PILGRIM NUCLEAR POWER STATION

Environmental Radiation Monitoring Program

REPORT NO. 13

JANUARY 1 THROUGH DECEMBER 31, 1980

ISSUED: APRIL 1981

BY: NUCLEAR OPERATIONS SUPPORT DEPT.
ENVIRONMENTAL AND RADIOLOGICAL
HEALTH AND SAFETY GROUP

BOSTON EDISON COMPANY

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

Environmental Radiation Monitoring Program

REPORT NO. 13

January 1, 1980 through December 31, 1980

Prepared by: Tom Sowdon

Thomas L. Sowdon

Environmental and Radiological

Health and Safety Group Leader

Date of Submittal: April 1, 1981

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. Introduction and Summary

This report presents a summary of the results of measurements of direct radiation and radioactivity in environmental media in the vicinity of the Pilgrim Nuclear Power Station - Unit 1 (PNPS-1) and at selected control locations for the period January 1 - December 31, 1980. The results of this Program indicate that PNPS-1 has had a negligible and most often immeasurably small impact on the environment in the vicinity of the plant. Conservatively estimated doses resulting from the measured highest station mean concentrations are typically less than 1% of the doses resulting from naturally occurring radionuclides and residual fallout from atmospheric nuclear weapons testing.

Estimates of concentrations of radionuclides in vegetation and milk and estimates of dose to man, as quoted in this report, were made using methods similar to those described in Regulatory Guide 1.109 and 1.111.

The performance record of the PNPS-1 for the calendar year of 1980 reflects an average capacity factor of 52.7%. Monthly capacity factors are given in Table I-1.

A tabulation of radioactive effluents from the PNPS-1 is provided in Appendix B for the 1980 calendar year.

There were seven Anomalous Measurement Reports made during 1980. The media involved were mussels and algae from the discharge canal and on two occasions, milk from the Plimoth Plantation.

It should be strongly emphasized that the measured concentrations in milk were characteristic of fallout nuclides. These measured anomalous concentrations were 10,000 to 1,000,000 times in excess of the concentrations expected to be present in milk as a result of effluents from PNPS-1. In other words, PNPS-1 probably contributed much less than 1% of the measured concentrations of Sr-90 and Cs-137 in milk at the Plimoth Plantation. The remainder of the measured radioactivity is unquestionably due to atmospheric fallout from weapons tests, not PNPS-1.

The measured concentrations of Co-60, Cr-51 and Mn-54 in the discharge canal samples are unquestionably due to liquid effluents from PNPS-1. However, the maximum dose due to consumption of either algae or mussels with the peak concentrations would result in less than 0.01 mrem to the total body and 0.05 mrem to any organ. Clearly, this dose is not significant when compared to the natural background dose rate of 80 to 100 mrem/year as it is much less than 1% of background.

Essentially, all samples required by the PNPS-1 Technical Specifications were collected on schedule. The only exceptions were occasional failures of the air samplers and/or site inaccessability and occasional unavailability of milk samples from the Plimoth Plantation. Such incidents affected only about 5% of the total number of samples scheduled for collection.

The only other deviation from the technical specification was that on one occasion a measurement of Sr-90 in a sample of milk taken from the Plimoth Plantation on 1/28/80 was high enough to warrent an Anomalous Measurement Report which was not submitted due to an administrative error. This measurement of Sr-90 was 1,000,000 times in excess of the concentration expected to be present as a result of effluents from PNPS-1. In other words, there is no question that this measurement was the result of a source other than PNPS-1. This source was undoubtly, atmospheric fallout due to atmospheric weapons tests.

All other required Anomalous Measurement Reports were made in a timely manner.

TABLE I-1

PNPS-1

CAPACITY FACTORS

1980

(Based on 670 MWe)

Month	Percent Capacity
January	12.08
February	0
March	0
April	0
May	21.32
June	85.05
July	89.73
August	80.54
September	95.57
October	76.64
November	70.02
December	101.88
Average	52.74

II. Description of the Monitoring Program

The Radiological Monitoring Program conducted in accordance with the PNPS-1 Technical Specification is included as Appendix D. The program is essentially identical to that conducted during the latter half of 1977 and incorporates supplemental provisions as specified in the Settlement Agreement between the Massachusetts Wildlife Federation and Boston Edison Company, June 9, 197[2]. The exceptions to the program are as follows:

1) There is no TLD station at Saquish neck since the Mass Wildlife Federation has not yet provided a means for placement and retrival of the TLD as prescribed by the agreement noted above.

2) There is no longer a milk-producing cow at the Plymouth County Farm. The location of the nearest cow is now at the Plimoth Plantation (2.2 miles W). Samples have been collected from this new location since 1979.

3) There is no longer a Karbott Farm. Vegetable samples are now collected at the two nearest gardens near the WNW and SE site boundaries.

The 1980 site Census conducted according to Technical Specification requirements determined that there are several vegetable gardens near the site boundary in the W-WNW and SE-ESE sectors (see Appendix E). In the ESE sector, the nearest garden is at the Shakalis residence (0.6 miles ESE). A sample of squash sprouts was collected from a nearby garden on 9/10/80 (the actual garden was at the resident of Mr. J. B. Work due to the unavailability of appropriate samples from the Shakalis residence). In the west direction the location of the nearest observed garden of approximately 500 square feet was at the residence of Mary Lloyd Evans (0.7 miles W). A sample of Chinese Cabbage was collected from this location on 9/11/80. The location of the nearest animal which produces milk for human consumption is still at the Plimoth Plantation (2.2 miles W). Samples of milk have been collected from this location since May of 1979.

During the 1980 year milk was not always available in sufficient quantity from the Plimoth Plantation to allow sample analyses. However, every reasonable effort was made to collect samples on the frequency specified in the technical specifications.

III. Results of Analyses

This section summarizes the results of the analyses of environmental media samples in compliance with the monitoring program described in Appendix C. The section is divided into sub-sections, each of which describes a particular media or potential exposure pathway.

The results of analyses conducted on environmental media are maintained in a computerized data file which constitutes a data base used for statistical analyses by a computer code entitled ERMAP[3].

ERMAP calculates a set of statistical parameters for each radionuclide whose concentration is reported in a given environmental medium. This set of statistical parameters includes separate analyses for (1) the indicator stations, (2) the control stations, and (3) the station having the highest annual mean concentration. For each of these three groups of data, ERMAP calculates:

1) the mean value of all measured concentrations;

2) the square root of the mean square deviation (this is an estimate of the sample variance);

3) the lowest and highest calculated concentrations;

4) the number of positive measurements divied by the total number of measurements;

Entries listed under the heading LLD* are the mean of all LLD values, where each LLD equals 4.67 times the standard error of the associated background measurement.

* Lower Limit of Detection

The results of ERMAP are provided in each subsection for the appropriate media. In addition, plots of measured concentration as a function of sampling time are included for certain isotopes in certain media in an effort to simplify interpretation of the results.

Sample station identification numbers used by the ERMAP program are provided in Table III-A-1.

TABLE III-A-1

Sample Station Identification Codes

Media	Station Code Number	Station Location
Air Particulate and Iodine Filters	00	Warehouse (0.03 mi-SSE)
	01	Rocky Hill Road (0.8 mi-SE)
	03	Rocky Hill Road (0.3 mi-WNW)
	06	Property Line (0.34 mi-NW)
	07	Pedestrian Bridge (0.14 mi-N)
	08	Overlook Area (0.03 mi-W)
	09	East Breakwater (0.35 mi-ESE)
	10	Cleft Rock (0.9 mi-S)
	15	Plymouth Center (4.5 mi-W-WNW)
	17	Manomet Substation (2.5 mi-SSE)
	21	East Weymouth (control - 23 mi-NW)
Waterborne	11	Discharge Canal
	17	Bartlett Pond (1.7 mi-SE)
	25	Power Point (control 7.8 mi-NNW)
Shellfish	11	Discharge Canal Outfall
	12	Plymouth Harbor
	13	Duxbury Bay
	15	Manomet Point
	24	Marshfield (Control)
[illegible] Moss)	11	Discharge Canal Outfall
	15	Manomet Point
	22	Ellisville (Control)
Lobster (Arthropods)	11	Vicinity of Discharge Canal Offshore
	15/99	Offshore (Control)
	25	Scituate (Control)
Fish	2	Round Hill Point - Offshore - (Control)
	11	Vicinity of Discharge Canal
	21	Auto Trawl Station - Offshore - (Control)
	22	Offshore - (Control)
	99	Priest Cove - Offshore - (Control)
Sediment	11	Rocky Point
	12	Plymouth Harbor
	13	Duxbury Bay
	14	Plymouth Beach
	15	Manomet Point
	24	Marshfield (Control)

TABLE III-A-1 (Continued)

Media	Station Code Number	Station Location
Milk	11	Plymouth County Farm (3.5 mi-W)
	15	Plimoth Plantation (2.2 mi-W)
	21	Whitman Farm (control-21 mi-NW)
	22	King Residence (control-12 mi-W)
Cranberries	13	Manomet Point Bog (2.5 mi-SE)
	14	Bartlett Road Bog (2.8 mi-SSE/S)
	23	Pine Street Bog (Control-17 mi-WNW)
Vegetation	11	Plymouth County Farm (3.5 mi-W)
	15	Greenwood Garden (0.5 mi-SE)
	16	Work Residence (0.7 mi-ESE)
	17	Evans Garden (0.7 mi-W)
	22	Bridgewater Farm (Control-20 mi-W)
Beef Forage	11	Plymouth County Farm (3.5 mi-W)
	15	Plimoth Plantation (2.2 mi-W)
	21	Whitman Farm (Control-21 mi-NW)
	22	Bridgewater Farm (Control-20 mi-W)

III. A. Air Particulate Filters

Sample collection systems consisting of a cellulose disc particulate filter and a charcoal filter cartridge are used to collect particulate matter and iodine isotopes respectively. Analyses of the particulate filters for beta radiation is performed weekly. In addition, quarterly composite particulate samples are analysed for gamma emitting isotopes. Table III-A-2 presents the results of the ERMAP for air particulate analyses. (The station identification numbers correspond to the locations identified in Table III-A-1.)

For ease of interpretation of these measurements, a plot of gross beta activity vs. time for all indicator stations is provided in Figure III-A-1 and for the control station in Figure III-A-2.

Positive measurements of specific isotopes characteristic of reactor operation (i.e., Co-60, Zr-95, Nb-95, Ru-103, Cs-137 and Ce-141) were observed at the Warehouse (Station 00 - 0.3 mi - SSE) and on Rocky Hill Road (Station 03 - 0.3 mi - WNW and Station 01 - 0.8 mi - SE). All of the positive measurements on Rocky Hill Road were seen in composite samples for the fourth quarter. As can be seen from Figures III-A-1 and III-A-2 there were peaks in the gross beta activity during the fourth quarter (early October) at the control station in East Weymouth (Station 21 - 23 mi - NW) and at Cleft Rock (Station 10 - 0.9 mi - S). The presence of an elevated gross beta activity at the control station is indication of a contribution of radioactivity from fallout which could also have influenced the measurements made on Rocky Hill Road during that same period.

The positive measurements of Co-60 and Cs-137 made at the Warehouse are certainly due to effluents from PNPS-1. However, even if a person were to breathe air with the highest concentrations measured at the station with one or more positive measurements, they would receive an annual dose of less than 0.0003 mrem to the total body and 0.02 mrem to the maximum exposed organ (teen - lung).

In consideration of the natural background dose rate of 80 to 100 mrem/year, there was clearly no significant environmental effect observed in the air particulate media as a result of the operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: AIR PARTICULATE FILTERS UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
GR-B (553)	4.0E-03	(2.5 ± .1)E -2	15	(3.2 ± .5)E -2	(2.6 ± .3)E -2
(0)		(2.9 - 222.0)E -3		(5.7 - 222.0)E -3	(7.5 - 107.0)E -3
		(498/502)		*(48/ 48)*	*(51/ 51)*
BE-7 (44)	2.0E-02	(3.9 ± .1)E -2	03	(4.5 ± .4)E -2	(3.7 ± .4)E -2
(0)		(2.4 - 5.0)E -2		(3.3 - 5.0)E -2	(2.7 - 4.8)E -2
		(40/ 40)		*(4/ 4)*	*(4/ 4)*
K-40 (44)	4.0E-02	(7.4 ± .7)E -3	15	(1.2 ± .5)E -2	(9.3 ± 1.6)E -3
(0)		(2.0 - 27.1)E -3		(3.7 - 27.1)E -3	(5.1 - 12.7)E -3
		(15/ 40)		*(2/ 4)*	*(2/ 4)*
CR-51 (44)	2.0E-02	(-8.7 ± 228.6)E -6	17	(1.4 ± .6)E -3	(-2.8 ± 1.4)E -3
(0)		(-4.2 - 2.8)E -3			(-6.5 - 0.0)E -3
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
MN-54 (44)	2.0E-03	(3.5 ± 2.2)E -5	00	(1.1 ± .9)E -4	(-1.4 ± 8.7)E -5
(0)		(-2.6 - 3.9)E -4			(-2.2 - 1.5)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
CO-58 (44)	2.0E-03	(-7.4 ± 2.3)E -5	03	(8.7 ± 6.8)E -5	(3.1 ± 62.9)E -6
(0)		(-3.8 - 2.1)E -4			(-1.0 - 1.8)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
FE-59 (44)	3.0E-03	(5.8 ± 5.9)E -5	09	(3.3 ± 1.4)E -4	(-1.9 ± 2.8)E -4
(0)		(-8.3 - 6.6)E -4			(-1.0 - .2)E -3
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
CO-60 (44)	2.0E-03	(3.2 ± 1.0)E -4	00	(1.4 ± .8)E -3	(2.2 ± 11.2)E -5
(0)		(-5.2 - 24.2)E -4		(3.6 - 24.2)E -4	(-1.6 - 3.2)E -4
		(7/ 40)		*(3/ 4)*	*(0/ 4)*
ZN-65 (44)	4.0E-03	(8.0 ± 6.3)E -5	09	(3.1 ± 1.8)E -4	(-1.6 ± 2.0)E -4
(0)		(-8.4 - 8.8)E -4			(-5.2 - 2.7)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-A-2
ERMAP RESULTS
AIR PARTICULATE FILTERS

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: AIR PARTICULATE FILTERS UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
ZR-95 (44)	3.0E-03	(4.3 ± 1.3)E -4	03	(7.3 ± 6.6)E -4	(3.5 ± 3.6)E -4
(0)		(-5.9 - 26.8)E -4		(-1.8 - 26.8)E -4	(-1.1 - 14.4)E -4
		(8/ 40)		*(1/ 4)*	*(1/ 4)*
NB-95 (44)	1.0E-02	(5.1 ± 1.6)E -4	03	(1.0 ± 1.0)E -3	(3.8 ± 3.5)E -4
(0)		(-2.4 - 38.9)E -4		(2.6 - 389.0)E -5	(-1.3 - 13.8)E -4
		(9/ 40)		*(1/ 4)*	*(0/ 4)*
AG-110M(44)	2.0E-03	(-1.8 ± 1.7)E -4	09	(1.0 ± .2)E -3	(1.1 ± 43.1)E -5
(0)		(-2.7 - 2.4)E -3			(-1.3 - .5)E -3
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
RU-103 (44)	2.0E-03	(3.9 ± 1.3)E -4	03	(6.2 ± 6.2)E -4	(5.0 ± 3.2)E -4
(0)		(-3.9 - 24.8)E -4		(-2.0 - 24.8)E -4	(-5.2 - 139.0)E -5
		(10/ 40)		*(1/ 4)*	*(1/ 4)*
[illegible]-106 (44)	2.0E-02	(1.8 ± 2.2)E -4	08	(1.1 ± .9)E -3	(9.1 ± 4.2)E -4
(0)		(-2.4 - 3.3)E -3			(2.4 - 21.5)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
I-131 (44)	3.0E-03	(-2.0 ± 1.5)E -4	08	(3.5 ± 7.0)E -4	(-1.0 ± .9)E -3
(0)		(-2.6 - 2.4)E -3			(-3.6 - .6)E -3
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
CS-134 (44)	2.0E-03	(-1.1 ± .2)E -4	03	(-1.9 ± 3.1)E -5	(-1.8 ± .7)E -4
(0)		(-4.0 - 1.8)E -4			(-3.3 - 0.0)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
CS-137 (44)	2.0E-03	(3.4 ± .4)E -4	00	(4.8 ± 2.1)E -4	(2.2 ± 1.1)E -4
(0)		(-1.7 - 8.6)E -4		(-4.8 - 85.7)E -5	(4.1 - 52.8)E -5
		(14/ 40)		*(2/ 4)*	*(1/ 4)*
BA-140 (44)	5.0E-03	(2.3 ± 83.3)E -6	08	(2.0 ± 2.2)E -4	(-4.8 ± 5.0)E -4
(0)		(-1.1 - 1.2)E -3			(-2.0 - .1)E -3
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
CE-141 (44)	3.0E-03	(3.7 ± 1.0)E -4	01	(7.7 ± 3.1)E -4	(4.5 ± 4.3)E -4
(0)		(-3.5 - 18.4)E -4		(5.0 - 153.0)E -5	(-1.8 - 16.8)E -4
		(8/ 40)		*(1/ 4)*	*(1/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-A-2
(continued)

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: AIR PARTICULATE FILTERS UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
CE-144 (44)	2.0E-02	(4.2 ± 1.0)E -4	09	(1.0 ± .3)E -3	(5.9 ± 1.4)E -4
(0)		(-8.4 - 17.2)E -4			(3.0 - 9.0)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*
TH-228 (44)	9.0E-03	(-3.3 ± 7.3)E -5	09	(4.4 ± .6)E -4	(-1.5 ± 3.8)E -4
(0)		(-7.1 - 11.3)E -4			(-9.0 - 8.7)E -4
		(0/ 40)		*(0/ 4)*	*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-A-2 (continued)

