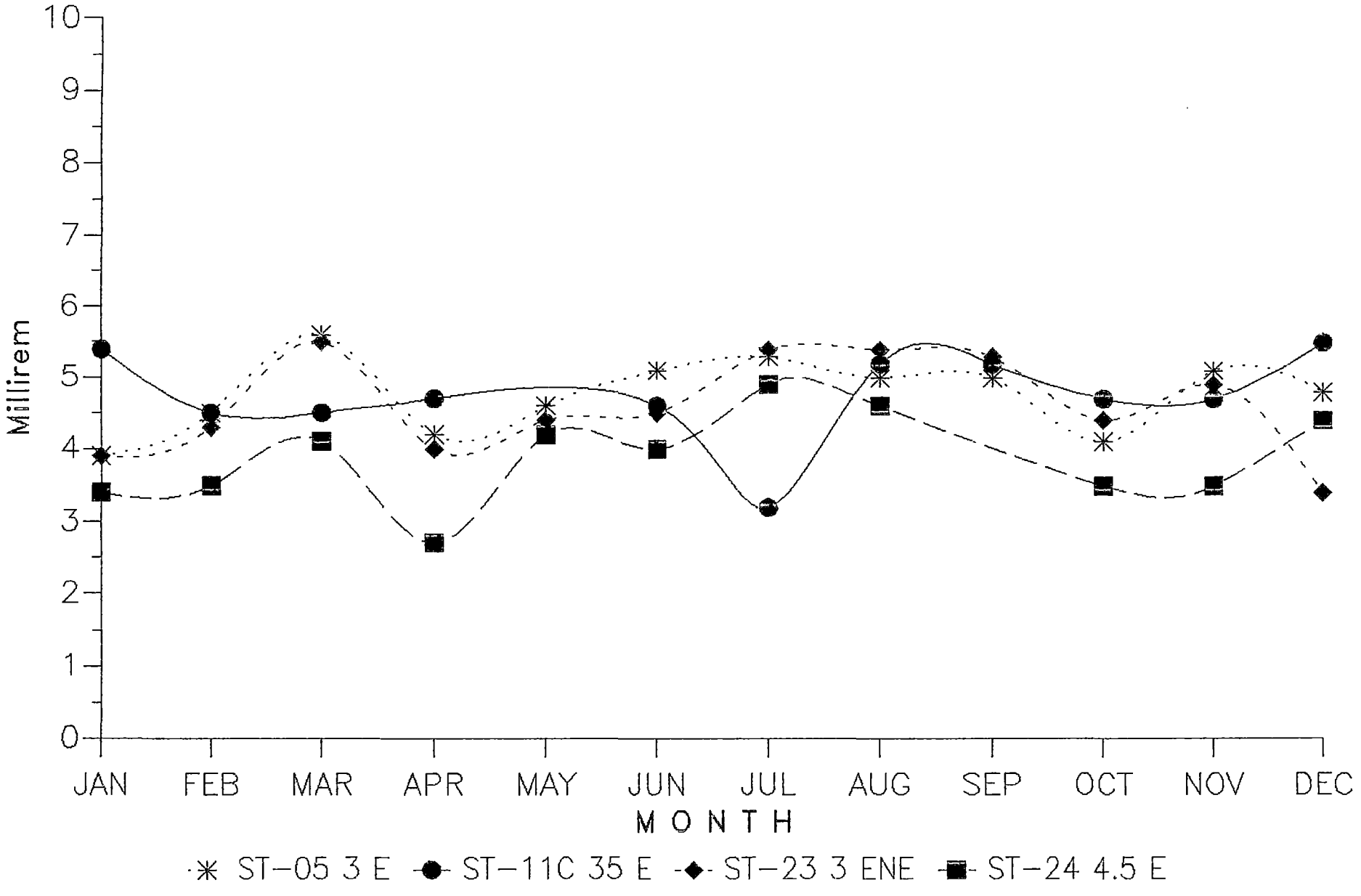
Palisades Milk Cs-137
Pre-Operational vs. Operational



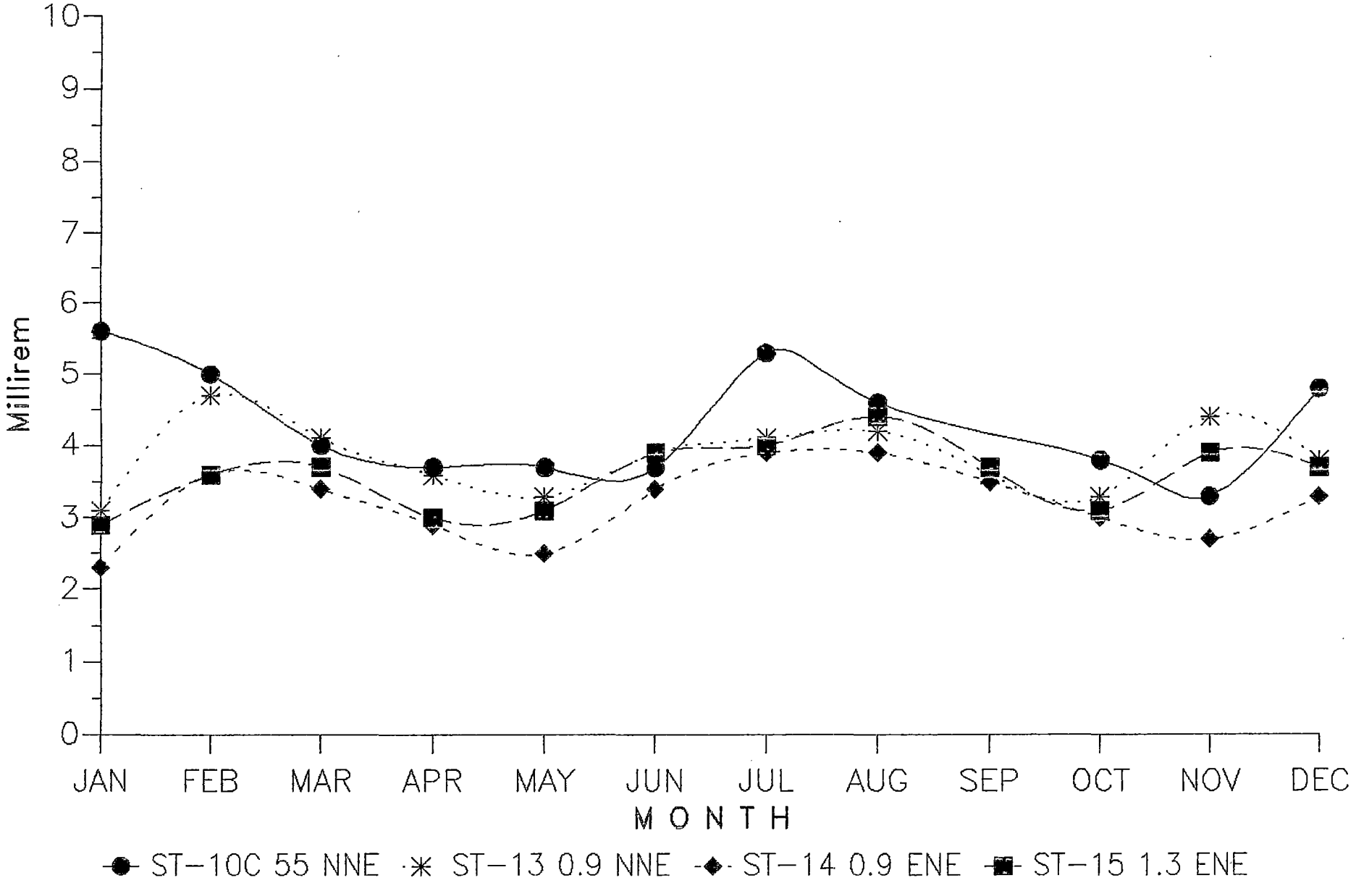
1992 PALISADES TLD's
ST10 Control vs ST06, ST07A, ST08



