SHOREHAM NUCLEAR POWER STATION
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

ANNUAL RADIOLOGICAL ENVIRONMENTAL

OPERATING REPORT

JANUARY 1 TO DECEMBER 31, 1992

ISSUED BY

NUCLEAR ENGINEERING DIVISION - LIPA

ENVIRONMENTAL ENGINEERING DEPARTMENT - LILCO

SHOREHAM NUCLEAR POWER STATION

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TELEDYNE ISOTOPES

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report summarizes the Shoreham Nuclear Power Station's (SNPS) Radiological Environmental Monitoring Program (REMP) operations and results for 1992.

The objective of the SNPS REMP is to monitor the radiation level and the radioactivity concentrations in the plant offsite environs, and to identify and measure those that are attributable to the operations and activities of the plant. When such plant-derived radiation level or radioactivity concentrations are found, verify that the projections of amount of releases and resultant doses to the surrounding population, as made by models and methods contained in the plant's Offsite Dose Calculation Manual (ODCM), are reasonable.

In the current non-operational, decommissioning phase of the plant, as well as in the earlier operational phase, REMP uses the preoperational baseline data to identify plant contributed radiation/radioactivities, and evaluates the effects of plant radioactive effluents, when detected, on the environment.

The SNPS REMP is designed to comply with the plant's Technical Specifications, ODCM and NRC Regulatory Guides as described in licensing basis documents.

The REMP data is acquired by sampling various media in the environment which are then analyzed for radiation levels and/or radioactivity concentrations present. Media sampled within the aquatic environment in 1992 included surface water, fish, invertebrates (squid, lobsters, etc.) and sediment. The atmospheric environment was sampled for airborne particulates throughout the year. Starting in June, locally grown food products were sampled monthly during the growing season. Direct radiation was measured using TLDs.

Radioactivity in environmental media varies from sample to sample as well as geographically; therefore, a number of sampling locations for each medium were selected using available meteorological, land and water usage data. Sampling locations are designated as either indicator or control locations. The indicator locations are placed close enough to Shoreham so that plant contributed radiation and radioactivity will be at their highest levels. The control sample locations are placed so that they will be beyond measurable influence of Shoreham and any other nuclear facilities. An exception to this occurred at the onshore site for REMP location 13G2, at the entrance to Port Jefferson Harbor. During preoperational testing, aquatic samples revealed the presence of low levels of iodine-131. An investigation revealed that the iodine-131 was from area hospitals treating patients for thyroid carcinoma. Thereafter, until 1990 a second onshore aquatic background location was sampled at the entrance to Mt. Sinai Harbor.

In 1992, as the decommissioning effort at Shoreham continued under the Possession Only License (POL), REMP remained at a reduced level from that required under the full power operating license, with decreased scopes in sampling and analyses. Surveillance of soil, milk, game, precipitation, airborne iodine, aquatic plants and ground water remained discontinued, as did radiochemistry analyses for Sr-89, Sr-90 and I-131. Monitoring of direct radiation by TLD continued at a reduced scope, being conducted at stations near the site boundaries only.

A number of radioactivity analyses were performed on each medium sampled. Not all samples underwent all types of radioanalyses; only those analyses appropriate for the particular medium sampled were performed. The analyses included gamma spectrometry, tritium concentration, gross beta and direct gamma radiations.

Dose calculations for the SNPS environs were performed using concentrations of radioactivity detected in the samples collected. In all cases the calculated doses were similar to background doses calculated for previous years. Therefore, no environmental radioactivity was identified as having originated from SNPS.

I. PROGRAM

THE PROGRAM

The Shoreham Nuclear Power Station's (SNPS) Radiological Environmental Monitoring Program (REMP) is conducted in compliance with NRC Regulatory Guide 4.15, the Defueled Safety Analysis Report (DSAR) 11.6, SNPS Technical Specification Section 6.7.4.b, and SNPS Offsite Dose Calculation Manual (ODCM) Section 3/4.12. The REMP was developed in general accordance with the NRC Radiological Assessment Branch Technical Position (BTP), Rev. 1, Nov. 1979, and findings in the Environmental Report (ER) 6.1.5. All samples were collected by personnel of the Long Island Lighting Company (Environmental Engineering Department) or contractors hired for the collection of aquatic samples. A synopsis of the sampling program can be found in Table 1. Maps and a description of sampling locations appear in Appendix B.

During 1992 sample analyses were performed by Teledyne Isotopes of Westwood, New Jersey (referred to throughout the text as either "TI" or "the laboratory"), under contract to LIPA. A summary of analytical results appears in Appendix A and individual analysis results in Appendix C. Aquatic sample collections were performed by LILCO's Environmental Engineering Department and Energy & Environmental Analysts Inc. (EEA Inc.) under contract to LIPA.

A. Objectives

The objectives of the radiological environmental monitoring program are:

1. Identify and measure radiation and radioactivity in the plant environs for the calculation of potential dose to the population.

2. Verify the effectiveness of in-plant measures used for controlling the release of radioactive materials.

3. Provide reasonable assurance that the predicted doses, based on effluent data, have not been substantially underestimated and are consistent with applicable standards.

4. Comply with regulatory requirements, SNPS Technical Specifications and ODCM requirements, and provide records to document compliance.

B. Sample Collection

1. Aquatic Environment

The aquatic environment at the SNPS site was examined by analyzing samples of surface water, fish, invertebrates, and sediment. Surface water samples were taken at three locations in May and

October using a Niskin bottle. The samples were placed in new polyethylene bottles following three rinses with the sample medium prior to collection. Samples of Bluefish (Pomatomus saltatrix), Winter Flounder (Pseudopleuronectes americanus), Windowpane (Scophthalmus aquosus), Sea Robin (Prionotus spp), and Little Skate (Raja erinacea) were taken by trawl, sealed in plastic bags, frozen, and shipped to the laboratory for analysis.

Invertebrate samples of American Lobster (Homarus americanus), Squid (Loligo pealeii) and Channeled Whelk (Busycon canaliculata) were collected by trawl. Channeled Whelk were also collected using pots. These invertebrate samples were sealed in plastic bags, frozen and shipped to the laboratory for analysis.

Beach sediment samples were also collected, sealed in plastic bags, frozen and shipped to the laboratory.

2. Atmospheric Environment

The atmospheric environment was examined by analyzing airborne particulates collected on Gelman Type A/E filters using low volume air samplers (approximately 1 cfm). The samplers used were equipped with a vacuum recorder for sample volume correction to ensure sample validity and to indicate any maintenance problems. Should the sampler lose vacuum due to a leak the vacuum level reading will drop to zero. Since this may occur without a corresponding loss of electric supply the exact time of the maintenance problem will be evident on the vacuum recorder chart.

Sample volumes were measured using dry gas meters and corrected for differences between the actual pressure seen by the volume meter and the average atmospheric pressure. Sample volumes are corrected to standard pressure using average weekly barometric pressure (measured at LILCO's Environmental Engineering Department, Melville) and air sampler vacuum readings. Time totalizers indicate the duration of time the sample was taken.

3. Terrestrial Environment

The terrestrial environment was examined by analyzing samples of locally grown food products during the growing season (June to November).

4. Direct Radiation

Direct radiation levels in the environs were measured with energy compensated calcium sulfate ($CaSO_4$:Dy) TLDs, each containing four separate readout areas. The TLDs are annealed by LILCO prior to

placement in the field. After the quarterly collection, the TLDs are packaged and shipped to the laboratory for analysis along with a control dosimeter, and new ones are placed for the next quarterly period.

C. Quality Assurance

Teledyne Isotopes has an extensive quality assurance program designed to ensure the precision and accuracy of the data generated. An Interlaboratory Comparison Program is conducted with the Environmental Protection Agency (EPA). The results of the Program analyses are listed in Appendix E. Participation in this program permits estimation of bias in TI results from the deviation from the "known" value given, or by comparison with means of all participants. The TI Quality Assurance Program for Radiological Monitoring is described in various TI publications (References 15, 16, 17).

Approximately 10 percent of TI's total analytical effort is spent on quality control including process quality control, instrument quality control, intra and interlaboratory cross-check, and comprehensive data review. In addition, LIPA specifically requires that two percent of its analyses be duplicated for further quality control cross check.

Additional information on the LIPA Quality Assurance Program is provided in NED 4170004, Quality Assurance Program for Radiological Environmental Monitoring Program, Shoreham Nuclear Power Station.

D. Data Interpretation

1. General

The analytical data generated during 1992 were routinely evaluated by the TI project leader who served as liaison with Long Island Lighting Company's Environmental Engineering Department and LIPA's Nuclear Engineering Division. Several factors are important in the interpretation of the data. These factors are discussed here to avoid repetition in sections that follow.

Within the data tables (Appendix C) an approximate 95 percent (±2 sigma) confidence interval is supplied for those data points above the lower limit of detection (LLD). These intervals represent the range of values into which 95 percent of repeated analyses of the same sample would fall. Tables C-13 and C-14 present typical and required LLDs, respectively.

Results for each type of sample were grouped according to the analysis performed. Means and standard deviations of these results are calculated when applicable. The calculated standard deviations of grouped data represent sample rather than analytical variability. For these calculations any values below LLD are considered to be at the LLD. As a result, the means are biased high and the standard deviations are biased low. When a group of data is completely composed of LLD values, averages are not calculated.

Grab sampling is a useful and acceptable procedure for taking environmental samples of a medium in which the concentration of radionuclides is expected to vary minimally with time or where intermittent sampling is deemed sufficient to establish the radiological characteristics of the medium. This method, however, is only representative of the sampled medium for that specific location and instant of time. As a result, variation of radionuclide concentrations in the samples will normally occur. Since these variations will tend to counterbalance one another, the extraction of averages based upon repetitive grab samples is valid.

2. Gamma Isotopic Analyses

SNPS ODCM Table 3.12.1-1 requires that analyses be performed on all media for gamma emitting radionuclides which may be attributable to effluents from the plant. These analyses are in addition to requirements for specific gamma emitters such as I-131, Cs-134, Cs-137, Ba-140, Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95 and Nb-95. Industry experience suggests that these are the most likely radionuclides to find their way into the environment from a BWR nuclear power plant. Gamma spectroscopy is expected to identify most other nuclides which may be discharged when the LLDs for specified gamma emitters are met by this technique.

Tables 3.1 and 3.2 of the Shoreham Final Environmental Statement list the calculated liquid and gaseous effluents by radionuclide in curies per year. These release rates assume normal operation of the plant, including anticipated operational occurrences. Those nuclides listed in Tables 3.1 and 3.2 which are not routinely observable by gamma spectroscopy and which are not specifically analyzed in other ways fall into two categories:

1. Those radionuclides with half-lives on the order of hours or minutes which cannot accumulate appreciably in the environment (Na-24, Cu-64, Zn-69m, Zn-69, Sr-91, Y-91m, Y-92, Y-93, Tc-99m, Rh-103m, Rh-105, Rh-106, Te-129, Te-131m, Te-131, I-132, I-135, Ba-137m, Pr-143, Ce-143, Pr-144 and W-187).

2. Those radionuclides with no gammas (P-32, Fe-55), those with a trivial percentage of their transitions going by gamma emissions (Y-91), or those with their primary gamma occurring at such a low energy and at such low abundance that it is not routinely observable in the presence of other gamma activity (Nd-147). With only 10 pCi of Nd-147 calculated to be released per year in Shoreham's liquid effluents, the nuclide cannot be an important contributor to dose.

E. Dose Assessment

The methodology for determining doses is similar for all pathways. Laboratory analyses from the REMP for each sample type are compiled. Data from all locations taken on the same date are averaged to obtain the most reliable approximation of the radioactivity concentration on that date for that sample type. The averages of all dates are then taken to provide the best approximation of radioactivity concentrations for the year.

When an average value has been obtained which represents a sample medium or an exposure pathway, it can then be used to calculate the dose for the year. Additional information, such as the quantity of fish, vegetables, etc., consumed per year by the maximum exposed individual is also needed to calculate the total dose (Reference 13).

The dose due to direct radiation exposure is monitored by TLDs. The laboratory results for TLDs are expressed in dose units directly and do not require any additional calculations.

The dose to the total body or to a specific organ is then calculated by the product of the radionuclide specific dose conversion factor for its applicable exposure pathway, the environmental sample radionuclide concentration, and the ingestion or inhalation rate of the sample or medium of interest. For example, the following general equation expresses this principle:

Dose (mRem/yr)	=	Concentration per sample	X	Quantity ingested per year	X	Dose factor

The sample concentration is typically expressed in pCi/l or pCi/kg. For the ingestion pathway, the quantity ingested or consumed per year is expressed in kg/year or l/year. Finally, the dose conversion factor is expressed in terms of mRem/pCi ingested or inhaled.

F. Program Summary

Table 1 summarizes information on the REMP as performed during the period of this report, January 1 through December 31, 1992. During this reporting period 444 separate analyses were performed on 418 environmental samples.

Appendix A summarizes the analytical results obtained from the SNPS REMP. The format used is that recommended in NRC Radiological Assessment Branch Technical Position (BTP), Rev. 1, Nov. 1979. Appendix B describes the sample coding system, which specifies sample type and relative locations at a glance. In addition, pertinent information on individual sampling locations, and maps which show their geographic location, are included.

Appendix C presents the analytical results of the Shoreham Nuclear Power Station's Radiological Environmental Monitoring Program for the period January 1 through December 31, 1992. Appendix D contains a synopsis of the analytical procedures used in the REMP.

Results of the EPA interlaboratory comparison program can be found in Appendix E. Appendix F lists the program exceptions for 1992, and Appendix G reports the Land Use Census performed by LILCO's Environmental Engineering Department during 1992 in the vicinity of the SNPS. Common and scientific names of species collected in the program are presented in Appendix H.

TABLE 1

SYNOPSIS OF THE SHOREHAM NUCLEAR POWER STATION'S RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM FOR THE PERIOD JANUARY 1 THROUGH DECEMBER 31, 1992

SAMPLE TYPE	SAMPLING FREQUENCY	LOCATIONS	NUMBER COLLECTED	ANALYSIS	ANALYSIS FREQUENCY	NUMBER PERFORMED
Aquatic Environment						
Surface Water	Semiannual	3	6	H-3	Semiannual	6
				Gamma	Semiannual	6
Fish	Semiannual	3	25	Gamma	Semiannual	25
Invertebrates	Semiannual	3	19	Gamma	Semiannual	19
Sediment - Beach	Semiannual	1	2	Gamma	Semiannual	2
Atmospheric Environment						
Airborne Particulates	Weekly	5	262	Gross Beta	Weekly	262
				Gamma	Quarterly	20
Terrestrial Environment						
Food Products	Monthly	5	32	Gamma	Monthly	32
Direct Radiation						
TLDs	Quarterly	18	72	Gamma Dose	Quarterly	72

II. RESULTS AND DISCUSSION

RESULTS AND DISCUSSION

The analytical results for the reporting period of January 1 through December 31, 1992, have been divided into four categories: aquatic, atmospheric, terrestrial, and direct radiation. The individual samples and analyses within each category display the unique radiological characteristics of that type of environment. Analytical results of the REMP are summarized in Appendix A. The data for individual analyses are presented in Appendix C.

A. Aquatic Environment

The aquatic environment in the vicinity of SNPS consists primarily of Long Island Sound. The radiological characteristics were studied by analyzing samples of surface water, Winter Flounder, Windowpane, Sea Robin, Bluefish, Little Skate, American Lobster, Squid, Channeled Whelk, and sediment. The samples were collected by LILCO's Environmental Engineering Department and Energy & Environmental Analysts Inc. (EEA Inc.) under contract to LIPA.

1. Surface Water (Table C-1)

Semiannual surface water samples were taken at three locations and were analyzed for tritium and gamma emitters.

There was no detectable tritium in any surface water sample. This compares consistently with the 1991 tritium results, which were also all below the detection limit.

Naturally occurring potassium-40 was measured in all six semiannual samples over three locations with an average of 227 pCi/l and a range between 128 and 310 pCi/l, as compared with 1991's average of 188 pCi/l and a range between 143 and 235 pCi/l. No other gamma activity above the detectable levels was measured in the six surface water samples as analyzed by gamma spectroscopy.

2. Fish (Table C-2)

Twenty-four fish samples were collected at three locations and the edible portions analyzed for gamma emitters. Gamma spectrometry showed potassium-40 present in all samples with an average concentration of 3590 pCi/kg wet and a range between 1630 to 5720 pCi/kg wet, comparing with 1991's average of 3451 pCi/kg wet and a range between 1540 and 4940 pCi/kg wet. Cesium-137 was not detected in any samples during 1992. This compares well with 1991 and 1990 when cesium-137 was detected in three fish samples.

3. Invertebrates (Table C-3)

Nineteen invertebrate samples, comprised of lobsters, squid, and whelk, were collected at three locations and analyzed for gamma emitters. Gamma spectrometry showed detectable levels of potassium-40 in all samples, ranging from 595 to 4440 pCi/kg wet with an average activity of 2905 pCi/kg wet. These compare well to 1991's average potassium-40 activity of 3176 pCi/kg wet. Thorium-228 was not detected during 1992 and this compares favorably with the one measurement of thorium in 1991.

4. Sediment (Table C-4)

Two beach sediment samples were collected at one location and analyzed for gamma emitters. Both samples had measurable activities of naturally occurring potassium-40 with an average activity of 1845 pCi/kg dry and a range of 1790 to 1900 pCi/kg dry. This is lower than the average concentration of potassium-40 of 2350 pCi/kg dry measured in 1991. Thorium-228 was measured in both samples with an average activity of 132 pCi/kg dry and a range of 101 to 163 pCi/kg dry. This also compares favorably with the average thorium concentration of 164 pCi/kg dry measured during 1991. All other gamma emitters were below the lower limits of detection.

B. Atmospheric Environment

The atmospheric environment in the vicinity of the SNPS was examined by analyzing samples of airborne particulates at five sampling locations. Airborne particulate filters were collected weekly and analyzed for beta emitters. Quarterly composites from each station were analyzed for gamma emitters.

1. Airborne Particulates (Tables C-5 and C-6)

Beta-emitter concentrations ranged from 0.005 to 0.029 pCi/m^3 with an annual average for the five sampling locations of 0.016 pCi/m^3 (Table C-5). Of the 262 measurements one was below the detection limit, nominally 0.003 pCi/m^3. Figure 1 shows the average weekly gross beta fluctuations in airborne particulates from all stations for 1992. Figure 2 represents the average monthly gross beta results in airborne particulates from January 1, 1977 through December 31, 1992.

Results of gamma spectrometry (Table C-6) showed detectable levels of naturally occurring beryllium-7 in all twenty samples. The average beryllium-7 activity in the quarterly analyses was 0.101 pCi/m^3 with a range of 0.050 to 0.152 pCi/m^3. Naturally occurring potassium-40 was observed in two samples with an average concentration of 0.008 pCi/m^3 and a range of 0.007 to 0.009 pCi/m^3. Cesium-137 was not measured during 1992. All other gamma emitters were below the lower limit of detection.

C. Terrestrial Environment

1. Food Products (Table C-7)

Thirty-two fruit and vegetable food products grown locally were collected and analyzed at both control and indicator locations, including tomatoes, potatoes, cabbage, lettuce, carrots, stringbeans, apples, strawberries, and corn. All samples contained naturally occurring potassium-40 with an average of 2545 pCi/kg wet and a range of 592 to 6410 pCi/kg wet. Also naturally occurring beryllium-7 was observed in six samples (3 from indicator locations and 3 from control locations) with an average concentration of 162 pCi/kg wet and a range of 42.5 to 464 pCi/kg wet. All other gamma emitters were below the lower limits of detection. The detection limit varied from 3 to 100 pCi/kg wet.

D. Direct Radiation (Table C-8)

Direct radiation measurements were taken quarterly at 18 locations during 1992, using $CaSO_4$:Dy thermoluminescent dosimeters (TLDs). TLDs were used to detect radiation levels near ground level in the vicinity of the Shoreham site due to terrestrial and cosmic gamma ray emitters and possible SNPS contributed direct radiation. Figure 3 presents a comparison of average TLD results from 1977 to 1992.

All TLD results presented in this report have been normalized to a standard month (30.4 days) to eliminate the apparent differences caused by the variations in exposure period. The average of the quarterly exposures of all 18 locations was 3.4 mR/standard month. This is less than quarterly values, 4.1 and 4.3 mR/standard month, respectively, measured during the preoperational years 1983 and 1984.

Annual average results of all quarters at the same locations, as well as of all locations for each quarter, are given in Table C-8 with 95% confidence limits for the mean value, except for the average of all locations and all quarters. For this last value, the 95% limits about any individual measurement, i.e., ±0.5 mR/std. month, is given.

E. Dose Assessment

Initially, all positive concentrations of radionuclides in indicator samples, as shown in Appendix A, were considered for inclusion in the dose calculation. In an attempt to factor out as much of the contribution due to natural and man-made background radiation as possible, indicator and control sample results were compared. If the control location results were greater than those at the indicator location, the indicator sample results were not included in the dose assessment.

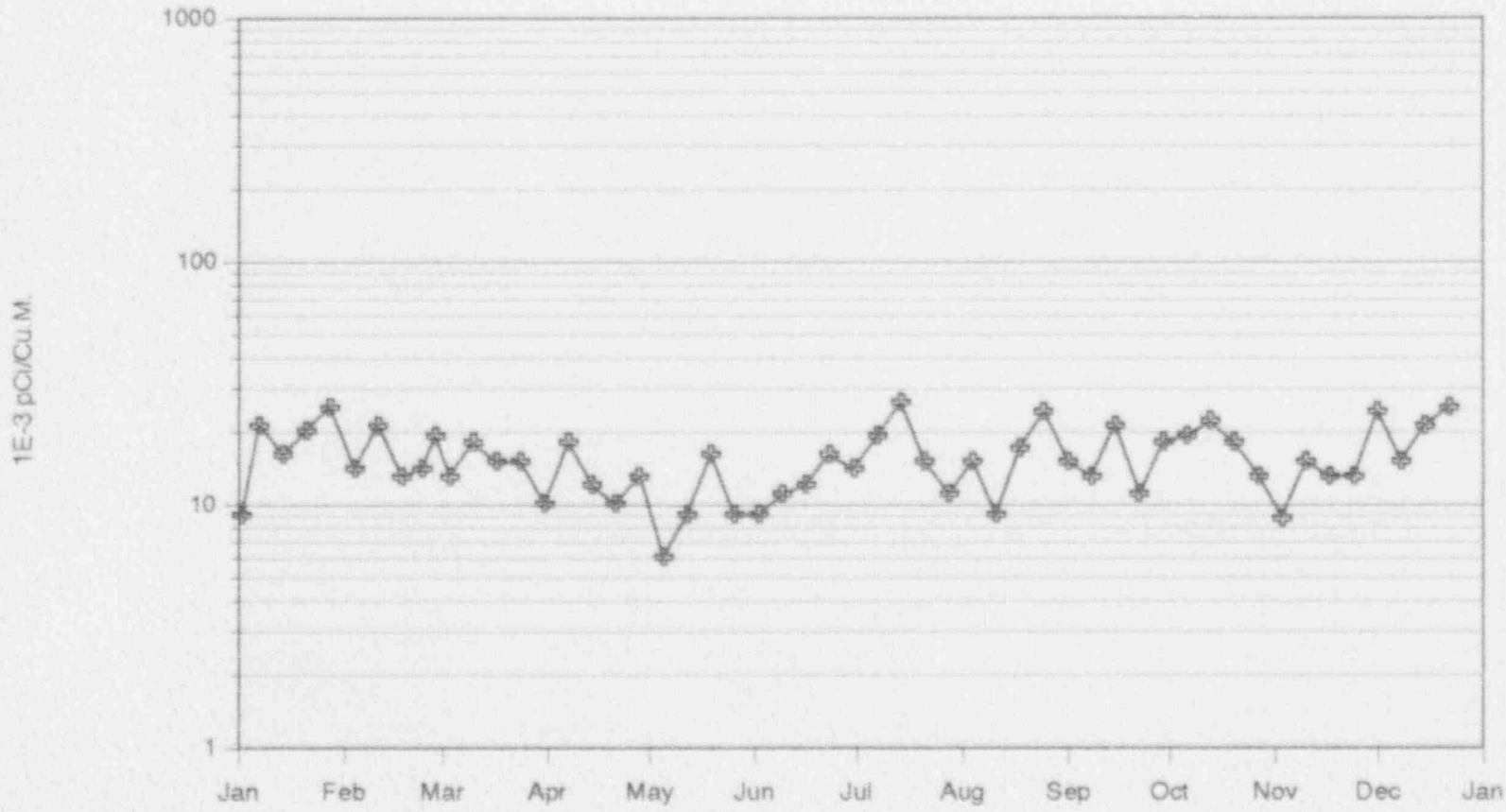
Surface water from Long Island Sound was not considered as a significant human exposure pathway and therefore, not considered in the dose assessment. The dose due to standing on soil/sediment was not calculated since this is accounted for in the direct radiation dose.

Beryllium-7, potassium-40, radium-226, radium-228 and thorium-228 are all naturally occurring isotopes and not likely to be produced as a result of the operation of Shoreham, so they were excluded. Cesium-137 was not detected in samples during 1992.

Comparison of environmental concentrations found in 1992 shows that they are consistent with those of 1983. For 1992, therefore, there is no discernible dose components other than those from natural sources in the environment.