FIGURE III-A-2
GROSS BETA ACTIVITY
AIR PARTICULATES
INDICATOR STATIONS

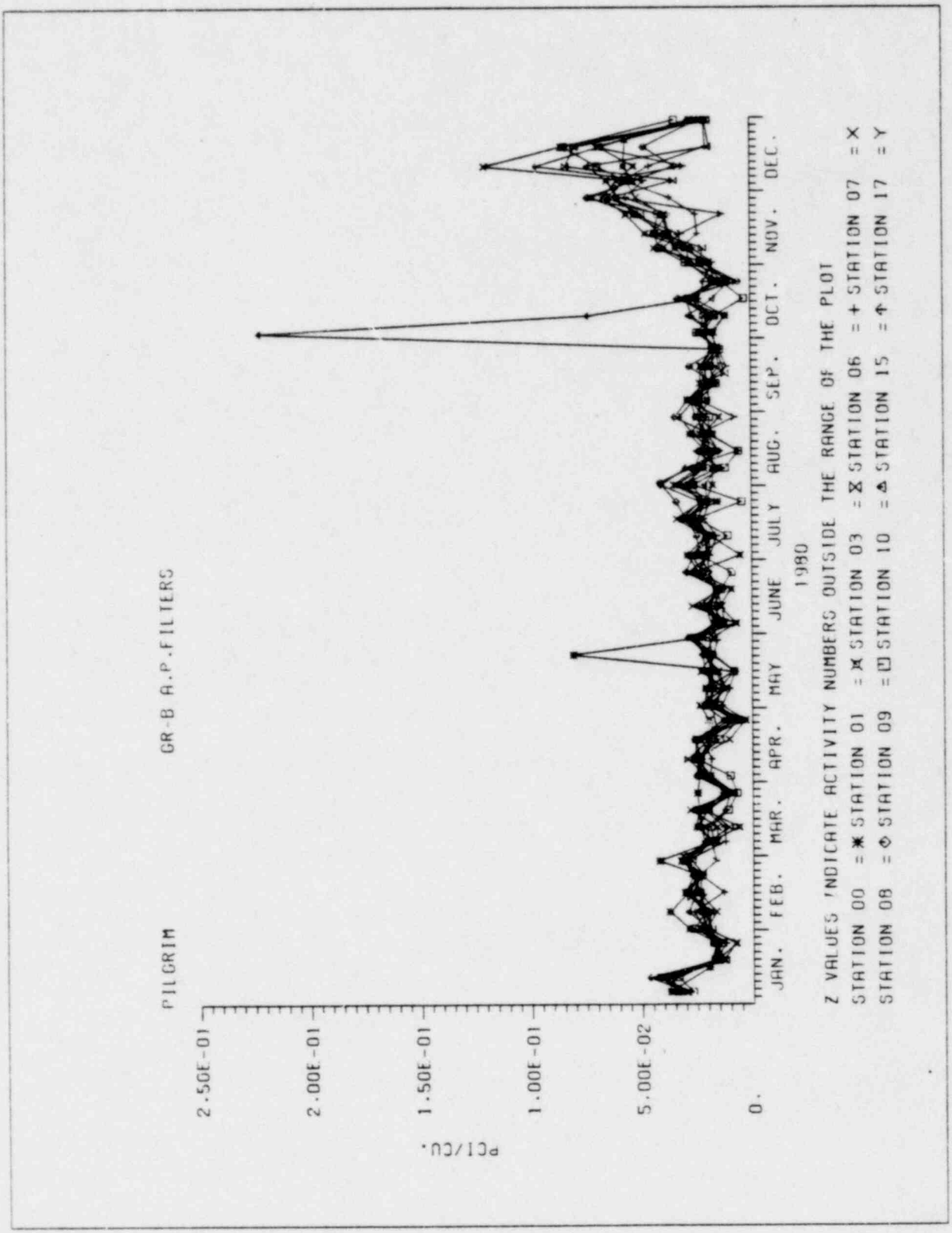
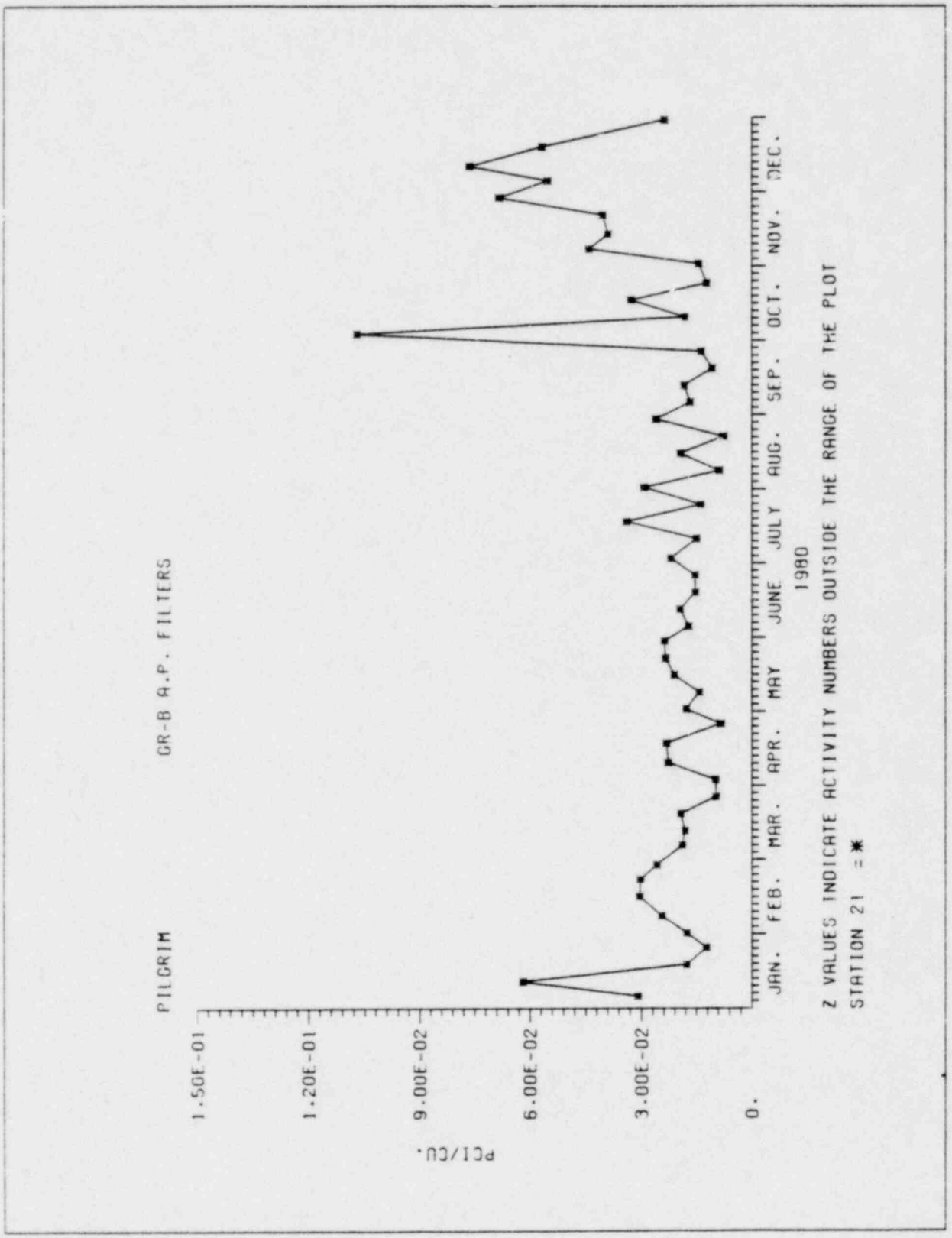


FIGURE III-A-2
GROSS BETA ACTIVITY
AIR PARTICULATES
CONTROL STATION



III. B. Iodine

The same sample collection systems used to collect airborne particulates are used to collect gaseous iodine on a charcoal filter cartridge. The cartridge is removed and analyzed for I-131 weekly. The results of the ERMAP program for this media are provided in Table III-B-1. It is apparent from this table that the mean value of the calculated concentrations for the indicator stations is less than the mean value for the control station.

The calculated mean value for the highest indicator station (Station 07 - Pedestrian Bridge - 0.14 mi - N) is significantly higher than the calculated mean of the control station. This measured mean concentration is the result of only one positive measurement (week ending 2/11/80) and is probably the result of gaseous effluents from PNPS-1. However, even if a person were to breathe air with the highest measured mean concentration they would receive an annual dose of less than 0.04 mrem to the thyroid and less than 0.0001 mrem to the total body. The results of these analyses are presented graphically in Figure III-B-1 for the indicator stations and Figure III-B-2 for the control station.

There was clearly no significant environmental effect observed in the airborne gaseous iodine collection media as a result of operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: CHARCOAL FILTERS UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
I-131 (554)	3.0E-03	(4.9 ± 4.6)E -4	07	(2.2 ± 1.6)E -3	(7.5 ± 10.9)E -4
(3)		(-4.5 - 7.4)E -2		(-2.1 - 3.3)E -2	(-1.5 - 2.6)E -2
		(4/503)		*(1/ 50)*	*(0/ 51)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-B-1
ERMAP RESULTS
CHARCOAL CARTRIDGES

FIGURE III-B-1
CONCENTRATIONS OF I-31
CHARCOAL FILTERS
INDICATOR STATIONS

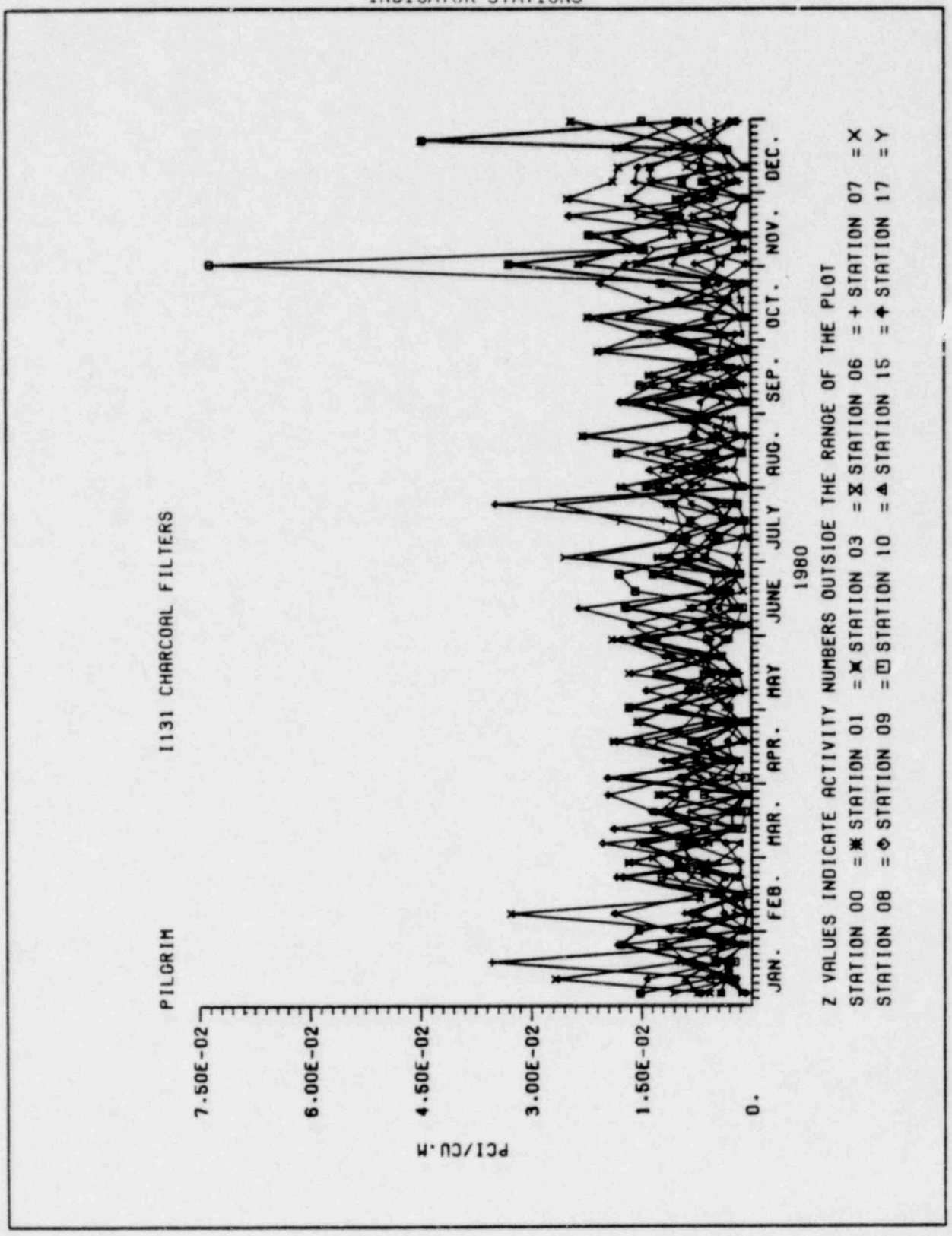
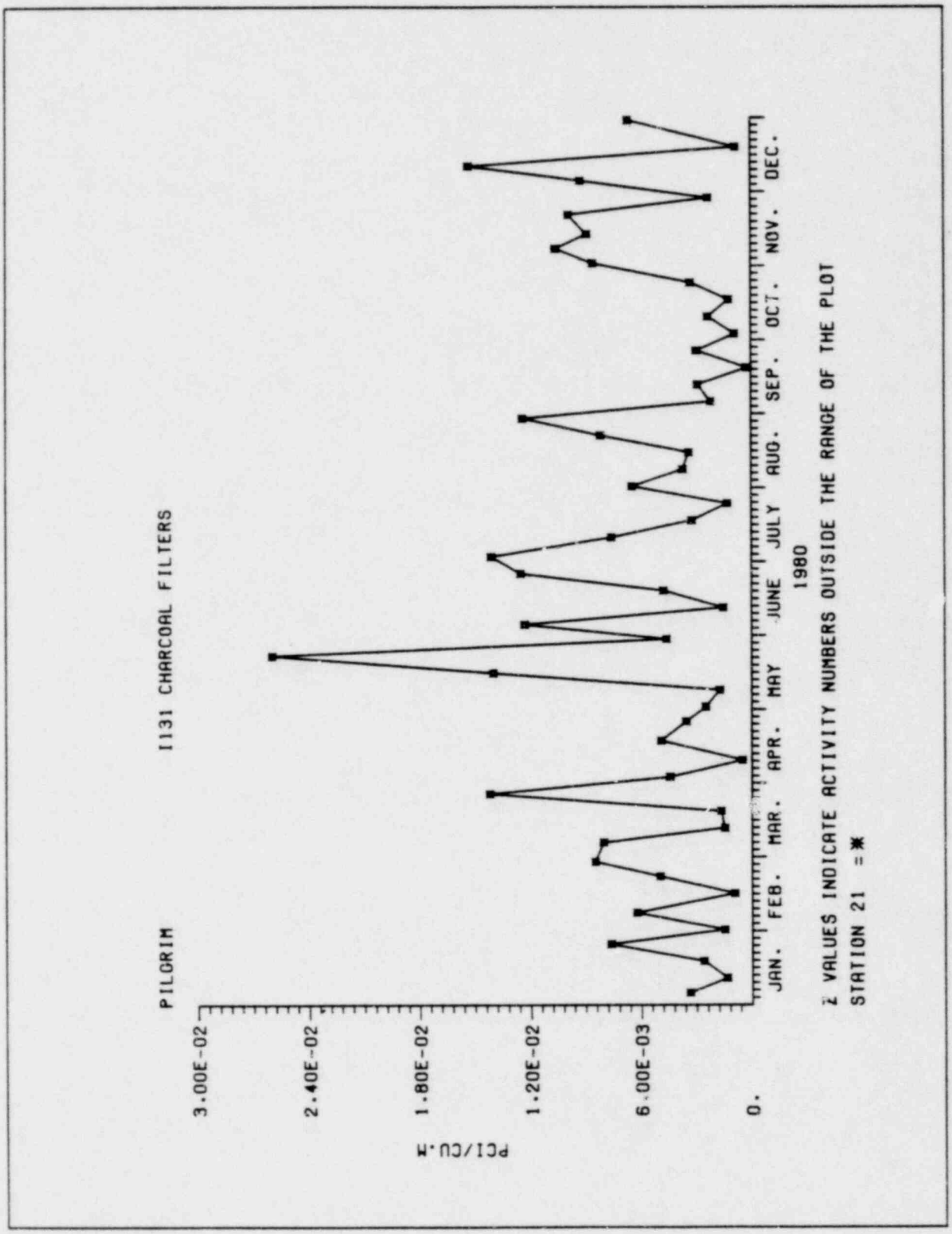


FIGURE III-B-2
CONCENTRATION OF I-131
CHARCOAL FILTER
CONTROL STATION



III. C. Soil

Soil surveys at eleven locations are required once every three years in compliance with the revised Technical Specifications which went into effect on April 19, 1977. These in-situ surveys were conducted during July of 1979. The results of these surveys are included in Appendix C of this report for reference information only. They do not constitute measurements made during the 1980 calendar year.

III D. Direct Radiation

1. Continuous Thermoluminescent Dosimetry

Thermoluminescent dosimeters (TLD) of the $CaSO_4$(Dy) type are used to record direct gamma radiation from all sources including direct and scattered radiation from Nitrogen-16 in the turbine building, and cosmic and other natural and artificial gamma radiation. TLD's are installed at the locations identified in Table III-D-1 and on Figures III-D-1 and III-D-2.

Tables III-D-2 through III-D-8 show monthly and quarterly average doses from direct gamma radiation in uR/hr at these stations.

Prior to 1980, TLD's were read out monthly although the Technical Specification indicated that a quarterly read out frequency was adequate. In an effort to improve the statistics associated with the measurement of extremely low radiation levels around PNPS-1, the frequency of read out was decreased to quarterly at the end of the first quarter of 1980.

As a result, data is available for January, February and March on a monthly basis and for the rest of the year on a quarterly basis.

In addition to average doses for each TLD for each read out period, geographic regional average doses for sectors of different nearness are computed; viz, in immediate proximity to PNPS, more distant but near the site boundary, up to several miles away - "neighborhood", and far away (background). Each set of data show consistent trends; the near plant dosimeters (OA, PB, PA, WS) stand out among all readings and have an average above the dose rates further away. The next region has a lower average dose rate, and beyond 0.7 mile (distant neighborhood and background) the dose rates are statistically consistent.

In all cases, the near plant levels are distinctly higher than those off-site and off-site dose rates are not significantly sensitive to distance variations beyond the site itself. Thus beyond the "exclusion area" (for this purpose, the 0.25-0.7 mile region), dose rates show no significant plant effect; populated areas are therefore beyond the limits of elevated dose rates.

2. Field Survey

A gamma exposure survey of Plymouth Beach and Priscilla/White Horse Beach was conducted during May of 1980. The results of this most recent survey are in agreement with the last three beach surveys conducted for 1979, 1978 and 1977. In addition, a comprehensive soil survey of 11 locations was conducted during the spring of 1979. This study included both gamma exposure rate measurements and in-situ gamma spectrometry analysis for each location. Laboratory soil analyses were also conducted for selected locations. The results of this study are presented in Appendix C. The latest gamma exposure survey was conducted using a high pressure ion chamber (HPIC) Model MDL260, Serial Number 007[4]. The design and calibration of this instrument were described in the report of the survey of June 1976[5].