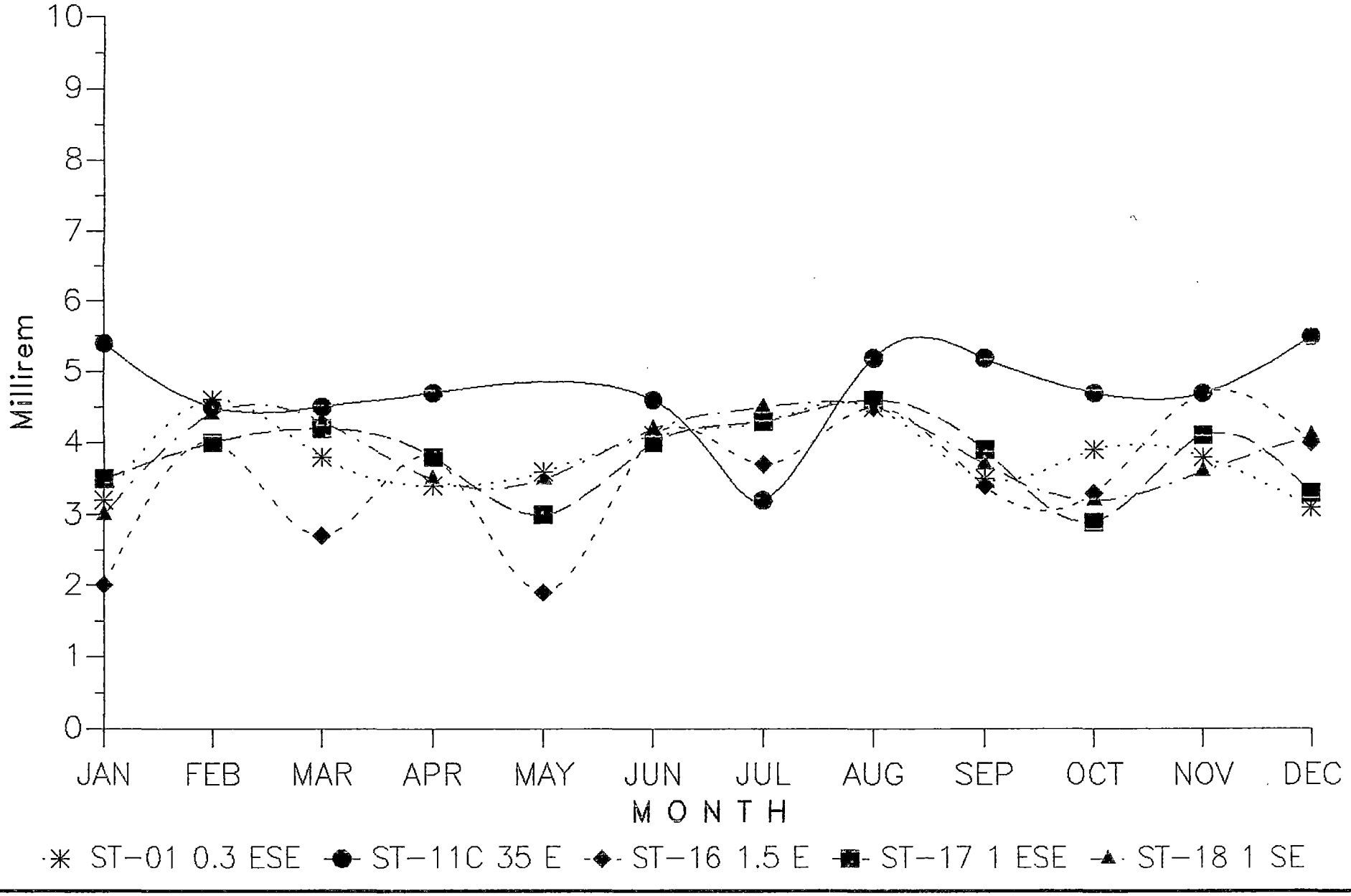
1992 PALISADES TLD's
ST11 Control vs ST05, ST23, ST24



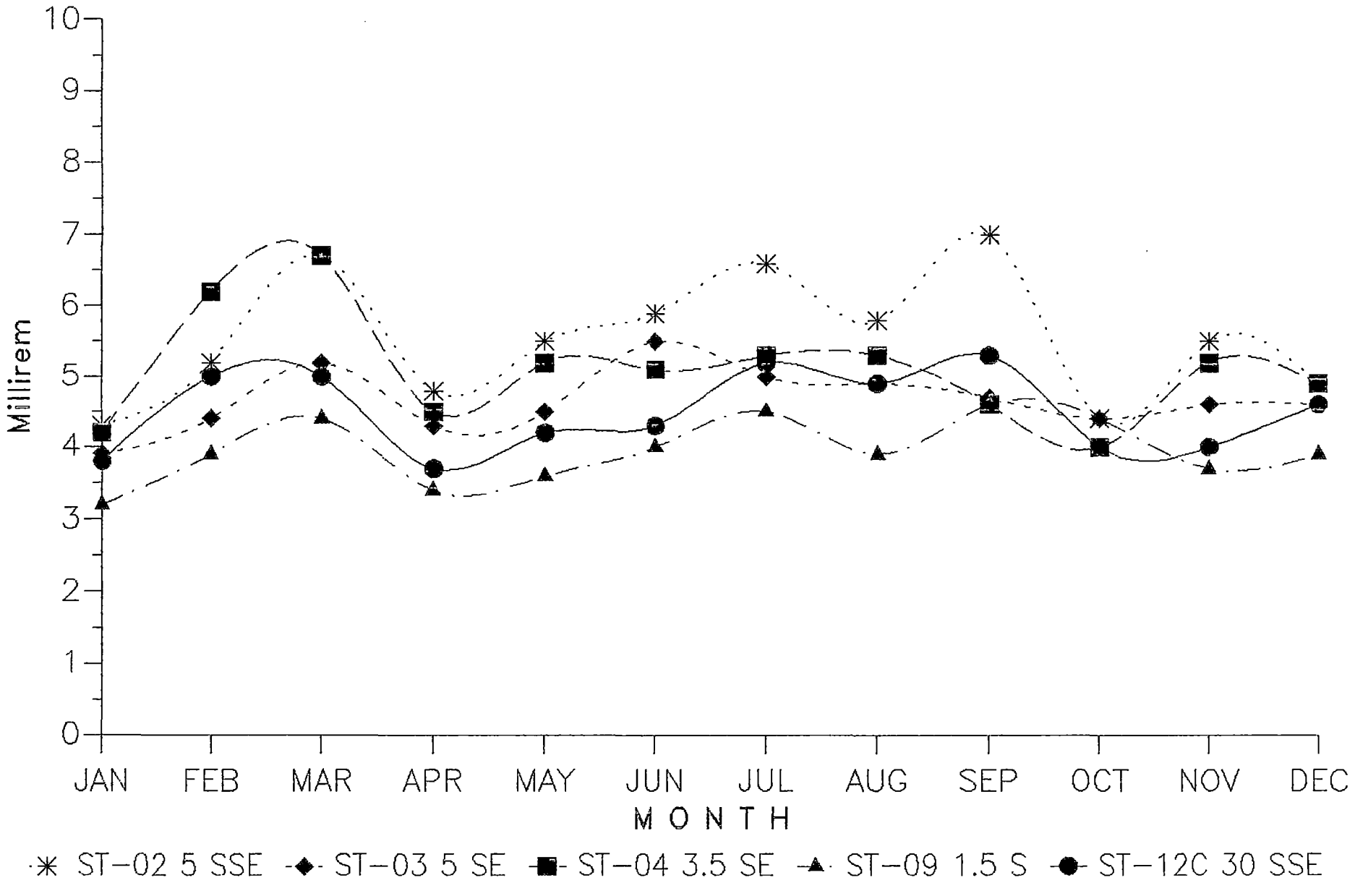
1992 PALISADES TLD's
ST10 Control vs ST13, ST14, ST15