FIGURE 1

AVERAGE WEEKLY GROSS BETA RESULTS IN AIRBORNE PARTICULATES



1992

FIGURE 2


COMPARISON OF AVERAGE MONTHLY GROSS BETA RESULTS IN AIRBORNE PARTICULATES
1000
100
10
1
1E-3 pCi/Cu. M.
1/77
1/78
1/79
1/80
1/81
1/82
1/83
1/84
1/85
1/86

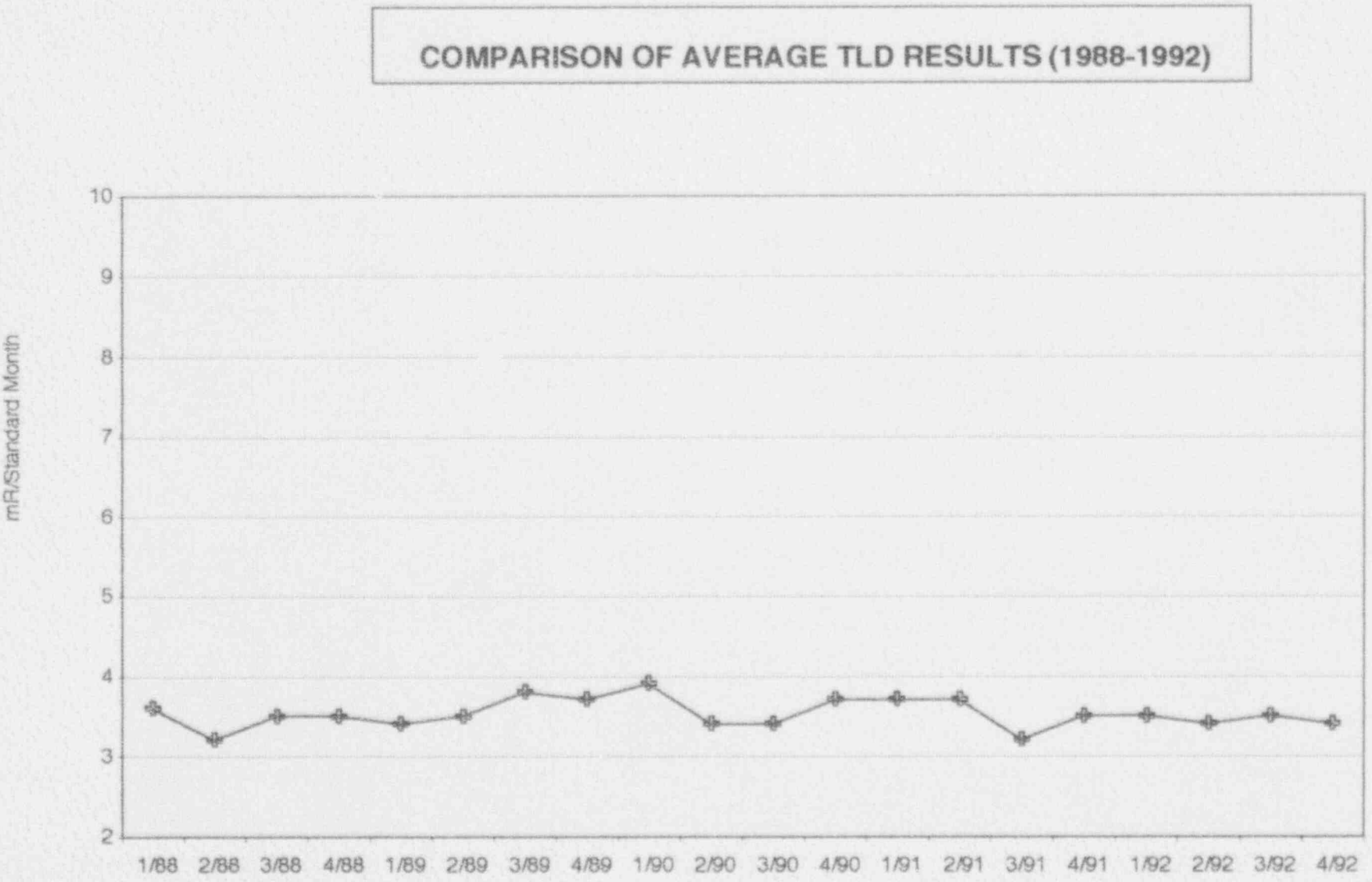
FIGURE 2 (Cont.)

COMPARISON OF AVERAGE MONTHLY GROSS BETA RESULTS IN AIRBORNE PARTICULATES

FIGURE 3

COMPARISON OF AVERAGE TLD RESULTS (1977-1988)

FIGURE 3 (Cont.)



III. CONCLUSIONS

CONCLUSIONS

The unit was defueled in August 1989, and has subsequently been in a non-operating condition. On February 29, 1992, the Shoreham plant license was transferred from LILCO to LIPA. On June 11, 1992, NRC issued LIPA a Decommissioning Order. The REMP operation continued through these plant ownership and license changes in 1992 without interruption.

Analyses of environmental samples show results consistent with those found during the preoperational years of 1983 and 1984. In addition, comparison of results reveals little difference between indicator and control locations. Therefore, no isotopes could be identified as having originated from SNPS.

Sensitive indicators revealed minute quantities of radioactive fallout from the October 1980 atmospheric nuclear weapons test by the Peoples Republic of China and the Chernobyl accident in addition to radioactivity remaining from two decades of atmospheric testing.

Aside from these anomalies in the environment, expected normal background radioactivity has been measured in REMP samples. Aquatic and terrestrial samples were analyzed and reflected the normal background radiation found in the environment. The atmospheric environment was sampled for airborne particulates and Figure 1 shows weekly gross beta results in airborne particulates from January through December 1992. Figure 2 shows the average monthly gross beta results in airborne particulates from February 1977 to December 1992. Direct radiation levels were relatively low and approximately the same at all locations. Figure 3 shows the average quarterly TLD results in mR/standard month from January 1977 to December 1992.

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IV. REFERENCES

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(28) Defueled Safety Analysis Report (DSAR), Rev. 4, July 1992.

(29) Decommissioning Plan Order, June 1992.

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

1992

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SHOREHAM NUCLEAR POWER STATION — DOCKET NO. 50-322

SUFFOLK COUNTY, NEW YORK — JANUARY 1 to DECEMBER 31, 1992

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		LOWER LIMIT OF DETECTION (LLD) (1)	ALL INDICATOR LOCATIONS(3) MEAN (2) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(2) RANGE	CONTROL LOCATION(3) MEAN(2) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Surface Water (pCi/liter)	H-3	6	100	-(0/4) -	N/A	N/A	-(0/2) -	0
	Gamma	6						
	K-40		60	213(4/4) (128-285)	13G2 13.2 mi W	255(2/2) (199-310)	255(2/2) (199-310)	0
	Cs-137		4	-(0/4) -	N/A	N/A	-(0/2) -	0
Fish (pCi/kg wet)	Gamma	24						
	K-40		300	3406(17/17) (1630-5130)	13G2 13.2 mi W	4037(7/7) (3160-5720)	4037(7/7) (3160-5720)	0
	Th-228		7	-(0/17) -	N/A	N/A	-(0/7) -	0
	Cs-137		5	-(0/17) -	N/A	N/A -	-(0/7) -	0

(1) The LLDs quoted are the lowest actual LLDs obtained in the various media during the reporting period. Typical LLDs were determined for each nuclide as found on Tables C-13 and C-14.
(2) Means calculated using detectable measurements only. Fractions of detectable measurements in parentheses.
(3) Indicator and control locations are noted in Appendix B, Table B-1.
(4) These are radiochemistry lab analyses. I-131 by gamma analyses are not included as separate analyses here. See Table C-11 for more details.

TABLE A-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SHOREHAM NUCLEAR POWER STATION DOCKET NO. 50-322

SUFFOLK COUNTY, NEW YORK JANUARY 1 to DECEMBER 31, 1992

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (1)	ALL INDICATOR LOCATIONS(3) MEAN (2) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(2) RANGE	CONTROL LOCATION(3) MEAN(2) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Aquatic Invertebrates (pCi/kg wet)	Gamma 19						
	Be-7	200	-(0/14)	N/A	N/A	-(0/5)	0
	K-40	300	3010(14/14) (595-4440)	14C1 2.1 mi WNW	3079(7/7) (595-4440)	2612(5/5) (2110-3100)	0 0
	Cs-137	4	-(0/14)	N/A	N/A	-(0/5)	0
	Th-228	7	-(0/14)	N/A	N/A	-(0/5)	0

(1) The LLDs quoted are the lowest actual LLDs obtained in the various media during the reporting period. Typical LLDs were determined for each nuclide as found on Tables C-9 and C-10.
(2) Means calculated using detectable measurements only. Fractions of detectable measurements in parentheses.
(3) Indicator and control locations are noted in Appendix B, Table B-1.

TABLE A-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SHOREHAM NUCLEAR POWER STATION DOCKET NO. 50-322

SUFFOLK COUNTY, NEW YORK JANUARY 1 to DECEMBER 31, 1992

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (1)	ALL INDICATOR LOCATIONS(3) MEAN (2) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(2) RANGE	CONTROL LOCATION(3) MEAN(2) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Sediment (Beach) (pCi/kg dry)	Gamma 2						
	K-40	900	1845(2/2) (1790-1900)	2A4 0.4 mi NNE	1845(2/2) (1790-1900)	-(0/0) -	0
	Cs-137	8	-(0/2) -	N/A	N/A	-(0/0) -	0
	Ra-226	200	-(0/2) -	N/A	N/A	-(0/0) -	0
	Th-228	60	132(2/2) (101-163)	2A4 0.4 mi NNE	132(2/2) (101-163)	-(0/0) -	0

(1) The LLDs quoted are the lowest actual LLDs obtained in the various media during the reporting period. Typical LLDs were determined for each nuclide as found on Tables C-13 and C-14.
(2) Means calculated using detectable measurements only. Fractions of detectable measurements in parentheses.
(3) Indicator and control locations are noted in Appendix B, Table B-1.

TABLE A-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SHOREHAM NUCLEAR POWER STATION DOCKET NO. 50-322

SUFFOLK COUNTY, NEW YORK JANUARY 1 to DECEMBER 31, 1992

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (1)	ALL INDICATOR LOCATIONS(3) MEAN (2) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(2) RANGE	CONTROL LOCATION(3) MEAN(2) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Airborne Particulates (10^{-3}pCi/m^3)	Gross Beta 262	4	15.5(208/209) (4.6-29)	7B1 1.4 mi SE	16.0(53/53) (7.5-28)	14.9(53/53) (6.8-29)	0
	Gamma 20						
	Be-7	-	103(16/16) (63.8-152)	6S2 0.1 mi ESE	109(4/4) (69.8-143)	93.9(4/4) (50.4-135)	0
	K-40	5	7.17(1/16) -	11G1 16.6 mi SW	8.53(1/4) -	8.53(1/4) -	0
	Cs-134	0.4	-(0/16) -	N/A	N/A	-(0/4) -	0
	Cs-137	0.4	-(0/16) -	N/A	N/A	-(0/4) -	0

(1) The LLDs quoted are the lowest actual LLDs obtained in the various media during the reporting period. Typical LLDs were determined for each nuclide as found on Tables C-13 and C-14.
(2) Means calculated using detectable measurements only. Fractions of detectable measurements in parentheses.
(3) Indicator and control locations are noted in Appendix B, Table B-1.
(4) These are radiochemistry lab analyses. I-131 by gamma analyses are not included as separate analyses here. See Table C-11 for more details.

TABLE A-1 (Cont.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SHOREHAM NUCLEAR POWER STATION DOCKET NO. 50-322

SUFFOLK COUNTY, NEW YORK JANUARY 1 to DECEMBER 31, 1992

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION (LLD) (1)	ALL INDICATOR LOCATIONS(3) MEAN (2) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(2) RANGE	CONTROL LOCATION(3) MEAN(2) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Direct Radiation (mR/Standard month)	Gamma Dose Quarterly 72	1.5	3.45(64/64) (3.0-4.1)	12A1 0.9 mi WSW	3.95(4/4) (3.8-4.0)	3.45(8/8) (3.3-3.6)	0
Food Products (pCi/kg wet)	Gamma 32						
	K-40	300	2498(23/23) (592-6410)	12H2 32.1 mi WSW	2663(9/9) (1320-3320)	2663(9/9) (1320-3320)	0
	Be-7	50	196(3/23) (46.0-464)	8B1 1.2 mi SSE	271(2/18) (77.3-464)	129(3/9) (42.5-181)	0
	Cs-137	6	-(0/23)	N/A	N/A	-(0/9)	0

(1) The LLDs quoted are the lowest actual LLDs obtained in the various media during the reporting period. Typical LLDs were determined for each nuclide as found on Tables C-13 and C-14.
(2) Means calculated using detectable measurements only. Fractions of detectable measurements in parentheses.
(3) Indicator and control locations are noted in Appendix B, Table B-1.
(4) These are radiochemistry lab analyses. I-131 by gamma analyses are not included as separate analyses here. See Table C-11 for more details.

APPENDIX B

SAMPLE DESIGNATION AND SAMPLING LOCATIONS

APPENDIX B

Sample Designation

LIPA's Radiological Environmental Monitoring Program (REMP) identifies samples by a three part code. The first two letters are the power station identification code, in this case "SN". The next three letters are for the media sampled.

SWA	=	Surface Water (Long Island Sound)	MLK	=	Cow Milk
AQF	=	Fish (1)	GMK	=	Goat Milk
AQI	=	Invertebrates (1)	PWA	=	Potable Water (ground water)
AQS	=	Sediment	FPV	=	Food Products (1)
APT	=	Airborne Particulates	FPF	=	Fruit
AIO	=	Airborne Iodine	IDM	=	Immersion Dose (TLD)

The last four symbols are a location code based on direction and distance from the site. Of these, the first two represent each of the sixteen angular sectors of 22 1/2 degrees centered about the reactor site. Sector one is divided evenly by the north axis, and other sectors are numbered in a clockwise direction, i.e., 2=NNE, 3=NE, 4=ENE, etc. The next digit is a letter which represents the radial distance from the plant:

S	=	On site location	E	=	4-5 miles off site
A	=	0-1 miles off site	F	=	5-10 miles off site
B	=	1-2 miles off site	G	=	10-20 miles off site
C	=	2-3 miles off site	H	=	>20 miles off site
D	=	3-4 miles off site			

The last number is the location numerical designation within each sector and zone, e.g., 1,2,3,.....for example, the designation SN-SWA-3C1 would indicate a sample in the SNPS program SN, consisting of surface water SWA, which had been collected in the 22-1/2 degree sector centered on the northeast axis (3) between the site boundary and 2-3 miles off site (C). The number 1 indicates that this is sampling station No. 1 in the designated area.

Sampling Locations

All sampling locations and specific information about the individual locations are given in Table B-1. Tables B-2 through B-5 list the sampling locations and media required by Technical Specifications.

(1) A more specific means of classification will be noted in the comment section of each laboratory report for these samples. For example, AQI will be designated, in the sample description, as aquatic invertebrate. However, the comment section will specify the sample type by the generally accepted common name of the sample involved. In this case, clam, lobster, crab or other aquatic invertebrate would be listed in the comment section.

Maps B-1, B-2 and B-3 show the locations of 1992 sampling stations with respect to the site. These maps are tracings of portions of larger maps prepared by LILCO's Survey Division after an extensive land survey of REMP monitoring locations. Additional information can be obtained by referring to the Site and Vicinity Map of the Shoreham Nuclear Power Station (Map B-2), the map of Long Island and Connecticut Shore (Map B-3) and by contacting either LILCO's Environmental Engineering Department or Survey Division.

TABLE B-1

Sampling Locations Required By SNPS Offiste Dose Calculation Manual

SECTOR		LOCATION CODE	LOCATION	SAMPLE TYPE	
N		1S1	Beach east of intake, 0.3 mi. N	IDM	
NE		3S1	Site Boundary, 0.1 mi. NE	APT,IDM	
ENE		4S1	Site Boundary, 0.1 mi. ENE	IDM	
E		5S2	Site Boundary, 0.1 mi. E	IDM	
ESE		6S2	Site Boundary, 0.1 mi. ESE	APT,IDM	
S		9S1	Service Road, 0.2 mi. S	IDM	
W		13S3	Site Boundary, 0.2 mi. W	IDM	
WNW		14S2	St. Joseph's Villa, 0.4 mi. WNW	IDM	
NW		15S1	Beach west of intake, 0.3 mi. NW	IDM	
NNW		16S2	Site Boundary, 0.3 mi. NNW	IDM	
NNE		2A2	West end of Creek Road, 0.2 mi. NNE	APT,IDM	
NNE		2A4	Beach, 0.4 mi. NNE	AQS	
SE		7A2	North Country Road, 0.7 mi. SE	IDM	
SSE		8A3	North Country Road, 0.6 mi. SSE	IDM	
SSW		10A1	North Country Road, 0.3 mi. SSW	IDM	
SW		11A1	Site Boundary, 0.3 mi. SW	IDM	
WSW		12A1	Meteorological Tower, 0.9 mi. WSW	IDM	
SE		7B1	Overhill Road, Wading River, 1.4 mi.	APT,SE	IDM
SSE		8B1	Farm stand 1.2 mi. SSE	FPV,FPF	
ESE		6B21	Farm stand 1.8 mi ESE	FPV,FPF	
NE		3C1	Outfall area, aquatic location B-5, 2.9 mi. NE	AQF,AQI, SWA	
WNW		14C1	Outfall area, aquatic location B-4, 2.1 mi. WNW	SWA,AQF, AQI	
SW	C	11G1	MacArthur Substation, 16.6 mi. SW	APT,IDM	
WSW	C	12G1	Central Islip Substation, 19.9 mi. WSW	IDM	
W	C	13G2	Background aquatic location, 13.2 mi. W	SWA AQF,AQI	
WSW	C	12H1	Farm, 25.8 mi. WSW	FPV,FPF	
WSW	C	12H2	Farm, 32.1 mi. WSW	FPV, FPF	

C Denotes Control Location

REMP LOCATIONS REQUIRED BY
SNPS OFFSITE DOSE CALCULATION MANUAL

TABLE B-2

Airborne Particulate Monitoring Stations

Location Codes NUREG-0473	SHOREHAM REMP	Location Description
A1	6S2	Site Boundary, 0.1 mi. ESE
A2	2A2	West end of Creek Road, 0.2 mi. NNE
A3	3S1	Site Boundary, 0.1 mi., NE
A4	7B1	Overhill Road, 1.4 mi. SE
A5	11G1	MacArthur Substation, 16.6 mi. SW

TABLE B-3

Waterborne Monitoring Stations

Location Codes NUREG-0473	SHOREHAM REMP	Location Description
WA1	13G2	Surface, background area, 13.2 mi. W
WA2	14C1	Surface, outfall area, 2.1 mi. WNW
WA3	3C1	Surface, outfall area, 2.9 mi. NE
Wd1	2A4	Sediment, Beach, 0.4 mi. NNE

TABLE B-4

Ingestion Monitoring Stations

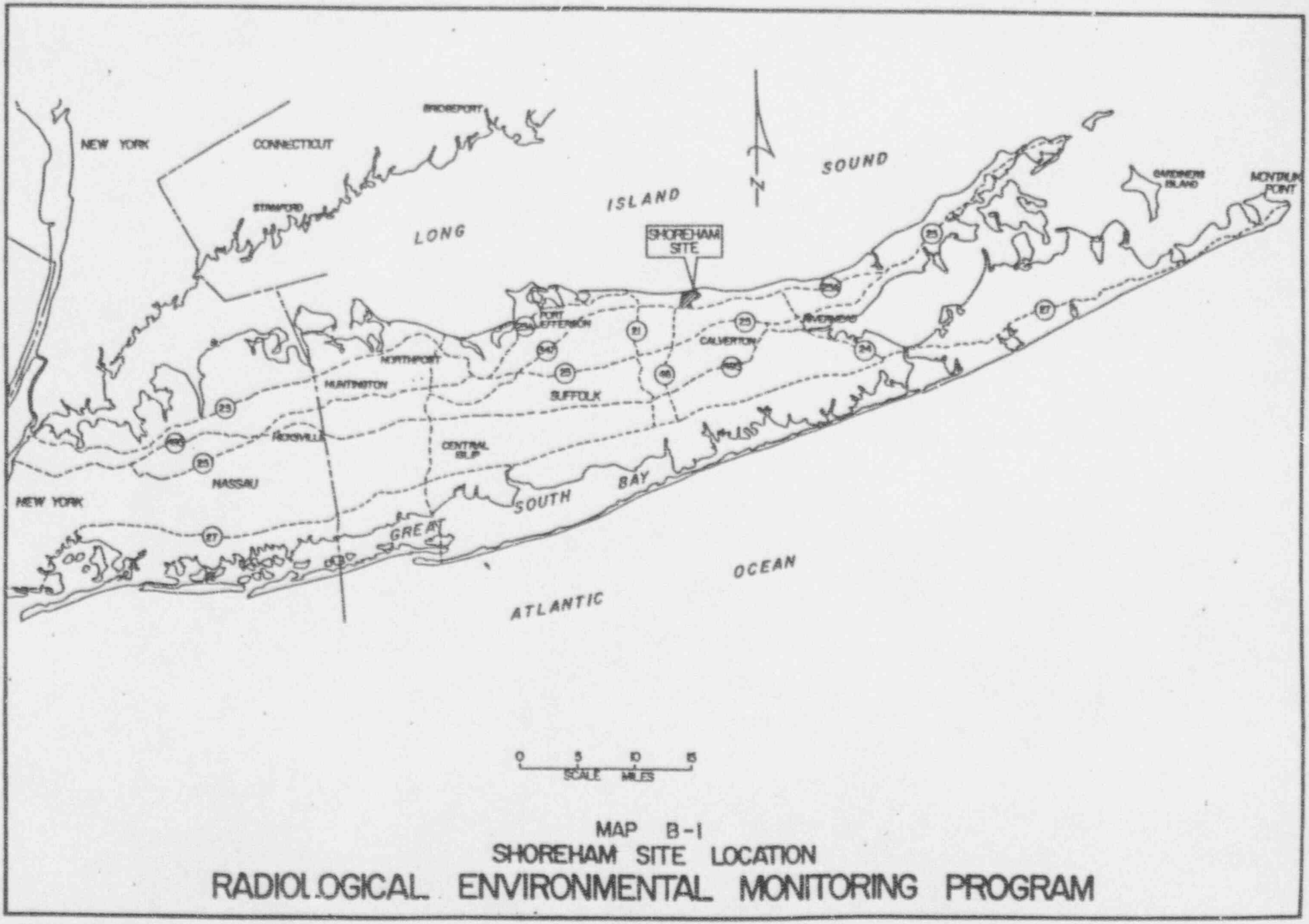
Location Codes NUREG-0473	SHOREHAM REMP	Location Description
Ib1	3C1	Fish and Invertebrates, outfall area, 2.9 mi. NE
Ib2	14C1	Fish and Invertebrates, outfall area, 2.1 mi. WNW
Ib3	13G2	Fish and Invertebrates, background, 13.2 mi. W
Ic1	8B1	Local Farm, 1.2 mi. SSE
Ic2	6B21	Local Farm, 1.8 mi. ESE
Ic3	12H1	Background Farm, 25.8 mi. WSW

REMP LOCATIONS REQUIRED BY
SNPS OFFSITE DOSE CALCULATION MANUAL

TABLE B-5

Direct Radiation Monitoring Stations

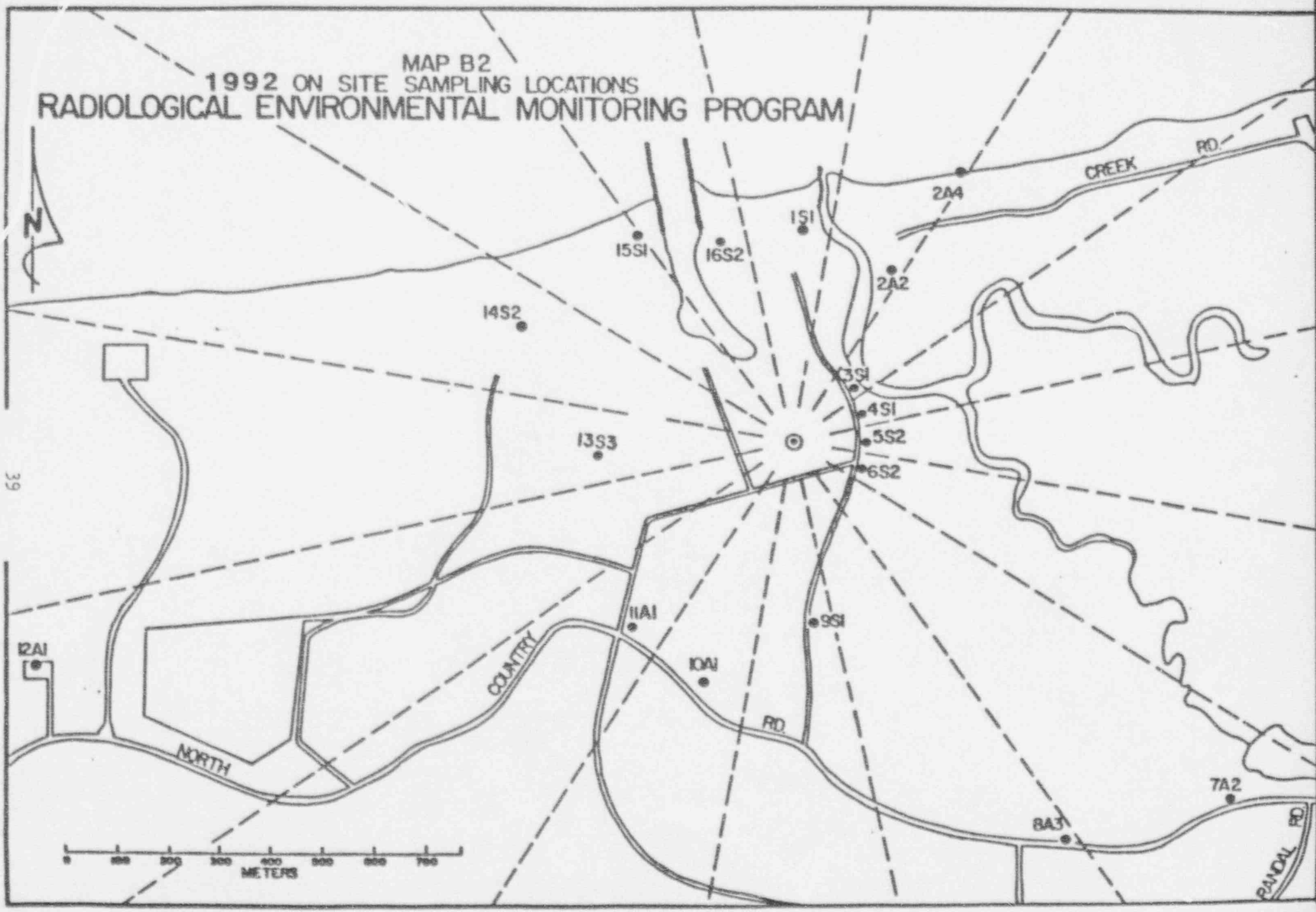
Location Codes NUREG-0473	SHOREHAM REMP	Location Description
DR1	1S1	Beach east of intake, 0.3 mi. N
DR2	2A2	West end of Creek Road, 0.2 mi. NNE
DR3	3S1	Site Boundary, 0.1 mi. NE
DR4	4S1	Site Boundary, 0.1 mi. ENE
DR5	5S2	Site Boundary, 0.1 mi. E
DR6	6S2	Site Boundary, 0.1 mi. ESE
DR7	7A2	North Country Road, 0.7 mi. SE
DR8	8A3	North Country Road, 0.6 mi. SSE
DR9	9S1	Service Road SNPS, 0.2 mi. S
DR10	10A1	North Country Road, 0.3 mi. SSW
DR11	11A1	Site Boundary, 0.3 mi. SW
DR12	12A1	Meteorological Tower, 0.9 mi. WSW
DR13	13S3	Site Boundary, 0.2 mi. W
DR14	14S2	St. Joseph's Villa, 0.4 mi. WNW
DR15	15S1	Beach west of intake, 0.3 mi. NW
DR16	16S2	Site Boundary, 0.3 mi. NNW
DR30	12G1	Central Islip Substation, 19.9 mi. WSW
DR31	11G1	MacArthur Substation, 16.6 mi. SW