The present survey was designed to detect differences in the external exposure rate encountered at beaches near the plant (Plymouth and Priscilla/White Horse) and a control location (Duxbury). The detector's calibration was checked before each measurement.

The data (Table III-D-9) indicate that the exposure rates at Plymouth Inner Beach and Priscilla/White Horse Beach are not significantly greater than the exposure rates measured at the control station in Duxbury. The small differences are likely due to the presence of granite beach stones which are essentially absent at the Duxbury location.

It has been demonstrated that proximity to beach stones results in higher exposure rates than in sandy areas (see Annual Report No. 10).

This survey indicates that the natural background exposure rate at beaches near Pilgrim Station is probably 7-9 uR/hr. These results are in complete agreement with similar measurements performed in Maine[6], where the natural background exposure rate at shoreline locations was found to vary between 6.6 and 14.5 uR/hr. These exposure rates were also found to vary directly with the size and proximity of granite outcroppings[6].

These latest measurements are also in agreement with the soil survey mentioned earlier. The results of that survey indicate that off-site dose rates have a range of 8.0 to 8.5 uR/hr with an average of 8.2 uR/hr.

TABLE III-D-1

THERMOLUMINESCENT DOSIMETER LOCATIONS

Surveillance Stations				Station Specification				
Near Plant (0-0.16 miles)	Exclusion Area (0.25-0.7)	Distant Neighborhood (0.96-6.5 miles)	Background (8-23 miles)	Station Code	See Fig.	Item No.	† Distance (miles)	Direction
Overlook Area				OA	II-2	9	0.09	W-WSW
*Warehouse				WS	II-2	23	0.10	S-SSE
*Pedestrian Bridge				PB	II-2	8	0.15	NNW
Public Parking Area				PA	II-2	7	0.16	NW-NNW
	*Property Line			A	II-2	5	0.25	W-WSW
	*Property Line			F	II-2	2	0.27	WNW-NW
	*East Breakw.ter			EB	II-2	10	0.31	ESE
	Property Line			B	II-2	13	0.32	SSE
	Property Line (SW)			H	II-2	6	0.33	SW
	Property Line			I	II-2	3	0.33	W-WNW
	*Property Line			PL	II-2	24	0.34	WNW-NW
	*Property Line			D	II-2	1	0.37	NW-NNW
	*Property Line			L	II-2	22	0.40	ESE-SE
	*Property Line			HB	II-2	12	0.43	SE
	*Property Line			C	II-2	11	0.44	ESE-SE
	*Property Line (West)			G	II-2	4	0.44	W
	Rocky Hill Road (West)			WR	II-2	18	0.51	WNW
	Microwave Tower			MT	II-2	14	0.55	S-SSW
	Cleft Rock Area			CR	II-1	7	0.63	S-SSW
	Rocky Hill Road (East)			ER	II-2	21	0.68	SE
	*Bay Shore Drive			BD	II-1	6	0.70	W-WNW
		*Emerson Road		EM	II-2	15	0.97	SSE
		*Property Line		J	II-2	19	1.21	S-SSE
		*Property Line (South)		E	II-2	17	1.23	S
		*White Horse Road		WH	II-2	16	1.31	SSE
		*Property Line		K	II-2	20	1.32	S-SSE
		Manomet Point		MP	II-1	8	2.25	E-ESE
		Manomet Elem. School		ME	II-1	9	2.50	SE
		Manomet Substation		MS	II-1	10	2.50	SSE
		South Plymouth		SP	II-1	5	3.00	WSW
		*Manomet Beach		MB	II-1	11	3.50	SE-SSE
		Plymouth Center		PC	II-1	4	4.50	W-WNW
		North Plymouth		NP	II-1	3	5.50	WNW
		*Standish Shores (Dux)		SS	II-1	1	6.25	NW
		*College Pond		CP	II-1	12	6.50	SW
			Sherman Airport (Ply)	SA	II-1	14	8.00	WSW
			Cedarville Sub. (Sag)	CS	II-1	13	10.00	S-SSE
			Kingston Substation	KS	II-1	2	10.00	WNW
			East Weymouth	EW	II-1	15	23.00	NW

*Not required by operating license.
† Distances measured from Unit 1 reactor building.

TABLE III-D-2
GAMMA EXPOSURE (TLD) DATA FOR JANUARY 1980

TLD NO.	STATION	MICROR/ HOUR	+-	2 SIGMA
50	CP	6.44	+-	1.89
51	CR	4.30	+-	0.87
52	CS	5.35	+-	1.32
53	ER	5.33	+-	1.11
55	EW	6.04	+-	1.41
3003	KS	5.00	+-	0.91
57	MB	6.06	+-	1.61
3013	ME	5.32	+-	1.16
59	MP	4.23	+-	0.89
60	MS	8.32	+-	1.40
61	NP	5.69	+-	1.25
62	PC	6.14	+-	1.40
63	SA	3.77	+-	0.56
3010	SP	6.38	+-	1.01
65	SS	6.88	+-	1.75
66	WR	7.79	+-	1.98
67	BD	9.88	+-	1.79
68	EB	8.29	+-	1.81
69	EM	4.42	+-	1.01
70	MT	3.75	+-	0.69
71	OA	6.84	+-	2.71
72	PA	4.96	+-	1.39
73	PB	9.56	+-	1.70
74	WH	6.58	+-	1.75
75	A	6.49	+-	1.53
76	B	8.13	+-	1.59
77	C	6.12	+-	2.16
78	D	8.52	+-	1.12
79	E	4.75	+-	1.02
80	F	4.41	+-	1.07
3005	G	8.31	+-	1.94
82	H	5.52	+-	1.91
83	I	5.50	+-	1.80
84	J	8.46	+-	2.07
85	K	8.75	+-	1.89
86	L	8.88	+-	1.86
87	PL	3.99	+-	1.06
88	WS	6.92	+-	2.49
92	HP	5.98	+-	1.66
3046	RL	3.32	+-	0.51
37	RL	3.24	+-	0.51

Geographic Regional Averages this period are:			
Near Plant (0-.16 mi)	7.07	+-	1.43
Exclusion Area (.25-.68 mi)	6.36	+-	0.43
Distant Neighborhood (.7-6.5 mi)	6.52	+-	0.40
Background (8-23 mi)	5.04	+-	0.74

TABLE III-D-3
GAMMA EXPOSURE (TLD) DATA FOR FEBURARY 1980

TLD NO.	STATION	MICROR/ HOUR	+-	2 SIGMA
1	CP	37.01	+-	24.79
31	CR	23.06	+-	4.96
32	CS	31.22	+-	8.41
33	ER	13.44	+-	2.48
34	EW	16.56	+-	3.98
35	KS	21.24	+-	6.16
36	MB	27.05	+-	6.01
38	ME	16.54	+-	3.15
39	MP	16.42	+-	3.57
40	MS	10.73	+-	4.17
41	NP	13.81	+-	2.97
42	PC	10.30	+-	2.52
43	SA	16.85	+-	4.35
45	SP	19.60	+-	4.34
46	SS	15.89	+-	3.44
47	WR	18.30	+-	7.14
48	BD	17.24	+-	3.68
3	EB	33.12	+-	7.60
90	EM	22.56	+-	6.72
91	MT	15.86	+-	4.73
94	OA	12.74	+-	2.66
95	PA	12.60	+-	2.44
96	PB	27.84	+-	6.04
97	WH	15.15	+-	3.04
98	A	85.42	+-	42.99
99	B	20.33	+-	6.84
3033	C	15.27	+-	3.44
3001	D	5.09	+-	2.43
3042	E	12.78	+-	4.89
3043	F	0.00	+-	0.00
3044	G	13.11	+-	3.18
3045	H	9.60	+-	3.35
20	I	11.82	+-	3.85
3048	J	8.64	+-	2.15
23	K	11.97	+-	2.45
1008	L	8.46	+-	2.54
1009	PL	15.01	+-	5.05
1011	WS	13.67	+-	3.17
2011	HB	19.63	+-	5.67
37	RL	7.57	+-	0.95
3046	RL	10.02	+-	3.12

Geographic Regional Averages this period are:			
Near Plant (0-.16 mi)	16.71	+-	2.57
Exclusion Area (.25-.68 mi)	20.50	+-	3.33
Distant Neighborhood (.7-6.5 mi)	17.05	+-	2.07
Background (8-23 mi)	21.47	+-	3.99

TABLE III-D-4
GAMMA EXPOSURE (TLD) DATA FOR MARCH 1980

TLD NO.	STATION	MICROR/ HOUR	+-	2 SIGMA
50	CP	14.55	+-	2.86
51	CR	20.09	+-	4.53
52	CS	24.32	+-	5.25
53	ER	17.17	+-	3.90
55	EW	18.52	+-	4.47
3003	KS	27.28	+-	10.65
57	MB	17.33	+-	3.90
3013	ME	12.67	+-	3.07
59	MP	17.71	+-	8.42
60	MS	12.59	+-	3.64
61	NP	11.75	+-	2.90
62	PC	10.26	+-	3.43
63	SA	11.14	+-	3.15
3010	SP	16.30	+-	5.34
65	SS	12.19	+-	3.66
66	WR	14.39	+-	4.53
67	BD	19.13	+-	6.03
68	EB	12.89	+-	2.58
69	EM	9.01	+-	1.67
70	MT	14.64	+-	3.78
71	OA	16.22	+-	4.59
72	PA	17.19	+-	3.26
73	PB	73.39	+-	20.44
74	WH	14.55	+-	5.77
75	A	10.50	+-	2.66
76	B	14.49	+-	3.23
77	C	17.15	+-	4.31
78	D	14.55	+-	6.78
79	E	15.22	+-	3.65
80	F	34.60	+-	8.36
3005	G	11.27	+-	3.15
82	H	18.60	+-	4.17
83	I	16.39	+-	6.01
84	J	9.98	+-	2.53
85	K	13.94	+-	3.82
86	L	13.14	+-	2.41
87	PL	29.40	+-	6.09
88	WS	44.61	+-	13.30
92	HB	28.48	+-	5.60
37	RL	5.21	+-	1.02
3046	RL	5.86	+-	1.13

Geographic Regional Averages this period are:			
Near Plant (0-.16 mi)	37.85	+-	8.34
Exclusion Area (.25-.68 mi)	17.98	+-	1.28
Distant Neighborhood (.7-6.5 mi)	13.81	+-	1.21
Background (8-23 mi)	20.31	+-	4.36

TABLE III-D-5
GAMMA EXPOSURE (TLD) DATA FOR QUARTER #2 1980

TLD NO.	STATION	MICROR/ HOUR	+-	2 SIGMA
1	CP	40.96	+-	26.38
31	CR	23.80	+-	5.97
32	CS	23.77	+-	5.65
33	ER	16.53	+-	3.38
34	EW	20.44	+-	4.44
35	KS	17.21	+-	4.41
36	MB	17.35	+-	5.21
38	ME	21.82	+-	8.68
39	MP	17.43	+-	3.32
40	MS	20.12	+-	5.94
41	NP	16.44	+-	3.33
42	PC	14.14	+-	3.38
43	SA	18.40	+-	4.65
45	SP	17.56	+-	3.87
46	SS	16.83	+-	3.65
47	WR	29.28	+-	6.50
48	BD	26.47	+-	5.62
3	EB	27.13	+-	10.42
90	EM	23.19	+-	5.75
91	MT	0.00	+-	0.00
94	OA	24.24	+-	7.86
95	PA	17.26	+-	3.64
96	PB	25.45	+-	5.96
97	WH	20.54	+-	6.01
98	A	47.66	+-	22.25
99	B	18.81	+-	5.63
3033	C	17.68	+-	3.25
3001	D	15.38	+-	2.78
3042	E	14.87	+-	3.86
3006	F	8.86	+-	1.59
3044	G	17.35	+-	5.14
3045	H	0.00	+-	0.00
20	I	16.04	+-	2.96
3048	J	11.28	+-	1.91
23	K	13.48	+-	2.42
1008	L	12.60	+-	9.77
1009	PL	18.05	+-	3.95
1011	WS	42.40	+-	8.62
2011	HB	17.81	+-	4.17
37	RL	1.92	+-	0.29
3046	RL	2.03	+-	0.53

Geographic Regional Averages this period are:			
Near Plant (0-.16 mi)	27.34	+-	4.53
Exclusion Area (.25-.68 mi)	20.50	+-	2.32
Distant Neighborhood (.7-6.5 mi)	19.50	+-	2.28
Background (8-23 mi)	19.96	+-	3.21

TABLE III-D-6
GAMMA EXPOSURE (TLD) DATA FOR QUARTER #3 1980

TLD NO.	STATION	MICROR/ HOUR	+-	2 SIGMA
50	CP	19.74	+-	5.92
51	CR	20.23	+-	7.61
52	CS	26.22	+-	8.76
53	ER	20.23	+-	6.29
55	EW	24.37	+-	12.96
3003	KS	22.06	+-	12.20
57	MB	14.98	+-	4.70
3013	ME	19.94	+-	6.99
59	MP	19.37	+-	6.08
60	MS	18.27	+-	5.83
61	NP	18.36	+-	6.86
62	PC	12 98	+-	5.23
63	SA	12.70	+-	5.45
3010	SP	11.75	+-	5.58
65	SS	16.75	+-	5.07
66	WR	16.84	+-	4.99
67	BD	23.25	+-	8.06
68	EB	16.03	+-	4.75
69	EM	12.57	+-	3.77
70	MT	27.25	+-	11.60
71	OA	29.17	+-	12.65
72	PA	19.11	+-	5.83
73	PB	63.47	+-	23.24
74	WH	16.99	+-	5.14
75	A	19.93	+-	6.95
76	B	21.75	+-	8.48
77	C	13.82	+-	4.23
78	D	18.39	+-	6.41
79	E	18.21	+-	5.34
80	F	25.09	+-	7.41
3005	G	14.23	+-	5.31
82	H	19.10	+-	7.22
83	I	17.34	+-	7.78
84	J	11.78	+-	3.45
85	K	18.55	+-	5.46
86	L	16.56	+-	4.89
87	PL	22.87	+-	8.30
88	WS	0.00	+-	0.00
92	HB	23.48	+-	7.37
3014	RL	2.10	+-	0.79
93	RL	1.85	+-	0.68

Geographic Regional Averages this period are:			
Near Plant (0-.16 mi)	37.25	+-	13.59
Exclusion Area (.25-.68 mi)	19.57	+-	1.89
Distant Neighborhood (.7-6.5 mi)	16.90	+-	1.57
Background (8-23 mi)	21.34	+-	6.86

TABLE III-D-7
GAMMA EXPOSURE (TLD) DATA FOR QUARTER #4 1980

TLD NO.	STATION	MICROR/ HOUR	+-	2 SIGMA
1	CP	34.97	+-	22.76
31	CR	35.18	+-	8.23
32	CS	26.73	+-	7.32
33	ER	17.29	+-	4.92
34	EW	26.64	+-	5.76
35	KS	21.66	+-	4.59
36	MB	25.30	+-	6.48
38	ME	27.53	+-	5.87
39	MP	19.09	+-	5.34
40	MS	23.79	+-	7.59
41	NP	17.90	+-	4.50
42	PC	24.35	+-	8.20
43	SA	18.31	+-	5.15
45	SP	22.40	+-	7.48
46	SS	17.55	+-	4.48
47	WR	29.77	+-	10.13
48	BD	16.95	+-	4.22
3	EB	27.12	+-	5.50
90	EM	21.94	+-	5.23
213	MT	0.00	+-	0.00
94	OA	43.15	+-	9.90
95	PA	18.60	+-	6.47
96	PB	82.66	+-	8.26
97	WH	23.99	+-	5.88
98	A	48.89	+-	25.42
99	B	0.00	+-	0.00
3033	C	21.91	+-	7.17
3001	D	14.56	+-	3.26
3042	E	23.10	+-	7.90
3006	F	22.15	+-	4.71
3044	G	18.97	+-	4.43
214	H	11.20	+-	2.11
20	I	18.45	+-	3.76
3048	J	17.12	+-	3.95
23	K	18.49	+-	4.90
1008	L	15.93	+-	5.41
1009	PL	20.76	+-	5.21
1011	WS	32.23	+-	6.55
2011	HB	21.92	+-	6.25
44	RL	2.17	+-	0.45
54	RL	2.69	+-	0.72

Geographic Regional Averages this period are:			
Near Plant (0-.16 mi)	30.66	+-	5.28
Exclusion Area (.25-.68 mi)	23.15	+-	2.54
Distant Neighborhood (.7-6.5 mi)	22.30	+-	2.29
Background (8-23 mi)	23.34	+-	3.86