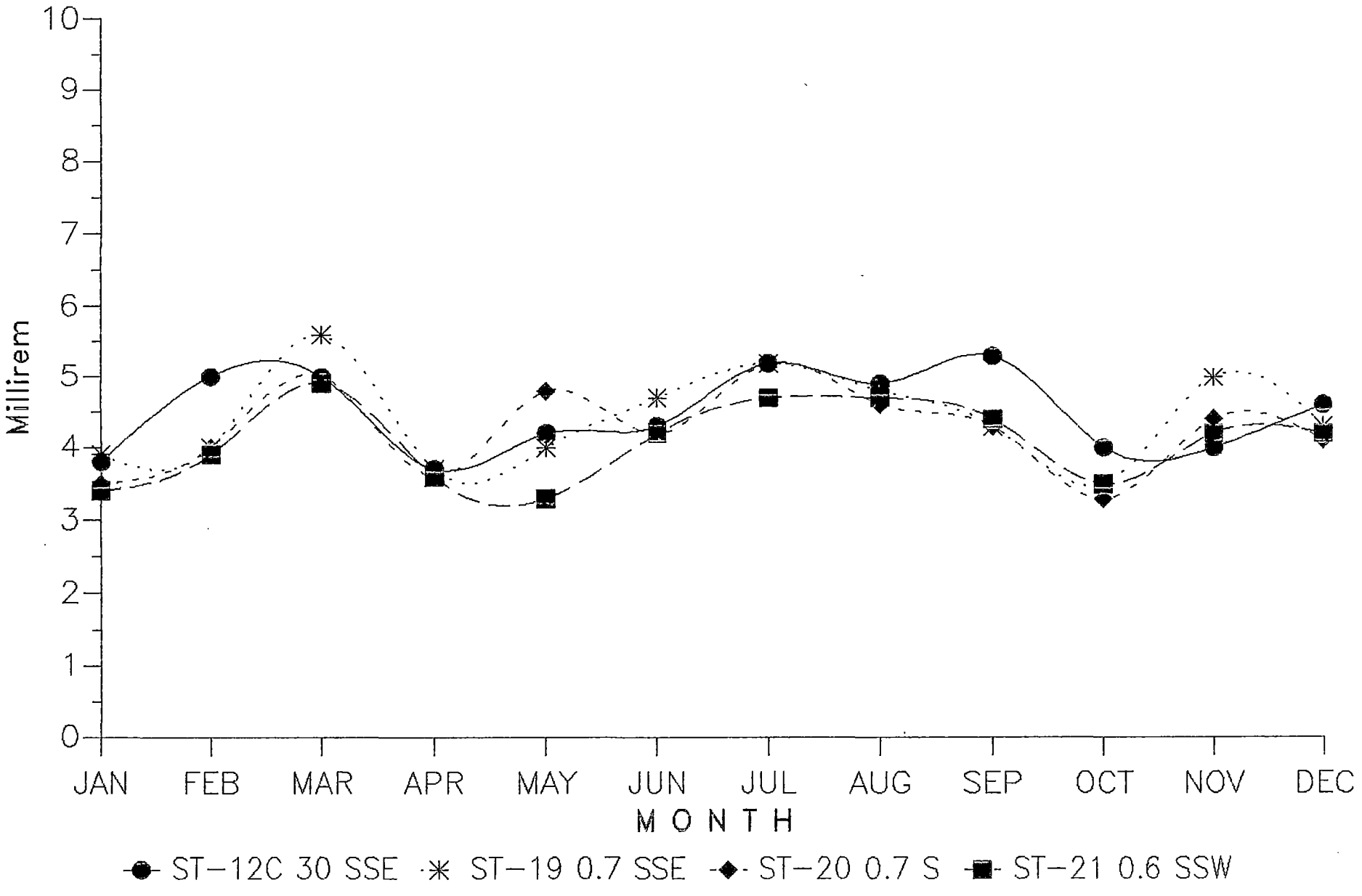
1992 PALISADES TLD's
ST11 Control vs ST01, ST16, ST17, ST18



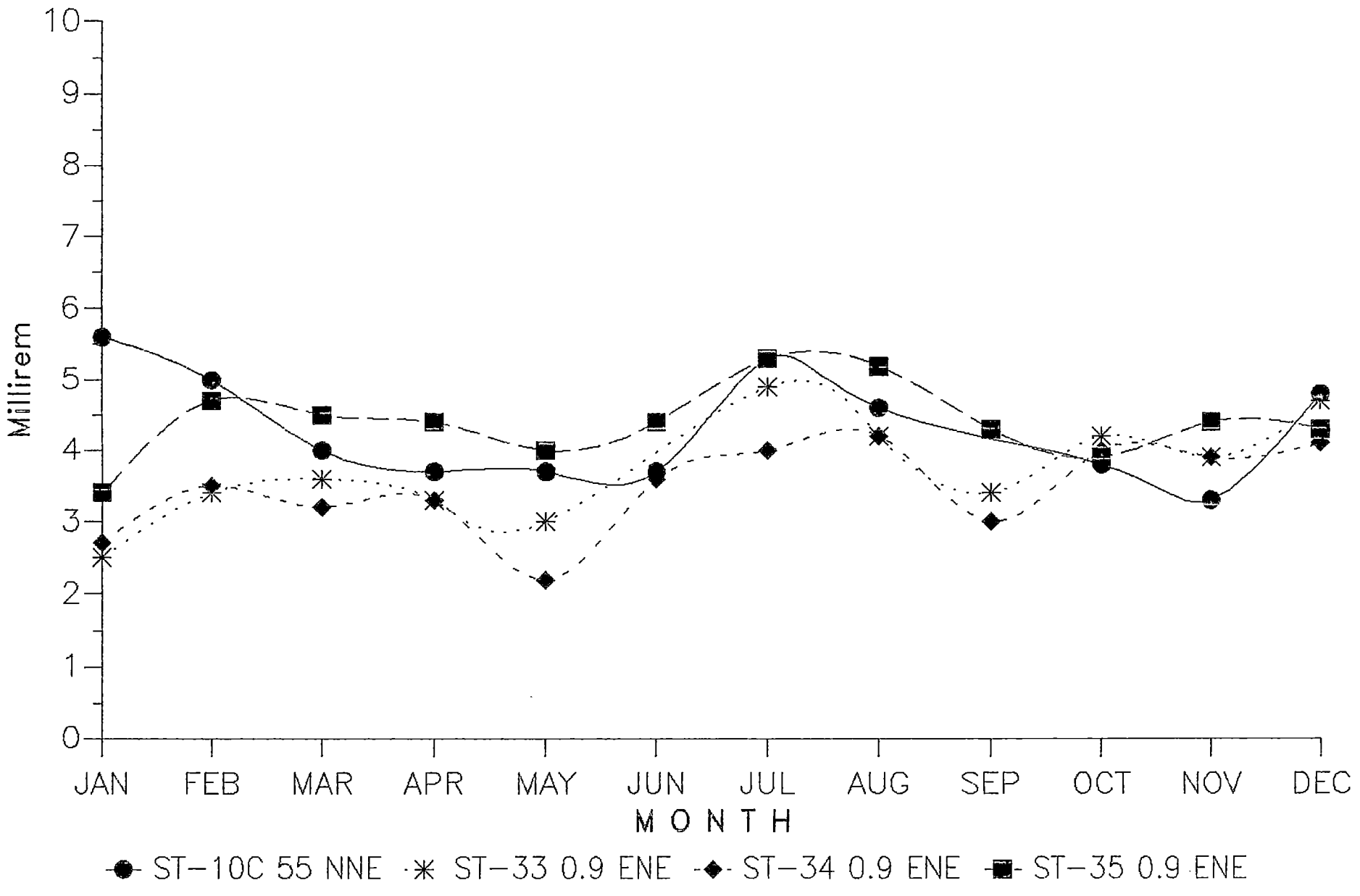
1992 PALISADES TLD's
ST12 Control vs ST02, ST03, ST04, ST09