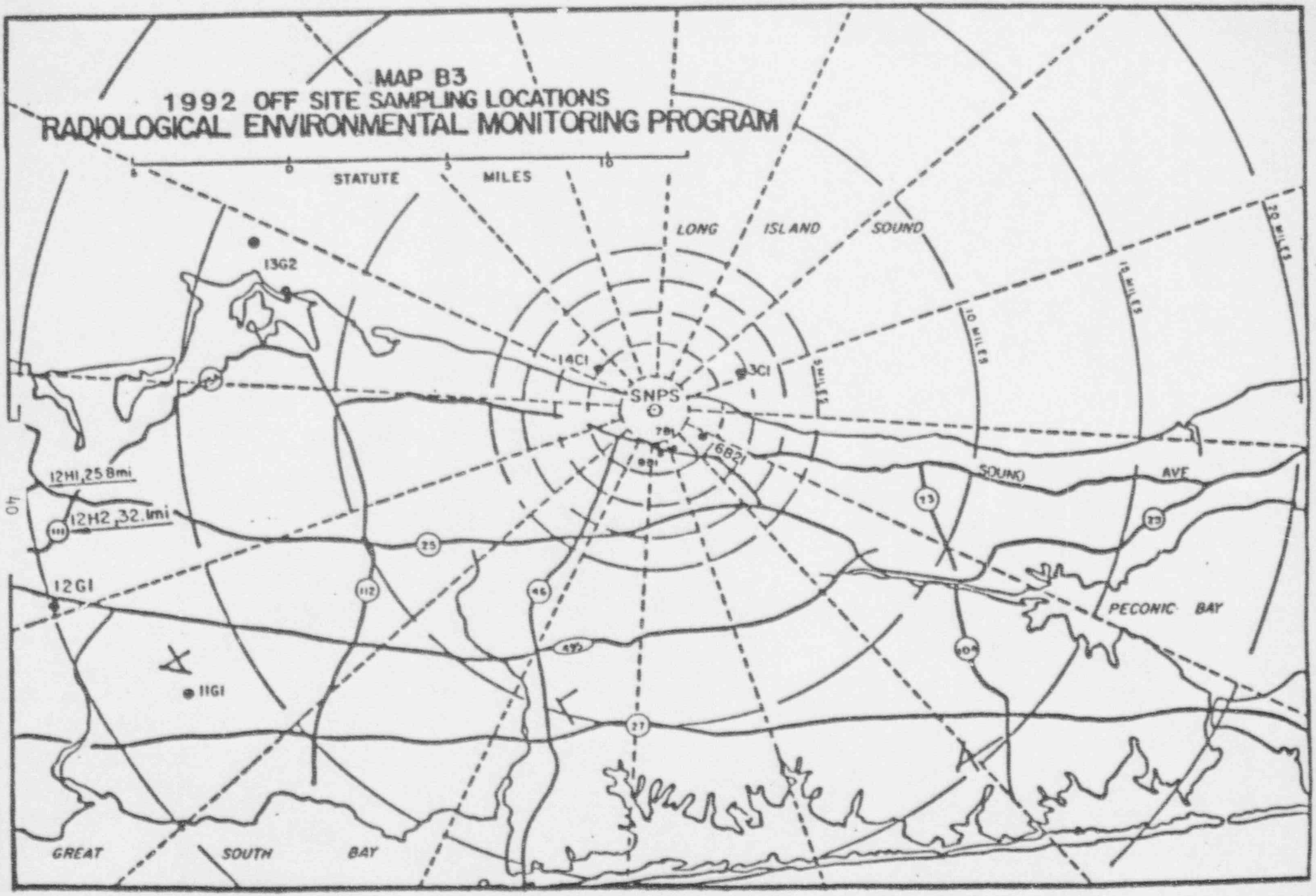


MAP B-1

SHOREHAM SITE LOCATION

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM


MAP B2
1992 ON SITE SAMPLING LOCATIONS
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
N
15S1
16S2
1S1
2A4
CREEK
RD.
2A2
14S2
3S1
4S1
5S2
6S2
13S3
11A1
9S1
10A1
12A1
COUNTRY
RD.
NORTH
7A2
8A3
RANDAL
RD.
METERS


MAP B3
1992 OFF SITE SAMPLING LOCATIONS
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
STATUTE MILES
LONG ISLAND SOUND
13G2
14CI
3CI
SNPS
12HI, 25.8mi
12H2, 32.1mi
12GI
11GI
6B2I
PECONIC BAY
GREAT SOUTH BAY

APPENDIX C

DATA TABLES

TABLE C-1

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN SURFACE WATER SAMPLES

Results in Units of pCi/l ± 2 sigma

LOCATION CODE	COLLECTION DATE	H-3	I-131**	K-40	Cs-137
SN-SWA-3C1	05/26/92	< 100	< 7	128 ± 30	< 4
	10/14/92	< 100	< 10	285 ± 45	< 4
SN-SWA-13G2 (c1)	05/26/92	< 100	< 8	199 ± 42	< 4
	10/14/92	< 100	< 10	310 ± 40	< 4
SN-SWA-14C1	05/26/92	< 100	< 7	225 ± 40	< 4
	10/14/92	< 100	< 10	215 ± 37	< 5
Average ± 2 s.d.				**227 ± 130**	

* All other gamma emitters not listed were <LLD; typical LLDs are given in Tables C-9 and C-10.
** I-131 by gamma spectroscopy.
(c1) Denotes Control Location.

TABLE C-2

CONCENTRATIONS OF GAMMA EMITTERS* IN FISH SAMPLES

Results in Units of pCi/kg (wet) ± 2 sigma

LOCATION CODE	COLLECTION DATE	DESCRIPTION	K-40	Cs-137	Th-228
SN-AQF-3C1	05/20/92	Little Skate	2620 ± 330	< 30	< 50
	05/20/92	Windowpane	3580 ± 480	< 40	< 60
	05/20/92	Winter Flounder	4400 ± 550	< 30	< 60
	10/08/92	Little Skate	1630 ± 370	< 30	< 70
	10/08/92	Little Skate	1800 ± 490	< 30	< 70
	10/08/92	Sea Robin	3790 ± 490	< 30	< 50
	10/08/92	Windowpane	3180 ± 530	< 40	< 80
	10/08/92	Flounder	3270 ± 410	< 30	< 50
	10/08/92	Bluefish	4180 ± 520	< 40	< 60
SN-AQF-14C1	05/19/92	Winter Flounder	5130 ± 510	< 20	< 30
	05/19/92	Winter Flounder	4850 ± 530	< 30	< 40
	05/19/92	Little Skate	3880 ± 690	< 50	< 100
	05/19/92	Windowpane (a)			
	10/06/92	Sea Robin	3700 ± 500	< 30	< 60
	10/06/92	Winter Flounder	4100 ± 440	< 20	< 30
	10/06/92	Windowpane	3530 ± 360	< 20	< 40
	10/06/92	Little Skate	1760 ± 320	< 40	< 50
	10/06/92	Little Skate	2500 ± 420	< 30	< 50
SN-AQF-13G2 (cl)	05/21/92	Windowpane	3510 ± 520	< 30	< 60
	05/21/92	Little Skate	3940 ± 390	< 30	< 40
	05/21/92	Winter Flounder	4440 ± 560	< 30	< 70
	10/12/92	Little Skate	3490 ± 380	< 30	< 50
	10/12/92	Winter Flounder	4000 ± 520	< 30	< 50
	10/12/92	Sea Robin	5720 ± 1120	< 100	< 200
	10/12/92	Windowpane	3160 ± 400	< 20	< 30
Average ± 2 s.d.			**3590 ± 2039**		

* All other gamma emitters not listed were <LLD; typical LLDs are given in Tables C-9 and C-10.
(a) Unable to locate sample in laboratory.
(cl) Denotes Control Location.

TABLE C-3

CONCENTRATIONS OF GAMMA EMITTERS* IN INVERTEBRATE SAMPLES

Results in Units of pCi/kg (wet) ± 2 sigma

LOCATION CODE	COLLECTION DATE	DESCRIPTION	Be-7	K-40	Cs-137	Th-228
SN-AQI-3C1	05/20/92	Lobster	< 200	2560 ± 330	< 20	< 40
	05/20/92	Lobster	< 300	3270 ± 360	< 30	< 40
	05/26/92	Whelk	< 100	2520 ± 250	< 20	< 30
	10/14/92	Whelk	< 300	2810 ± 420	< 20	< 50
	10/07/92	Lobster	< 200	3080 ± 440	< 20	< 50
	10/08/92	Lobster	< 300	3560 ± 390	< 30	< 40
	10/08/92	Squid	< 300	2780 ± 320	< 20	< 40
SN-AQI-14C1	05/26/92	Whelk	< 200	595 ± 147	< 30	< 60
	05/19/92	Lobster	< 200	4440 ± 440	< 20	< 50
	05/19/92	Lobster	< 200	2700 ± 270	< 20	< 30
	10/06/92	Lobster	< 300	3030 ± 450	< 20	< 50
	10/06/92	Squid	< 300	4370 ± 440	< 30	< 40
	10/06/92	Squid	< 300	4160 ± 480	< 20	< 50
	10/14/92	Whelk	< 300	2260 ± 380	< 30	< 50
SN-AQI-13G2 (cl)	05/21/92	Whelk	< 100	2370 ± 240	< 10	< 30
	05/21/92	Lobster	< 200	3100 ± 380	< 20	< 30
	10/12/92	Lobster	< 200	2950 ± 340	< 20	< 40
	10/12/92	Squid	< 300	2530 ± 390	< 40	< 50
	10/12/92	Whelk	< 300	2110 ± 380	< 30	< 70
Average ± 2 s.d.				**2905 ± 1758**		

* All other gamma emitters not listed were <LLD: typical LLDs are given in Tables C-9 and C-10.

(cl) Denotes Control Location.

TABLE C-4

CONCENTRATIONS OF GAMMA EMITTERS* IN SEDIMENT SAMPLES

Results in Units of pCi/kg (dry) ± 2 sigma

LOCATION CODE	SAMPLE LOCATION	COLLECTION DATE	K-40	Ra-226	Cs-137	Th-228
SN-AQS-2A4	Beach	06/03/92	1790 ± 240	< 300	< 20	163 ± 26
		10/20/92	1900 ± 300	< 600	< 20	101 ± 35
Average ± 2 s.d.			**1845 ± 156**			**132 ± 88**

* All other gamma emitters not listed were <LLD; typical LLDs are given in Tables C-9 and C-10.
(c1) Denotes Control Location.

TABLE C-5

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	LOCATION CODES SN-APT-2A2	SN-APT-3S1	SN-APT-6S2	SN-APT-7B1	SN-APT-11G1 (c1)	AVERAGE ± 2 s.d.
JANUARY 92						
01/02/92-01/07/92	10 ± 4	6.8 ± 3.6	8.2 ± 3.9	13 ± 4	9.0 ± 3.7	9 ± 5
01/07/92-01/14/92	19 ± 3	23 ± 3	20 ± 3	21 ± 3	20 ± 3	21 ± 3
01/14/92-01/21/92	15 ± 3	16 ± 3	18 ± 3	17 ± 3	16 ± 3	16 ± 2
01/21/92-01/28/92	21 ± 3	21 ± 3	(a)	18 ± 3	19 ± 3	20 ± 3
FEBRUARY						
01/28/92-02/04/92	24 ± 3	26 ± 3	26 ± 3	24 ± 3	27 ± 3	25 ± 3
02/04/92-02/11/92	14 ± 3	12 ± 3	13 ± 3	15 ± 3	14 ± 3	14 ± 2
02/11/92-02/18/92	21 ± 3	23 ± 3	22 ± 3	20 ± 3	19 ± 3	21 ± 3
02/18/92-02/24/92	16 ± 3	12 ± 3	14 ± 3	12 ± 3	13 ± 3	13 ± 3
02/24/92-02/28/92	11 ± 4	12 ± 4	19 ± 5	12 ± 4	16 ± 4	14 ± 7
MARCH						
02/28/92-03/03/92	18 ± 5	18 ± 5	18 ± 5	25 ± 5	15 ± 5	19 ± 7
03/03/92-03/10/92	11 ± 3	13 ± 3	12 ± 3	15 ± 3	14 ± 3	13 ± 3
03/10/92-03/17/92	17 ± 3	19 ± 3	19 ± 3	19 ± 3	18 ± 3	18 ± 2
03/17/92-03/24/92	16 ± 3	15 ± 3	16 ± 3	16 ± 3	15 ± 3	15 ± 1
03/24/92-03/31/92	13 ± 3	14 ± 3	12 ± 3	20 ± 3	14 ± 3	15 ± 6
APRIL						
03/31/92-04/07/92	12 ± 3	9.5 ± 2.9	9.4 ± 3.1	11 ± 3	9.6 ± 2.8	10 ± 2
04/07/92-04/14/92	16 ± 3	17 ± 3	19 ± 3	20 ± 3	18 ± 3	18 ± 3
04/14/92-04/21/92	15 ± 3	13 ± 3	12 ± 3	10 ± 3	11 ± 3	12 ± 4
04/21/92-04/28/92	8.2 ± 2.7	10 ± 3	11 ± 3	12 ± 3	10 ± 3	10 ± 3

(a) Sampler malfunction; no sample available.
(c1) Denotes Control Location.

TABLE C-5 (Cont.)

CONCENTRATIONS OF CROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	LOCATION CODES SN-APT-2A2	SN-APT-3S1	SN-APT-6S2	SN-APT-7B1	SN-APT-11G1 (c1)	AVERAGE ± 2 s.d.
MAY						
04/28/92-05/05/92	14 ± 3	11 ± 3	17 ± 3	11 ± 3	14 ± 3	13 ± 5
05/05/92-05/12/92	4.6 ± 2.7	5.7 ± 2.8	6.7 ± 2.9	7.5 ± 3.0	6.8 ± 2.8	6 ± 2
05/12/92-05/19/92	10 ± 3	7.8 ± 2.5	7.8 ± 2.6	9.9 ± 2.7	9.1 ± 2.5	9 ± 2
05/19/92-05/26/92	15 ± 3	< 4	16 ± 3	19 ± 3	15 ± 3	16 ± 4
05/26/92-06/02/92	9.0 ± 2.8	9.9 ± 2.8	7.8 ± 2.8	7.8 ± 2.7	9.0 ± 2.7	9 ± 2
JUNE						
06/02/92-06/09/92	9.9 ± 2.8	9.6 ± 2.8	11 ± 3	8.7 ± 2.8	7.5 ± 2.7	9 ± 3
06/09/92-06/16/92	11 ± 3	13 ± 3	10 ± 3	9.0 ± 2.9	13 ± 3	11 ± 4
06/16/92-06/23/92	14 ± 3	11 ± 3	12 ± 3	9.8 ± 2.8	13 ± 3	12 ± 3
06/23/92-06/30/92	16 ± 3	16 ± 3	16 ± 3	16 ± 3	17 ± 3	16 ± 1
JULY						
06/30/92-07/07/92	14 ± 3	13 ± 3	14 ± 3	16 ± 3	12 ± 3	14 ± 3
07/07/92-07/14/92	24 ± 4	17 ± 4	20 ± 4	17 ± 4	17 ± 4	19 ± 6
07/14/92-07/21/92	29 ± 4	21 ± 4	25 ± 4	28 ± 4	29 ± 4	26 ± 7
07/21/92-07/28/92	12 ± 4	19 ± 4	17 ± 4	13 ± 4	12 ± 4	15 ± 6
07/28/92-08/04/92	9.4 ± 2.7	11 ± 3	12 ± 3	11 ± 3	9.2 ± 2.7	11 ± 2
AUGUST						
08/04/92-08/11/92	12 ± 3	16 ± 3	13 ± 3	14 ± 3	19 ± 3	15 ± 6
08/11/92-08/18/92	8.6 ± 2.6	8.3 ± 2.6	9.5 ± 2.7	10 ± 3	10 ± 3	9 ± 2
08/18/92-08/25/92	18 ± 3	16 ± 3	18 ± 3	17 ± 3	17 ± 3	17 ± 2
08/25/92-09/01/92	22 ± 3	25 ± 3	27 ± 4	24 ± 4	24 ± 4	24 ± 4

(c1) Denotes Control Location.

TABLE C-5 (Cont.)

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	LOCATION CODES SN-APT-2A2	SN-APT-3S1	SN-APT-6S2	SN-APT-7B1	SN-APT-11G1 (c1)	AVERAGE ± 2 s.d.
SEPTEMBER						
09/01/92-09/08/92	14 ± 3	13 ± 3	15 ± 3	17 ± 3	14 ± 3	15 ± 3
09/08/92-09/15/92	14 ± 3	11 ± 3	15 ± 3	12 ± 3	14 ± 3	13 ± 3
09/15/92-09/22/92	21 ± 3	21 ± 3	23 ± 3	21 ± 3	18 ± 3	21 ± 4
09/22/92-09/29/92	11 ± 2	9.0 ± 2.4	12 ± 3	12 ± 3	11 ± 2	11 ± 2
OCTOBER						
09/29/92-10/06/92	18 ± 3	18 ± 3	19 ± 3	17 ± 3	17 ± 3	18 ± 2
10/06/92-10/13/92	21 ± 3	16 ± 3	20 ± 3	21 ± 3	16 ± 3	19 ± 5
10/13/92-10/20/92	22 ± 3	23 ± 3	23 ± 3	20 ± 3	20 ± 3	22 ± 3
10/20/92-10/27/92	17 ± 3	17 ± 3	18 ± 3	22 ± 3	16 ± 3	18 ± 5
10/27/92-11/03/92	11 ± 3	13 ± 3	12 ± 3	14 ± 3	14 ± 3	13 ± 3
NOVEMBER						
11/03/92-11/10/92	8.5 ± 2.4	7.8 ± 2.4	9.7 ± 2.5	9.0 ± 2.5	8.4 ± 2.4	8.7 ± 1.4
11/10/92-11/17/92	15 ± 3	14 ± 3	16 ± 3	17 ± 3	14 ± 3	15 ± 3
11/17/92-11/24/92	12 ± 3	10 ± 3	14 ± 3	13 ± 3	14 ± 3	13 ± 3
11/24/92-12/01/92	13 ± 3	12 ± 3	16 ± 3	13 ± 3	8.9 ± 2.6	13 ± 5
DECEMBER						
12/01/92-02/08/92	23 ± 3	23 ± 3	25 ± 3	25 ± 3	23 ± 3	24 ± 2
12/08/92-12/15/92	21 ± 7	12 ± 3	14 ± 3	17 ± 4	8.7 ± 2.9	15 ± 9
12/15/92-12/22/92	(a)	18 ± 3	21 ± 3	24 ± 10	19 ± 3	21 ± 5
12/22/92-12/29/92	(a)	27 ± 3	25 ± 3	25 ± 3	21 ± 3	25 ± 5
Average ± 2 s.d.	**15 ± 10**	**15 ± 11**	**16 ± 10**	**16 ± 10**	**15 ± 10**	**16 ± 1**

(a) Sample not collected.
(c1) Denotes Control Location.

TABLE C-6

CONCENTRATIONS OF GAMMA EMITTERS* IN QUARTERLY COMPOSITE OF AIRBORNE PARTICULATE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

LOCATION CODES	NUCLIDES	FIRST QUARTER 01/02/92-03/31/92	SECOND QUARTER 03/31/92-06/30/92	THIRD QUARTER 06/30/92-09/29/92	FOURTH QUARTER 09/29/92-12/15/92	AVERAGE ± 2 s.d.
SN-APT-2A2	Be-7	120 ± 12	129 ± 13	80.5 ± 8.0	64.0 ± 8.0	98.4 ± 62.3
	K-40	< 10	< 20	< 10	< 10	-
	Cs-134	< 0.5	< 0.6	< 0.5	< 0.7	-
	Cs-137	< 0.4	< 0.6	< 0.5	< 0.6	-
SN-APT-3S1	Be-7	152 ± 16	117 ± 12	63.8 ± 6.9	82.7 ± 8.3	104 ± 78
	K-40	< 10	7.17 ± 3.51	< 9	< 10	7.17 ± 3.51
	Cs-134	< 0.6	< 0.6	< 0.6	< 0.5	-
	Cs-137	< 0.6	< 0.7	< 0.5	< 0.6	-
SN-APT-6S2	Be-7	143 ± 14	135 ± 14	88.1 ± 8.8	69.8 ± 7.0	109 ± 71
	K-40	< 20	< 10	< 7	< 8	-
	Cs-134	< 0.7	< 0.5	< 0.5	< 0.4	-
	Cs-137	< 0.7	< 0.7	< 0.4	< 0.5	-
SN-APT-7B1	Be-7	120 ± 12	132 ± 14	79.8 ± 8.0	68.4 ± 8.4	100 ± 61
	K-40	< 10	< 20	< 8	< 10	-
	Cs-134	< 0.6	< 0.7	< 0.4	< 0.5	-
	Cs-137	< 0.7	< 0.7	< 0.4	< 0.6	-
SN-APT-11G1	Be-7	111 ± 11	135 ± 13	79.1 ± 7.9	50.4 ± 5.4	93.9 ± 73.9
(c1)	K-40	< 8	< 10	< 20	8.53 ± 4.69	8.53 ± 4.69
	Cs-134	< 0.6	< 0.5	< 0.6	< 0.6	-
	Cs-137	< 0.6	< 0.5	< 0.6	< 0.6	-

* All other gamma emitters not listed were <LLD; typical LLDs are found in Tables C-9 and C-10.
(c1) Denotes control location.

TABLE C-7

CONCENTRATIONS OF GAMMA EMITTERS* AND I-131 IN FOOD PRODUCT SAMPLES

Results in Units of pCi/kg (wet) ± 2 sigma

LOCATION CODE	SAMPLE TYPE	COLLECTION DATE	K-40	I-131	Cs-137	Be-7
SN-FPF-6B21	Strawberries	06/25/92	1070 ± 110	< 6	< 3	46.0 ± 20.4
SN-FPV-6B21	Stringbeans	09/16/92	6410 ± 640	< 9	< 6	< 50
SN-FPV-6B21	Tomatoes	09/16/92	2130 ± 210	< 8	< 5	< 40
SN-FPV-6B21	Tomatoes	10/14/92	2140 ± 210	< 8	< 5	< 40
SN-FPL-6B21	Cabbage	10/14/92	1390 ± 140	< 10	< 10	< 90
SN-FPF-8B1	Strawberries	06/25/92	1950 ± 190	< 7	< 4	< 40
SN-FPL-8B1	Lettuce	06/25/92	1990 ± 200	< 8	< 5	77.3 ± 34.4
SN-FPV-8B1	Potato	07/21/92	3170 ± 320	< 4	< 4	< 30
SN-FPL-8B1	Cabbage	07/21/92	2400 ± 240	< 10	< 8	< 70
SN-FPV-8B1	Corn	07/21/92	3160 ± 320	< 10	< 7	< 60
SN-FPV-8B1	Carrots	08/19/92	3420 ± 240	< 10	< 6	< 50
SN-FPV-8B1	Potato	08/19/92	3160 ± 320	< 8	< 6	< 50
SN-FPL-8B1	Cabbage	08/19/92	1910 ± 190	< 10	< 10	< 80
SN-FPL-8B1	Lettuce	08/19/92	2870 ± 290	< 20	< 10	464 ± 76
SN-FPV-8B1	Corn	09/16/92	3080 ± 310	< 10	< 6	< 50
SN-FPV-8B1	Carrots	09/16/92	2230 ± 220	< 9	< 6	< 50
SN-FPV-8B1	Potato	09/16/92	3130 ± 310	< 10	< 7	< 60
SN-FPL-8B1	Cabbage	09/16/92	1530 ± 150	< 10	< 10	< 80
SN-FPV-8B1	Carrots	10/14/92	3360 ± 340	< 20	< 7	< 60
SN-FPF-8B1	Apples	10/14/92	592 ± 63	< 20	< 8	< 70
SN-FPV-8B1	Potato	10/14/92	2950 ± 290	< 8	< 5	< 40
SN-FPL-8B1	Cabbage	10/14/92	1860 ± 190	< 10	< 9	< 70
SN-FPL-8B1	Lettuce	10/14/92	1560 ± 160	< 9	< 6	< 50
SN-FPF-12H2 (cl)	Strawberries	06/25/92	1320 ± 130	< 7	< 3	42.5 ± 21.6
SN-FPL-12H2	Lettuce	06/25/92	3320 ± 330	< 10	< 6	< 50
SN-FPV-12H2	Corn	07/21/92	2910 ± 290	< 10	< 8	< 60
SN-FPL-12H2	Lettuce	08/19/92	2750 ± 270	< 20	< 10	181 ± 90
SN-FPV-12H2	Corn	09/16/92	3150 ± 320	< 10	< 5	< 40
SN-FPL-12H2	Lettuce	09/16/92	2610 ± 260	< 20	< 10	< 90
SN-FPV-12H2	Tomatoes	10/14/92	2280 ± 230	< 5	< 3	< 30
SN-FPV-12H2	Carrots	10/14/92	2800 ± 280	< 10	< 6	< 50
SN-FPL-12H2	Lettuce	10/14/92	2830 ± 280	< 8	< 6	163 ± 29
Average ± 2 s.d.			**2545 ± 2051**			**182 ± 318**

* All other gamma emitters not listed were <LLD; typical LLDs are given in Tables C-9 and C-10.
(cl) Denotes Control Location.