TABLE III-D-8

QUARTERLY AVERAGE
EXPOSURE RATES

Sta.	1st Quarter Micror/Hr	2nd Quarter Micror/Hr	3rd Quarter Micror/Hr	4th Quarter Micror/Hr
CP	18.86 +- 8.16	40.96 +- 26.38	19.74 +- 5.92	34.97 +- 22.76
CR	15.21 +- 2.15	23.80 +- 5.97	20.23 +- 7.61	35.18 +- 8.23
CS	19.54 +- 3.21	23.77 +- 5.65	26.22 +- 8.76	26.73 +- 7.32
ER	11.57 +- 1.49	16.43 +- 3.38	20.23 +- 6.29	17.29 +- 4.92
EW	13.25 +- 1.95	20.44 +- 4.44	24.37 +- 12.96	26.64 +- 5.76
KS	17.05 +- 3.82	17.21 +- 4.41	22.06 +- 12.20	21.66 +- 4.59
MB	16.32 +- 2.36	17.35 +- 5.21	14.98 +- 4.70	25.30 +- 6.48
ME	11.20 +- 1.45	21.82 +- 8.68	19.94 +- 6.99	27.53 +- 5.87
MP	12.29 +- 2.82	17.43 +- 3.32	19.37 +- 6.08	19.09 +- 5.34
MS	10.40 +- 1.83	20.12 +- 5.94	18.27 +- 5.83	23.79 +- 7.59
NP	10.17 +- 1.39	16.44 +- 3.33	18.36 +- 6.86	17.90 +- 4.50
PC	8.75 +- 1.42	14.14 +- 3.38	12.98 +- 5.23	24.35 +- 8.20
SA	10.27 +- 1.72	18.40 +- 4.65	12.70 +- 5.45	18.31 +- 5.15
SP	13.70 +- 2.18	17.56 +- 3.87	11.75 +- 5.58	22.40 +- 7.48
SS	11.43 +- 1.71	16.83 +- 3.65	16.75 +- 5.07	17.55 +- 4.48
WR	13.22 +- 2.80	29.28 +- 6.50	16.84 +- 4.99	29.77 +- 10.13
BD	15.09 +- 2.29	26.47 +- 5.62	23.25 +- 8.06	16.95 +- 4.22
EB	17.78 +- 2.68	27.13 +- 10.42	16.03 +- 4.75	27.12 +- 5.50
EM	11.72 +- 2.28	23.19 +- 5.75	12.57 +- 3.77	21.94 +- 5.23
MT	11.00 +- 1.94	0.00 +- 0.00	27.25 +- 11.60	0.00 +- 0.00
OA	11.61 +- 1.93	24.24 +- 7.86	29.17 +- 12.65	43.15 +- 9.90
PA	11.16 +- 1.37	17.26 +- 3.64	19.11 +- 5.83	18.60 +- 6.47
PB	34.88 +- 6.54	25.45 +- 5.96	63.47 +- 23.24	28.66 +- 8.26
WH	11.79 +- 2.11	20.54 +- 6.01	16.99 +- 5.14	23.99 +- 5.88
A	33.43 +- 14.04	47.66 +- 22.25	19.93 +- 6.95	48.89 +- 25.42
B	14.03 +- 2.50	18.81 +- 5.63	21.75 +- 8.48	0.00 +- 0.00
C	12.44 +- 1.90	17.68 +- 3.25	13.82 +- 4.23	21.91 +- 7.17
D	9.23 +- 2.24	15.38 +- 2.78	18.39 +- 6.41	14.56 +- 3.26
E	10.54 +- 1.98	14.87 +- 3.86	18.21 +- 5.34	23.10 +- 7.90
F	18.00 +- 3.81	8.86 +- 1.59	25.09 +- 7.41	22.15 +- 4.71
G	10.77 +- 1.58	17.35 +- 5.14	14.23 +- 5.31	18.97 +- 4.43
H	10.82 +- 1.82	0.00 +- 0.00	19.10 +- 7.22	11.20 +- 2.11
I	10.86 +- 2.31	16.04 +- 2.96	17.34 +- 7.78	18.45 +- 3.76
J	8.98 +- 1.29	11.28 +- 1.91	11.78 +- 3.45	17.12 +- 3.95
K	11.38 +- 1.57	13.48 +- 2.42	18.55 +- 5.46	18.49 +- 4.90
L	10.03 +- 1.30	12.60 +- 9.77	16.56 +- 4.89	15.93 +- 5.41
PL	15.29 +- 2.51	18.05 +- 3.95	22.87 +- 8.30	20.76 +- 5.21
WS	20.55 +- 4.27	42.40 +- 8.62	0.00 +- 0.00	32.23 +- 6.55
HB	17.25 +- 2.58	17.81 +- 4.17	23.48 +- 7.37	21.92 +- 6.25
RL	5.28 +- 0.48	1.92 +- 0.29	2.10 +- 0.79	2.17 +- 0.45
RL	6.24 +- 1.09	2.03 +- 0.53	1.85 +- 0.68	2.69 +- 0.72

TABLE III-D-9

Location	Exposure Rate (uR/Hr)	Beach Terrain
White Horse Beach (near Hill P Avenue)	6.1 ± 0.3	Sandy, granite boulders on beach
White Horse Beach (in back of Blue Sail Bar)	5.3 ± 0.3	Sandy
Plymouth Beach (outer beach)	4.6 ± 0.3	Sandy
Plymouth Beach (inner beach)	4.7 ± 0.3	Sandy
Plymouth Beach (behind Berts Restaurant)	7.1 ± 0.2	Sandy, granite boulder on beach
Duxbury Beach (Control) (ocean side)	5.1 ± 0.4	Sandy with small amounts of gravel

III. E. Waterborne

Samples of seawater are collected at three locations, the Station Discharge Canal, (Station 11), Bartlett Pond (Station 17 - 1.7 mi - SE) and Powder Point (Station 25 - 7.8 mi - NNW). The discharge canal sample is collected by a continuously compositing sampler which extracts a sample of about 20 ml of water from the canal every one-half hour. Grab samples are taken weekly from each of the other two locations.

The results of the ERMAP program for seawater samples are presented in Table III-E-1.

The only positive measurement in this media was Cs-137 in the discharge canal on one occasion (monthly composite for May). No other isotopes characteristic of reactor operation were observed at this station and the mean value of the Cs-137 concentration is well within one standard deviation of the mean value at the control station.

Therefore, it is not clear that PNPS-1 is responsible for this observation. There were no positive measurements at the other indicator station (Bartlett Pond - 1.7 mi - SE) and therefore there was clearly no significant environmental effect observed in the seawater media as a result of the operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/03/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: WATER - SEA UNITS: PCI/LITER

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7 (36)	8.0E+01	(2.3 ± 1.5)E 0	11	(3.9 ± 1.7)E 0	(-3.7 ± 19.4)E -1
(0)		(-2.0 - 1.3)E 1			(-1.7 - .7)E 1
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
K-40 (36)	2.0E+02	(1.6 ± .3)E 2	11	(3.1 ± .1)E 2	(3.0 ± .1)E 2
(0)		(-2.0 - 38.7)E 1		(2.8 - 3.5)E 2	(2.6 - 3.6)E 2
		(12/ 24)		*(12/ 12)*	*(12/ 12)*
CR-51 (36)	1.7E+01	(-1.2 ± 1.4)E 0	11	(6.6 ± 20.7)E -1	(-1.6 ± 1.9)E 0
(0)		(-1.5 - 1.9)E 1			(-1.4 - .9)E 1
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
MN-54 (36)	8.	(-5.7 ± 12.3)E -2	11	(-6.9 ± 93.8)E -3	(-7.2 ± 19.1)E -2
(0)		(-1.6 - 1.6)E 0			(-8.8 - 15.2)E -1
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
CO-58 (36)	8.	(-5.4 ± 13.0)E -2	11	(1.5 ± 2.0)E -1	(-1.4 ± 2.8)E -1
(0)		(-1.5 - 1.7)E 0			(-2.8 - .8)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
FE-59 (36)	1.0E+01	(-1.3 ± 4.9)E -1	25	(8.4 ± 7.8)E -1	(8.4 ± 7.8)E -1
(0)		(-4.1 - 4.0)E 0			(-3.8 - 6.3)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
CO-60 (36)	8.	(-2.6 ± 2.3)E -1	25	(-1.2 ± 2.3)E -1	(-1.2 ± 2.3)E -1
(0)		(-2.2 - 2.0)E 0			(-1.5 - 1.7)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
ZN-65 (36)	4.	(-2.0 ± 2.9)E -1	11	(2.6 ± 44.3)E -2	(-8.1 ± 4.1)E -1
(0)		(-2.9 - 3.1)E 0			(-2.9 - 1.8)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
ZR-95 (36)	1.0E+01	(-4.1 ± 3.0)E -1	25	(8.8 ± 5.3)E -1	(8.8 ± 5.3)E -1
(0)		(-3.2 - 2.5)E 0			(-1.2 - 4.7)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-E-1
ERMAP RESULTS
WATERBORNE

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: WATER - SEA UNITS: PCI/LITER

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
NB-95 (36)	2.	(-5.0 ± 11.8)E -2	25	(3.7 ± 1.4)E -1	(3.7 ± 1.4)E -1
(0)		(-1.0 - 1.3)E 0			(-1.9 - 18.3)E -1
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
AG-110M(36)	1.4E+01	(-6.5 ± 10.2)E -1	25	(1.8 ± 2.4)E 0	(1.8 ± 2.4)E 0
(0)		(-1.4 - .9)E 1			(-1.3 - 1.8)E 1
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
RU-103 (36)	8.	(-8.2 ± 1.8)E -1	25	(-6.2 ± 1.7)E -1	(-6.2 ± 1.7)E -1
(0)		(-2.6 - .8)E 0			(-1.7 - .3)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
RU-106 (36)	8.0E+01	(-1.7 ± 1.3)E 0	25	(5.4 ± 11.0)E -1	(5.4 ± 11.0)E -1
(0)		(-1.8 - 1.0)E 1			(-4.7 - 10.0)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
I-131 (36)	0.	(1.1 ± 33.2)E -2	25	(1.8 ± 6.8)E -1	(1.8 ± 6.8)E -1
(0)		(-2.7 - 3.7)E 0			(-3.4 - 5.9)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
CS-134 (36)	9.	(-5.2 ± 1.8)E -1	11	(-4.1 ± 2.4)E -1	(-6.6 ± 3.0)E -1
(0)		(-1.8 - 1.0)E 0			(-1.9 - 1.0)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
CS-137 (36)	9.	(3.9 ± 2.0)E -1	11	(6.6 ± 3.5)E -1	(4.2 ± 2.3)E -1
(0)		(-1.3 - 2.6)E 0		(-1.3 - 2.6)E 0	(-6.7 - 18.9)E -1
		(1/ 24)		*(1/ 12)*	*(0/ 12)*
BA-140 (36)	1.5E+01	(-5.1 ± 2.0)E -1	11	(-4.8 ± 4.4)E -1	(-1.3 ± .7)E 0
(0)		(-2.5 - 2.5)E 0			(-5.6 - 3.2)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
CE-141 (36)	2.0E+01	(-3.7 ± 4.3)E 1	17	(2.7 ± 7.8)E 1	(**** ± 7.4)E 1
(0)		(-3.4 - 3.9)E 2			(-8.6 - .9)E 2
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
CE-144 (36)	8.0E+01	(6.7 ± 9.8)E -1	17	(1.1 ± 1.2)E 0	(-2.3 ± 1.3)E 0
(0)		(-1.1 - 1.1)E 1			(-9.2 - 6.3)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-E-1 (continued)

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: WATER - SEA UNITS: PCI/LITER

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
RA-226 (36)	6.0E+01	(1.4 ± 3.5)E 0	11	(2.4 ± 6.0)E 0	(-1.7 ± 4.1)E 0
(0)		(-2.4 - 5.1)E 1			(-2.3 - 1.7)E 1
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
TH-228 (36)	1.0E+01	(-1.3 ± .8)E 0	25	(-7.2 ± 10.3)E -1	(-7.2 ± 10.3)E -1
(0)		(-7.6 - 6.8)E 0			(-6.8 - 4.2)E 0
		(0/ 24)		*(0/ 12)*	*(0/ 12)*
I-3 (12)	9.0E+01	(4.7 ± 5.7)E 1	17	(5.5 ± 9.2)E 1	(-4.3 ± 4.6)E 1
(0)		(-1.9 - 2.4)E 2			(-1.4 - .6)E 2
		(0/ 8)		*(0/ 4)*	*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-E-1 (continued)

III. F. Shellfish

Shellfish are normally sampled quarterly from 5 locations, the Station Discharge Canal, Duxbury Bay, Manomet Point, Plymouth Harbor and Marshfield. The results of the ERMAP program for shellfish are presented in Table III-F-1. It is clear from this table that there have been positive measurements of many isotopes (Cr-51, Mn-54, Co-58, Co-60, Nb-95, Cs-137) in the discharge canal. In addition there have been positive measurements of Co-60 and Ce-141 at Manomet Point (3 miles - SE).

These observed concentrations are most probably the result of PNPS-1 liquid releases.

However, even if a person were to consume the maximum annual quantity of seafood (5 kilograms/year) with the highest mean concentrations of these isotopes they would receive a dose of less than 0.004 mrem to the total body and about 0.02 mrem to the most restrictive organ (adult GI-LLI).

When compared to the natural background dose rate of 80-100 mrem/year, there was clearly no significant environmental impact observed in shellfish as a result of the operation of PNPS-1.

Mussel shells collected from the discharge canal exhibited a mean concentration of 29 pCi/kg of Co-60. No other isotope was detected. These measurements are undoubtly due to liquid effluents from PNPS-1. However, since shells are not consumed by man there is no potential impact on man from this media.

GRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: SHELLFISH UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7 (24)	.2	(2.2 ± .9)E 1	13	(2.5 ± 3.0)E 1	(9.3 ± 3.9)E 0
(5)		(-4.0 - 12.3)E 1			(-1.9 - 16.2)E 0
		(5/ 20)		*(0/ 4)*	*(0/ 4)*
K-40 (24)	.5	(1.6 ± .1)E 3	15	(1.8 ± .3)E 3	(1.4 ± .1)E 3
(0)		(1.1 - 2.7)E 3		(1.1 - 2.7)E 3	(1.2 - 1.7)E 3
		(20/ 20)		*(4/ 4)*	*(4/ 4)*
CR-51 (24)	3.2E+02	(1.5 ± 1.9)E 1	11	(8.3 ± 8.6)E 1	(-6.6 ± 4.8)E 0
(0)		(-9.1 - 33.9)E 1		(-1.4 - 33.9)E 1	(-1.5 - .2)E 1
		(1/ 20)		*(1/ 4)*	*(0/ 4)*
MN-54 (24)	2.0E-02	(2.9 ± 6.0)E -1	11	(2.7 ± 1.8)E 0	(-3.0 ± 5.3)E -1
(2)		(-7.1 - 7.9)E 0		(6.3 - 793.0)E -2	(-1.7 - .8)E 0
		(2/ 20)		*(2/ 4)*	*(0/ 4)*
CO-58 (24)	2.0E-02	(4.3 ± 95.7)E -2	11	(3.1 ± 2.6)E 0	(-3.2 ± 4.9)E -1
(1)		(-1.3 - .9)E 1		(-1.3 - 894.0)E -2	(-1.7 - .3)E 0
		(1/ 20)		*(1/ 4)*	*(0/ 4)*
FE-59 (24)	3.0E+01	(1.3 ± 3.2)E 0	12	(2.9 ± 3.5)E 0	(-1.4 ± .4)E 0
(0)		(-4.3 - 3.1)E 1			(-2.3 - 0.0)E 0
		(0/ 20)		*(0/ 8)*	*(0/ 4)*
CO-60 (24)	2.0E-02	(2.2 ± 1.0)E 1	11	(9.8 ± 2.6)E 1	(9.7 ± 84.6)E -2
(8)		(-9.1 - 167.0)E 0		(4.8 - 16.7)E 1	(-1.6 - 2.2)E 0
		(8/ 20)		*(4/ 4)*	*(0/ 4)*
ZN-65 (24)	6.7E+01	(2.8 ± 2.8)E 0	13	(7.0 ± 9.3)E 0	(1.9 ± .9)E 0
(0)		(-2.5 - 2.9)E 1			(1.5 - 34.0)E -1
		(2/ 20)		*(0/ 4)*	*(0/ 4)*
ZR-95 (24)	4.0E-02	(-1.3 ± 1.5)E 0	15	(6.1 ± 4.2)E -1	(-8.5 ± 11.9)E -2
(0)		(-1.9 - 1.4)E 1			(-3.1 - 1.8)E -1
		(0/ 20)		*(0/ 4)*	*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-F-1
ERMAP RESULTS
SHELLFISH

PILGRIM 1 OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: SHELLFISH UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
MN-54 (24)	3.9E+01	(-5.9 ± 7.7)E -1	11	(1.3 ± 1.1)E 0	(-7.8 ± 22.3)E -2
(0)		(-8.8 - 3.8)E 0		(-1.4 - 3.7)E 0	(-5.5 - 3.9)E -1
		(1/ 20)		*(1/ 4)*	*(0/ 4)*
AG-110M(24)	2.5E+02	(5.8 ± 0	12	(9.5 ± 10.3)E 0	(2.0 ± 8.3)E 0
(0)		(-1.1 - 2			(-5.5 - 13.1)E 0
		(1/ 20)		*(0/ 8)*	*(0/ 4)*
RU-103 (24)	2.0E-02	(1.0 ± 1.7)E 0	13	(8.1 ± 7.9)E 0	(-1.7 ± 9.6)E -1
(0)		(-5.8 - 31.8)E 0			(-1.6 - 2.7)E 0
		(0/ 20)		*(0/ 4)*	*(0/ 4)*
RU-106 (24)	.2	(-2.9 ± 10.3)E 0	11	(8.5 ± 2.3)E 0	(-6.6 ± 4.1)E -1
(0)		(-1.1 - 1.2)E 2			(-1.5 - .2)E 0
		(0/ 20)		*(0/ 4)*	*(0/ 4)*
I-131 (24)	0.	(3.9 ± 3.4)E 0	13	(1.5 ± 1.1)E 1	(-2.8 ± 262.6)E -2
(0)		(-2.8 - 4.9)E 1			(-7.5 - 3.9)E 0
		(0/ 20)		*(0/ 4)*	*(0/ 4)*
CS-134 (24)	2.0E-02	(-1.9 ± 1.1)E 0	11	(2.4 ± 3.7)E -1	(-8.7 ± 5.7)E -1
(0)		(-2.1 - .4)E 1			(-1.7 - .7)E 0
		(0/ 20)		*(0/ 4)*	*(0/ 4)*
CS-137 (24)	2.0E-02	(3.8 ± 11.3)E -1	11	(3.2 ± .9)E 0	(5.0 ± 3.2)E -1
(3)		(-1.5 - .7)E 1		(1.4 - 5.8)E 0	(-3.9 - 10.6)E -1
		(3/ 20)		*(3/ 4)*	*(0/ 4)*
BA-140 (24)	8.0E-02	(-4.3 ± 2.2)E 0	24	(1.6 ± 3.2)E 0	(1.6 ± 3.2)E 0
(0)		(-3.3 - 1.2)E 1			(-4.6 - 10.7)E 0
		(0/ 20)		*(0/ 4)*	*(0/ 4)*
CE-141 (24)	4.0E-02	(7.0 ± 3.3)E 0	13	(1.1 ± .7)E 1	(1.1 ± .5)E 0
(2)		(-1.9 - 5.2)E 1			(-1.0 - 22.0)E -1
		(2/ 20)		*(0/ 4)*	*(0/ 4)*
CE-144 (24)	.2	(-1.0 ± .5)E 1	24	(1.0 ± 1.8)E 0	(1.0 ± 1.8)E 0
(0)		(-5.1 - 4.3)E 1			(-1.1 - 6.3)E 0
		(0/ 20)		*(0/ 4)*	*(0/ 4)*

TABLE III-F-1
(continued)

POOR ORIGINAL

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: SHELLFISH UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
RA-226 (24)	.)	(2.8 & 2.0)E 1	13	(1.2 & .8)E 2	(2.1 & 1.9)E 1
(0)		(-9.4 - 30.4)E 1			(-1.6 - 7.5)E 1
		(0/ 20)		*(0/ 4)*	*(1/ 4)*
TH-228 (24)	2.0E-02	(1.4 & .5)E 1	12	(2.6 & [illegible].0)E 1	(1.7 & 1.4)E 0
(2)		(-2.4 - 80.0)E 0		(5.2 - 800.0)E -1	(-2.2 - 4.5)E 0
		(2/ 20)		*(1/ 8)*	*(0/ 4)*

TABLE III-F-4 (continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

III. G. Algae (Irish Moss)

Algae, referred to as Irish Moss or Chondrus Chrispus, is sampled quarterly at three locations, the Station Discharge Canal, Manomet Point and Ellisville. The results of the ERMAP program for Algae are presented in Table III-G-1.