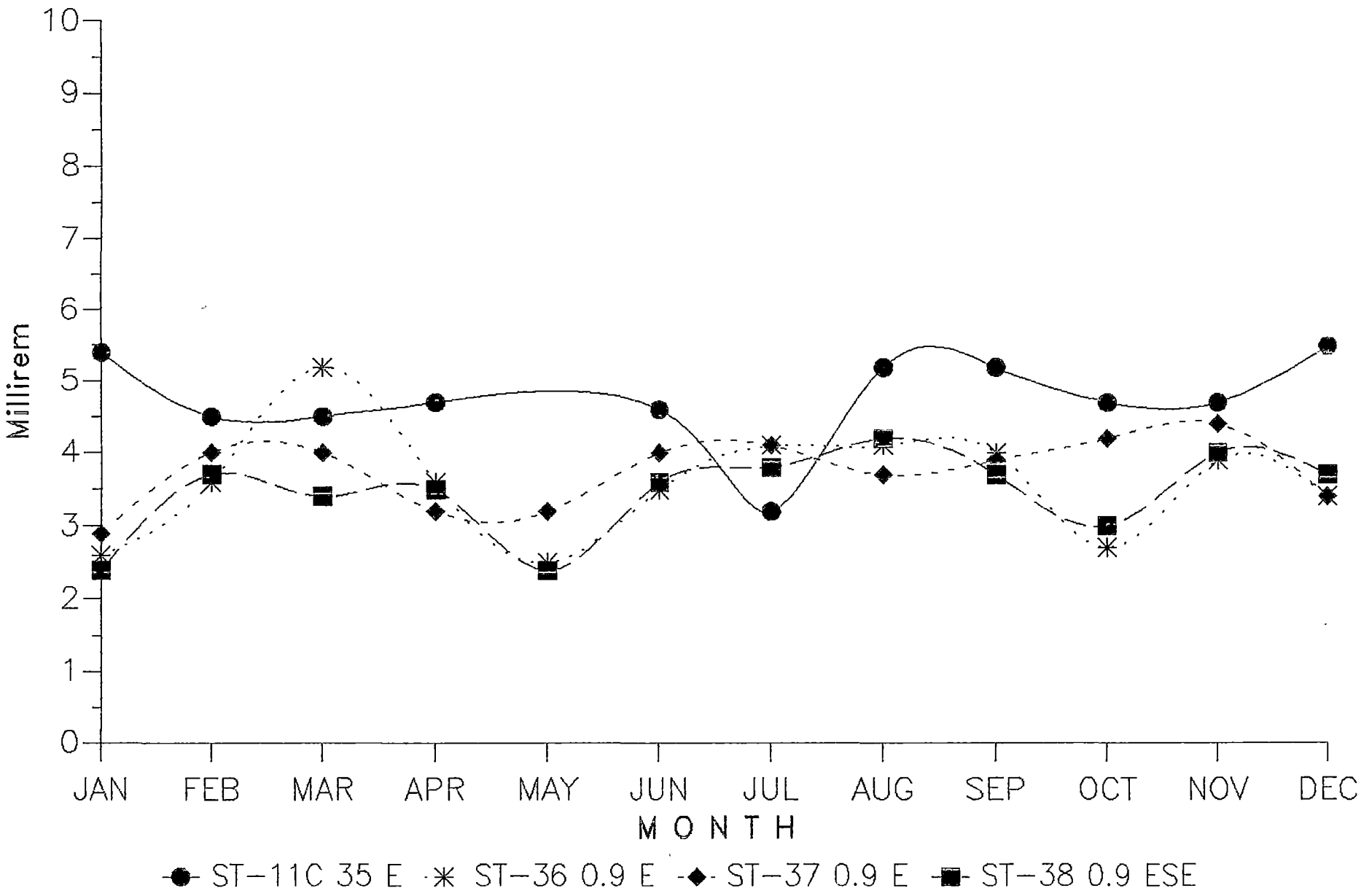
1992 PALISADES TLD's
ST12 Control vs ST19, ST20, ST21



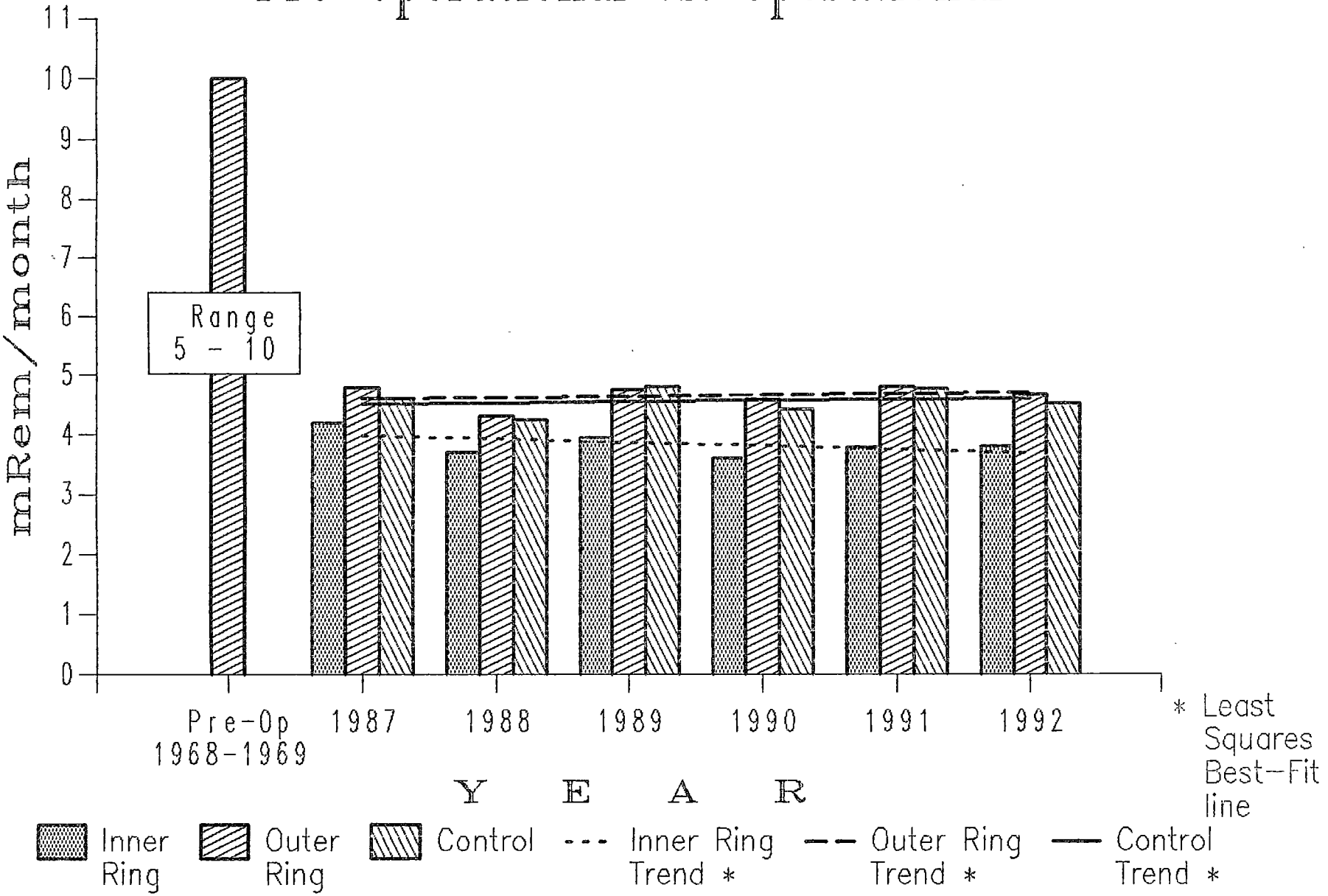
1992 PALISADES TLD's
ST10 Control vs ST33, ST34, ST35