TABLE C-8

DIRECT RADIATION MEASUREMENTS - QUARTERLY TLD RESULTS

mR/standard month*

LOCATION CODES	FIRST QUARTER 01/09/92-04/09/92	SECOND QUARTER 04/09/92-07/09/92	THIRD QUARTER 07/09/92-10/0892	FOURTH QUARTER 10/08/92-01/14/93	ANNUAL AVERAGE (a)
SN-IDM-1S1	3.4 ± 0.2	3.5 ± 0.8	3.2 ± 0.2	3.1 ± 0.1	3.3 ± 0.4
SN-IDM-3S1	3.3 ± 0.2	3.5 ± 0.7	3.7 ± 0.2	3.6 ± 0.1	3.5 ± 0.3
SN-IDM-4S1	3.5 ± 0.1	3.5 ± 0.2	3.7 ± 0.1	3.6 ± 0.1	3.6 ± 0.2
SN-IDM-5S2	3.7 ± 0.1	3.5 ± 0.6	3.7 ± 0.2	3.5 ± 0.1	3.6 ± 0.2
SN-IDM-6S2	3.5 ± 0.1	3.5 ± 0.5	4.0 ± 0.3	3.4 ± 0.0	3.6 ± 0.5
SN-IDM-9S1	3.6 ± 0.1	3.5 ± 0.3	3.6 ± 0.1	3.5 ± 0.1	3.6 ± 0.1
SN-IDM-13S3	3.6 ± 0.2	3.6 ± 0.4	3.6 ± 0.1	3.6 ± 0.3	3.6 ± 0.0
SN-IDM-14S2	3.1 ± 0.1	3.0 ± 0.1	3.1 ± 0.4	3.0 ± 0.2	3.1 ± 0.1
SN-IDM-15S1	3.1 ± 0.1	3.0 ± 0.5	3.0 ± 0.1	3.0 ± 0.1	3.0 ± 0.1
SN-IDM-16S2	3.5 ± 0.0	3.5 ± 0.3	3.4 ± 0.2	3.3 ± 0.4	3.4 ± 0.2
SN-IDM-2A2	3.0 ± 0.1	3.1 ± 0.8	3.0 ± 0.1	3.0 ± 0.5	3.0 ± 0.1
SN-IDM-7A2	3.6 ± 0.3	3.4 ± 0.5	3.4 ± 0.3	3.4 ± 0.1	3.5 ± 0.2
SN-IDM-8A3	3.5 ± 0.1	3.2 ± 0.5	3.6 ± 0.1	3.4 ± 0.1	3.4 ± 0.3
SN-IDM-10A1	3.7 ± 0.1	3.6 ± 0.4	3.7 ± 0.1	3.5 ± 0.1	3.6 ± 0.2
SN-IDM-11A1	3.4 ± 0.3	3.4 ± 0.7	3.5 ± 0.2	3.4 ± 0.0	3.4 ± 0.1
SN-IDM-12A1	4.0 ± 0.2	3.9 ± 0.2	4.1 ± 0.2	3.8 ± 0.1	4.0 ± 0.3
SN-IDM-11G1 (c)	3.4 ± 0.1	3.4 ± 0.5	3.5 ± 0.1	3.5 ± 0.1	3.5 ± 0.1
SN-IDM-12G1 (c)	3.6 ± 0.2	3.4 ± 1.2	3.3 ± 0.3	3.5 ± 0.2	3.5 ± 0.3
Averag (b)	**3.5 ± 0.5**	**3.4 ± 0.5**	**3.5 ± 0.6**	**3.4 ± 0.5**	**3.4 ± 0.5**

* The standard month = 30.4 days.
(a) The ± limits given in this column define a 95% confidence interval for the mean of the four quarterly results at that location.
(b) The ± limits given in this row define a 95% confidence interval for the mean of all locations for that quarter.
(c) The ± limits given here define a 95% confidence interval for a measurement at any location during any quarter in 1992.

TABLE C-9

TYPICAL LLDs ACHIEVED FOR GAMMA SPECTROMETRY

NUCLIDES	MILK AND WATER (pCi/l)	FISH, GAME AND AQUATIC INVERTEBRATES (pCi/kg wet)	AQUATIC PLANTS (pCi/kg dry)	SOIL AND AQUATIC SEDIMENT (pCi/kg dry)	AIR PARTICULATES (10^{-3}pCi/m^3)
Be-7	60	80	80	200	20
Na-22	7	8	10	30	2
K-40	100	300	300	900	20
Cr-51	50	100	70	200	10
Mn-54	5	7	9	30	2
Co-58	5	8	8	20	2
Fe-59	15	20	15	50	2
Co-60	5	8	9	20	2
Zn-65	10	20	20	60	2
Zr-95	30	10	10	40	2
Nb-95	15	(a)	(a)	(a)	(a)
Mo-99	10	10	10	20	5
Ru-103	7	10	10	30	2
Ru-106	50	60	80	200	10
Ag-110m	7	10	10	40	2
Sb-125	15	20	25	80	4
Te-129m	6	10	10	30	2
I-131	10	10	10	30	10
Te-132	10	6	6	25	2
I-133	10	10	10	40	15
Cs-134	6	7	10	30	2
Cs-136	10	10	10	30	2
Cs-137	6	7	10	30	2
Ba-140	60	10	10	5	5
La-140	15	(a)	(a)	(a)	(a)
Ce-141	10	10	15	30	3
Ce-144	30	40	60	150	7
Ra-226	90	100	150	400	20
Th-228	10	10	25	60	3

(a) No ODCM Requirements

TABLE C-10

LLD's AND REPORTING ACTION LEVELS - 1992

REQUIRED BY ODCM AND CONTRACT

SAMPLE TYPE			Units	Sr-90[2]	Zr-95	Nb-95	I-131[2]	Cs-134	Cs-137	Ba-140	La-140
WATER											
Surface	LLD	Contract		2	30	15	0.5	15	18	60	15
AIR											
Air Sample	LLD	ODCM	pCi/m^3	-	-	-	.07	.05	.06	-	-
	LLD	Contract		.0001	-	-	.07	.05	.06	-	-
	RAL	ODCM		-	-	-	0.9	10	20	-	-
	RAL	Contract		0.1	-	-	0.9	10	20	-	-
Aquatic (1)											
Fish											
Invertebrate	LLD	ODCM	pCi/kg	-	-	-	-	130	150	-	-
Aquatic Plants/	Contract			5	-	-	-	130	150	-	-
Game	RAL	Contract		20	-	-	-	1,000	2,000	-	-
FOOD											
Food	LLD	ODCM	pCi/kg	-	-	-	60	60	80	-	-
Products	LLD	Contract	(wet)	-	-	-	90	60	80	-	-
	RAL	ODCM		-	-	-	100	1,000	2,000	-	-
	RAL	Contract		-	-	-	100	1,000	2,000	-	-
SEDIMENTS/SOILS											
Sediments	LLD	ODCM	pCi/kg	-	-	-	-	150	180	-	-
Soils	LLD	Contract	(dry)	5	-	-	-	150	180	-	-
	RAL	ODCM		-	-	-	-	-	-	-	-
	RAL	Contract		80	-	-	-	1,000	2,000	-	-

(1) There are no ODCM requirements for game or aquatic plants. Aquatic contract LLDs and RALs for gamma spectrometry apply to game and aquatic plants. Sr-89/90 LLDs and RALs for aquatic plants are 30 pCi/kg (dry) and 45 pCi/kg (dry), respectively.

(2) Sr-90 and I-131 by radiochemistry remained in contract for special request cases (e.g. Termination Survey) only.

TABLE C-10 (Cont.)

LLD's AND REPORTING ACTION LEVELS - 1992

REQUIRED BY ODCM AND CONTRACT

SAMPLE TYPE	Requirements		Units	Gross Beta	H-3	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Sr-89(1)
ATMOSPHERIC/AIRBORNE											
Air Sample	LLD*	ODCM	pCi/m^3	0.01	-	-	-	-	-	-	-
	LLD	Contract		0.01	-	-	-	-	-	-	-
	RAL**	ODCM		-	-	-	-	-	-	-	.0001
	RAL	Contract		1	-	-	-	-	-	-	0.1
AQUATIC											
Fish	LLD	ODCM	pCi/kg	-	-	130	130	260	130	260	-
Invertebrate/	LLD	Contract	(wet)	-	-	130	130	260	130	260	5
Algae	RAL	ODCM		-	-	30,000	30,000	10,000	10,000	20,000	-
	RAL	Contract		-	-	30,000	30,000	10,000	10,000	20,000	20
WATERBORNE											
Surface	LLD	Contract		4	200	15	15	30	15	30	10
TERRESTRIAL											
Food	LLD	ODCM	pCi/kg	-	-	-	-	-	-	-	-
Products	LLD	Contract	(wet)	-	-	-	-	-	-	-	-
	RAL	ODCM		-	-	-	-	-	-	-	-
	RAL	Contract		-	-	-	-	-	-	-	-
SEDIMENT/SOILS											
Sediments	LLD	ODCM	pCi/kg	-	-	-	-	-	-	-	-
Soils	LLD	Contract	(dry)	-	-	-	-	-	-	-	5
	RAL	ODCM		-	-	-	-	-	-	-	-
	RAL	Contract		-	-	-	-	-	-	-	80
DIRECT	LLD	ODCM		-	-	-	-	-	-	-	-
RADIATION	LLD	Contract	1.5 mR/std. month	-	-	-	-	-	-	-	-
TLD											

* Lower limit of detection

** Reporting action level

(1) Sr-89 data remained in contract for special request cases (e.g. Termination Survey) only.

APPENDIX D

ANALYTICAL PROCEDURES SYNOPSIS

ANALYTICAL PROCEDURES SYNOPSIS

Appendix D is a synopsis of the analytical procedures performed during 1992 on samples collected for the Shoreham Nuclear Power Station Radiological Environmental Monitoring Program. All analyses have been mutually agreed upon by Long Island Power Authority and Teledyne Isotopes and include those recommended by the USNRC Regulatory Guide 4.8, BTP, Rev. 1, November 1979.

GROSS BETA ANALYSIS OF SAMPLES

Airborne Particulates

After a delay of five or more days, allowing for the radon-222 and radon-220 (thoron) daughter products to decay, the filters are counted in a gas-flow proportional counter. An unused air particulate filter, supplied by LIPA, is counted as the blank.

Calculations of the results, the two sigma error and the lower limit of detection (LLD):

RESULT (pCi/m^3) = $((S/T) - (B/t))/(2.22\ V\ E)$

TWO SIGMA ERROR (pCi/m^3) = $2((S/T^2) + (B/t^2))^{1/2}/(2.22\ V\ E)$

LLD (pCi/m^3) = $4.66\ (B/t/T)^{1/2}/(2.22\ V\ E)$

where:

S = Gross counts of sample including blank
B = Counts of blank
E = Counting efficiency
T = Number of minutes sample was counted
t = Number of minutes blank was counted
V = Sample aliquot size (cubic meters)

DETERMINATION OF GROSS BETA ACTIVITY IN WATER SAMPLES

1.0 INTRODUCTION

The procedures described in this section are used to measure the overall radioactivity of water samples without identifying the radioactive species present. No chemical separation techniques are involved.

One liter of the sample is evaporated on a hot plate. A smaller volume may be used if the sample has a significant salt content. If requested by the customer, the sample is filtered through No. 54 filter paper before evaporation, removing particles greater than 30 microns in size.

After evaporating to a small volume in a beaker, the sample is rinsed into a 2-inch diameter stainless steel planchet which is stamped with a concentric ring pattern to distribute residue evenly. Final evaporation to dryness takes place under heat lamps.

Residue mass is determined by weighing the planchet before and after mounting the sample. The planchet is counted for beta activity on an automatic proportional counter. Results are calculated using empirical self-absorption curves which allow for the change in effective counting efficiency caused by the residue mass.

2.0 DETECTION CAPABILITY

Detection capability depends upon the sample volume actually represented on the planchet, the background and the efficiency of the counting instrument, and upon self-absorption of beta particles by the mounted sample. Because the radioactive species are not identified, no decay corrections are made and the reported activity refers to the counting time.

The minimum detectable level (MDL) for water samples is nominally 1.6 picocuries per liter for gross beta at the 4.66 sigma level (1.0 pCi/l at the 2.83 sigma level), assuming that 1 liter of sample is used and that $\frac{1}{2}$ gram of sample residue is mounted on the planchet. These figures are based upon a counting time of 50 minutes and upon representative values of counting efficiency and background of 0.2 and 1.2 cpm, respectively.

The MDL becomes significantly lower as the mount weight decreases because of reduced self-absorption. At a zero mount weight, the 4.66 sigma MDL for gross beta is 0.9 picocuries per liter. These values reflect a beta counting efficiency of 0.38.

ANALYSIS OF SAMPLES FOR TRITIUM

(Gas Counting)

Water

Approximately 2 ml of water are converted to hydrogen by passing the water, heated to its vapor state, over a granular zinc conversion column heated to 400° C. The hydrogen is loaded into a one liter proportional detector and the volume is determined by recording the pressure.

The proportional detector is passively shielded by lead and steel and an electronic, anticoincidence system provides additional shielding from cosmic rays.

Calculation of the results, the two sigma error and the lower limit detection (LLD) in pCi/l:

RESULT = $2(3.234)\ T_N\ V_N(C_G - B)/(C_N\ V_S)$

TWO SIGMA ERROR = $2(3.234)\ T_N\ V_N(E)^{1/2}/(C_N\ V_S)$

LLD = $3.3\ (3.234)T_N\ V_N(E)^{1/2}/(C_N\ V_S)$

where:

T_N	=	tritium units of the standard
3.234	=	conversion factor changing tritium units to pCi/l
V_N	=	volume of the standard used to calibrate the efficiency of the detector in psia
V_S	=	volume of the sample loaded into the detector in psia
C_N	=	the net cpm of the standard of volume V_N
C_G	=	the gross cpm of the sample of volume V_S
B	=	the background of the detector in cpm
Δt	=	counting time for the sample
E	=	$S/T^2 + B/t^2$

ANALYSIS OF SAMPLES FOR TRITIUM

(Liquid Scintillation)

Water

Ten milliliters of water are mixed with 10 ml of a liquid scintillation solution and then the mixture is counted in an automatic liquid scintillator.

Calculation of the results, the two sigma error and the lower limit detection (LLD) in pCi/l:

RESULT = $(N-B)/(2.22\ V\ E)$

TWO SIGMA ERROR = $2((N + B)/\Delta t)^{1/2}/ (2.22\ V\ E)$

LLD = $4.66\ (B/\Delta t)^{1/2}/(2.22\ V\ E)$

where:

N	=	the gross cpm of the sample
B	=	the background of the detector in cpm
2.22	=	conversion factor changing dpm to pCi
V	=	volume of the sample in ml
E	=	efficiency of the detector
Δt	=	counting time for the sample

GAMMA SPECTROMETRY OF SAMPLES

Milk and Water

A 1.0 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Dried Solids Other Than Soils and Sediments

A large quantity of the sample is dried at a low temperature, less than 100°C. As much as possible (up to the total sample) is loaded into a tared 1-liter Marinelli and weighed. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Fish

As much as possible (up to the total sample) of the edible portion of the sample is loaded into a tared Marinelli and weighed. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Soils and Sediments

Soils and sediments are dried at a low temperature, less than 100°C. The soil or sediment is loaded fully into a tared, standard 300 cc container and weighed. The sample is then counted for approximately six hours with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height and analysis.

Airborne Particulates

The thirteen airborne particulate filters for a quarterly composite for each field station are aligned one in front of another and then counted for at least six hours with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

A mini-computer software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional gamma ray abundance, half life, detector efficiency, and net counts in the peak region. The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume of pCi/mass:

RESULT = $(S-B)/2.22\ t\ E\ V\ F\ DF)$

TWO SIGMA ERROR = $2(S+B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$

LLD = $4.66(B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$

where:

S = Area, in counts, of sample peak and background (region of spectrum of interest)

B = Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak

t = length of time in minutes the sample was counted

2.22 = dpm/pCi

E = detector efficiency for energy of interest and geometry of sample

V = sample aliquot size (liters, cubic meters, kilograms, or grams)

F = fractional gamma abundance (specific for each emitted gamma)

DF = decay factor from the mid-collection date to the counting date

ENVIRONMENTAL DOSIMETRY

Teledyne Isotopes uses a $CaSO_4$:Dy thermoluminescent dosimeter (TLD) which the company manufactures. This material has a high light output, negligible thermally induced signal loss (fading), and negligible self dosing. The energy response curve (as well as all other features) satisfies NRC Reg. Guide 4.13. Transit doses are accounted for by use of separate TLDs.

Following the field exposure period the TLDs are placed in a Teledyne Isotopes Model 8300. One fourth of the rectangular TLD is heated at a time and the measured light emission (luminescence) is recorded. The TLD is then annealed and exposed to a known Cs-137 dose; each area is then read again. This provides a calibration of each area of each TLD after every field use. The transit controls are read in the same manner.

Calculations of results and the two sigma error in net milliRoentgen (mR):

RESULT $D = (D_1+D_2+D_3+D_4)/4$

TWO SIGMA ERROR = $2((D_1-D)^2+(D_2-D)^2+(D_3-D)^2+(D_4-D)^2)/3)^{1/2}$

WHERE:

D_1 = the net mR of area 1 of the TLD, and similarly for D_2, D_3, and D_4

$D1 = I_1\ K/R_1 - A$

I_1 = the instrument reading of the field dose in area 1

K = the known exposure by the Cs-137 source

R_1 = the instrument reading due to the Cs-137 dose on area 1

A = average dose in mR, calculated in similar manner as above, of the transit control TLDs

D = the average net mR of all 4 areas of the TLD.

APPENDIX E

SUMMARY OF EPA INTERLABORATORY COMPARISONS

EPA INTERLABORATORY COMPARISON PROGRAM

Teledyne Isotopes participates in the US EPA Interlaboratory Comparison Program to the fullest extent possible. That is, we participate in the program for all radioactive isotopes prepared and at the maximum frequency of availability. In this section trending graphs (since 1981) and the 1992 data summary tables are presented for isotopes in the various sample media applicable to the Shoreham's Radiological Environmental Monitoring Program. The footnotes of the table discuss investigations of problems encountered in a few cases and the steps taken to prevent reoccurrence.

US EPA INTERLABORATORY COMPARISON PROGRAM 1992
Environmental

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)		
01/17/92	Water	Sr-89	51.0 ±	5.0	45.67 ±	1.53	
		Sr-90	20.0 ±	5.0	18.67 ±	1.53	
01/31/92	Water	Gr-Alpha	30.0 ±	8.0	25.00 ±	4.00	
		Gr-Beta	30.0 ±	5.0	31.67 ±	0.58	
02/07/92	Water	I-131	59.0 ±	6.0	61.00 ±	1.73	
02/14/92	Water	Co-60	40.0 ±	5.0	38.00 ±	2.65	
		Zn-65	148.0 ±	15.0	145.00 ±	1.73	
		Ru-106	203.0 ±	20.0	191.00 ±	21.66	
		Cs-134	31.0 ±	5.0	29.00 ±	2.00	
		Cs-137	49.0 ±	5.0	53.67 ±	2.52	
		Ba-133	76.0 ±	8.0	75.67 ±	7.51	
02/21/92	Water	H-3	7904.0 ±	790.0	7800.00 ±	100.00	
03/06/92	Water	Ra-226	10.1 ±	1.5	5.30 ±	0.95	(c)
		Ra-228	15.5 ±	3.9	20.00 ±	2.00	
03/27/92	Air Filter	Gr-Alpha	7.0 ±	5.0	11.33 ±	0.58	
		Gr-Beta	41.0 ±	5.0	43.00 ±	1.00	
		Sr-90	15.0 ±	5.0	12.67 ±	0.58	
		Cs-137	10.0 ±	5.0	11.00 ±	1.73	
04/14/92	Water	Gr-Beta	140.0 ±	21.0	98.00 ±	2.00	(d)
		Sr-89	15.0 ±	5.0	16.00 ±	1.00	
		Sr-90	17.0 ±	5.0	14.33 ±	1.15	
		Co-60	56.0 ±	5.0	55.00 ±	1.73	
		Cs-134	24.0 ±	5.0	22.67 ±	1.53	
		Cs-137	22.0 ±	5.0	24.67 ±	3.06	
		Gr-Alpha	40.0 ±	10.0	34.33 ±	2.08	
		Ra-226	14.9 ±	2.2	13.33 ±	2.08	
		Ra-228	14.0 ±	3.5	15.33 ±	0.58	
04/24/92	Milk	Sr-89	38.0 ±	5.0	36.00 ±	4.58	
		Sr-90	29.0 ±	5.0	26.00 ±	0.00	
		I-131	78.0 ±	8.0	71.67 ±	4.04	
		Cs-137	39.0 ±	5.0	46.67 ±	2.31	(e)
		K	1710.0 ±	86.0	1680.00 ±	72.11	

US EPA INTERLABORATORY COMPARISON PROGRAM 1992
Environmental

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)	
05/08/92	Water	Sr-89	29.0 ±	5.0	24.00 ±	1.73
		Sr-90	8.0 ±	5.0	6.33 ±	0.58
05/15/92	Water	Gr-Alpha	15.0 ±	5.0	10.00 ±	1.00
		Gr-Beta	44.0 ±	5.0	44.67 ±	1.15
06/05/92	Water	Co-60	20.0 ±	5.0	21.33 ±	0.58
		Zn-65	99.0 ±	10.0	107.00 ±	3.61
		Ru-106	141.0 ±	14.0	127.00 ±	11.53
		Cs-134	15.0 ±	5.0	15.00 ±	1.00
		Cs-137	15.0 ±	5.0	16.00 ±	1.00
		Ba-133	98.0 ±	10.0	93.33 ±	6.03
06/19/92	Water	H-3	2125.0 ±	347.0	2100.00 ±	0.00
07/17/92	Water	Ra-226	24.9 ±	3.7	23.33 ±	1.15
		Ra-228	16.7 ±	4.2	17.33 ±	0.58
08/07/92	Water	I-131	45.0 ±	6.0	43.33 ±	6.03
08/28/92	Air Filter	Gr-Alpha	30.0 ±	8.0	27.33 ±	0.58
		Gr-Beta	69.0 ±	10.0	69.00 ±	1.00
		Sr-90	25.0 ±	5.0	22.67 ±	1.15
		Cs-137	18.0 ±	5.0	16.67 ±	2.31
09/11/92	Water	Sr-89	20.0 ±	5.0	16.00 ±	1.00
		Sr-90	15.0 ±	5.0	13.00 ±	1.0
09/18/92	Water	Gr-Alpha	45.0 ±	11.0	45.00 ±	2.00
		Gr-Beta	50.0 ±	5.0	45.00 ±	1.73
09/25/92	Milk	Sr-89	15.0 ±	5.0	16.00 ±	2.00
		Sr-90	15.00 ±	5.0	12.67 ±	1.15
		I-131	100.0 ±	10.0	99.00 ±	7.21
		Cs-137	15.0 ±	5.0	15.67 ±	1.15
		K	1750.0 ±	88.0	1660.00 ±	85.44
10/09/92	Water	Co-60	10.0 ±	5.0	11.00 ±	1.00
		Zn-65	148.0 ±	15.0	156.67 ±	0.58
		Ru-106	175.0 ±	18.0	164.33 ±	7.51
		Cs-134	8.0 ±	5.0	8.67 ±	0.58
		Cs-137	8.0 ±	5.0	8.67 ±	0.58
		Ba-133	74.0 ±	7.0	75.67 ±	9.29

US EPA INTERLABORATORY COMPARISON PROGRAM 1992
Environmental

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)	
10/20/92	Water	Gr-Beta	53.0 ±	10.00	49.00 ±	2.65
		Sr-89	8.0 ±	5.0	8.67 ±	0.58
		Sr-90	10.0 ±	5.0	8.00 ±	1.00
		Co-60	15.0 ±	5.0	15.00 ±	1.00
		Cs-134	5.0 ±	5.0	5.00 ±	0.00
		Cs-137	8.0 ±	5.0	8.67 ±	0.58
		Gr-Alpha	29.0 ±	7.0	27.33 ±	4.16
		Ra-226	7.4 ±	1.1	7.23 ±	0.68
		Ra-228	10.0 ±	2.5	10.33 ±	0.58
10/23/92	Water	H-3	5962.0 ±	596.0	5666.67 ±	57.74
11/11/92	Water	Ra-226	7.5 ±	1.1	5.27 ±	0.40 (f)
		Ra-228	5.0 ±	1.3	6.07 ±	0.47

Footnotes:

(a) EPA Results-Expected laboratory precision (1 sigma). Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters.