It is clear from this table that there have been positive measurements of Co-60, Mn-54 and Cs-137 in the discharge canal. In addition there was one positive measurement of Co-60 at Manomet Point (Station 15 - 3 miles - SE) during the first quarter of 1980. There was also one positive measurement of Co-60 at the control station in Marshfield, ten miles away. This suggests the presence of a source other than PNPS in the case of the measurements beyond the discharge canal.

In any event, the measured concentrations in the discharge canal are certainly due to liquid effluents from PNPS-1.

It is important to note that due to processing and market dilution, the presence of these concentrations do not represent a significant potential source of dose to the general public. In fact, even direct human consumption of Algae (which to our knowledge, does not occur) would result in a dose rate of less than 0.01 mrem/yr to the total body and 0.04 mrem/yr to the most sensitive organ (Adult - GI-LLI, using the models presented in Regulatory Guide 1.109) and assuming consumption of 5 kg/year of unprocessed material.

When compared with the natural background dose rate of 80-100 mrem/yr there was clearly no significant environmental impact observed in Algae as a result of the operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: VEGETATION - AQUATIC UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*		NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7	(13)	.2	(2.7 ± 2.1)E 1	22	(7.7 ± 4.0)E 1	(7.7 ± 4.0)E 1
	(0)		(-9.1 - 12.3)E 1		(-3.0 - 16.5)E 1	(-3.0 - 16.5)E 1
			(1/ 9)		*(3/ 4)*	*(3/ 4)*
K-40	(13)	.5	(5.1 ± .3)E 3	11	(5.2 ± .4)E 3	(5.1 ± .2)E 3
	(0)		(3.9 - 6.5)E 3			
					(3.9 - 6.1)E 3	(4.7 - 5.7)E 3
			(9/ 9)		*(5/ 5)*	*(4/ 4)*
CR-51	(13)	-1.0-100	(-1.2 ± 1.7)E 1	22	(5.6 ± 20.8)E 0	(5.6 ± 20.8)E 0
	(0)		(-1.1 - .5)E 2			(-4.8 - 5.0)E 1
			(0/ 9)		*(0/ 4)*	*(0/ 4)*
MN-54	(13)	2.0E-02	(1.6 ± .5)E 1	11	(2.6 ± .5)E 1	(4.5 ± 2.2)E 0
	(3)		(-5.6 - 39.5)E 0		(8.5 - 39.5)E 0	(-5.1 - 93.7)E -1
			(3/ 9)		*(3/ 5)*	*(0/ 4)*
CO-58	(13)	2.0E-02	(5.8 ± 3.2)E 0	15	(7.8 ± 5.2)E 0	(-1.1 ± 1.9)E 0
	(0)		(-1.2 - 2.3)E 1			(-6.8 - 2.4)E 0
			(0/ 9)		*(0/ 8)*	*(0/ 4)*
FE-59	(13)	3.0E+01	(5.0 ± 5.6)E 0	11	(6.7 ± 8.8)E 0	(-4.6 ± 5.1)E 0
	(0)		(-1.8 - 3.7)E 1			(-1.9 - .6)E 1
			(0/ 9)		*(0/ 5)*	*(0/ 4)*
CO-60	(13)	2.0E-02	(1.2 ± .4)E 2	11	(2.0 ± .4)E 2	(-8.0 ± 60.6)E -1
	(6)		(9.1 - 322.0)E 0		(1.1 - 3.2)E 2	(-1.7 - 1.2)E 1
			(6/ 9)			
					(5/ 5)	*(1/ 4)*
ZN-65	(13)	-1.0-100	(-1.5 ± 6.7)E 0	22	(3.4 ± 5.1)E 0	(3.4 ± 5.1)E 0
	(0)		(-4.5 - 2.9)E 1			(-5.8 - 13.5)E 0
			(0/ 9)		*(0/ 4)*	*(0/ 4)*
ZR-95	(13)	4.0E-02	(-3.1 ± 3.3)E 0	11	(-5.9 ± 40.4)E -1	(-3.0 ± 7.2)E 0
	(0)		(-2.3 - .9)E 1			(-2.8 - 1.3)E 1
			(0/ 9)		*(0/ 5)*	*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-G-1
ERMAP RESULTS
ALGAE

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: VEGETATION - AQUATIC UNITS: PCI/KG -FT

RADIONUCLIDES (NO. ANALYSED) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
NB-95 (13)	-1.0-100	(-2.8 ± 1.8)E 0	11	(-5.7 ± 18.2)E -1	(-6.8 ± 32.0)E -1
(0)		(-1.1 - .8)E 1			(-8.4 - 7.3)E 0
		(0/ 9)		*(0/ 5)*	*(0/ 4)*
AG-110M(13)	-1.0-100	(1.5 ± .9)E 1	11	(3.3 ± .7)E 1	(-3.8 ± 1.2)E 1
(0)		(-3.0 - 5.4)E 1			(-6.0 - 0.0)E 1
		(0/ 9)		*(0/ 5)*	*(0/ 4)*
RU-103 (13)	2.0E-02	(3.2 ± 1.7)E 0	15	(5.6 ± 2.9)E 0	(-5.5 ± 10.2)E -1
(0)		(-2.4 - 16.8)E 0			(-2.8 - 2.1)E 0
		(0/ 9)		*(0/ 4)*	*(0/ 4)*
RU-106 (13)	.2	(-4.4 ± 1.5)E 1	22	(2.5 ± .4)E 1	(2.5 ± .4)E 1
(0)		(-1.3 - .1)E 2			(1.5 - 3.4)E 1
		(0/ 9)		*(0/ 4)*	*(0/ 4)*
I-131 (13)	0.	(-2.0 ± 1.8)E 1	15	(3.8 ± 20.8)E 0	(-3.8 ± 5.7)E 0
(0)		(-1.4 - .5)E 2			(-1.3 - 1.2)E 1
		(0/ 9)		*(0/ 4)*	*(0/ 4)*
CS-134 (13)	2.0E-02	(-5.8 ± 20.9)E -1	15	(1.1 ± 3.4)E 0	(-9.1 ± 280.2)E -2
(0)		(-9.8 - 10.3)E 0			(-6.6 - 7.1)E 0
		(0/ 9)		*(0/ 4)*	*(0/ 4)*
CS-137 (13)	2.0E-02	(9.2 ± 8.5)E 0	11	(1.4 ± .8)E 1	(5.2 ± 8.3)E 0
(0)		(1.0 - 44.3)E 0		(1.4 - 44.3)E 0	(-3.0 - 180.0)E -1
		(2/ 9)		*(2/ 5)*	*(1/ 4)*
BA-140 (13)	8.0E-02	(-8.8 ± 12.2)E 0	22	(-5.3 ± 2.3)E 0	(-5.3 ± 2.3)E 0
(0)		(-7.0 - 2.8)E 1			(-9.5 - 0.0)E 0
		(0/ 9)		*(0/ 4)*	*(0/ 4)*
CE-141 (13)	4.0E-02	(4.5 ± 33.5)E -1	15	(2.7 ± 3.3)E 0	(-9.0 ± 63.6)E -1
(1)		(-1.9 - 1.5)E 1			(-1.9 - 1.0)E 1
		(1/ 9)		*(0/ 4)*	*(0/ 4)*
CE-144 (13)	.2	(4.9 ± 12.2)E 0	15	(1.9 ± 1.2)E 1	(-1.3 ± 1.3)E 1
(0)		(-6.5 - 4.9)E 1			(-3.8 - 1.4)E 1
		(0/ 9)		*(0/ 4)*	*(0/ 4)*

TABLE III-G-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: VEGETATION - AQUATIC UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
RA-226 (13)	.1	(10.0 ± 5.2)E 1	11	(1.7 ± .8)E 2	(1.2 ± .8)E 2
(0)		(-6.2 - 46.2)E 1			(-2.9 - 31.3)E 1
		(0/ 9)		*(0/ 5)*	*(0/ 4)*
TH-228 (13)	2.0E-02	(2.0 ± .9)E 1	22	(5.8 ± 2.7)E 1	(5.8 ± 2.7)E 1
(0)		(-5.8 - 80.2)E 0		(-1.6 - 11.5)E 1	(-1.6 - 11.5)E 1
		(0/ 9)		*(2/ 4)*	*(2/ 4)*

TABLE III-G-1 (continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

III. H. Lobster (Arthropods)

Lobster samples are collected four times per season at two locations, the vicinity of the discharge outfall area and at a distant point off-shore. The results of the ERMAP program for Lobsters are presented in Table III-H-1. These results are unremarkable in that there were no positive measurements of any isotopes other than K-40 in either the indicator or the control samples. Therefore, there is no evidence of any environmental impact on this media as a result of the operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: ARTHROPODS UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*		NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7	(6)	.2	(-1.9 ± 25.3)E 0	99	(2.5 ± 1.2)E 2	(1.0 ± 1.0)E 2
	(0)		(-4.5 - 6.4)E 1		*(0/ 1)*	(6.2 - 25.5)E 1
			(0/ 4)			*(0/ 2)*
K-40	(6)	.5	(2.3 ± .2)E 3	11	(2.3 ± .2)E 3	(1.9 ± .2)E 3
	(0)		(1.8 - 2.7)E 3		(1.8 - 2.7)E 3	(1.7 - 2.1)E 3
			(4/ 4)		*(4/ 4)*	*(2/ 2)*
CR-51	(6)	3.2E+02	(4.1 ± 3.[illegible]E 1	99	(4.7 ± 13.2)E 1	(9.1 ± 38.1)E 0
	(0)		(-1.4 - 14.0)E 1		*(0/ 1)*	(-2.9 - 4.7)E 1
			(0/ 4)			*(0/ 2)*
MN-54	(6)	2.0E-02	(1.2 ± 3.7)E 0	99	(8.3 ± 15.7)E 0	(6.3 ± 2.0)E 0 0
	(0)		(-4.8 - 10.7)E 0			(4.3 - 8.3)E 0
			(0/ 4)		*(0/ 1)*	*(0/ 2)*
CO-58	(6)	2.0E-02	(3.9 ± 287.7)E -2	99	(1.7 ± 16.3)E 0	(-0.8 ± 8.5)E 0
	(0)		(-7.6 - 5.7)E 0			(-1.5 - .2)E 1
			(0/ 4)		*(0/ 1)*	*(0/ 2)*
FE-59	(6)	3.0E+01	(5.9 ± 8.2)E 0	11	(5.9 ± 8.2)E 0	(-2.3 ± .7)E 1
	(0)		(-1.6 - 2.4)E 1			(-2.9 - 0.0)E 1
			(0/ 4)		*(0/ 4)*	*(0/ 2)*
CO-60	(6)	2.0E-02	(5.0 ± 1.4)E 0	11	(5.0 ± 1.4)E 0	(-2.5 ± 5.5)E 0
	(0)		(1.8 - 7.8)E 0			(-7.9 - 3.0)E 0
			(0/ 4)		*(0/ 4)*	*(0/ 2)*
ZN-65	(6)	6.7E+01	(2.0 ± .7)E 1	11	(2.0 ± .7)E 1	(-2.6 ± 2.5)E 1
	(0)		(4.3 - 294.0)E -1			(-5.1 - 0.0)E 1
			(0/ 4)		*(0/ 4)*	*(0/ 2)*
ZR-95	(6)	4.0E-02	(6.0 ± 59.4)E -1	11	(6.0 ± 59.4)E -1	(-1.1 ± .8)E 1
	(0)		(-1.5 - 1.1)E 1			(-1.8 - 0.0)E 1
			(0/ 4)		*(0/ 4)*	*(0/ 2)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-H-1
ERMAP RESULTS
LOBSTERS

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: ARTHROPODS UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
NB-95 (6)	3.9E+01	(4.3 ± 3.0)E 0	99	(2.5 ± 1.6)E 1	(1.1 ± 1.4)E 1
(0)		(-1.7 - 11.0)E 0			(-2.9 - 25.4)E 0
		(0/ 4)		*(0/ 1)*	*(0/ 2)*
AG-110M(6)	2.5E+02	(-8.5 ± 19.7)E 0	11	(-8.5 ± 19.7)E 0	(-9.5 ± 2.5)E 1
(0)		(-5.8 - 3.1)E 1			(-1.2 - 0.0)E 2
		(0/ 4)		*(0/ 4)*	*(0/ 2)*
RU-103 (6)	2.0E-02	(-1.4 ± 3.9)E 0	99	(1.7 ± 1.5)E 1	(-1.4 ± 18.2)E 0
(0)		(-8.1 - 8.8)E 0			(-2.0 - 1.7)E 1
		(0/ 4)		*(0/ 1)*	*(0/ 2)*
RU-106 (6)	.2	(-6.6 ± 3.5)E 1	99	(2.5 ± 1.3)E 2	(1.4 ± 1.1)E 2
(0)		(-1.2 - .3)E 2			(2.3 - 25.0)E 1
		(0/ 4)		*(0/ 1)*	*(0/ 2)*
I-131 (6)	0.	(1.3 ± 20.7)E 0	11	(1.3 ± 20.7)E 0	(-1.5 ± .4)E 1
(0)		(-3.8 - 5.8)E 1			(-1.9 - 0.0)E 1
		(0/ 4)		*(0/ 4)*	*(0/ 2)*
CS-134 (6)	2.0E-02	(-3.7 ± 3.2)E 0	99	(1.2 ± 1.5)E 1	(3.2 ± 8.4)E 0
(0)		(-1.3 - .2)E 1			(-5.2 - 11.6)E 0
		(0/ 4)		*(0/ 1)*	*(0/ 2)*
CS-137 (6)	2.0E-02	(2.3 ± 3.5)E 0	11	(2.3 ± 3.5)E 0	(-1.6 ± .6)E 0
(0)		(-4.1 - 12.1)E 0			(-2.2 - 0.0)E 0
		(0/ 4)		*(0/ 4)*	*(0/ 2)*
BA-140 (6)	8.0E-02	(3.5 ± 9.1)E 0	11	(3.5 ± 9.1)E 0	(-2.8 ± .9)E 1
(0)		(-1.4 - 1.9)E 1			(-3.7 - 0.0)E 1
		(0/ 4)		*(0/ 4)*	*(0/ 2)*
CE-141 (6)	4.0E-02	(-2.4 ± 2.4)E 2	15	(2.5 ± 1.1)E 1	(7.3 ± 17.3)E 0
(0)		(-9.6 - .1)E 2			(-1.0 - 2.5)E 1
		(0/ 4)		*(0/ 1)*	*(0/ 2)*
CE-144 (6)	.2	(6.0 ± 11.6)E 0	99	(3.7 ± 7.5)E 1	(2.9 ± .8)E 1
(0)		(-1.2 - 3.9)E 1			(2.1 - 3.7)E 1
		(0/ 4)		*(0/ 1)*	*(0/ 2)*

TABLE III-H-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: ARTHROPODS UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
TH-228 (6)	2.0E-02	(4.5 ± 4.9)E 0	15	(2.7 ± 2.9)E 1	(-7.9 ± 35.0)E 0
(0)		(-5.8 - 17.6)E 0			(-4.3 - 2.7)E 1
		(0/ 4)		*(0/ 1)*	*(0/ 2)*

TABLE III-H-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

III. I. Fish

Fish samples of Bottom Oriented (Group I) and Near Bottom (Group II) species are collected quarterly in the vicinity of the discharge outfall. In addition, samples of Anadromous (Group III) and Coastal Migratory (Group IV) species are collected when in season, in this same area. Lastly, a sample from each group is collected once per year at a distant location offshore.