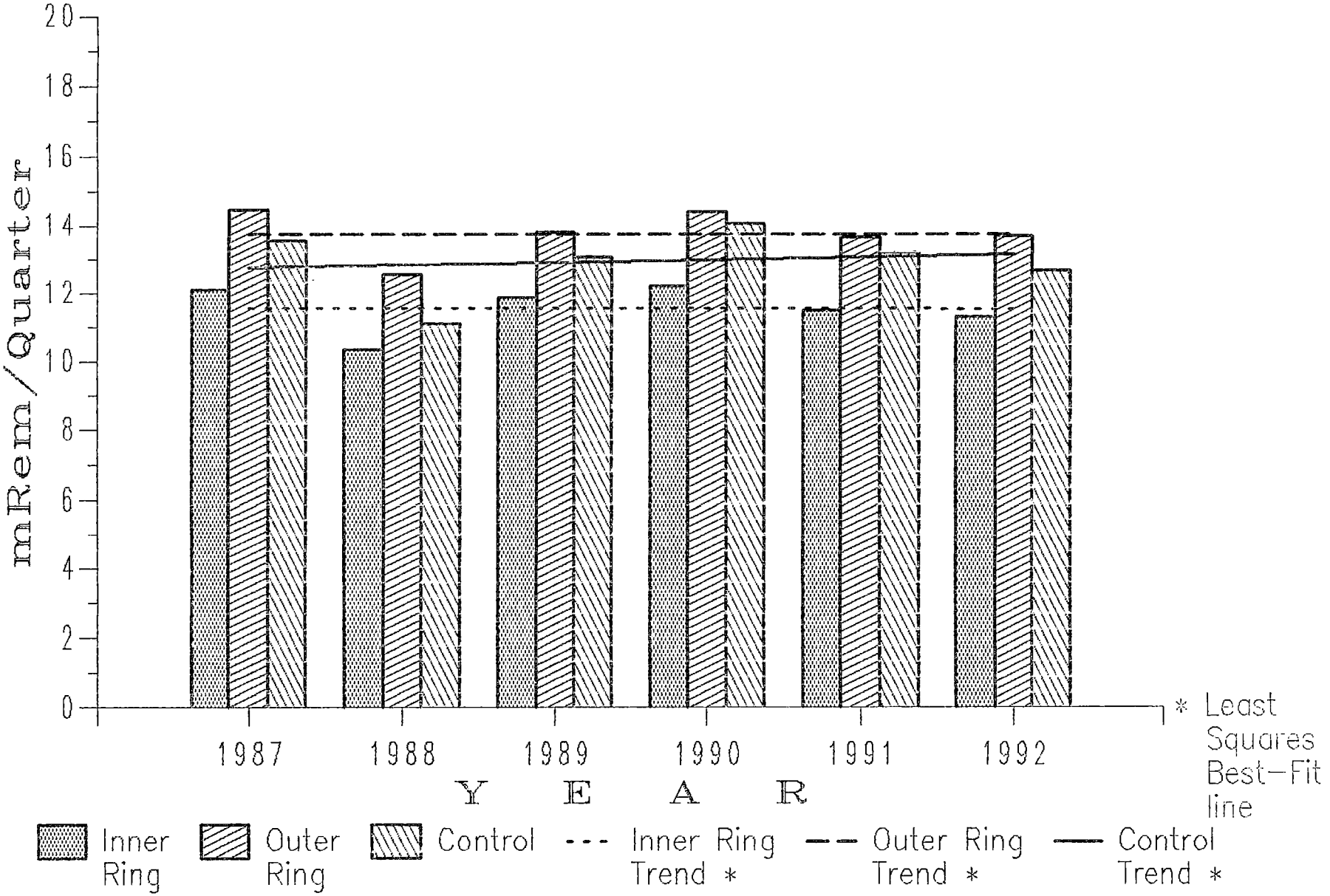
1992 PALISADES TLD's
ST11 Control vs ST36, ST37, ST38



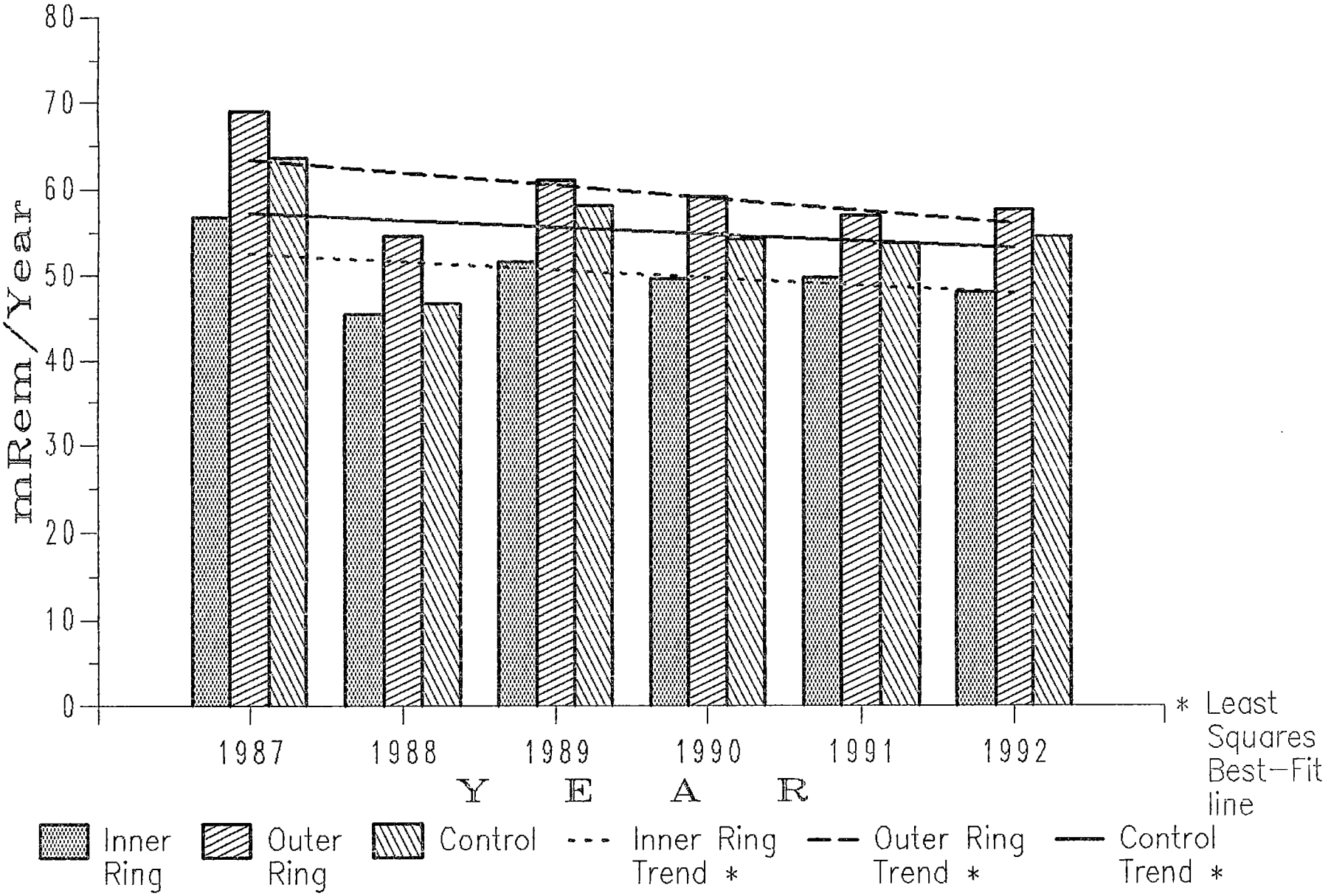
Palisades Monthly Thermoluminescent Dosimeters
Pre-Operational vs. Operational