(b) Teledyne Results - Average ± one sigma. Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters.

(c) All lab data sheets were verified for accuracy. Three different detectors were used with aliquot ingrowth times of 9 and 19 days. Results ranged from 4 to 6 pCi/l. Dilution error has been determined to be the probable cause for the deviation from the spike value. Internal biweekly spike analyses have been in control. Corrective action includes implementation of a dilution form to record aliquot and solvent volumes. Entries will be made by the technician and reviewed by the supervisor.

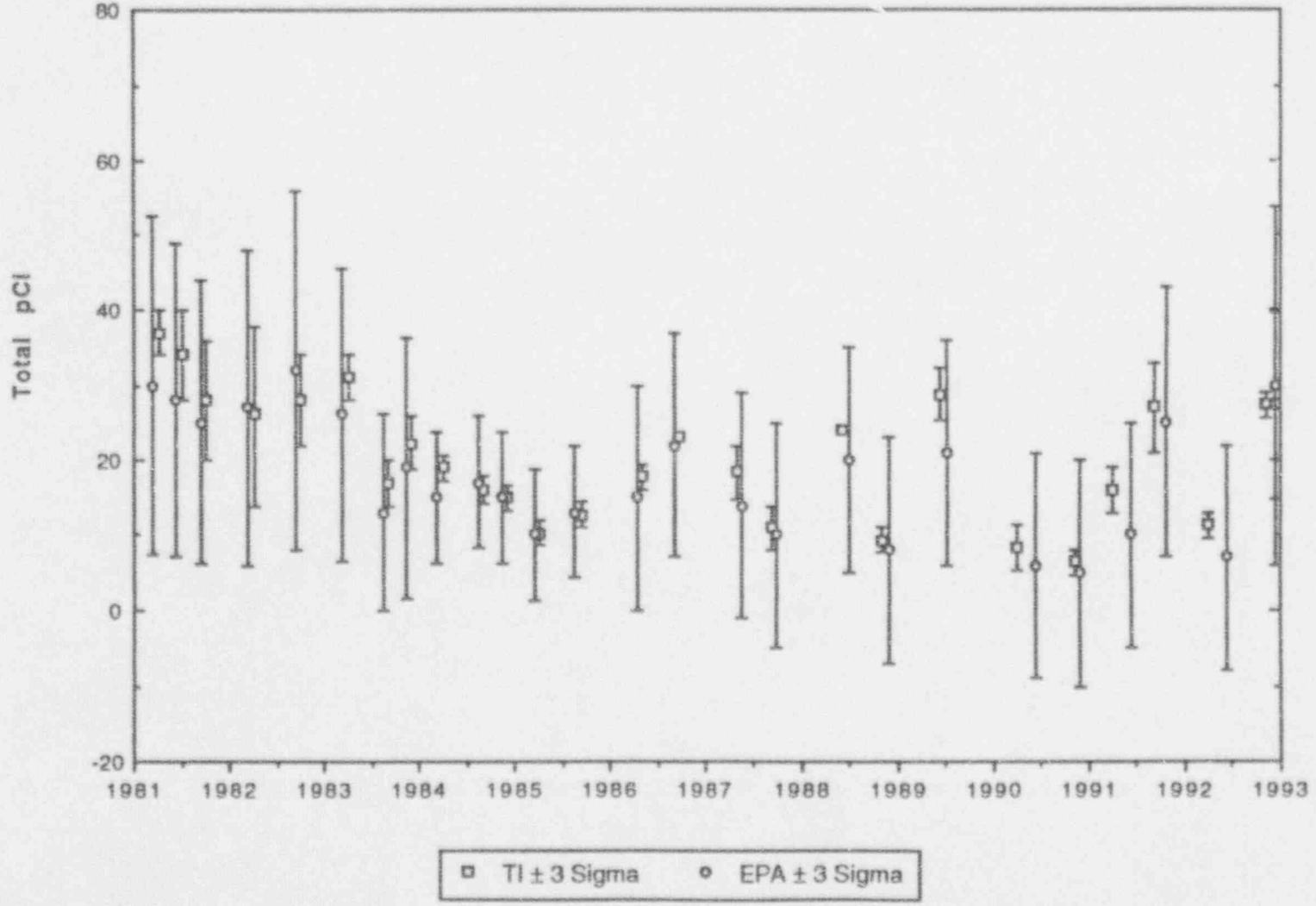
(d) There was large fraction of low energy beta emitters (Co-60 and Cs-134) in the sample. Detector efficiency decreases with decreasing energy. We are required to calibrate with the high energy beta emitters (Cs-137 and Sr-90). No corrective action necessary.

(e) There is no apparent reason for the high Cs-137 results. The sample geometry and detector efficiencies were verified to be correct. The Total K and I-131 by gamma spectroscopy were in good agreement with EPA values. There is no trend and results were within ± 3 sigma so no action taken.

(f) An investigation is being conducted; the results will be available shortly.