The results of the ERMAP program for fish are presented in Table III-I-1. There were no positive measurements of any isotope (other than naturally occuring K-40) at the indicator station (discharge canal - Station 11). Therefore, there is no evidence of any environmental impact on this media as a result of the operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FISH UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7 (34)	.2	(1.1 ± 1.0)E 1	22	(4.8 ± 7.1)E 1	(2.3 ± 1.7)E 1
(0)		(-9.3 - 9.9)E 1			(-4.6 - 8.0)E 1
		(0/ 25)		*(0/ 1)*	*(0/ 9)*
K-40 (34)	.5	(3.6 ± .1)E 3	21	(3.7 ± .2)E 3	(3.5 ± .1)E 3
(0)		(2.9 - 4.6)E 3		(3.4 - 3.9)E 3	(3.0 - 3.9)E 3
		(25/ 25)		*(2/ 2)*	*(9/ 9)*
CR-51 (34)	3.2E+02	(1.1 ± 19.4)E 0	99	(7.6 ± 27.1)E 0	(2.6 ± 182.2)E -1
(0)		(-2.3 - 2.5)E 2			(-7.1 - 8.8)E 1
		(0/ 25)		*(0/ 6)*	*(0/ 9)*
MN-54 (34)	2.0E-02	(1.4 ± 15.0)E -1	11	(1.4 ± 15.0)E -1	(-4.0 ± 2.2)E 0
(0)		(-1.3 - 1.5)E 1			(-1.6 - .2)E 1
		(0/ 25)		*(0/ 25)*	*(0/ 9)*
CO-58 (34)	2.0E-02	(2.5 ± 15.7)E -1	22	(7.4 ± 9.7)E 0	(1.7 ± 1.8)E 0
(0)		(-2.1 - 1.6)E 1			(**** - 7.4)E 0
		(0/ 25)		*(0/ 1)*	*(0/ 9)*
FE-59 (34)	3.0E+01	(2.1 ± 30.5)E -1			
			99	(1.3 ± .3)E 1	(4.6 ± 5.9)E 0
(0)		(-2.8 - 2.8)E 1			(-3.0 - 2.2)E 1
		(0/ 25)		*(0/ 6)*	*(0/ 9)*
CO-60 (34)	2.0E-02	(1.3 ± 17.8)E -1	99	(5.7 ± 5.3)E 0	(2.3 ± 3.8)E 0
(0)		(-1.8 - 1.6)E 1			(-7.2 - 28.1)E 0
		(0/ 25)		*(0/ 6)*	*(0/ 9)*
ZN-65 (34)	6.7E+01	(2.2 ± 43.5)E -1	22	(1.7 ± 2.0)E 1	(-3.7 ± 6.3)E 0
(0)		(-4.0 - 5.2)E 1			(-3.2 - 2.8)E 1
		(0/ 25)		*(0/ 1)*	*(0/ 9)*
ZR-95 (34)	4.0E-02	(3.2 ± 3.3)E 0	22	(3.5 ± 1.9)E 1	(1.8 ± 69.4)E -1
(0)		(-4.5 - 2.9)E 1			(-2.1 - 3.5)E 1
		(0/ 25)		*(0/ 1)*	*(0/ 9)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-I-1
ERMAP RESULTS
FISH

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FISH UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
NB-95 (34)	3.9E+01	(-2.0 ± 1.4)E 0	21	(3.3 ± 3.0)E 0	(3.9 ± 29.9)E -1
(0)		(-1.5 - 1.4)E 1			(-1.6 - 1.3)E 1
		(0/ 25)		*(0/ 2)*	*(0/ 9)*
AG-110M(34)	2.5E+02	(-4.9 ± 13.5)E 0	21	(9.2 ± 2.0)E 1	(1.0 ± 2.0)E 1
(0)		(-1.4 - 1.3)E 2			(-7.3 - 11.2)E 1
		(0/ 25)		*(0/ 2)*	*(0/ 9)*
RU-103 (34)	2.0E-02	(2.2 ± 2.0)E 0	11	(2.2 ± 2.0)E 0	(-4.4 ± 3.1)E 0
(0)		(-2.6 - 2.4)E 1			(-1.6 - 1.5)E 1
		(0/ 25)		*(0/ 25)*	*(0/ 9)*
RU-106 (34)	.2	(-1.2 ± 1.6)E 1	21	(1.5 ± 2.8)E 1	(-3.5 ± 3.1)E 1
(0)		(-1.5 - 2.4)E 2			(-2.3 - 1.0)E 2
		(0/ 25)		*(0/ 2)*	*(0/ 9)*
I-131 (34)	0.	(-3.4 ± 4.3)E 0	22	(-3.2 ± 39.6)E 0	(-2.3 ± .9)E 1
(0)		(-3.6 - 4.5)E 1			(-8.6 - .6)E 1
		(0/ 25)		*(0/ 1)*	*(0/ 9)*
CS-134 (34)	2.0E-02	(-5.6 ± 1.3)E 0	22	(-1.8 ± 9.5)E 0	(-7.1 ± 2.6)E 0
(0)		(-1.4 - .4)E 1			(-2.3 - .1)E 1
		(0/ 25)		*(0/ 1)*	*(0/ 9)*
CS-137 (34)	2.0E-02	(8.2 ± 2.3)E 0	99	(1.6 ± .5)E 1	(1.1 ± .6)E 1
(0)		[illegible] - 4.8)E 1		(5.5 - 33.4)E 0	(-2.1 - 3.3)E 1
		(0/ 25)		*(1/ 6)*	*(2/ 9)*
BA-140 (34)	8.0E-02	(-1.5 ± 3.5)E 0	11	(-1.5 ± 3.5)E 0	(-6.6 ± 4.2)E 0
(0)		(-4.7 - 2.9)E 1			(-2.3 - 1.4)E 1
		(0/ 25)		*(0/ 25)*	*(0/ 9)*
CE-144 (34)	.2	(-1.1 ± .6)E 1	11	(-1.1 ± .6)E 1	(-2.2 ± 1.1)E 1
(0)		(-8.8 - 3.6)E 1			(-8.0 - 1.7)E 1
		(0/ 25)		*(0/ 25)*	*(0/ 9)*
RA-226 (34)	.1	(-9.2 ± 22.9)E 0	22	(2.9 ± 2.8)E 2	(2.7 ± 78.7)E 0
(0)		(-2.1 - 2.9)E 2			(-3.5 - 2.9)E 2
		(0/ 25)		*(0/ 1)*	*(0/ 9)*

TABLE III-I-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FISH UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
TH-228 (34)	2.0E-02	(4.0 ± 6.0)E 0	21	(2.1 ± .0)E 1	(5.9 ± 7.0)E 0
(0)		(-5.4 - 5.6)E 1			(-4.1 - 2.9)E 1
		(0/ 25)		*(0/ 2)*	*(0/ 9)*

TABLE III-I-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

III. J. Sediments

Sediment samples are taken semi-annually at five indicator stations including Rocky Point, Plymouth Harbor, Duxbury Bay, Plymouth Beach and Manomet Point and a control sample is taken from Marshfield. There is a detailed subdivision of individual sample cores in which samples are sectioned into 2 cm increments (this applies to all locations except Plymouth Beach).

The surface and alternate sections are analyzed for gamma emitting isotopes. In addition, the surface section from each core and a mid-depth section from Rocky Point and Plymouth Harbor are analyzed for Pu-238 and Pu-239, 240.

The results of the ERMAP program for sediments are presented in Table III-J-1. It is clear from this table that Co-60 was observed in sediment samples taken from Rocky Point (Station 11) which is near the discharge canal outfall. These samples were collected on 6/9/80. Subsequent samples collected from the same location on 10/22/80 showed no evidence of any isotopes characteristic of reactor operation. Therefore, the observations of Co-60 are most probably a transient effect. The only other noteworthy values are the measured concentrations of Cs-137 and Ce-144 in Duxbury Bay samples. This may be explained by the fact that the sediment samples taken at Duxbury have a silty character not common to the other samples. It may be that the nature of the Duxbury sediment is such that certain materials are retained more strongly than others. This theory is supported by the fact that the Duxbury indicator station also had the highest mean concentration of K-40, an isotope which is chemically similar to Cs-137.

Analyses for plutonium isotopes in sediment samples were performed by the LFE Environmental Analyses Laboratories in Richmond, California. The results of these anlayses are presented in Table III-J-2. There is no apparent trend in these data to indicate that the PNPS-1 is contributing measurably to levels of Pu-238 or Pu-239, 240 in the environment since levels of Plutonium at Rocky Point are among the lowest measured at any location.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: SEDIMENT/SILT UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*		NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
BE-7	(88)	.2	(2.8 ± 2.4)E 1	13	(1.2 ± 1.0)E 2	(7.0 ± 1.2)E 1
	(3)		(-1.9 - 9.2)E 2		(-1.9 - 9.2)E 2	(3.9 - 9.9)E 1
			(3/ 88)		*(2/ 10)*	*(0/ 4)*
K-40	(88)	.5	(1.0 ± .0)E 4	13	(1.4 ± .1)E 4	(10.0 ± .2)E 3
	(0)		(7.8 - 16.8)E 3		(9.1 - 16.8)E 3	(9.3 - 10.8)E 3
			(88/ 88)		*(10/ 10)*	*(4/ 4)*
CR-51	(88)	3.7E+02	(9.5 ± 16.8)E 0	15	(9.5 ± 2.8)E 1	(-2.6 ± 3.8)E 1
	(0)		(-3.2 - 2.7)E 2			(-9.8 - 5.5)E 1
			(0/ 88)		*(0/ 10)*	*(0/ 4)*
MN-54	(88)	2.0E-02	(1.1 ± 1.2)E 0	11	(6.7 ± 2.0)E 0	(-5.0 ± 88.9)E -1
	(0)		(-1.2 - 1.9)E 1			(-1.2 - .7)E 1
			(0/ 88)		*(0/ 10)*	*(0/ 4)*
CO-58	(88)	2.0E-02	(-5.9 ± 1.3)E 0	15	(-3.1 ± 2.1)E 0	(-8.9 ± 1.7)E 0
	(0)		(-3.1 - 1.3)E 1			(-1.3 - 3.0)E 1
			(0/ 88)		*(0/ 10)*	*(0/ 4)*
FE-59	(88)	5.0E+01	(-3.6 ± 4.0)E 0	11	(1.3 ± .7)E 1	(7.2 ± 5.3)E 0
	(0)		(-6.9 - 4.9)E 1			(-6.6 - 18.5)E 0
			(0/ 88)		*(0/ 10)*	*(0/ 4)*
CO-60	(88)	2.0E-02	(5.7 ± 2.6)E 0	11	(1.6 ± .9)E 1	(-9.9 ± 87.0)E -1
	(2)		(-2.1 - 9.0)E 1		(-8.1 - 90.0)E 0	(-1.2 - .4)E 1
			(2/ 88)		*(2/ 10)*	*(0/ 4)*
ZN-65	(88)	6.8E+01	(-3.8 ± 3.2)E 0	24	(2.3 ± 4.0)E 0	(2.3 ± 4.0)E 0
	(0)		(-5.6 - 4.1)E 1			(-6.0 - 12.8)E 0
			(0/ 88)		*(0/ 4)*	*(0/ 4)*
ZR-95	(88)	4.0E-02	(7.5 ± 2.3)E 0	13	(1.6 ± .7)E 1	(1.5 ± .8)E 1
	(0)		(-2.5 - 4.5)E 1			(-2.5 - 35.1)E 0
			(0/ 88)		*(0/ 10)*	*(0/ 4)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-J-1
ERMAP RESULTS
SEDIMENTS

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: SEDIMENT/SILT UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
NB-95 (48)	3.1E+01	(6.8 ± 1.3)E 0	20	(1.3 ± .4)E 1	(1.3 ± .4)E 1
(0)		(-1.3 - 3.0)E 1			(6.3 - 25.0)E 0
		(0/ 44)		*(0/ 4)*	*(0/ 4)*
AG-110M(48)	1.9E+02	(4.1 ± 10.5)E 0	15	(2.6 ± 1.4)E 1	(-5.3 ± 1.5)E 1
(0)		(-1.6 - 1.7)E 2			(-9.9 - 0.0)E 1
		(0/ 44)		*(0/ 10)*	*(0/ 4)*
RU-103 (48)	2.0E-02	(1.0 ± 1.5)E 0	15	(3.6 ± 2.7)E 0	(1.6 ± 4.6)E 0
(0)		(-2.9 - 2.2)E 1			(-6.6 - 10.8)E 0
		(0/ 44)		*(0/ 10)*	*(0/ 4)*
RU-106 (48)	.2	(1.8 ± 8.2)E 0	13	(1.6 ± 1.9)E 1	(-1.7 ± 17.6)E 0
(0)		(-1.0 - 1.3)E 2			(-5.1 - 2.8)E 1
		(0/ 44)		*(0/ 10)*	*(0/ 4)*
I-131 (48)	0.	(2.6 ± 1.1)E 2	15	(5.3 ± 3.7)E 2	(-6.4 ± 8.6)E 0
(0)		(-9.9 - 25.4)E 2			(-2.4 - 1.6)E 1
		(0/ 44)		*(0/ 10)*	*(0/ 4)*
CS-134 (48)	2.0E-02	(-3.4 ± 1.1)E 0	14	(-4.6 ± 18.8)E -1	(-6.8 ± 3.3)E 0
(0)		(-2.1 - 1.0)E 1			(-1.4 - .1)E 1
		(0/ 44)		*(0/ 4)*	*(0/ 4)*
CS-137 (48)	2.0E-02	(2.7 ± .5)E 1	13	(7.6 ± 1.1)E 1	(1.8 ± .3)E 1
(0)		(-7.7 - 132.0)E 0		(2.3 - 13.2)E 1	(1.1 - 2.4)E 1
		(17/ 44)		*(10/ 10)*	*(3/ 4)*
BA-140 (48)	4.0E-02	(-8.6 ± 2.3)E 1	12	(-2.0 ± .7)E 1	(-2.7 ± .9)E 1
(0)		(-5.3 - 2.8)E 2			(-5.4 - 0.0)E 1
		(0/ 44)		*(0/ 10)*	*(0/ 4)*
CE-144 (48)	.2	(-4.4 ± 9.7)E 0	13	(2.3 ± 3.7)E 1	(-5.2 ± 16.0)E 0
(3)		(-1.3 - 2.3)E 2		(-1.3 - 2.3)E 2	(-3.6 - 2.4)E 1
		(3/ 44)		*(3/ 10)*	*(0/ 4)*
RA-226 (48)	.1	(7.7 ± .6)E 2	13	(1.2 ± .1)E 3	(6.8 ± .6)E 2
(0)		(2.0 - 18.7)E 2		(6.1 - 18.6)E 2	(5.8 - 8.5)E 2
		(35/ 44)		*(10/ 10)*	*(4/ 4)*

TABLE III-J-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: SEDIMENT/SILT UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
TH-228 (48)	2.0E-02	(3.6 & .2)E 2	13	(5.0 & .4)E 2	(3.0 & .4)E 2
(0)		(1.2 - 6.9)E 2		(3.0 - 6.9)E 2	(2.1 - 3.8)E 2
		(44/ 44)		*(10/ 10)*	*(4/ 4)*

TABLE III-J-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-J-2
RESULTS OF SEDIMENT ANALYSES
FOR PLUTONIUM

Location	Depth (cm)	Results pCi/Kg (Dry) ± % Error (1σ) (a) ^{238}Pu	$^{239,240}Pu$
Duxbury	0-2	1.15 ± 21%	42.9 ± 3%
Duxbury	16-18	0.27 ± 32%	9.82 ± 5%
Plymouth Harbor	0-2	0.22 ± 54%	7.72 ± 5%
Rocky Point	0-2	0 ± 0.07	3.35 ± 10%
Rocky Point	16-18	0 ± 0.12	2.32 ± 11%
Manomet Point	0-2	0.09 ± 80%	2.16 ± 10%

(a) If the result is zero, the error is in pCi/Kg.

(b) Sample analyses for control station in Marshfield and mid-depth sample at Plymouth Harbor not available as of this date.

III-K Milk

Milk samples were collected at three locations, Plimouth Plantation (station 15-2.2 mi-W), Plymouth County Farm (Station 11-3.5 mi-W) and the King Residence (Station 22-12 mi-W) during 1980.

The Plimouth Plantation is a substitute indicator station added to replace the Whitman Farm in 1979. The 1980 milk animal and garden census (see Appendix E) confirmed this location as the nearest location of a milk producing animal within 5 miles. As stated in Section I of this report, milk samples were not always available in sufficient quantity for analyses from this location, however, every reasonable effort was made to collect samples from this location whenever they were available.

When available, samples were collected semi-monthly when animals are on pasture and monthly at other times.

The results of the ERMAP program for the milk media are presented in Table III-K-1. The results of analyses for Cs-137, and Sr-90 are presented graphically in Figures III-K-1 and III-K-2 respectively. There were positive measurements of these isotopes at the indicator and control stations.

In the case of Sr-90, I-131 and Cs-137, the highest mean values of concentration occurred at the Plimouth Plantation. Station releases for this period exhibited a Sr-89/Sr-90 ratio of greater than 100/1 and therefore it is unlikely that the PNPS-1 is the major source of the indicator station activity since the measured Sr-89/Sr-90 ratio was at most 1/2.

In addition, the measured average concentration of both Cs-137 and Sr-90 were respectively 10,000 and 1,000,000 times in excess of the concentrations expected to be present based on measured releases from PNPS-1 and the conservative dose estimation methodology described in Regulatory Guide 1.109 and 1.111. In other words, PNPS-1 probably contributed much less than 0.01% of the measured concentrations of Sr-90 and Cs-137 in milk at the Plimouth Plantation. The remainder of the measured cesium and strontium radioactivity is unquestionably due to atmospheric fallout resulting from atmospheric weapons testing.

In the case of I-131 the only two positive measurements at the Plimouth Plantation occurred during October and November (0.52 and 1.7 pCi/liter respectively).

There was a Chinese atmospheric weapons test which occurred on 10/17/80 which undoubtly contributed most or all of the measured I-131 activity at this location.

However, even if a person were to consume milk with the highest mean concentration of I-131 for a full year they would receive less than 1 mrem/year to the most restrictive organ (infant thyroid).

When compared with the natural background dose rate of 80 to 100 mrem/year, there was clearly no significant environmental impact on the milk media as a result of operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: MILK UNITS: PCI/LITER

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
SR-89 (38)	4.	(1.9 ± 4.6)E -1	22	(4.9 ± 3.2)E -1	(4.3 ± 1.9)E -1
(0)		(-2.1 - 3.9)E 0		(-8.7 - 17.6)E -1	(-1.4 - 2.7)E 0
		(2/ 13)		*(1/ 8)*	*(2/ 25)*
SR-90 (38)	.8	(1.4 ± .2)E 1	15	(1.6 ± .2)E 1	(2.7 ± .3)E 0
(1)		(7.2 - 34.0)E 0		(7.2 - 34.0)E 0	(1.2 - 9.3)E 0
		(13/ 13)		*(13/ 13)*	*(25/ 25)*
BE-7 (38)	8.0E+01	(-1.6 ± 1.1)E 0	22	(-1.5 ± 22.5)E -1	(-1.6 ± 1.3)E 0
(0)		(-9.0 - 8.3)E 0			(-1.5 - .7)E 1
		(0/ 13)		*(0/ 8)*	*(0/ 25)*
K-40 (38)	2.0E+02	(1.4 ± .0)E 3	22	(1.4 ± .1)E 3	(1.4 ± .0)E 3
(0)		(8.5 - 15.7)E 2		(1.2 - 1.7)E 3	(1.2 - 1.7)E 3
		(13/ 13)		*(8/ 8)*	*(25/ 25)*
CR-51 (38)	1.0E+00	(3.6 ± 2.4)E 0	22	(4.2 ± 3.1)E 0	(9.6 ± 18.2)E -1
(0)		(-7.6 - 25.2)E 0			(-2.7 - 2.0)E 1
		(0/ 13)		*(0/ 8)*	*(0/ 25)*
MN-54 (38)	8.	(4.6 ± 3.1)E -1	22	(5.5 ± 3.5)E -1	(2.0 ± 1.8)E -1
(0)		(-1.7 - 2.8)E 0			(-2.4 - 2.1)E 0
		(0/ 13)		*(0/ 8)*	*(0/ 25)*
CO-58 (38)	8.	(-3.9 ± 2.5)E -1	21	(3.8 ± 2.2)E -1	(1.2 ± 1.9)E -1
(0)		(-1.7 - 1.7)E 0			(-2.4 - 1.8)E 0
		(0/ 13)		*(0/ 17)*	*(0/ 25)*
FE-59 (38)	1.0E+01	(6.2 ± 6.8)E -1	15	(6.2 ± 6.8)E -1	(1.7 ± 4.6)E -1
(0)		(-3.1 - 5.1)E 0			(-5.4 - 4.1)E 0
		(0/ 13)		*(0/ 13)*	*(0/ 25)*
CO-60 (38)	8.	(-1.5 ± 3.9)E -1	22	(-2.2 ± 49.1)E -2	(-8.4 ± 22.3)E -2
(0)		(-2.2 - 2.8)E 0			(-2.3 - 2.3)E 0
		(0/ 13)		*(0/ 8)*	*(0/ 25)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-K-1
ERMAP RESULTS
MILK