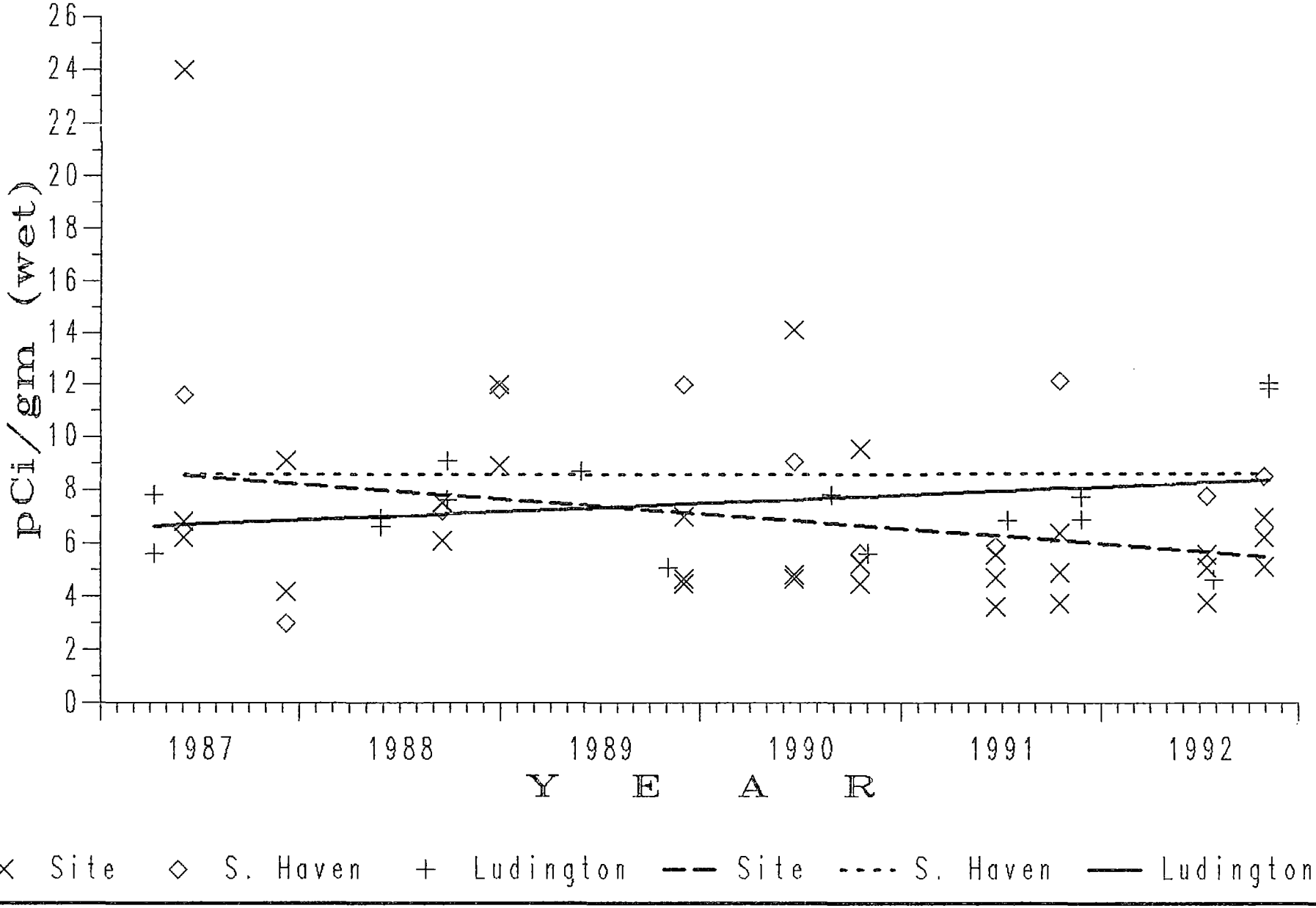
Palisades Quarterly Thermoluminescent Dosimeters
1987 - 1992



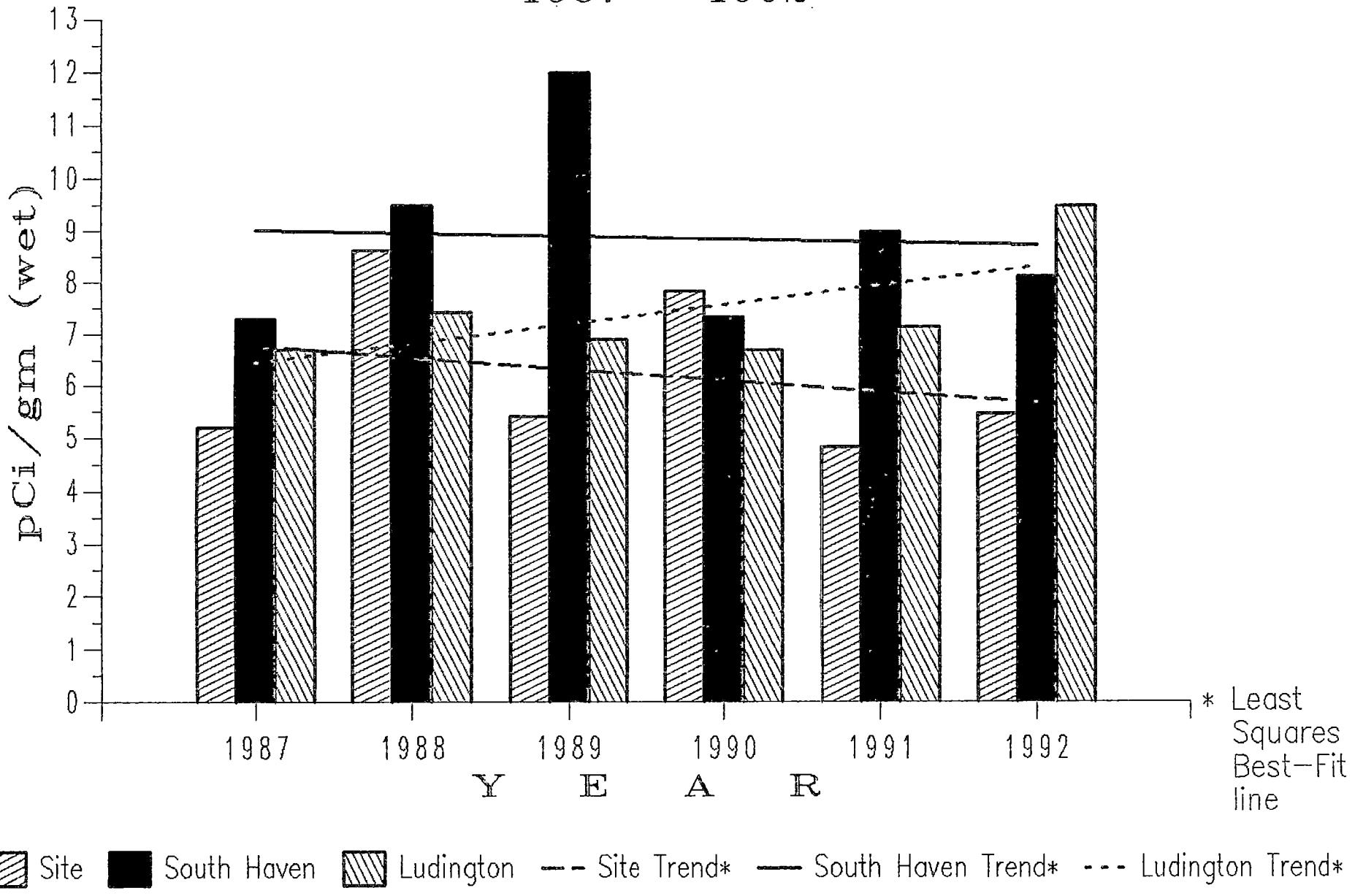
Palisades Annual Thermoluminescent Dosimeters
1987 - 1992