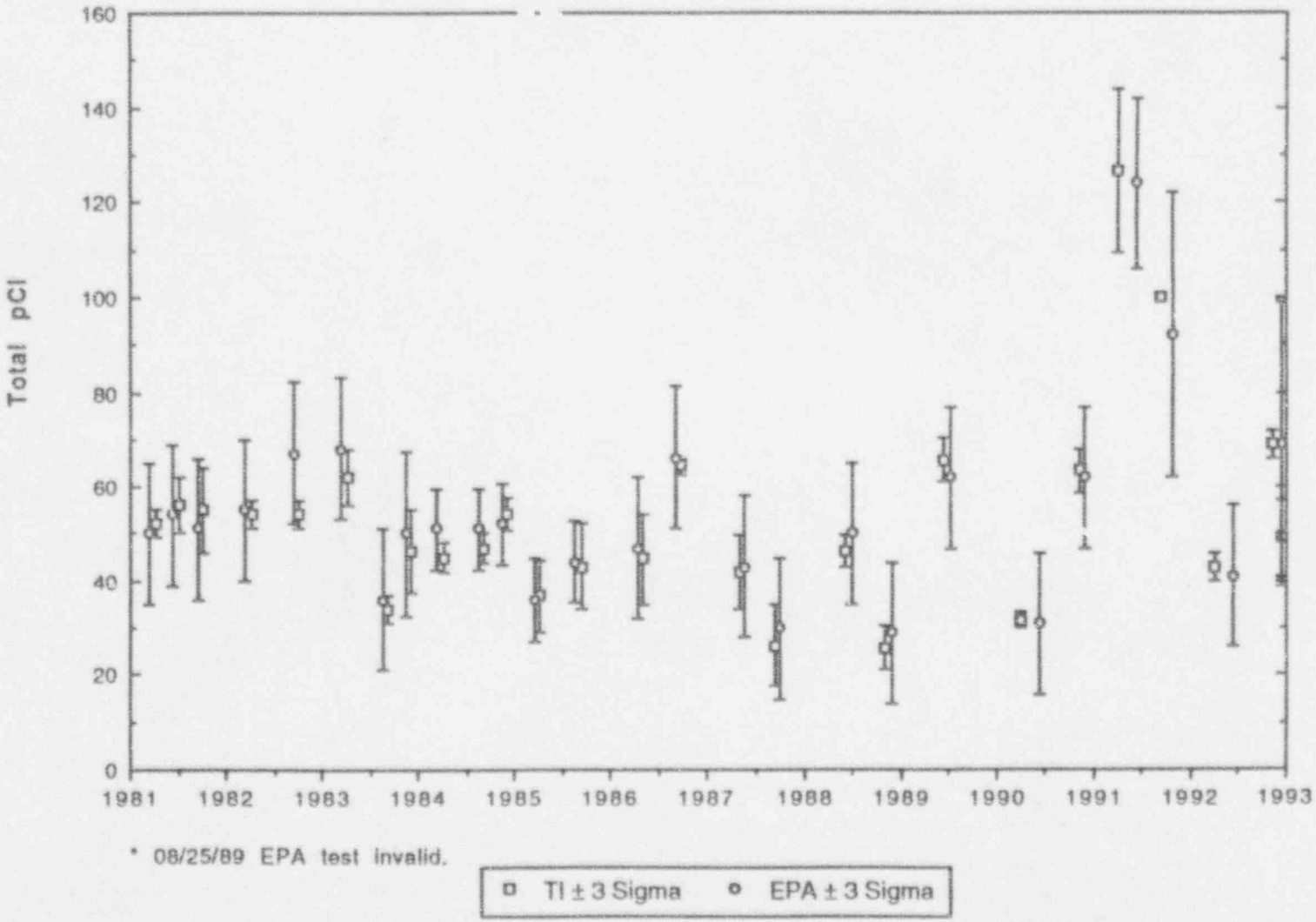
EPA CROSS CHECK PROGRAM

GROSS ALPHA IN AIR PARTICULATES



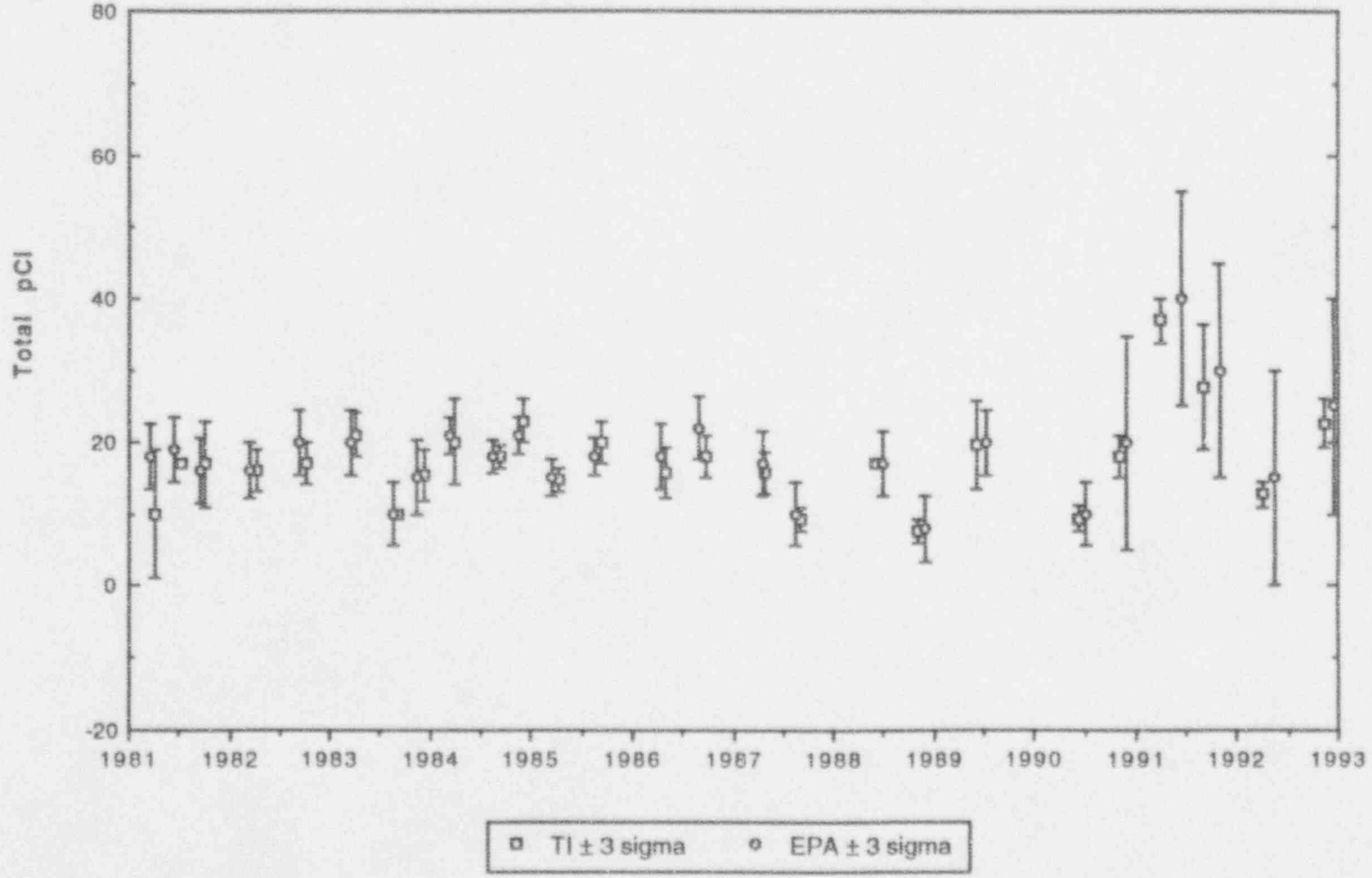
EPA CROSS CHECK PROGRAM

GROSS BETA IN AIR PARTICULATES



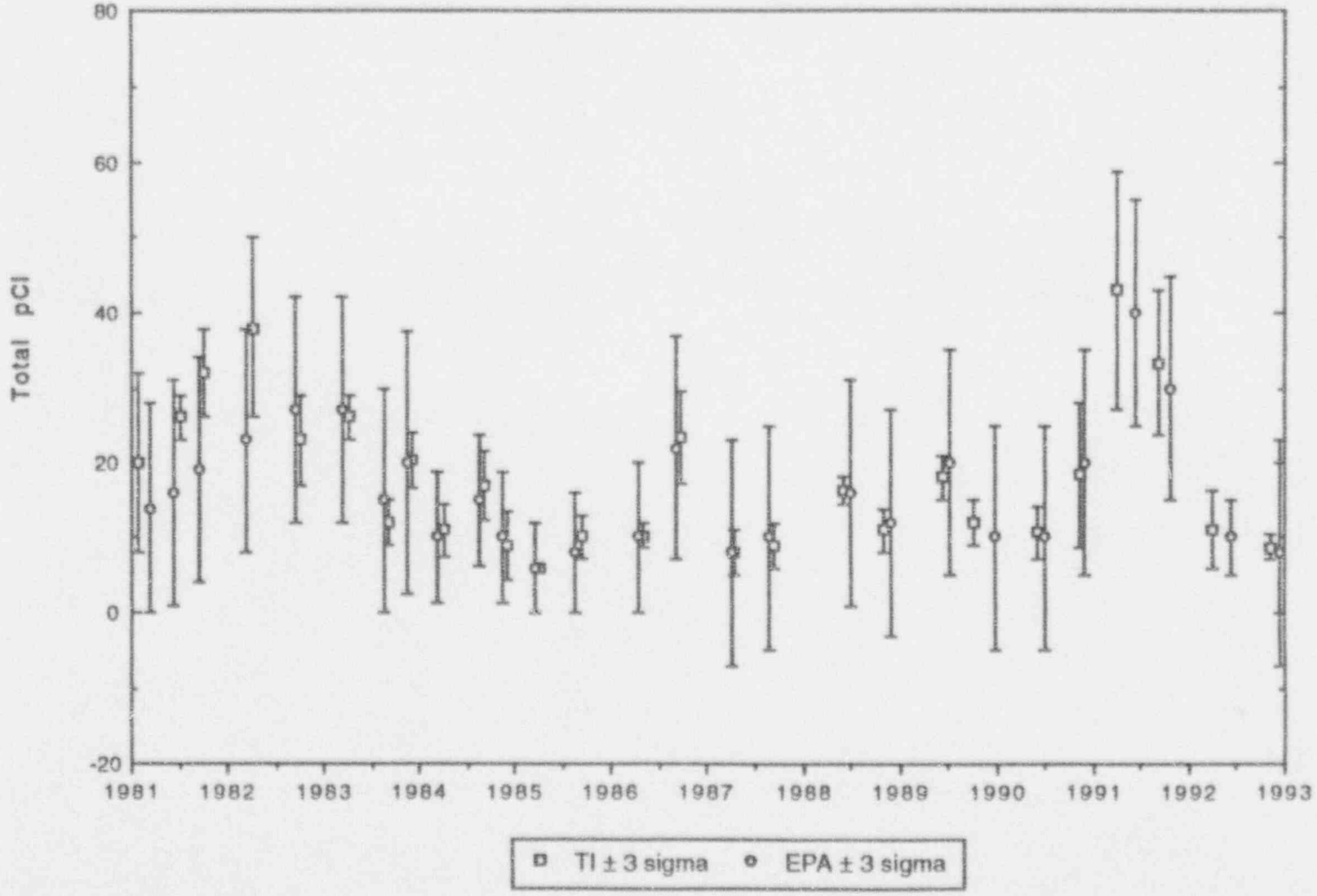
EPA CROSS CHECK PROGRAM

STRONTIUM-90 IN AIR PARTICULATES



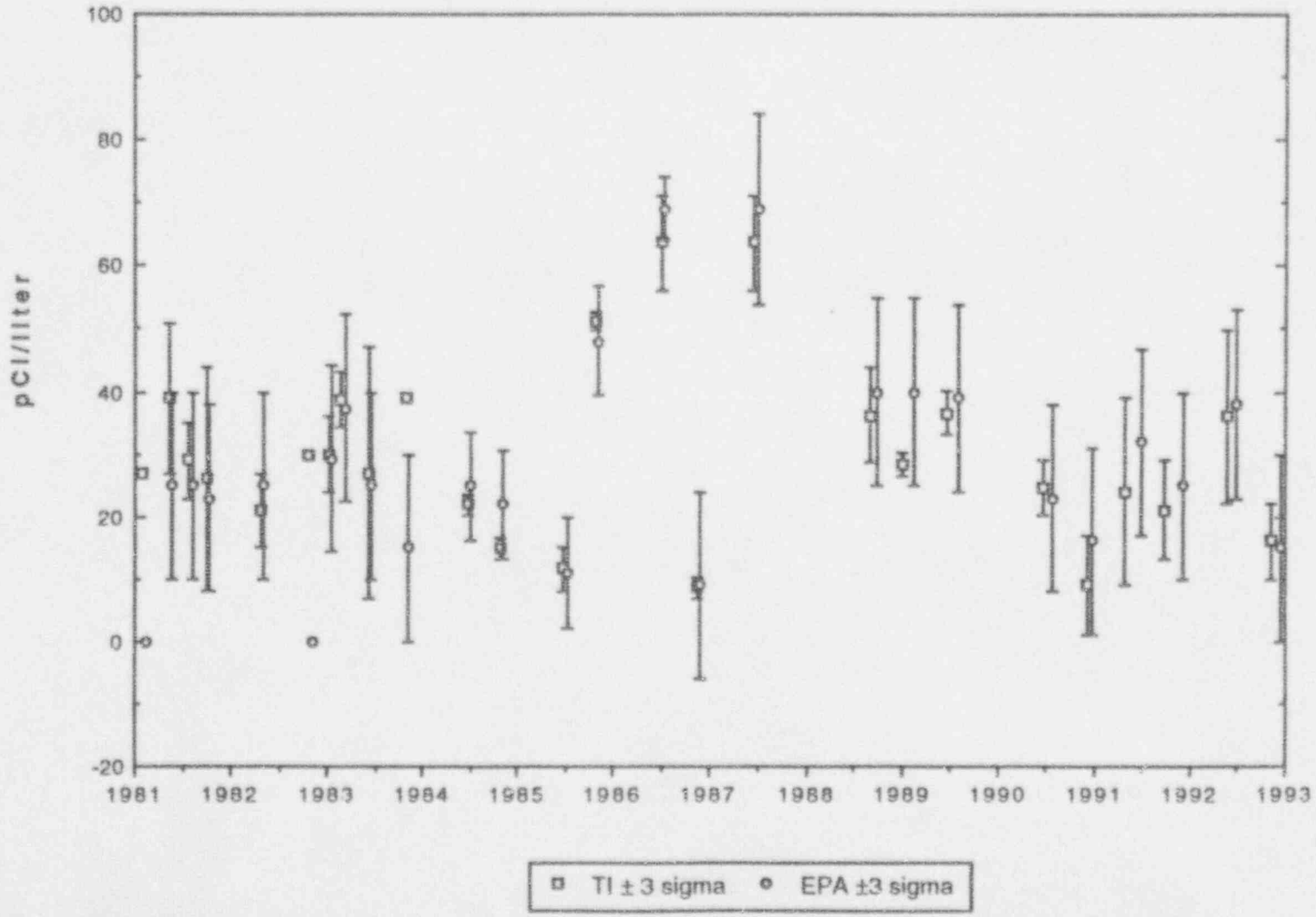
EPA CROSS CHECK PROGRAM

CESIUM-137 IN AIR PARTICULATES



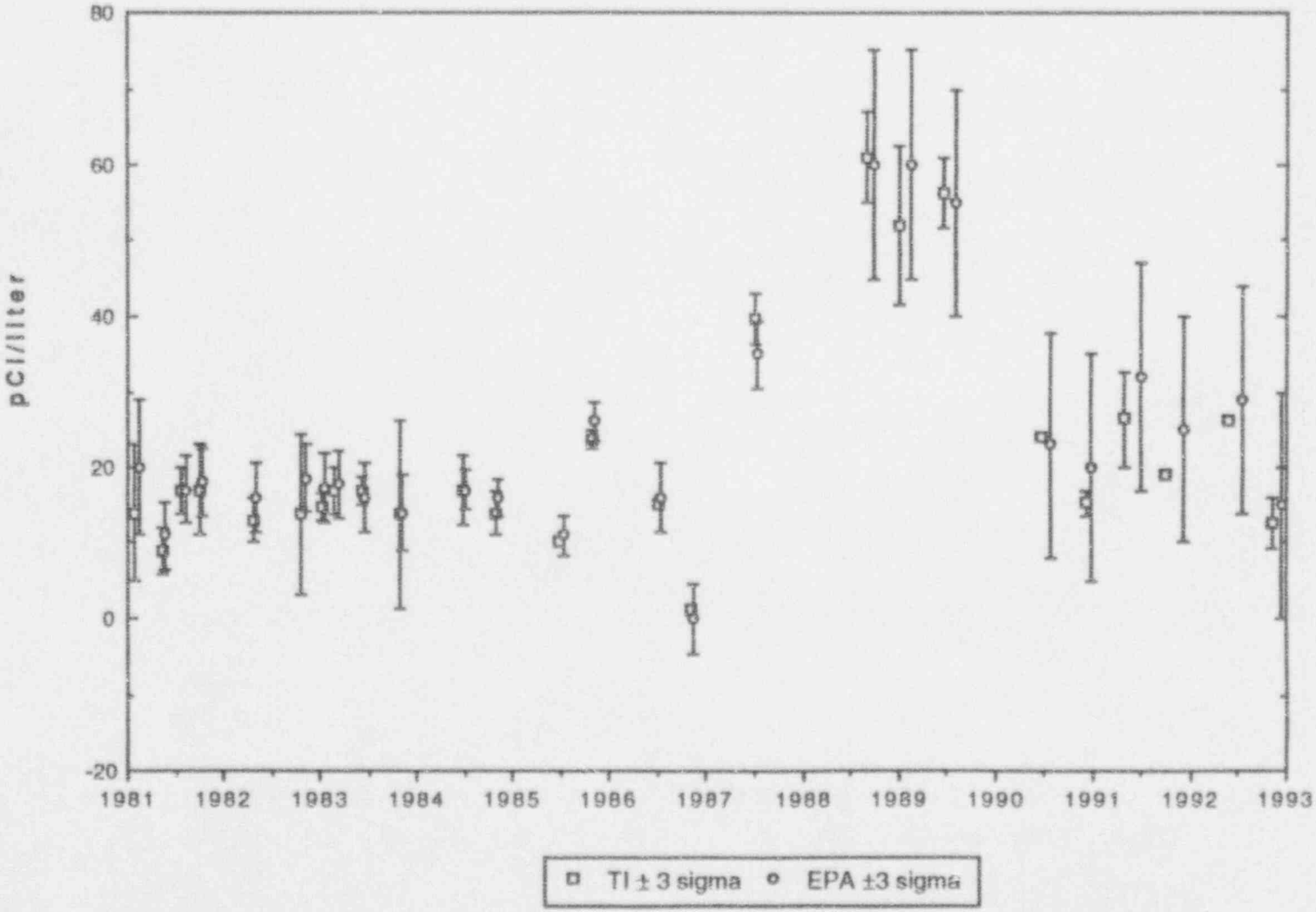
EPA CROSS CHECK PROGRAM

STRONTIUM-89 IN MILK



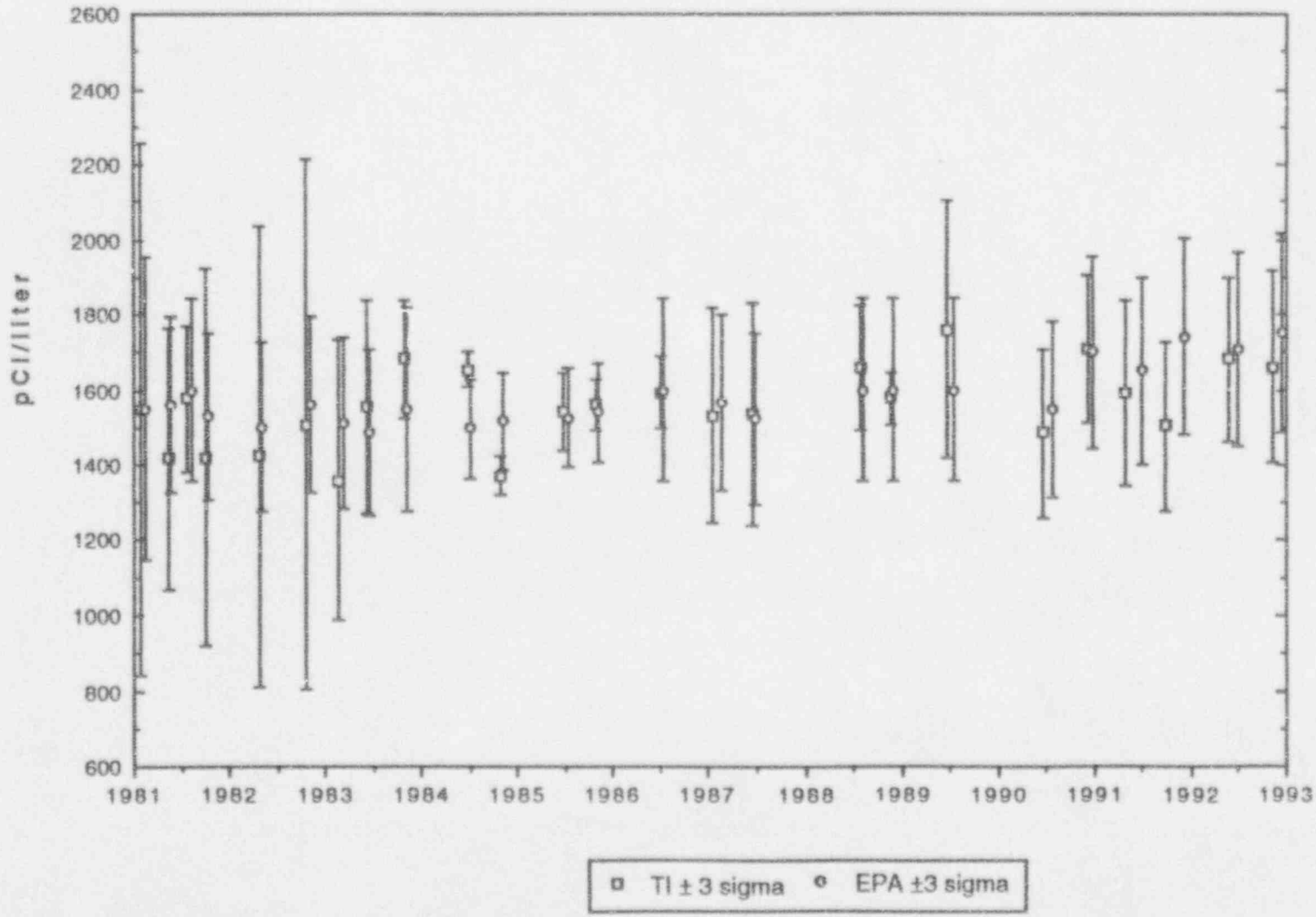
EPA CROSS CHECK PROGRAM

STRONTIUM-90 IN MILK



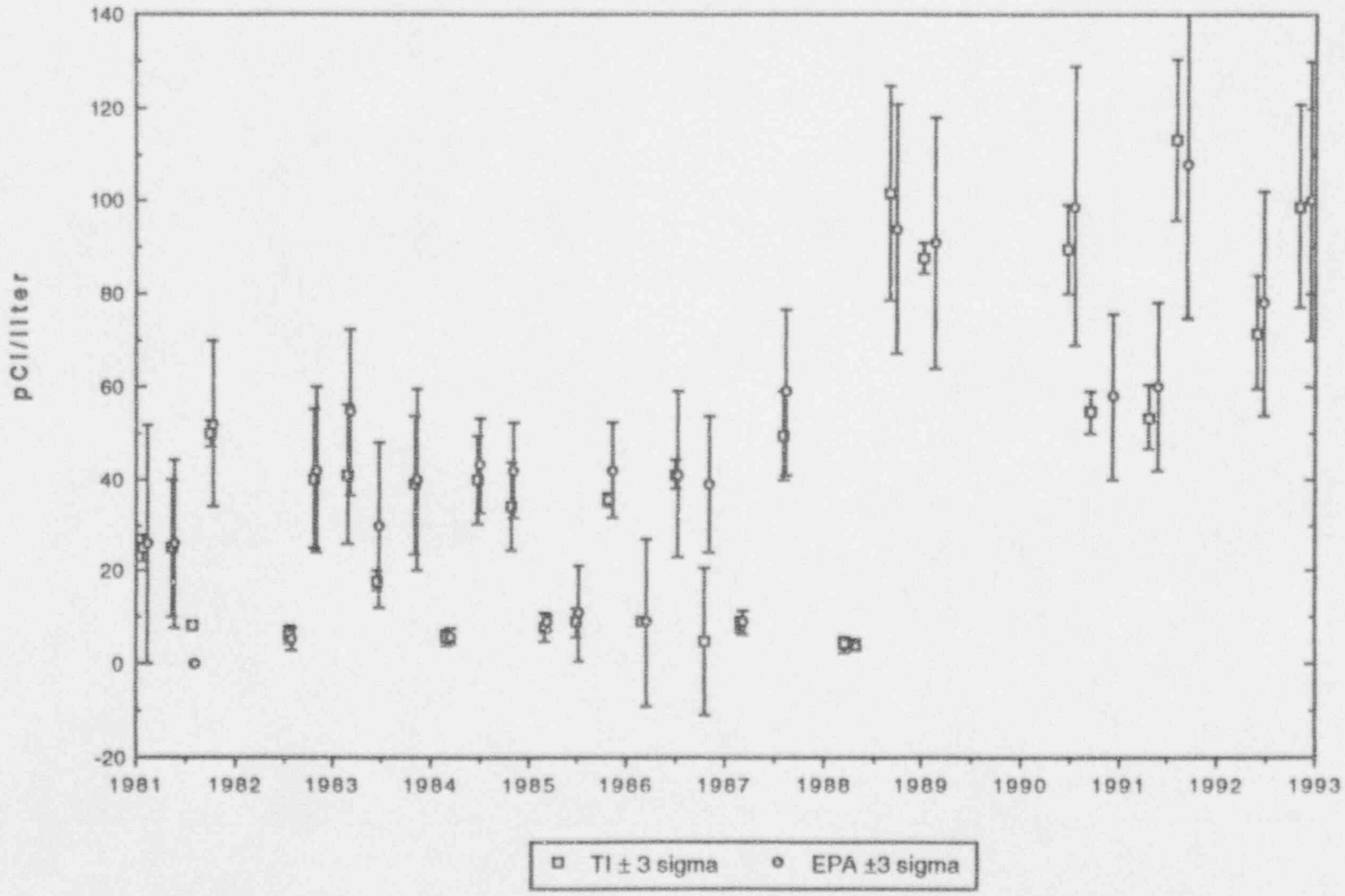
EPA CROSS CHECK PROGRAM

POTASSIUM-40 IN MILK



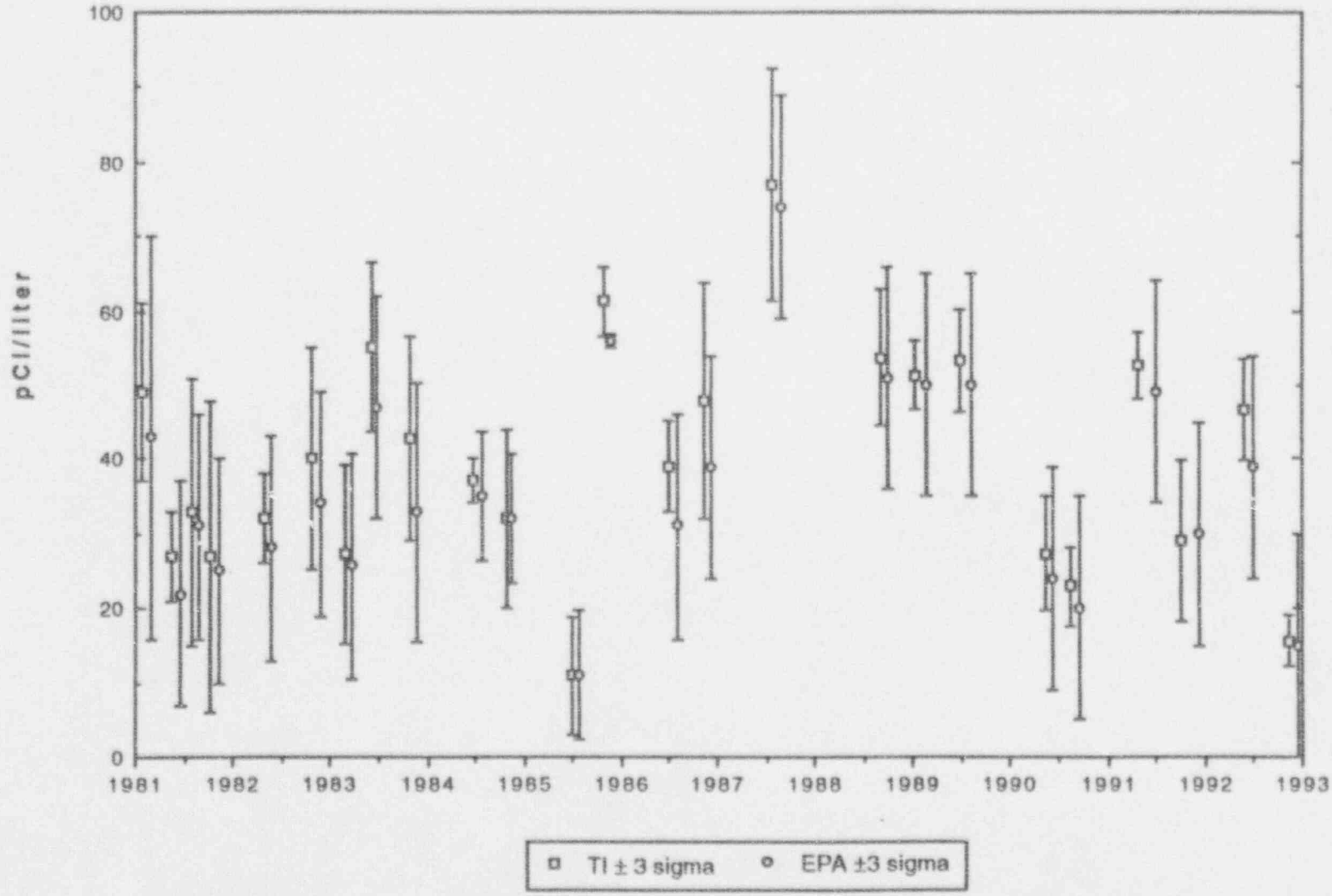
EPA CROSS CHECK PROGRAM

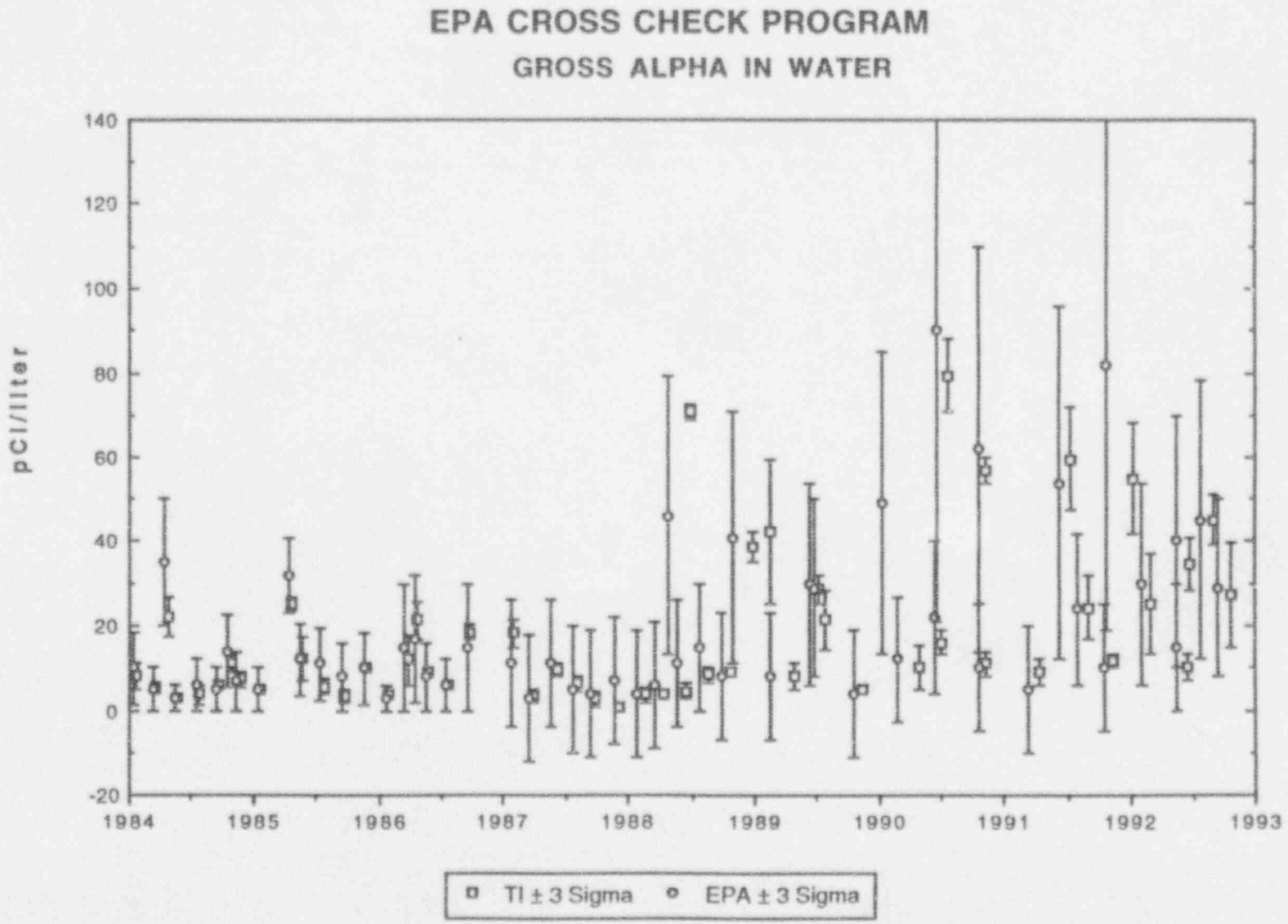
IODINE-131 IN MILK



EPA CROSS CHECK PROGRAM

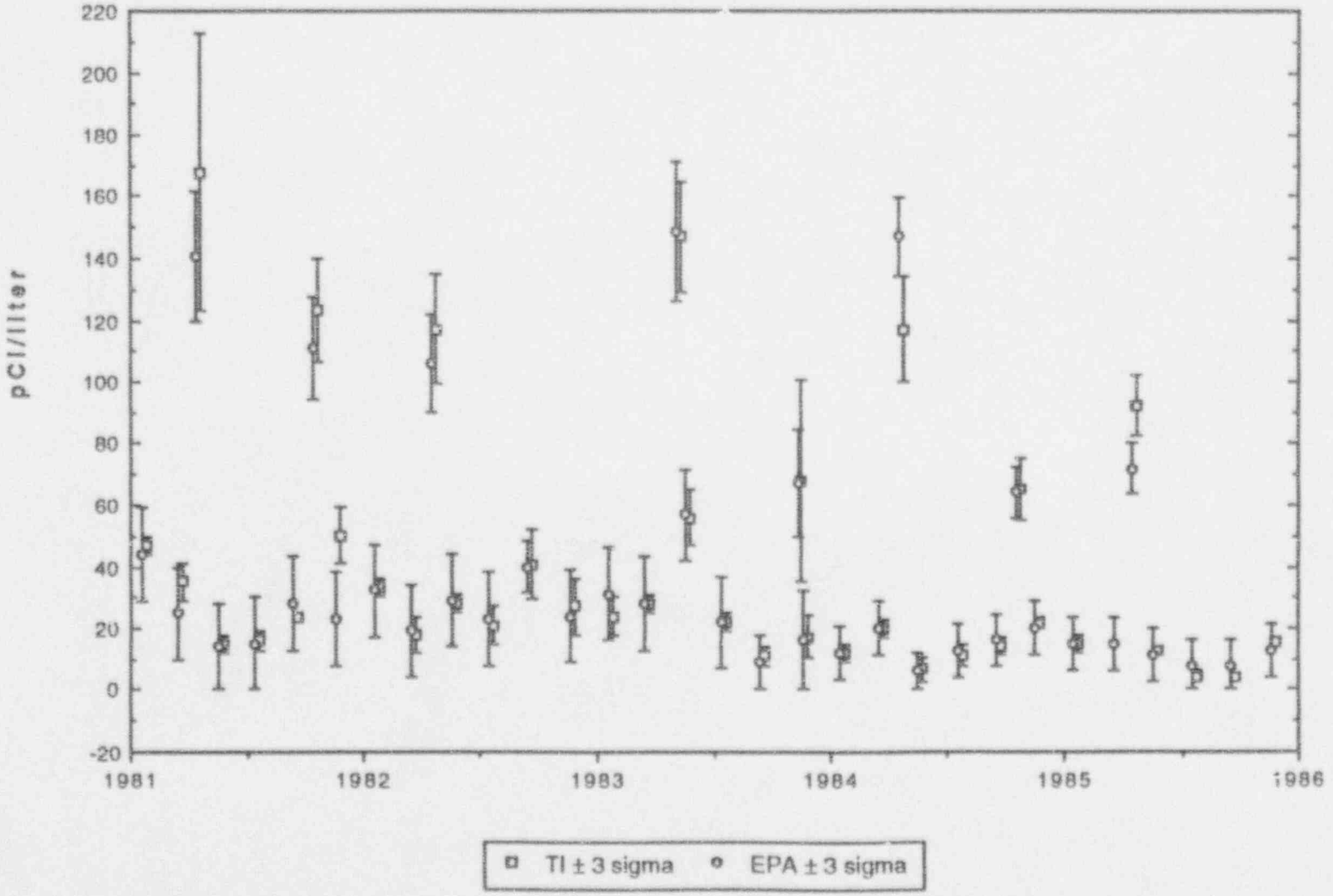
CESIUM-137 IN MILK




EPA CROSS CHECK PROGRAM
GROSS ALPHA IN WATER
pCi/liter
140
120
100
80
60
40
20
0
-20
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
TI ± 3 Sigma
EPA ± 3 Sigma

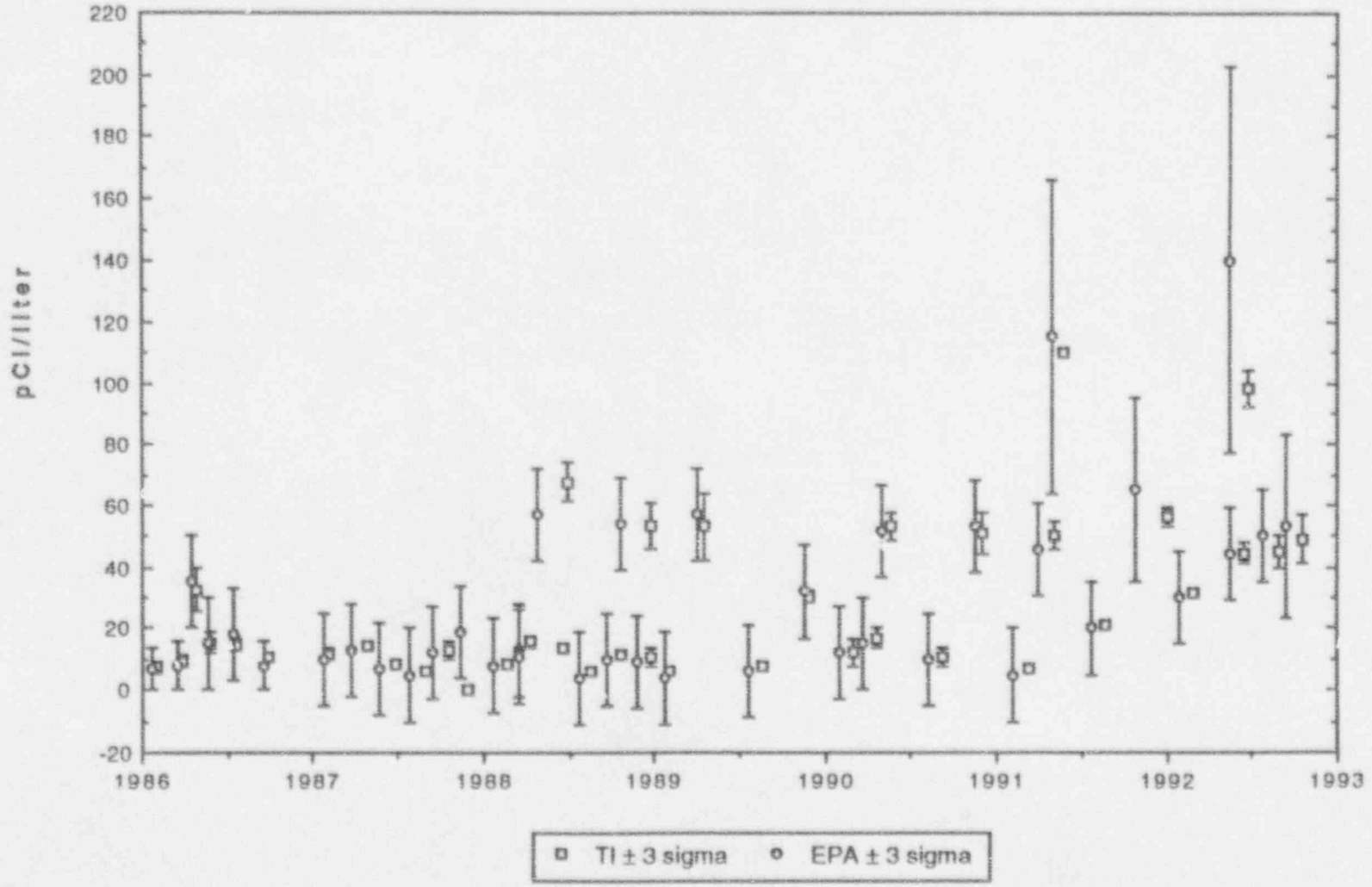
EPA CROSS CHECK PROGRAM

GROSS BETA IN WATER (pg. 1 of 2)



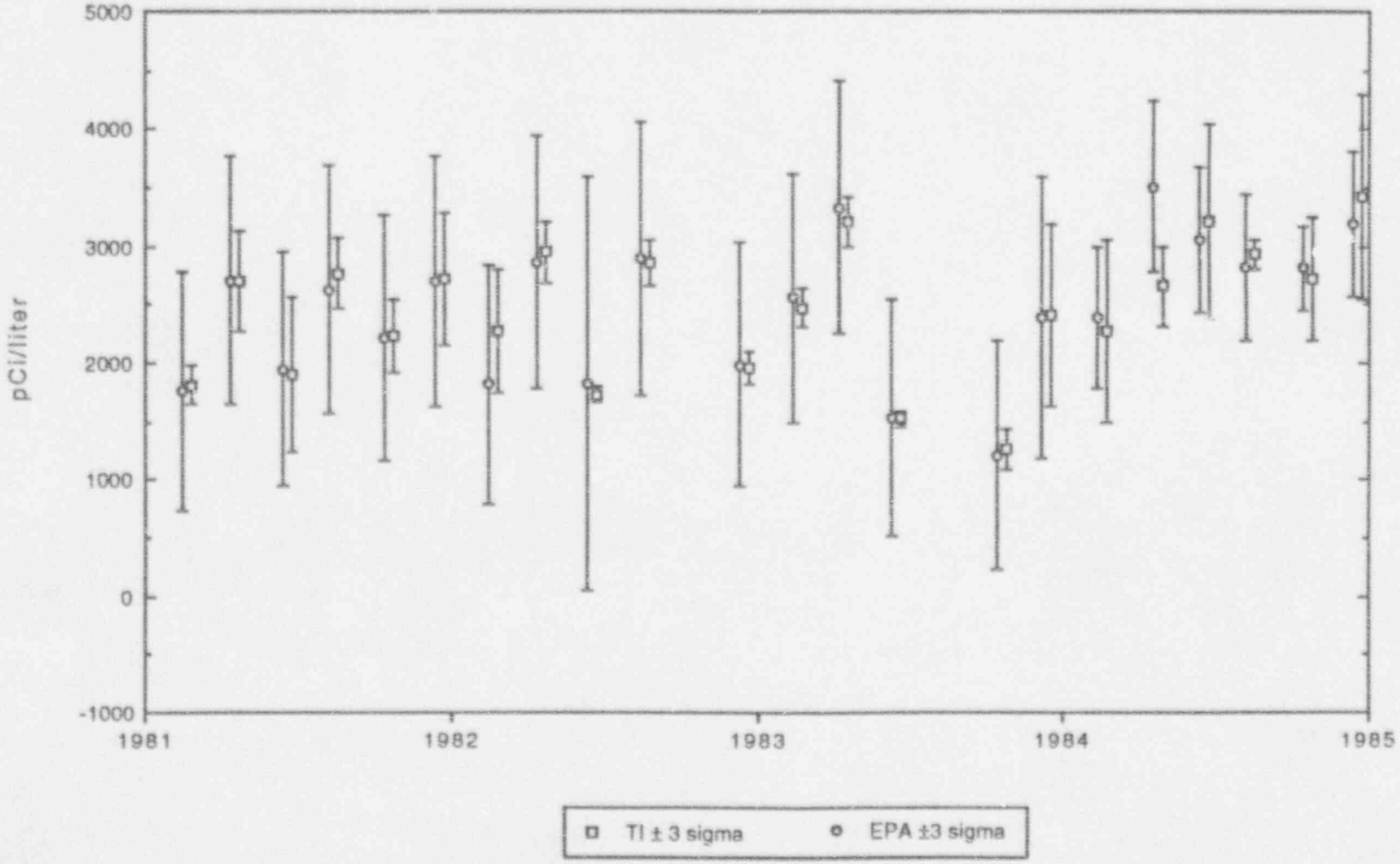
EPA CROSS CHECK PROGRAM

GROSS BETA IN WATER (pg. 2 of 2)