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: MILK UNITS: PCI/LITER

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
ZN-65 (38)	-1.0-100	(1.5 ± 1.0)E 0	15	(1.5 ± 1.0)E 0	(1.7 ± 5.3)E -1
(0)		(-3.4 - 7.7)E 0			(-4.2 - 7.3)E 0
		(0/ 13)		*(0/ 13)*	*(0/ 25)*
ZR-95 (38)	1.0E+01	(-6.7 ± 9.0)E -1	21	(-2.6 ± 3.9)E -1	(-9.7 ± 3.1)E -1
(0)		(-4.3 - 2.2)E 0			(-3.7 - 3.0)E 0
		(0/ 13)		*(0/ 17)*	*(0/ 25)*
NB-95 (38)	-1.0-100	(-2.8 ± 2.9)E -1	21	(2.9 ± 2.3)E -1	(1.6 ± 2.5)E -1
(0)		(-1.8 - 2.0)E 0			(-1.7 - 4.1)E 0
		(0/ 13)		*(0/ 17)*	*(0/ 25)*
AG-110M(38)	-1.0-100	(-2.8 ± 2.6)E 0	22	(6.8 ± 3.1)E 0	(-1.0 ± 2.0)E 0
(0)		(-1.8 - 1.5)E 1			(-1.8 - 2.7)E 1
		(0/ 13)		*(0/ 8)*	*(0/ 25)*
RU-103 (38)	8.	(-1.1 ± .)E 0	22	(-1.0 ± 3.8)E -1	(-4.7 ± 2.2)E -1
(0)		(-2.6 - 1.1)E 0			(-2.1 - 1.7)E 0
		(0/ 13)		*(0/ 8)*	*(0/ 25)*
RU-106 (38)	8.0E+01	(-3.8 ± 2.2)E 0	21	(3.8 ± 1.5)E 0	(1.1 ± 1.4)E 0
(0)		(-2.2 - .6)E 1			(-1.4 - 1.3)E 1
		(0/ 13)		*(0/ 17)*	*(0/ 25)*
I-131 (38)	.5	(1.9 ± 1.3)E -1	15	(1.9 ± 1.3)E -1	(3.3 ± 1.5)E -1
(2)		(-4.4 - 172.0)E -2		(-4.4 - 172.0)E -2	(-7.6 - 30.2)E -1
		(2/ 13)		*(2/ 13)*	*(4/ 25)*
CS-134 (38)	9.	(-4.4 ± 2.5)E -1	22	(-2.3 ± 3.6)E -1	(-8.4 ± 2.0)E -1
(0)		(-2.2 - .7)E 0			(-2.3 - 1.2)E 0
		(0/ 13)		*(0/ 8)*	*(0/ 25)*
CS-137 (38)	9.	(1.8 ± .1)E 1	15	(1.8 ± .1)E 1	(7.7 ± 1.7)E -1
(0)		(1.3 - 2.5)E 1		(1.3 - 2.5)E 1	(2.8 - 372.0)E -1
		(13/ 13)		*(13/ 13)*	*(22/ 25)*
BA-140 (38)	1.5E+01	(1.3 ± 4.1)E -1	15	(1.3 ± 4.1)E -1	(-3.7 ± 3.8)E -1
(0)		(-2.5 - 3.5)E 0			(-6.6 - 2.0)E 0
		(0/ 13)		*(0/ 13)*	*(0/ 25)*

TABLE III-K-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: MILK UNITS: PCI/LITER

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
CE-144 (38)	8.0E+01	(-2.0 ± 12.7)E -1	21	(-1.5 ± 108.3)E -2	(-5.0 ± 8.8)E -1
(0)		(-5.8 - 9.7)E 0			(-9.6 - 6.1)E 0
		(0/ 13)		*(0/ 17)*	*(0/ 25)*
RA-226 (38)	6.0E+01	(6.5 ± 3.7)E 0	15	(6.5 ± 3.7)E 0	(4.6 ± 3.7)E 0
(0)		(-1.3 - 3.7)E 1			(-2.4 - 4.0)E 1
		(0/ 13)		*(0/ 13)*	*(0/ 25)*
TH-228 (38)	1.0E+01	(4.5 ± 8.7)E -1	22	(1.4 ± 1.5)E 0	(3.1 ± 6.3)E -1
(0)		(-8.0 - 4.9)E 0			(-5.5 - 10.0)E 0
		(0/ 13)		*(0/ 8)*	*(0/ 25)*

TABLE III-K-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

FIGURE III-K-1
CONCENTRATIONS OF Cs-137 IN MILK
ALL STATIONS

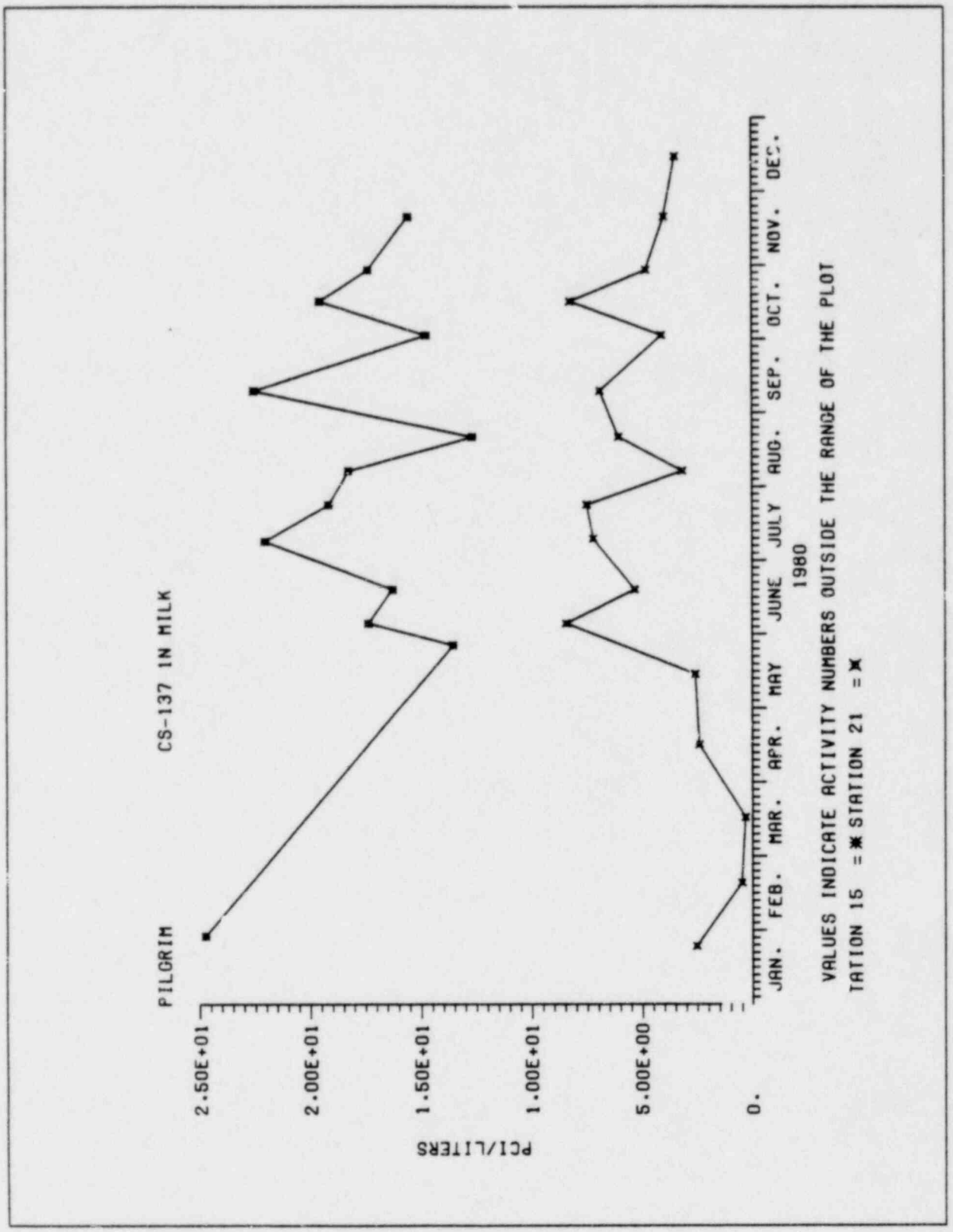
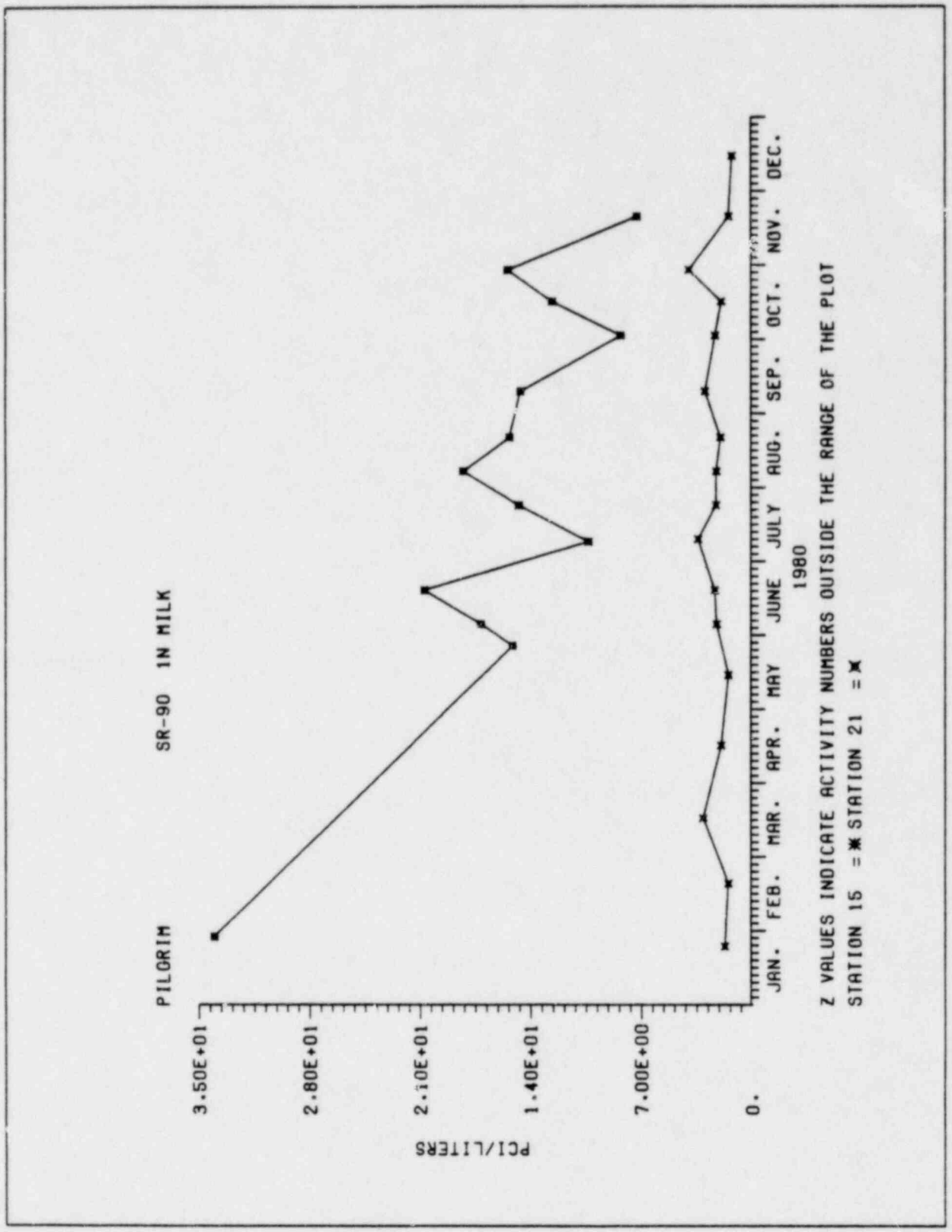


FIGURE III-K-2
CONCENTRATIONS OF Sr-90 IN MILK
ALL STATIONS



III. L. Cranberries

Cranberries are collected from three locations, the Manoment Point Bog (2.6 mi - SE - location 13), the Bartlett Road Bog (2.8 mi - SSE/S - location 14) and the Pine Street Bog (17 mi - WNW - location 23) at the time of harvest. The results of the ERMAP program for this media are presented in Table III-L-1. The only man-made radionuclide detected in any sample was Cs-137 which appeared in all samples collected. A comprehensive study of cesium uptake in cranberries was performed during 1978. The results of this study are published in the 1978 Environmental Radiation Monitoring Program Report No. 11. The results of this study and the fact that no other reactor related isotopes were measured above LLD in cranberry samples makes it extremely unlikely that there was any environmental impact on cranberries due to operation of PNPS-1.

PILGRIM I — OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING — 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FOOD CRANBERRIES — UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*		NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
BE-7	(3)	.2	(9.1 ± 3.4)E 1	13	(1.3 ± 1.0)E 2	(-3.3 ± 3.7)E 1
	(0)		(5.8 - 12.5)E 1			(-3.3 - 0.0)E 1
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
K-40	(3)	.5	(8.0 ± .4)E 2	13	(8.4 ± 2.6)E 2	(7.6 ± .9)E 2
	(0)		(7.6 - 8.4)E 2			
			(2/ 2)		*(1/ 1)*	*(1/ 1)*
CR-51	(3)	3.2E+02	(7.1 ± .5)E 1	14	(7.6 ± 5.1)E 1	(-6.3 ± 4.2)E 1
	(0)		(6.5 - 7.6)E 1			(-6.3 - 0.0)E 1
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
MN-54	(3)	2.0E-02	(-5.5 ± 2.3)E 0	23	(-2.1 ± 4.5)E 0	(-2.1 ± 4.5)E 0
	(0)		(-7.9 - 0.0)E 0			(-2.1 - 0.0)E 0
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
CO-58	(3)	2.0E-02	(-1.0 ± .8)E 1	14	(-2.8 ± 5.0)E 0	(-3.4 ± 4.8)E 0
	(0)		(-1.8 - 0.0)E 1			(-3.4 - 0.0)E 0
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
FE-59	(3)	3.0E+01	(-1.3 ± .1)E 1	23	(1.4 ± 10.1)E 0	(1.4 ± 10.1)E 0
	(0)		(-1.4 - 0.0)E 1			
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
CO-60	(3)	2.0E-02	(4.7 ± 1.8)E 0	14	(6.5 ± 7.7)E 0	(3.0 ± 6.9)E 0
	(0)		(2.8 - 6.5)E 0			
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
ZN-65	(3)	6.7E+01	(1.5 ± 2.4)E 1	13	(3.9 ± 3.5)E 1	(1.3 ± 1.0)E 1
	(0)		(-8.9 - 38.9)E 0			
			(0/ 2)		*(0/ 1)*	*(0/ 1)*
ZR-95	(3)	4.0E-02	(-1.8 ± 1.9)E 1	14	(1.1 ± 9.8)E 0	(-2.5 ± 9.0)E 0
	(0)		(-3.7 - .1)E 1			(-2.5 - 0.0)E 0
			(0/ 2)		*(0/ 1)*	*(0/ 1)*

TABLE III-L-1
ERMAP RESULTS
CRANBERRIES

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FOOD CRANBERRIES UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
NB-95 (3)	3.9E+01	(4.3 ± 1.0)E 0	14	(5.3 ± 6.8)E 0	(-8.0 ± 4.6)E 0
(0)		(3.2 - 5.3)E 0			(-8.0 - 0.0)E 0
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
AG-110M(3)	2.5E+02	(1.6 ± .7)E 2	13	(2.3 ± 1.0)E 2	(5.0 ± 3.9)E 1
(0)		(9.4 - 23.5)E 1			
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
RU-103 (3)	2.0E-02	(3.9 ± 1.4)E 0	13	(5.3 ± 11.9)E 0	(3.6 ± 4.7)E 0
(0)		(2.5 - 5.3)E 0			
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
RU-106 (3)	.2	(6.0 ± 6.4)E 1	13	(1.2 ± 1.2)E 2	(-5.7 ± 4.3)E 1
(0)		(-3.5 - 128.0)E 0			(-5.7 - 0.0)E 1
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
I-131 (3)	0.	(2.0 ± 1.0)E 0	13	(3.0 ± 16.9)E 0	(-2.3 ± 12.8)E 0
(0)		(9.3 - 30.3)E -1			(-2.3 - 0.0)E 0
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
CS-134 (3)	2.0E-02	(8.0 ± .7)E 0	14	(8.7 ± 6.2)E 0	(-6.8 ± 4.7)E 0
(0)		(7.3 - 8.7)E 0			(-6.8 - 0.0)E 0
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
CS-137 (3)	2.0E-02	(1.9 ± 1.6)E 2	13	(3.5 ± .3)E 2	(1.7 ± .5)E 1
(1)		(3.0 - 35.4)E 1			
		(2/ 2)		*(1/ 1)*	*(1/ 1)*
BA-140 (3)	8.0E-02	(-8.8 ± 10.9)E 0	14	(2.2 ± 10.3)E 0	(-2.9 ± 9.9)E 0
(0)		(-2.0 - .2)E 1			(-2.9 - 0.0)E 0
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
CE-141 (3)	4.0E-02	(-1.4 ± 1.5)E 1	14	(2.7 ± 9.1)E -2	(-3.6 ± 17.6)E 2
(0)		(-2.9 - .0)E 1			(-3.6 - 0.0)E 2
		(0/ 2)		*(0/ 1)*	*(0/ 1)*
CE-144 (3)	.2	(6.1 ± 6.8)E 1	13	(1.3 ± .7)E 2	(2.4 ± 2.1)E 1
(0)		(-.7 - 129.0)E 0			
		(0/ 2)		*(0/ 1)*	*(0/ 1)*

TABLE III-L-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM 1 OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FOOD CRANBERRIES UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
TH-228 (3)	2.0E-02	(-4.3 ± 2.7)E 1	23	(-5.3 ± 22.2)E 0	(-5.3 ± 22.2)E 0
(0)		(-7.0 - 0.0)E 1			(-5.3 - 0.0)E 0
		(0/ 2)		*(0/ 1)*	*(0/ 1)*

TABLE III-L-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

III. M. Vegetation

Samples of tuberous and green leafy vegetables are collected at the time of harvest at four locations, Plymouth County Farm (3.5 mi - W), Bridgewater Farm (2⁰ mi - W), the Evans Residence (0.7 mi - W) and the Work Residence (0.6 mi - ESE). The results of the ERMAP program for this media are presented in Table III-M-1.