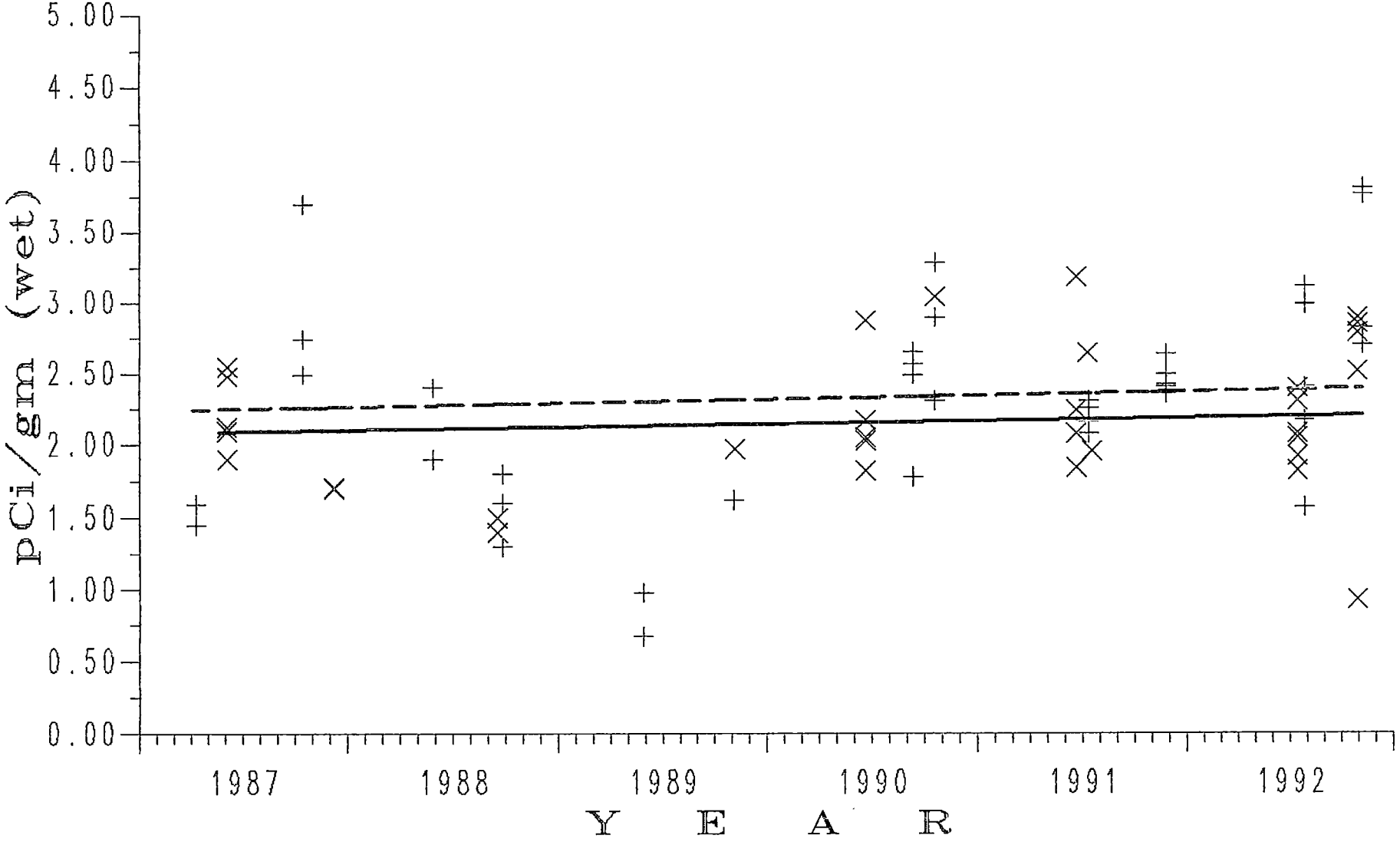
Palisades Sediments Gross Beta
1987 - 1992



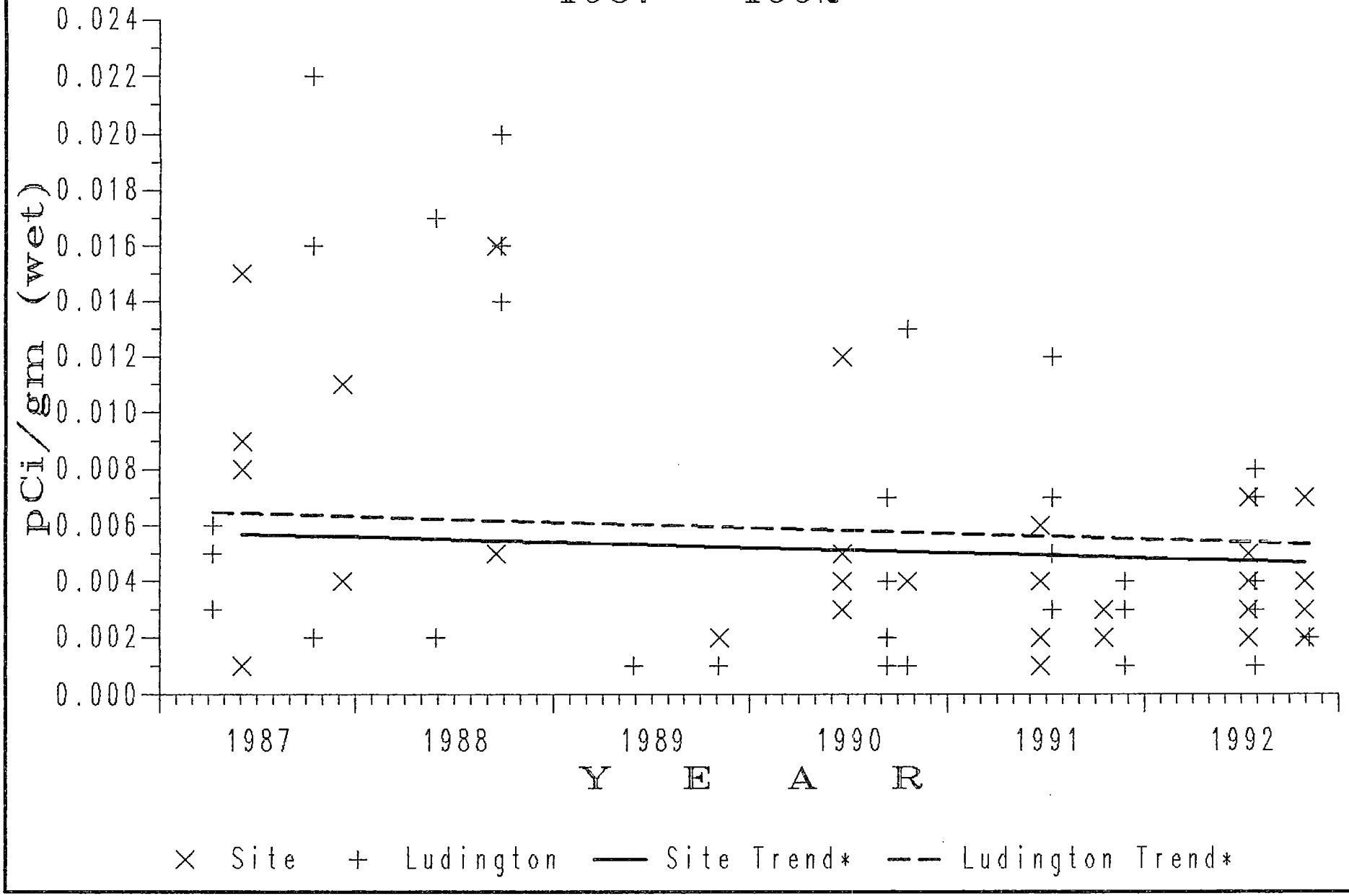
Palisades Sediments Gross Beta
1987 - 1992