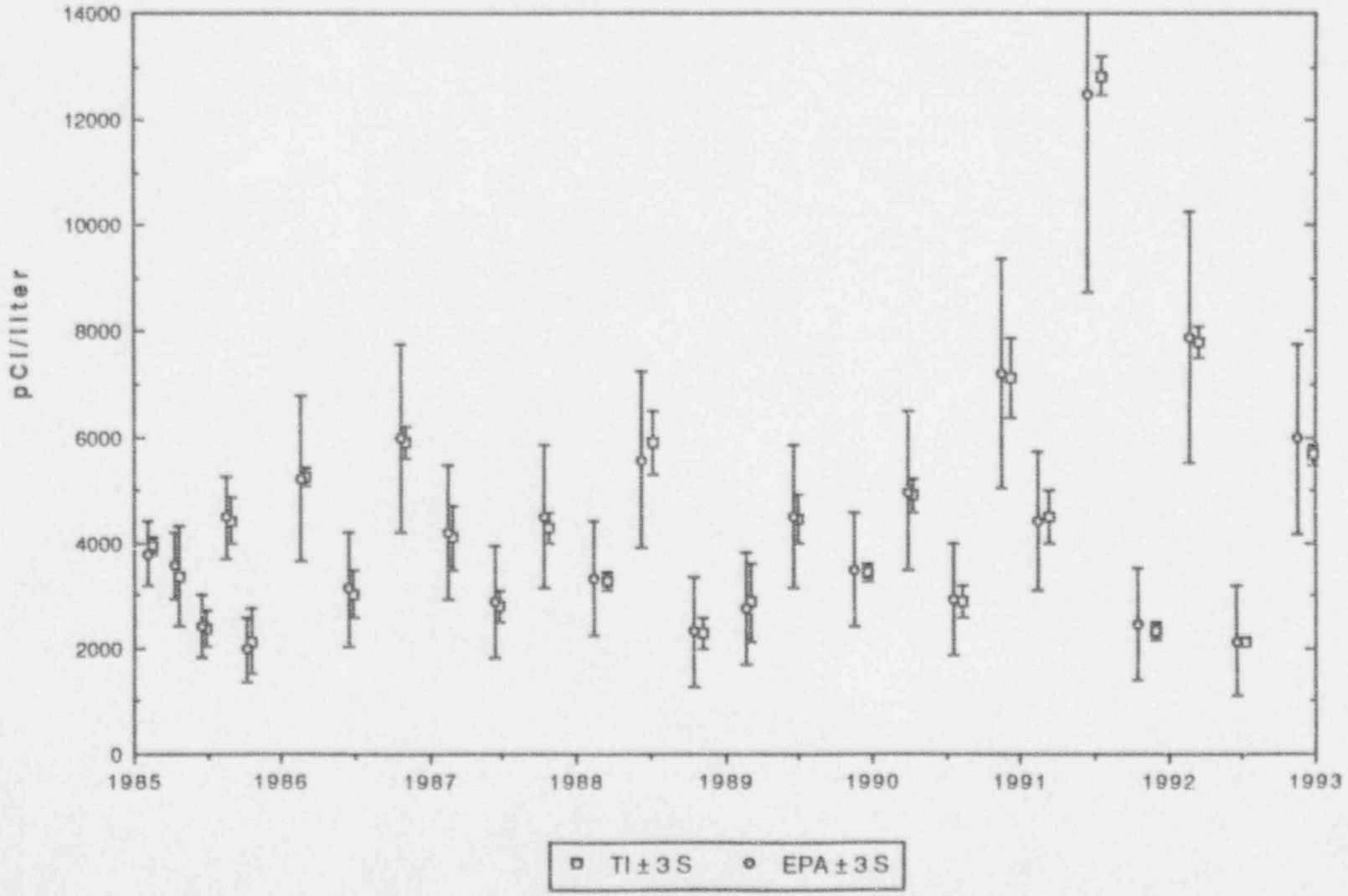
EPA CROSS CHECK PROGRAM

TRITIUM IN WATER (pg. 1 of 2)



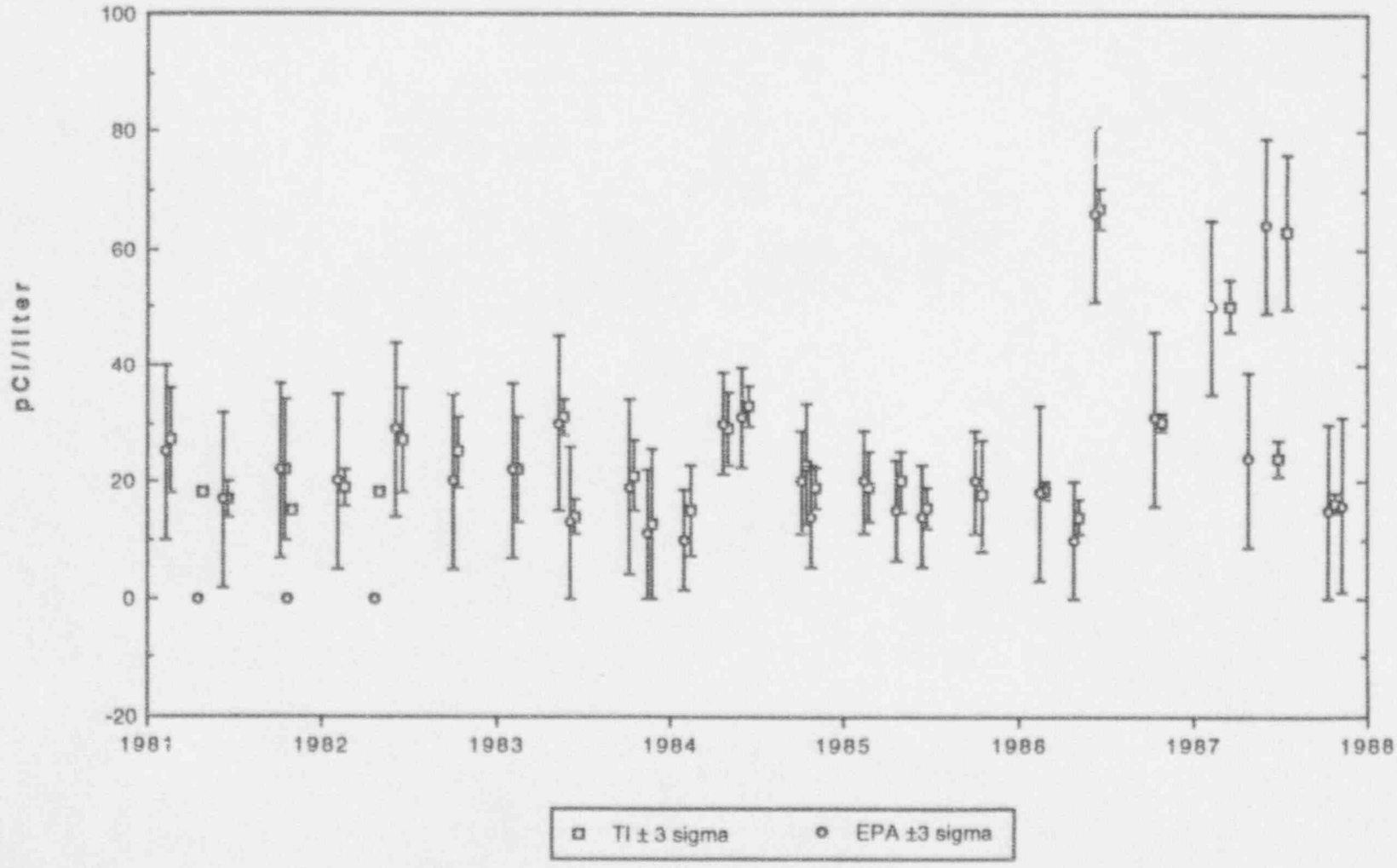
EPA CROSS CHECK PROGRAM

TRITIUM IN WATER (pg. 2 of 2)



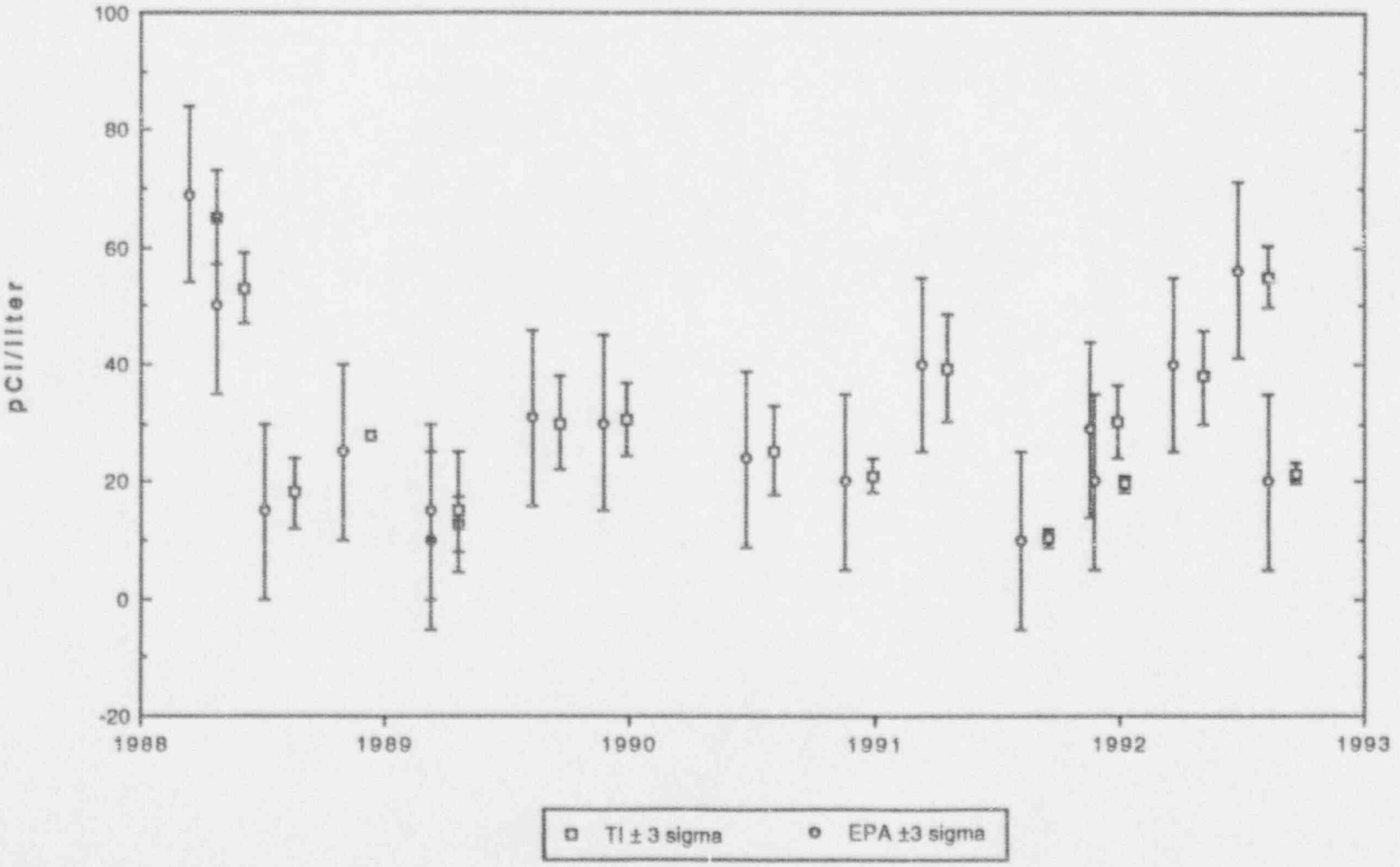
EPA CROSS CHECK PROGRAM

COBALT-60 IN WATER (pg 1 of 2)



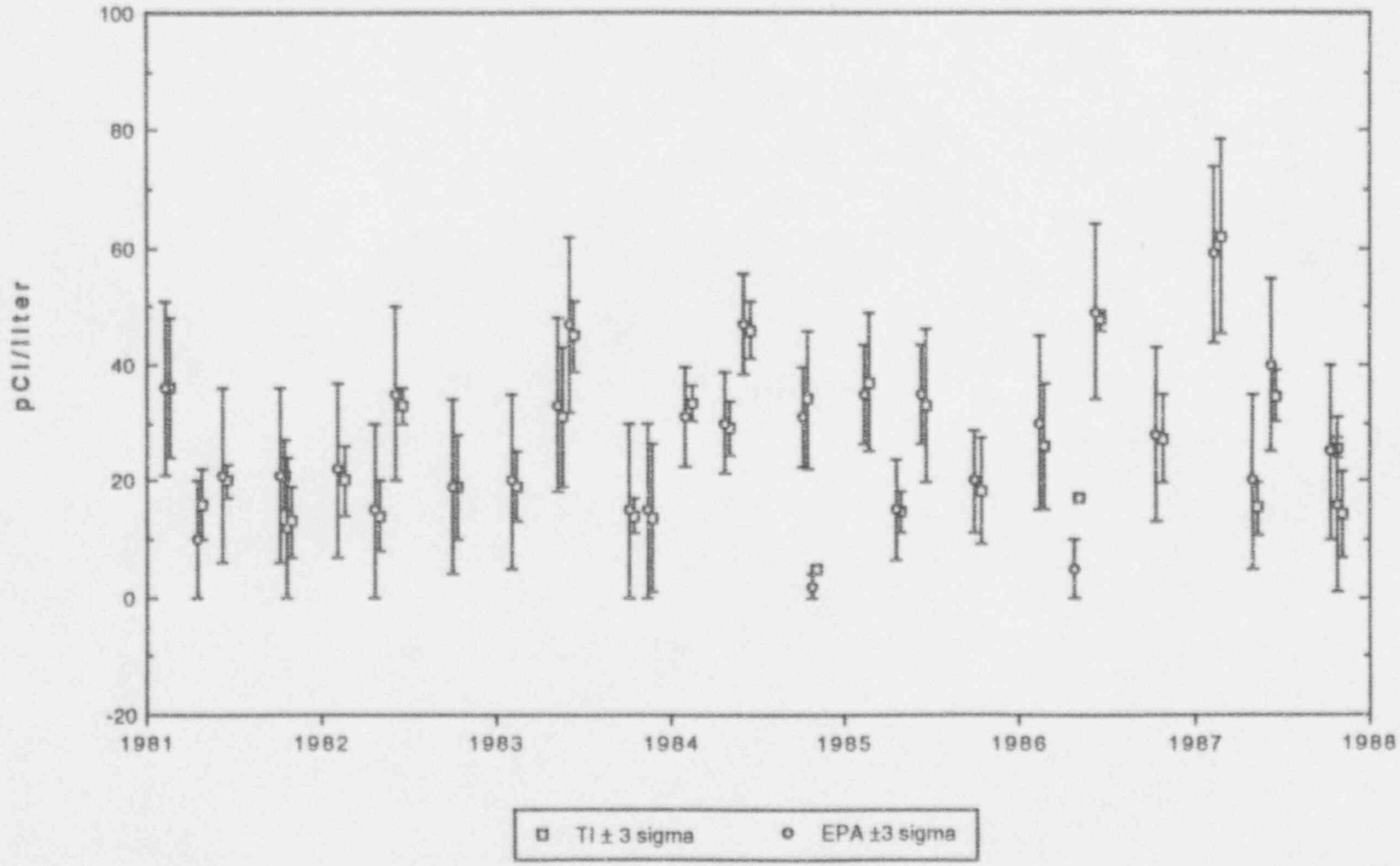
EPA CROSS CHECK PROGRAM

COBALT-60 IN WATER (pg. 2 of 2)



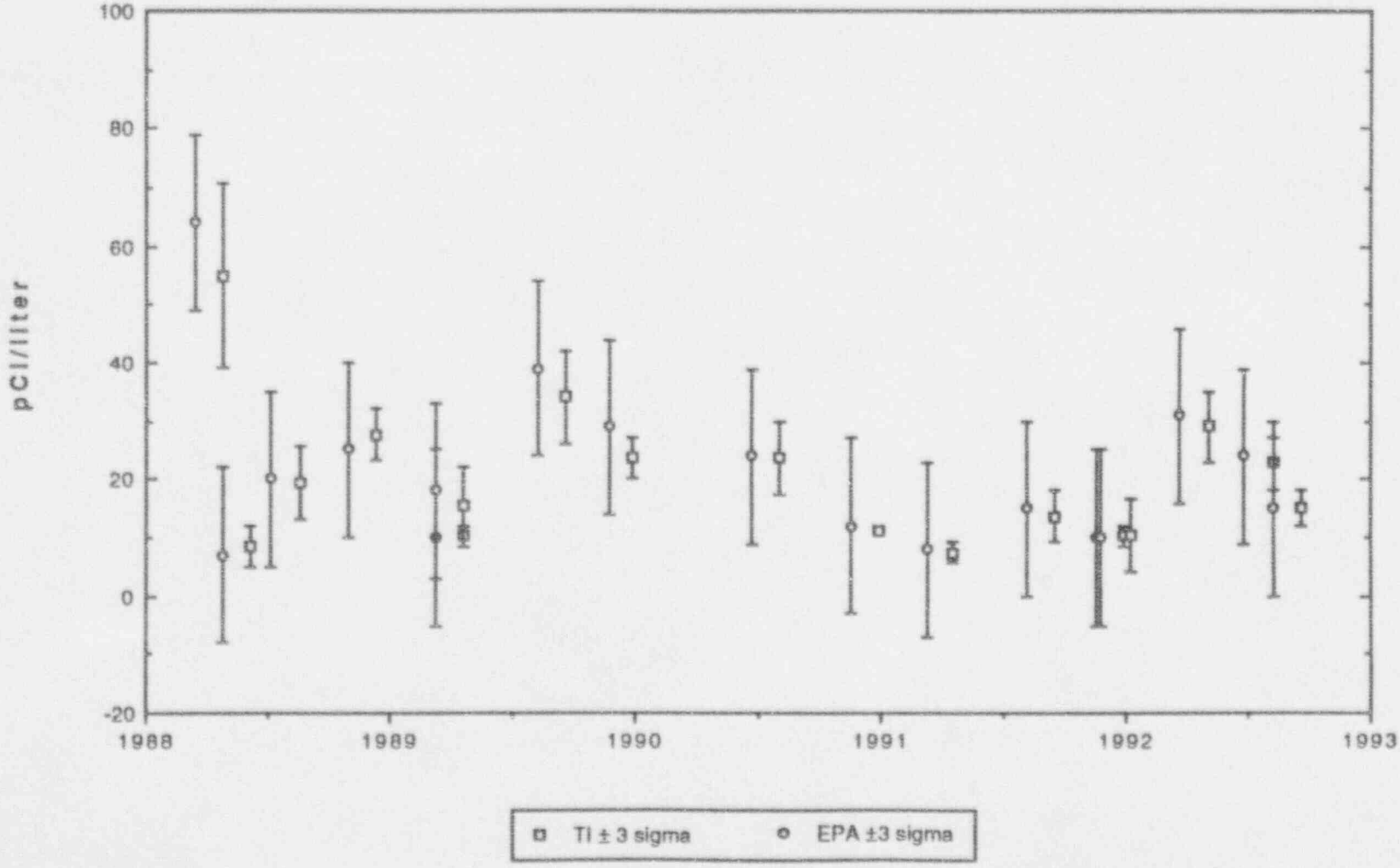
EPA CROSS CHECK PROGRAM

CESIUM-134 IN WATER (pg. 1 of 2)



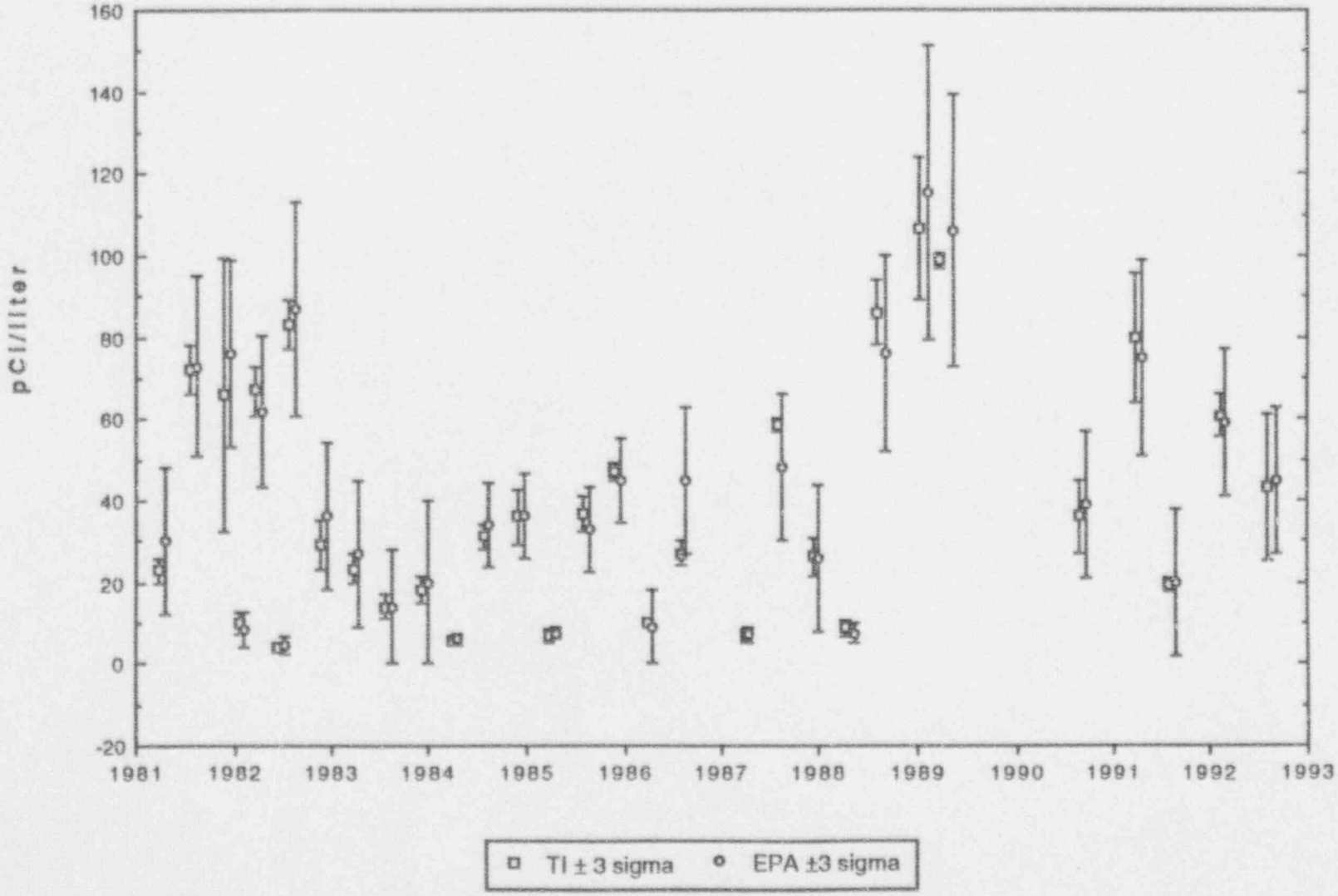
EPA CROSS CHECK PROGRAM

CESIUM-134 IN WATER (pg. 2 of 2)