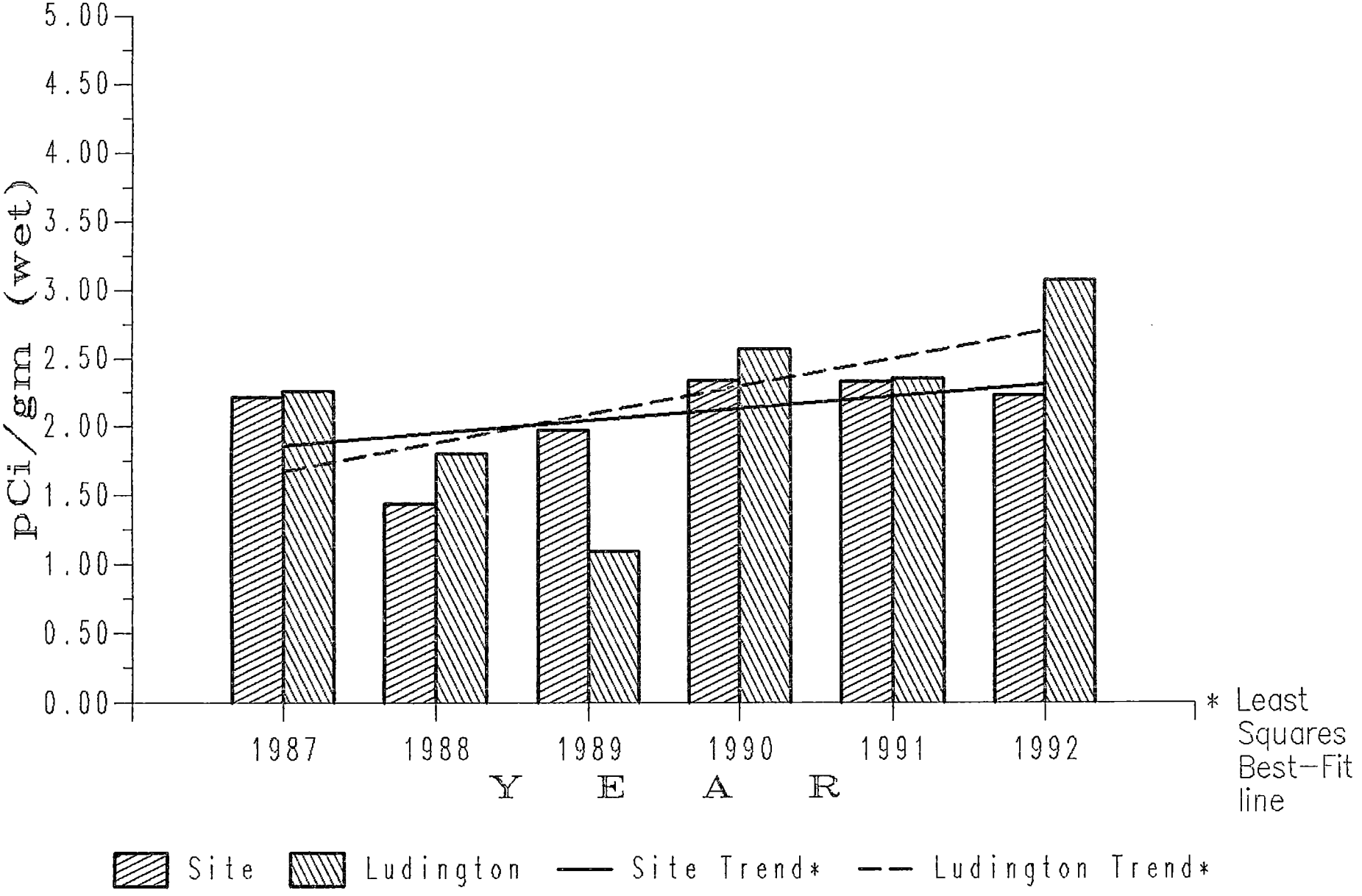
Palisades Fish Gross Beta
1987 - 1992



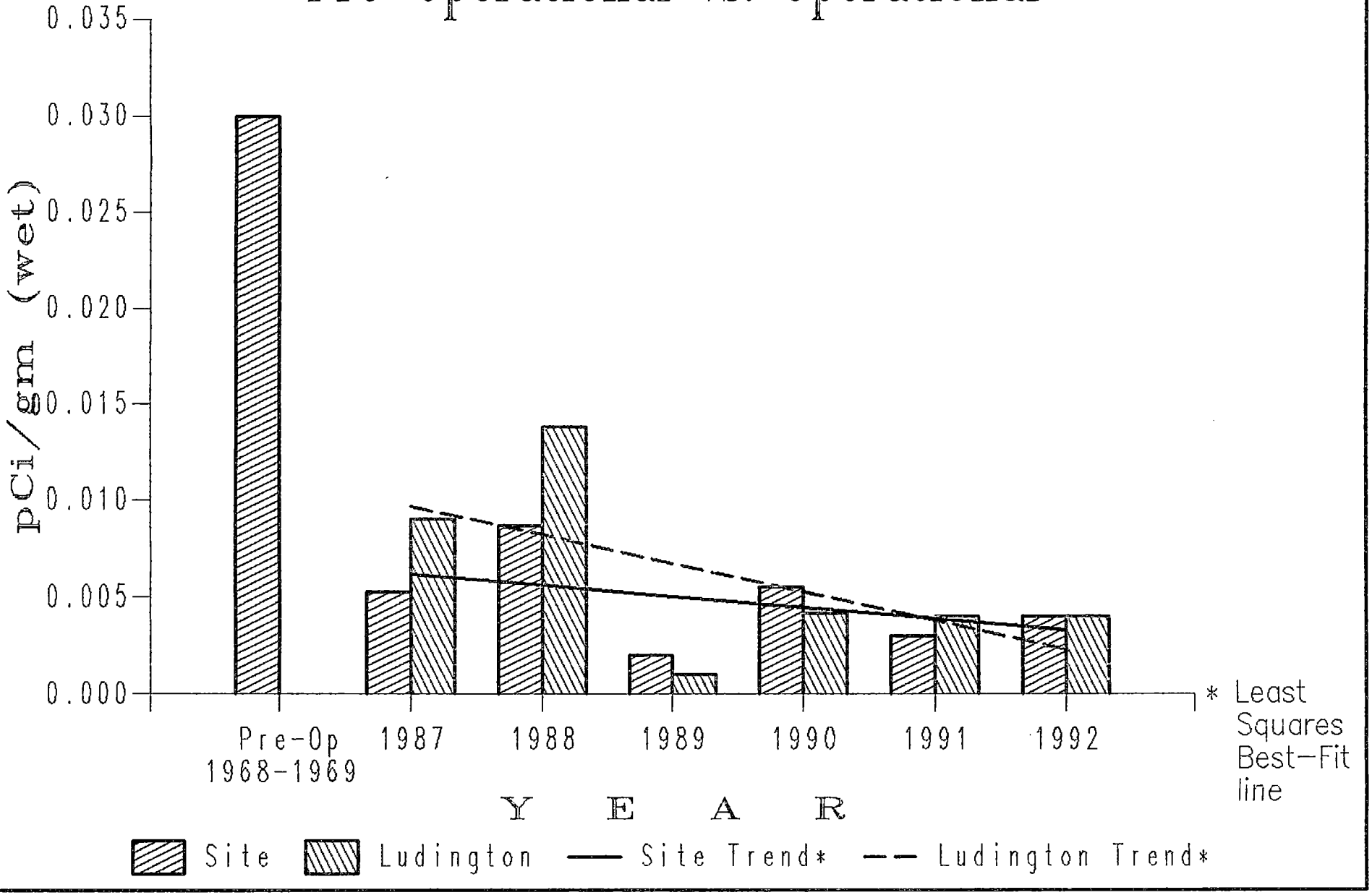
Palisades Fish Sr-90
1987 - 1992



Palisades Fish Gross Beta
1987 - 1992



Palisades Fish Sr-90
Pre-Operational vs. Operational



Palisades Fish Cs-137
Pre-Operational vs. Operational