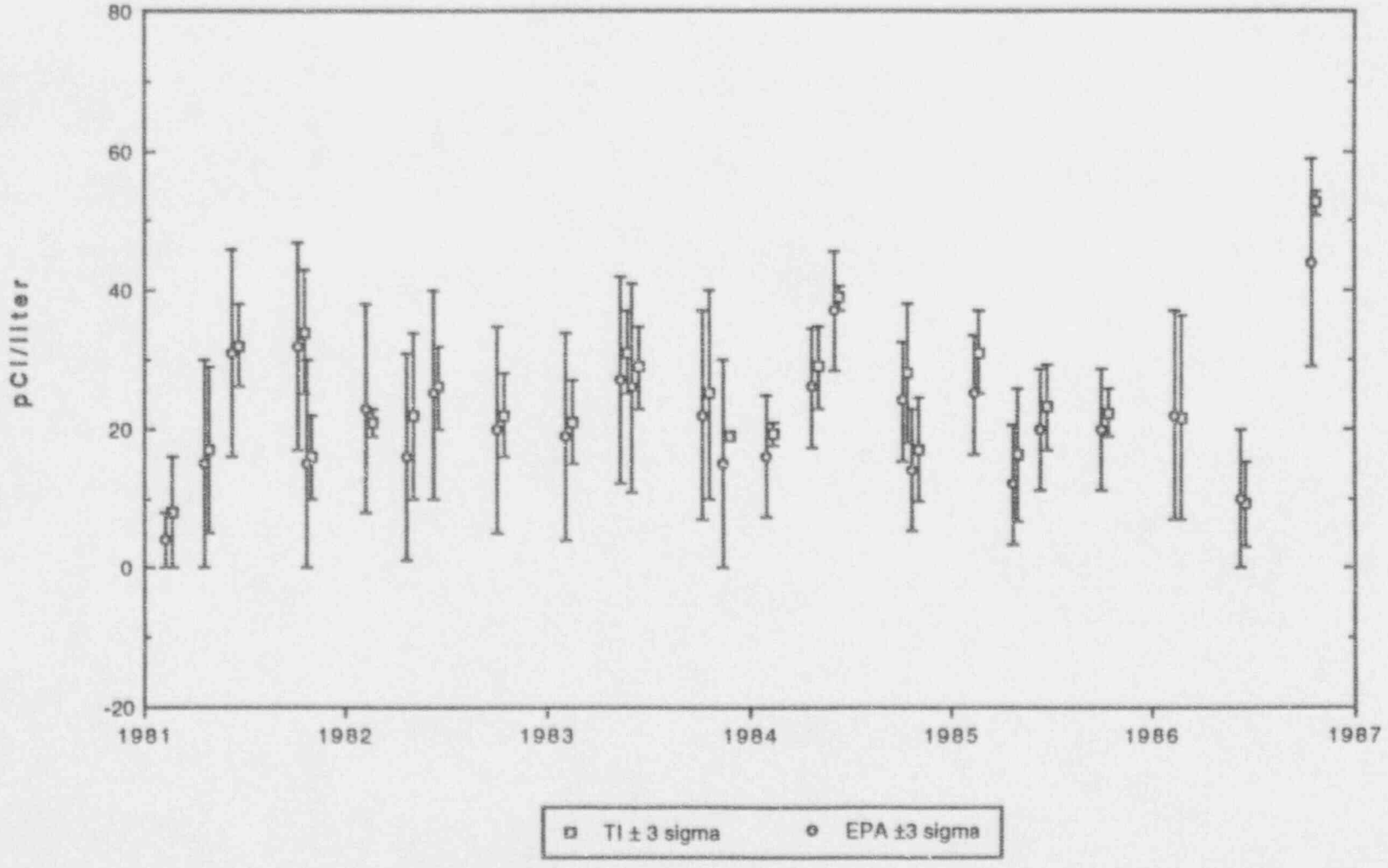
EPA CROSS CHECK PROGRAM

IODINE-131 IN WATER



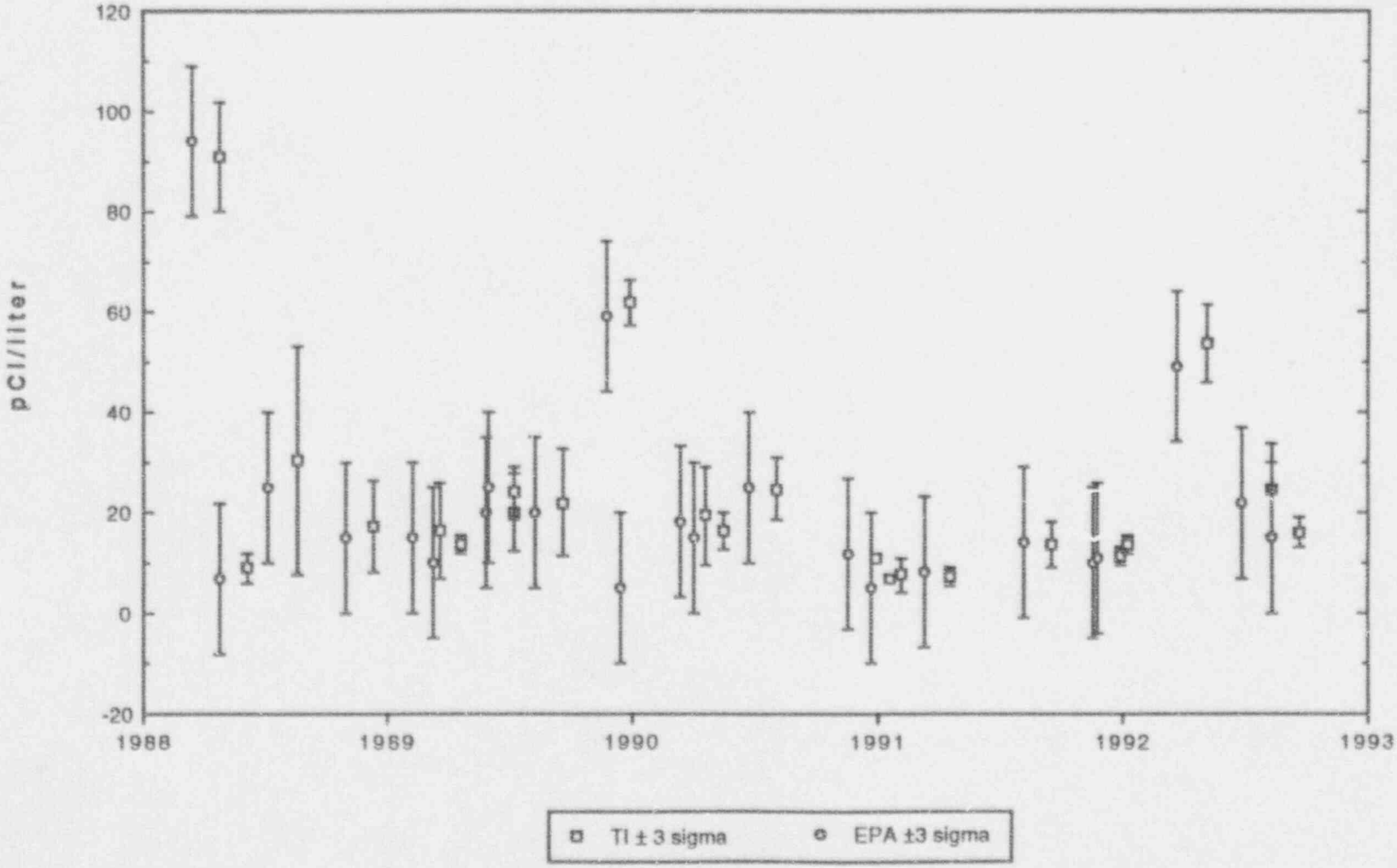
EPA CROSS CHECK PROGRAM

CESIUM-137 IN WATER (pg. 1 of 2)



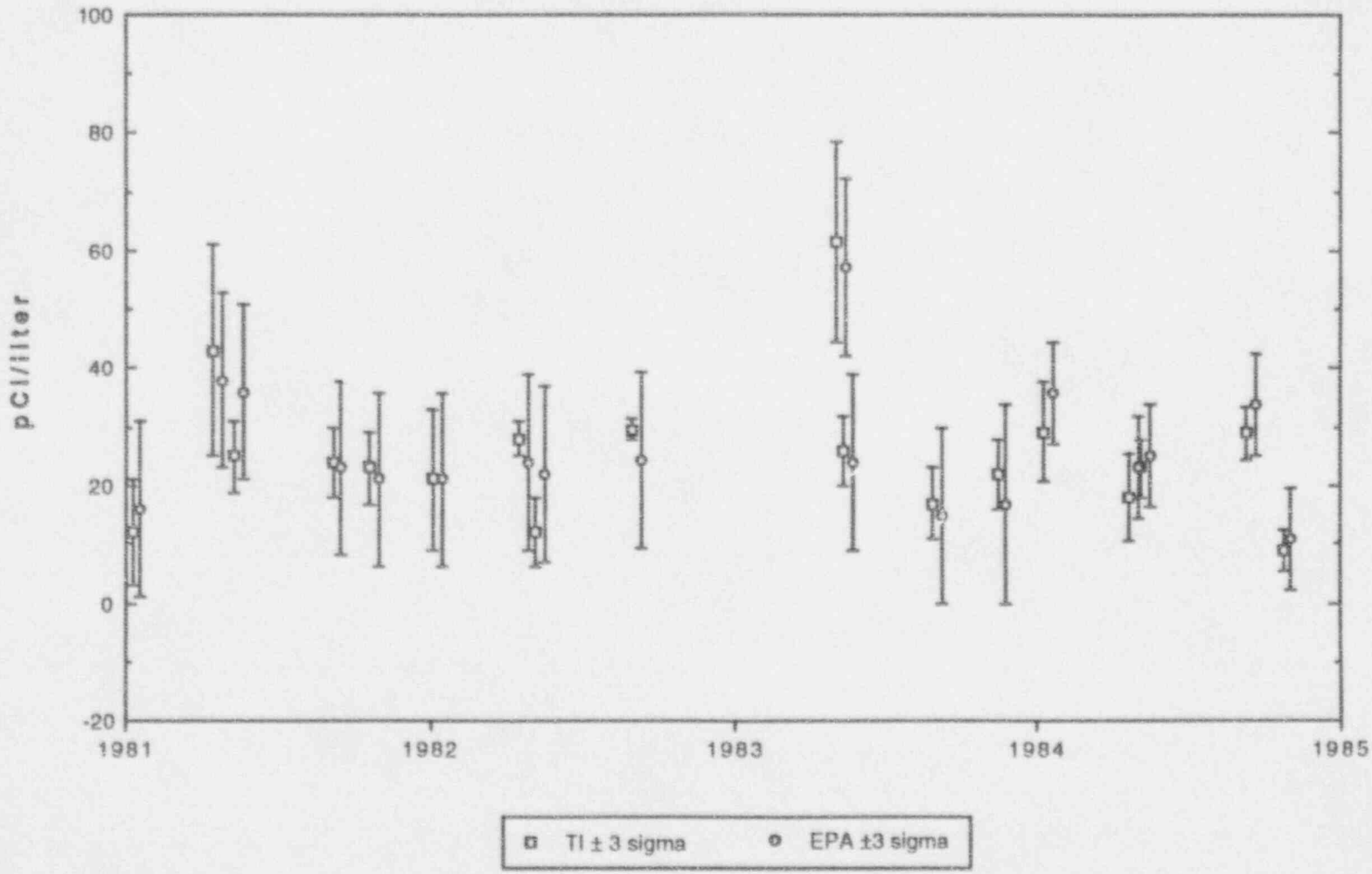
EPA CROSS CHECK PROGRAM

CESIUM-137 IN WATER (pg. 2 of 2)



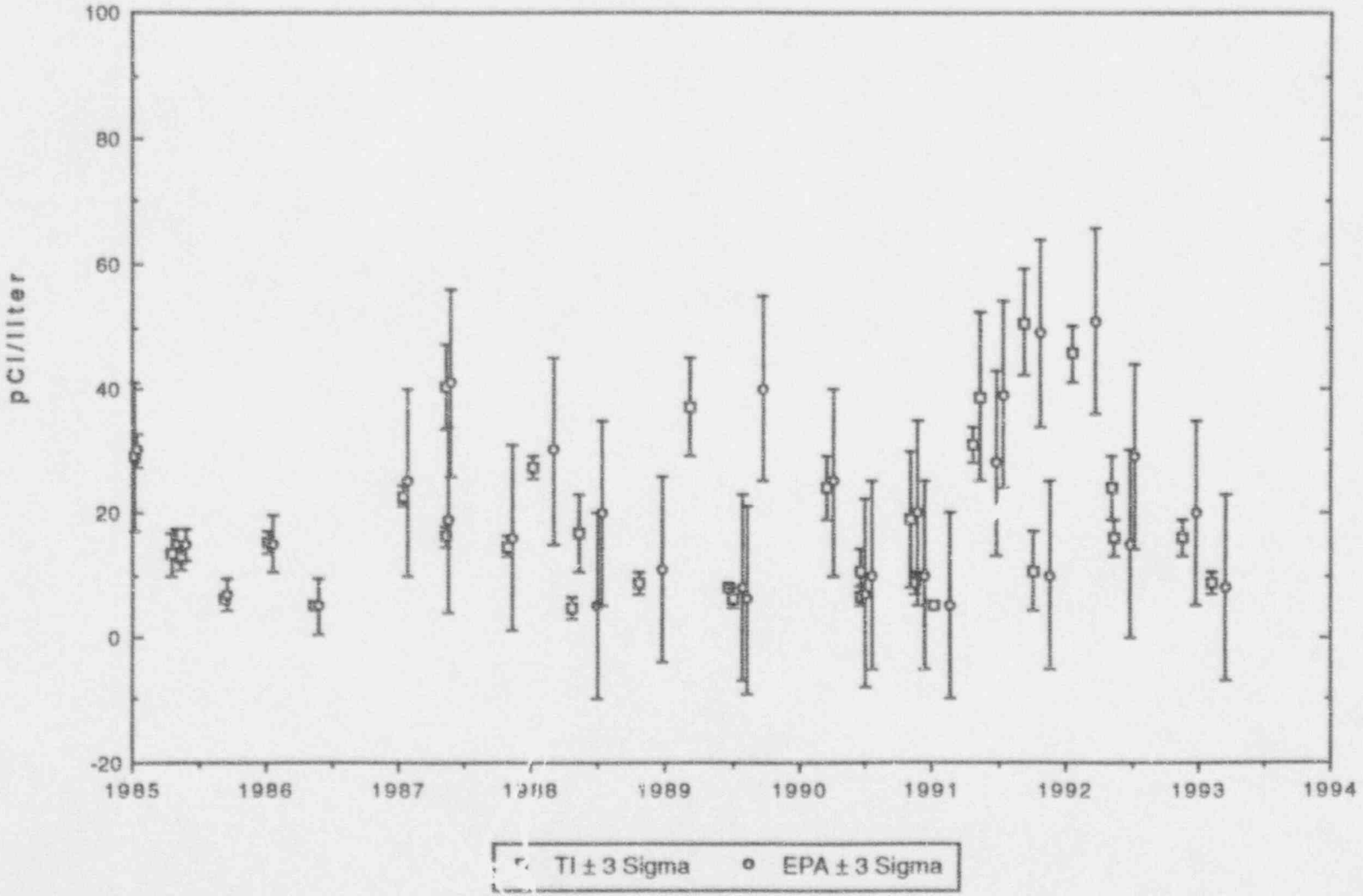
EPA CROSS CHECK PROGRAM

STRONTIUM-89 IN WATER (pg. 1 of 2)



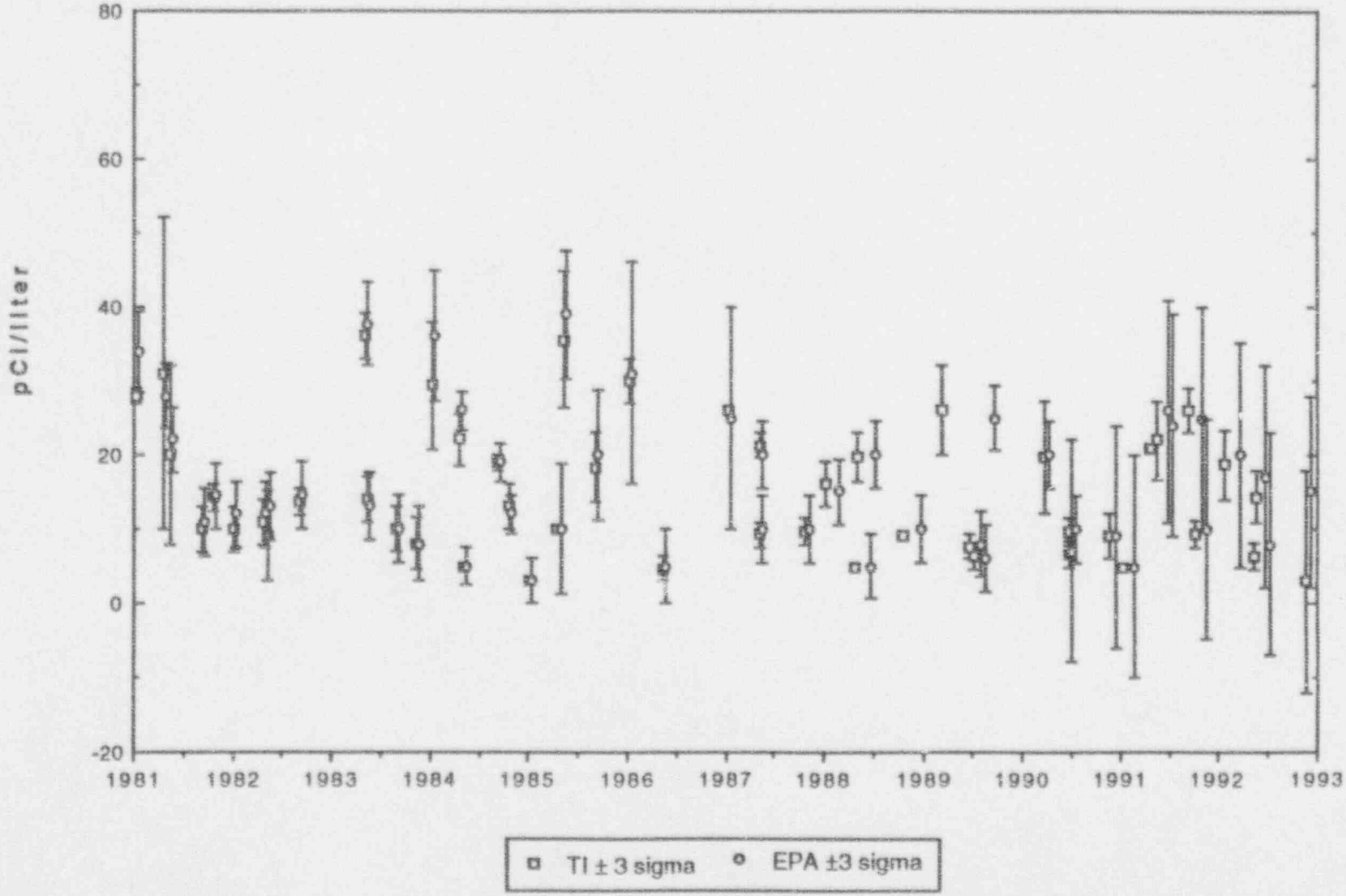
EPA CROSS CHECK PROGRAM

STRONTIUM-89 IN WATER (pg. 2 of 2)



EPA CROSS CHECK PROGRAM

STRONTIUM-90 IN WATER



APPENDIX F

REMP SAMPLING AND ANALYTICAL EXCEPTIONS

TABLE F-1

REMP Exceptions for Scheduled
Fish Sampling and Analysis During 1992

Location	Description	Date of Sampling	Reason(s) for Loss/Exception
3C1 14C1 1 3G2	Sea Robin Sea Robin Sea Robin	05/20/92 05/19/92 05/26/92	Sea Robin were not present at any location during sampling.
14C1	Windowpane	05/19/92	Samples collected did not meet specified amount; collected 100g, required 12kg. Sample was inadvertently lost at analytical laboratory.
Various	Fish		Samples collected did not meet specified amount; however all required analyses were performed.
3C1	Windowpane	05/20/92	Collected: 500g Required: 1.2kg
14C1	Windowpane	10/06/92	Collected: 700g Required: 1.2kg
14C1	Sea Robin	10/06/92	Collected: 300g Required: 1.2kg
3C1	Winter Flounder	10/08/92	Collected: 700g Required: 1.2kg
3C1	Windowpane	10/08/92	Collected: 400g Required: 1.2kg
3C1	Sea Robin	10/08/92	Collected: 300g Required: 1.2kg
13G2	Sea Robin	10/12/92	Collected: 100g Required: 1.2kg

TABLE F-2

REMP Exceptions for Scheduled
Invertebrate Sampling and Analysis During 1992

Location	Description	Date of Sampling	Reason(s) for Loss/Exception
Various	Invertebrates		Samples collected did not meet specified amount; however, all required analyses were performed.
14C1	Lobster	05/19/92	Collected: 850g Required: 1.2kg
3C1	Lobster	05/20/92	Collected: 600g Required: 1.2kg
3C1	Whelk	05/26/92	Collected: 600g Required: 1.2kg
3C1	Lobster	10/08/92	Collected: 800g Required: 1.2kg
3C1	Squid	10/08/92	Collected: 600g Required: 1.2kg
13G2	Lobster	10/12/92	Collected: 900g Required: 1.2kg

TABLE F-3

REMP Exceptions for Scheduled
Airborne Particulates Sampling and Analysis During 1992

Location	Description	Date of Sampling	Reason(s) for Loss/Exception
6S2	Particulate	01/21/92-01/28/92	Sampler malfunction and no sample collected.
2A2	Particulates	12/15/92-12/22/92	Sample not collected. Sampler out of service due to storm damage.
2A2	Particulates	12/22/92-12/29/92	Sample not collected. Sampler out of service due to storm damage.

TABLE F-4

REMP Exceptions for Scheduled
Food Product Sampling and Analysis During 1992

Location	Description	Date of Sampling	Reason(s) for Loss/Exception
12H1	Strawberries	06/25/92	Not grown locally.
6B21	Lettuce	06/25/92	None available.
8B1	Lettuce	07/21/92	Not grown locally.
B21	Various	07/21/92	Farm stand not open.
12H1	Various	07/21/92	Lettuce, cabbage, potatoes and corn not grown locally.
12H2	Various	07/21/92	Lettuce, cabbage and potatoes not grown locally.
6B21	Various	08/19/92	Lettuce, cabbage, carrots and potatoes not grown locally.
8B1	Lettuce	09/16/92	None available.
6B21	Various	09/16/92	Lettuce and cabbage not grown locally.
12H2	Cabbage	09/16/92	Not grown locally.
8B1	Tomatoes	10/14/92	None available.

APPENDIX G

SNPS LAND USE SURVEYS

SNPS LAND USE CENSUS

The Land Use Census program complies with Section 3/4.12.2 of SNPS ODCM. This requires a survey of all milk animals and gardens greater than $50m^2$ (500 ft^2) producing broad leaf vegetation within a radial distance of 8 Km (5 miles). LIPA is also required to identify the nearest milk animal, residence and garden in each of the 16 meteorological sectors.

LILCO's Environmental Engineering Department conducted the 1992 dairy animal census, during April through July. This survey was conducted by Environmental Technicians driving through each neighborhood within the 5 mile radial distance and visually checking for dairy animals. When a dairy animal was observed the technicians requested information from the owner concerning the amount of milk produced, feed, number of animals and grazing methods.

The 1992 census results indicated that there are no milk producing cows within a 5 mile radial distance from the site; however, the survey did locate the following milk producing goats:

1. Sector 13, 1.9 miles west of SNPS
   Poole
   Briarcliff Road
   Shoreham, New York 11786

   REMP Monitoring Location 13B1

   Inventory: 2 milking goat
   0 non-milking goat

   Inventory Date: April 15, 1992

2. Sector 11, 2.40 miles southwest of SNPS
   Shoreham-Wading River School District
   Middle School
   Randall Road
   Shoreham, New York 11786

   REMP Monitoring Location 11C1

   Inventory: 1 milking goats
   1 non-milking goat

   Inventory Date: April 15, 1992

Table G-1 lists the nearest milk animal in the sixteen meteorological sectors. Additional field survey data are filed in the Shoreham Record Retrieval System.

The Garden Census was also conducted by Environmental Engineering Technicians visually noting each garden of $50m^2$ ($500\ ft^2$) or greater. The 1992 census was performed during July, August, and September locating a total of 200 gardens. Table G-2 lists the nearest garden in the sixteen meteorological sectors. The field survey sheets and maps are filed at Environmental Engineering Melville and in the Shoreham Record Retrieval System.

Environmental Engineering identifies nearest residences by utilizing both aerial photography and visual confirmation. This year's census was conducted in December, 1992. Table G-3 lists the nearest residence in each meteorological sector.

TABLE G-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

1992 Land Use Census

Nearest Milk Animal (within 8 km)

Sector	Direction	Location
1	N	Area within sector is Lond Island Sound
2	NNE	None
3	NE	None
4	ENE	None
5	E	None
6	ESE	None
7	SE	None
8	SSE	None
9	S	None
10	SSW	None
11	SW	Shoreham-Wading River Middle School Randall Road, Shoreham
12	WSW	None
13	W	C.B. Poole Residence, Briarcliff Road, Shoreham
14	WNW	None
15	NW	Area within sector is Long Island Sound
16	NNW	Area within sector is Long Island Sound

TABLE G-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

1992 Land Use Census

Nearest Garden (> 50m^2 within 8 km)*

Sector	Garden Code #	Location & Direction
1	-	Area within sector is Long Island Sound
2	-	None
3	-	None
4	4B22G	Czebotar, Sunset Blvd., Wading River, 5853' ENE of SNPS.
5	5A11G	Loggia, Little Bay Road, Wading River, 4201' E. of SNPS.
6	6A12G	Punda, Sound Ave., Wading River, 4343' ESE of SNPS.
7	7B14G	Waski, Gateway Dr., Wading River, 6788' SE of SNPS.
8	8A14G (8B1)	Pierzchanowski, Randall Road, Wading River, 5194' SSE of SNPS.
9	9B14G	Smith, Randall Road, Wading River, 6028' S of SNPS.
10	10C13G	Waligura, Bradley Dr., Shoreham, 14,014' SSW of SNPS.
11	11B34G	Gallagher, Royal Way, Shoreham 6724', SW of SNPS.
12	12B31G	Murtagh, Harvard Road, Shoreham, 6403' SW of SNPS.
13	13B22G	Connoly, Valentine Road, Shoreham, 4542' W of SNPS.
14	-	None
15	-	Area within sector is Long Island Sound
16	-	Area within sector is Long Island Sound

* SNPS ODCM Part I, Section 3/4.12.2

TABLE G-3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

1992 Land Use Census

Nearest Residence (within 8 km)*

Sector	Direction	Location
1	N	Area within sector is Long Island Sound
2	NNE	Thurber-Creek Road, Wading River, 1503' from SNPS
3	NE	Creek Road, Wading River, 1916' from SNPS (First house east of Field and Tennis Club).
4	ENE	Hughes-Creek Road, Wading River, 3444' from SNPS (fifth house west of Riverhead Town Beach)
5	E	Peterson-Sound Road, Wading River, 3598' from SNPS
6	ESE	Bartow-Sound Road, Wading River, 2917' from SNPS
7	SE	Larsen-North Country Road and Thomas Drive, Wading River, 3304' from SNPS
8	SSE	North Country Road, fifth house west of Pheasant Run, Wading River, 2588' from SNPS
9	S	Fugelsang- 20 Long Bow, Wading River, 3839' from SNPS
10	SSW	16 Defense Hill Road, Wading River, 4877' from SNPS
11	SW	170 North Country Road, Wading River, 1632' from SNPS
12	WSW	Gildea-Valentine Road, Shoreham, 5557' from SNPS
13	W	Brice, 55 Valentine Road, Shoreham, 4620' from SNPS

* SNPS ODCM Part I, Section 3/4.12.2

TABLE G-3 (Cont.)

Sector	Direction	Location
14	WNW	St. Joseph's Villa, Wading River, 2178' from SNPS
15	NW	Area within sector is Long Island Sound
16	NNW	Area within sector is Long Island Sound

APPENDIX H

COMMON AND SCIENTIFIC NAMES OF SPECIES COLLECTED IN THE REMP

TABLE H-1

COMMON AND SCIENTIFIC NAMES OF SPECIES COLLECTED
IN THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Common Name	Scientific Name
Fish	
Winter Flounder	*Pseudopleuronectes americanus*
Windowpane	*Scophthalmus aquosus*
Searobin	*Prionotus* spp.
Little Skate	*Raja erinacea*
Invertebrates	
American Lobster	*Homarus americanus*
Squid	*Loligo pealeii*
Channeled Whelk	*Busycon canaliculata*