The only man-made isotope observed was Cs-137 at the Evans Residence. The absence of Cs-134 at this location and the fact that the measured Cs-137 concentration (40 pCi/Kg) is about 8000 times what would be expected at this location based on releases from PNPS-1, strongly indicates that fallout, not PNPS-1, is the primary source of this Cesium-137. Therefore, it is extremely unlikely that there was any environmental impact on vegetation due to operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FOOD/GARDEN CROPS UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*		NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7	(A)	.2	(3.7 ± 3.8)E 1	17	(1.4 ± .7)E 2	(-2.2 ± 3.3)E 1
	(0)		(-3.3 - 13.8)E 1			(-6.9 - 4.2)E 1
			(0/ 5)		*(0/ 1)*	*(0/ 3)*
K-40	(A)	.5	(3.2 ± .5)E 3	16	(3.4 ± .2)E 3	(3.2 ± .7)E 3
	(0)		(1.9 - 4.8)E 3			(2.3 - 4.6)E 3
			(5/ 5)		*(1/ 1)*	*(3/ 3)*
CR-51	(A)	3.2E+02	(6.6 ± 2.9)E 1	17	(1.7 ± .9)E 2	(-9.7 ± 6.6)E 1
	(0)		(6.0 - 170.0)E 0			(-2.2 - .0)E 2
			(0/ 5)		*(0/ 1)*	*(0/ 3)*
MN-54	(A)	2.0E-02	(-3.8 ± 2.6)E 0	18	(6.0 ± 6.5)E 0	(-2.1 ± 5.1)E 0
	(0)		(-9.5 - 6.0)E 0			(-7.9 - 8.0)E 0
			(0/ 5)		*(0/ 1)*	*(0/ 3)*
CO-58	(A)	2.0E-02	(-7.3 ± 3.4)E 0	22	(5.1 ± 3.7)E 0	(5.1 ± 3.7)E 0
	(0)		(-1.7 - .2)E 1			(-2.1 - 10.0)E 0
			(0/ 5)		*(0/ 3)*	*(0/ 3)*
FE-59	(A)	3.0E+01	(-1.6 ± .8)E 1	22	(1.0 ± 1.3)E 1	(1.0 ± 1.3)E 1
	(0)		(-3.4 - 1.1)E 1			(-4.6 - 35.4)E 0
			(0/ 5)		*(0/ 3)*	*(0/ 3)*
CO-60	(A)	2.0E-02	(6.2 ± 33.7)E -1	18	(7.6 ± 11.6)E 0	(-3.2 ± 5.8)E 0
	(0)		(-8.2 - 8.7)E 0			(-9.0 - 8.3)E 0
			(0/ 5)		*(0/ 1)*	*(0/ 3)*
ZN-65	(A)	6.7E+01	(-1.2 ± .8)E 1	22	(4.4 ± 20.7)E 0	(4.4 ± 20.7)E 0
	(0)		(-2.8 - .3)E 1			(-2.4 - 4.5)E 1
			(0/ 5)		*(0/ 3)*	*(0/ 3)*
ZR-95	(A)	4.0E-02	(1.2 ± 7.3)E 0	17	(8.4 ± 18.0)E 0	(-5.8 ± 12.3)E 0
	(0)		(-2.0 - 2.2)E 1			(-2.6 - 1.6)E 1
			(0/ 5)		*(0/ 1)*	*(0/ 3)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-M-1
ERMAP RESULTS
VEGETATION

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FOOD/GARDEN CROPS UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
NB-95 (A)	3.9E+01	(4.7 ± 8.4)E 0	17	(1.8 ± .9)E 1	(4.3 ± 10.7)E 0
(0)		(-8.6 - 17.5)E 0			(-1.5 - 2.1)E 1
		(0/ 5)		*(0/ 1)*	*(0/ 3)*
AG-110M(A)	2.5E+02	(3.9 ± 2.5)E 1	16	(1.2 ± .6)E 2	(-5.7 ± 414.1)E -1
(0)		(-2.8 - 12.1)E 1			(-4.7 - 8.2)E 1
		(0/ 5)		*(0/ 1)*	*(0/ 3)*
RU-103 (A)	2.0E-02	(2.6 ± 5.5)E 0	17	(4.3 ± 10.2)E 0	(1.9 ± 1.4)E 0
(0)		(-9.5 - 21.6)E 0			(-7.4 - 0.0)E 0
		(0/ 5)		*(0/ 1)*	*(0/ 3)*
RU-106 (A)	.2	(-1.1 ± 2.6)E 1	11	(5.6 ± 41.9)E 0	(-3.1 ± 4.1)E 1
(0)		(-7.1 - 7.3)E 1			(-1.1 - .1)E 2
		(0/ 5)		*(0/ 3)*	*(0/ 3)*
I-131 (A)	0.	(-1.0 ± .0)E 1	16	(1.5 ± 1.1)E 1	(-2.1 ± 4.8)E 0
(0)		(-4.1 - 1.5)E 1			(-7.7 - 7.4)E 0
		(0/ 5)		*(0/ 1)*	*(0/ 3)*
CS-134 (A)	2.0E-02	(-1.1 ± .4)E 1	16	(-5.9 ± 7.3)E 0	(-8.6 ± 2.0)E 0
(0)		(-2.6 - 0.0)E 1			(-1.1 - 0.0)E 1
		(0/ 5)		*(0/ 1)*	*(0/ 3)*
CS-137 (A)	2.0E-02	(6.0 ± 9.3)E 0	17	(4.0 ± .8)E 1	(8.1 ± 21.5)E -1
(1)		(-1.6 - 4.0)E 1			(-3.5 - 3.4)E 0
		(1/ 5)		*(1/ 1)*	*(0/ 3)*
BA-140 (A)	8.0E-02	(-4.9 ± 3.5)E 0	22	(1.4 ± 1.0)E 1	(1.4 ± 1.0)E 1
(0)		(-1.4 - .4)E 1			(-5.2 - 29.8)E 0
		(0/ 5)		*(0/ 3)*	*(0/ 3)*
CE-141 (A)	4.0E-02	(-3.6 ± 4.0)E 0	22	(1.2 ± .1)E 1	(1.2 ± .1)E 1
(0)		(-1.0 - 1.2)E 1			(1.1 - 1.4)E 1
		(0/ 5)		*(0/ 3)*	*(0/ 3)*
CE-144 (A)	.2	(1.9 ± .7)E 1	17	(3.1 ± 5.8)E 1	(-6.7 ± 11.1)E 0
(0)		(2.9 - 36.9)E 0			(-2.9 - .5)E 1
		(0/ 5)		*(0/ 1)*	*(0/ 3)*

TABLE III-M-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: FOOD/GARDEN CROPS UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
RA-226 (6)	.1	(8.6 ± 5.2)E 1	16	(1.3 ± 1.9)E 2	(9.0 ± 19.3)E 1
(0)		(-1.1 - 2.1)E 2			
		(0/ 5)		*(0/ 1)*	*(0/ 1)*
TH-228 (6)	2.0E-02	(2.2 ± 1.5)E 1	17	(6.7 ± 4.5)E 1	(2.4 ± 12.5)E 0
(0)		(-1.7 - 6.7)E 1			(-1.2 - 2.7)E 1
		(0/ 5)		*(0/ 1)*	*(0/ 3)*

TABLE III-M-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT
** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

III. N. Forage

Beef Forage is collected from three locations annually, the Plymouth County Farm (3.5 mi - W - Station Number 11), Whitman Farm (21 mi - NW - Station Number 21) and Plimoth Plantation (2.2 mi - W - Station Number 15). The results of the ERMAP program for the media are presented in Table III-N-1. The only man-made isotope detected was Cs-137 which was detected in all samples. There were no other reactor-related isotopes detected above LLD in any sample.

The highest mean concentration of Cs-137 occurred at the Plimoth Plantation. However, the absence of Cs-134 and the fact that the measured mean Cs-137 concentration (120 pCi/Kg) is in excess of 100,000 times what would be expected based on releases from PNPS-1, strongly indicates that fallout, not PNPS-1, is the primary source of this Cesium-137. Therefore, it is extremely unlikely that there was any environmental impact on forage due to operation of PNPS-1.

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: VEGETATION - TERRESTIAL UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*		NOMINAL LLD	INDICATOR STATIONS: MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
BE-7	(5)	.2	(1.1 ± .5)E 3	15	(1.3 ± .9)E 3	(5.5 ± 5.8)E 2
	(0)		(4.1 - 21.5)E 2		(4.1 - 21.5)E 2	(-2.0 - 113.0)E 1
			(2/ 3)		*(1/ 2)*	*(1/ 2)*
K-40	(5)	.5	(6.8 ± .8)E 3	21	(1.7 ± .1)E 4	(1.6 ± .1)E 4
	(0)		(4.9 - 7.6)E 3		(1.0 - 1.7)E 4	(1.0 - 1.7)E 4
			(3/ 3)		*(1/ 1)*	*(2/ 2)*
CR-51	(5)	-1.0-100	(1.0 ± 12.3)E 1	11	(2.2 ± 1.3)E 2	(1.1 ± .6)E 2
	(0)		(-2.0 - 2.2)E 2			(4.2 - 16.8)E 1
			(0/ 3)		*(0/ 1)*	*(0/ 2)*
MN-54	(5)	2.0E-02	(7.1 ± 9.2)E 0	21	(2.2 ± 1.9)E 1	(1.8 ± .8)E 1
	(0)		(-1.1 - 2.0)E 1			(1.4 - 2.2)E 1
			(0/ 3)		*(0/ 1)*	*(0/ 2)*
CO-58	(5)	2.0E-02	(-2.4 ± 5.6)E 0	21	(6.2 ± 19.0)E 0	(8.5 ± 53.1)E -1
	(0)		(-1.3 - .6)E 1			(-4.5 - 6.2)E 0
			(0/ 3)		*(0/ 1)*	*(0/ 2)*
FE-59	(5)	3.0E+01	(2.2 ± 2.2)E 1	11	(4.3 ± 3.7)E 1	(1.5 ± .5)E 1
	(0)		(-2.1 - 4.5)E 1			(1.0 - 2.0)E 1
			(0/ 3)		*(0/ 1)*	*(0/ 2)*
CO-60	(5)	2.0E-02	(5.1 ± 11.3)E 0	11	(1.5 ± 2.9)E 1	(5.9 ± 39.4)E -1
	(0)		(-1.7 - 1.8)E 1			(-3.3 - 8.5)E 0
			(0/ 3)		*(0/ 1)*	*(0/ 2)*
ZN-65	(5)	-1.0-100	(1.5 ± .8)E 1	21	(5.8 ± 5.5)E 1	(1.7 ± 3.6)E 1
	(0)		(8.0 - 18.8)E 0			(-1.9 - 5.8)E 1
			(0/ 3)		*(0/ 1)*	*(0/ 2)*
ZR-95	(5)	4.0E-02	(3.2 ± 1.2)E 1	21	(7.8 ± 3.1)E 1	(3.2 ± 8.5)E 1
	(0)		(1.3 - 5.8)E 1			(-1.3 - 7.8)E 1
			(0/ 3)		*(0/ 1)*	*(0/ 2)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH ARE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-N-1
ERMAP RESULTS
FORAGE

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/03/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: VEGETATION - TERRESTIAL UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN, RANGE, AND NO. DETECTED**	STA.	HIGHEST STATION MEAN, RANGE, AND NO. DETECTED**	CONTROL LOCATIONS MEAN, RANGE, AND NO. DETECTED**
NB-95 (5)	-1.0-100	(7.1 ± 3.1)E 0	11	(1.2 ± 1.7)E 1	(6.0 ± 37.9)E -2
(0)		(1.3 - 11.0)E 0			(-3.2 - 4.8)E -1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
AG-110M(5)	-1.0-100	(-7.8 ± 10.8)E 1	21	(3.1 ± 1.6)E 2	(1.7 ± 1.4)E 2
(0)		(-2.7 - 1.0)E 2			(3.5 - 31.0)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
RU-103 (5)	2.0E-02	(7.4 ± 6.1)E 0	11	(1.9 ± 1.6)E 1	(1.5 ± .3)E 1
(0)		(-2.2 - 18.8)E 0			(1.2 - 1.8)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
RU-106 (5)	.2	(-2.3 ± .7)E 2	21	(1.4 ± 1.8)E 2	(4.3 ± 10.2)E 1
(0)		(-3.5 - 0.0)E 2			(-6.0 - 14.5)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
I-131 (5)	0.	(2.1 ± .8)E 1	11	(2.9 ± 2.5)E 1	(-6.6 ± 7.7)E 0
(0)		(5.5 - 29.2)E 0			(-1.4 - .1)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
CS-134 (5)	2.0E-02	(-2.2 ± 1.0)E 1	22	(6.8 ± 12.7)E 0	(-1.1 ± 1.7)E 1
(0)		(-3.9 - 0.0)E 1			(-2.8 - .6)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
CS-137 (5)	2.0E-02	(1.2 ± .2)E 2	15	(1.2 ± .3)E 2	(1.5 ± 2.4)E 1
(3)		(8.7 - 15.1)E 1		(8.7 - 15.1)E 1	(-9.1 - 39.8)E 0
		(3/ 3)		*(2/ 2)*	*(0/ 2)*
BA-140 (5)	8.0E-02	(-4.8 ± .8)E 1	21	(5.8 ± 3.0)E 1	(2.8 ± 3.0)E 1
(0)		(-5.5 - 0.0)E 1			(-2.1 - 58.0)E 0
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
CE-141 (5)	4.0E-02	(1.2 ± 1.3)E 2	11	(3.7 ± 7.7)E 2	(-7.5 ± 16.5)E 0
(0)		(-2.9 - 37.4)E 1			(-2.8 - .0)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*
CE-144 (5)	.2	(3.9 ± 3.2)E 1	21	(6.0 ± .8)E 2	(1.8 ± 8.3)E 1
(0)		(3.2 - 103.0)E 0			(-6.4 - 10.1)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

TABLE III-N-1
(continued)

PILGRIM I OFFSITE ENVIRONMENTAL RADIOLOGICAL MONITORING 81/02/27.
SUMMARY FOR THE PERIOD 12/31/79 - 12/31/80

MEDIUM: VEGETATION - TERRESTIAL UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	NOMINAL LLD	INDICATOR STATIONS MEAN,RANGE,AND NO. DETECTED**	STA.	HIGHEST STATION MEAN,RANGE,AND NO. DETECTED**	CONTROL LOCATIONS MEAN,RANGE,AND NO. DETECTED**
TH-228 (5)	2.0E-02	(4.2 ± 5.4)E 1	11	(1.6 ± .9)E 2	(7.8 ± 1.3)E 1
(0)		(-2.0 - 15.7)E 1			(6.4 - 9.1)E 1
		(0/ 3)		*(0/ 1)*	*(0/ 2)*

TABLE III-N-1
(continued)

* NON-ROUTINE REFERS TO THE NUMBER OF SEPARATE MEASUREMENTS WHICH WERE GREATER THAN TEN (10) TIMES THE AVERAGE BACKGROUND FOR THE PERIOD OF THE REPORT

** THE FRACTION OF SAMPLE ANALYSES YIELDING DETECTABLE MEASUREMENTS (I.E. >3SIGMA) IS INDICATED WITHIN *( )*.

IV. References

1. Regulatory Guide 1.109 - CALCULATION OF ANNUAL DOSES TO MAN FROM ROUTINE RELEASES OF REACTOR EFFLUENTS FOR THE PURPOSE OF EVALUATING COMPLIANCE WITH 10 CFR PART 50, APPENDIX I -Revision 1, October 1977

2. SETTLEMENT AGREEMENT BETWEEN MASSACHUSETTS WILDLIFE FEDERATION AND BOSTON EDISON COMPANY RELATING TO OFFSITE RADIOLOGICAL MONITORING - June 9, 1977

3. Yankee Atomic Electric Company - Program "ERMAP", Version 3.1 - January 9, 1979, Author - J. E. Vossahlik

4. Memorandum, Yankee Atomic Electric Company, Reg 94/77, A. E. Desrosiers

5. Direct Radiation Survey, June 1976, S. A. Farber, Yankee Atomic Electric Company

6. Memorandum, Yankee Atomic Electric Company, Reg 211/76, A. E. Desrosiers

7. Report on Accumulation of Cesium-137 in Cranberries, March, 1979 Yankee Atomic Electric Company, M. Strum

Appendix A - Anomalous Measurement Reports

BOSTON Edison COMPANY

PILGRIM NUCLEAR POWER STATION
RFD #1 ROCKY HILL ROAD
PLYMOUTH, MASSACHUSETTS 02360

February 6, 1980

BECo Ltr. #80-23

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-005/01T-0

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-005/01T-0, "Anomolous Measurement Report" is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

P. J. McGuire
Station Manager
Nuclear Operations

MTM:ep
Enclosures: (3 copies)
LER 80-005/01T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. G. C. Andognini
E. L. Cobb
P. A. Foulsham(2)
M. G. Hensch
C. J. Mathis
M. T. McLoughlin
J. W. Nicholson
W. F. Olsen
J. A. Seery
R. Sevigny
W. M. Sides
D. G. Stoodley
C. K. Vantrease
G. G. Whitney
K. Calderone
NOD Licensing
PNPS Records Center
P.J.M.(LB)

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

1 | M A P P S 1 (2) 0 0 - 0 0 0 0 0 - 0 0 (3) 4 1 1 1 1 (4) | | (5)

LICENSEE CODE 9–14 · LICENSE NUMBER 15–25 · LICENSE TYPE 26–30 · CAT 57–58

1 REPORT SOURCE L (6) 0 5 0 - 0 2 9 3 (7) 0 1 3 1 8 0 (8) 0 2 0 6 8 0 (9)

DOCKET NUMBER 61–68 · EVENT DATE 69–74 · REPORT DATE 75–80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

2 On January 1, 1980, BECo was notified by Yankee Atomic Electric Lab that measured
3 concentrations of Sr-90 in a milk sample taken from an indicator station was greater
4 than 10 times the concentration in the control station sample, 18 pci/kg to 1.6 pci/kg
5 respectively. The indicator station is 2.2 miles west of the reactor site. There is
6 no detectable Sr-89 or I-131 in the indicator sample; therefore, it is not likely
7 that Pilgrim Station is the source of the measured concentrations.
8

SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
X X (11)	X (12)	Z (13)	Z Z Z Z Z Z (14)	Z (15)	Z (16)

(17) LER/RO REPORT NUMBER

EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
8 0	—	0 0 5	/	0 1	T	—	0

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS (22)	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
(18)	Z (19)	Z (20)	Z (21)	0 0 0 0	N (23)	N (24)	Z (25)	Z 9 9 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

0 No corrective action is contemplated. It appears that these levels are due to
1 local meteorological conditions which resulted in the deposition of old fallout.
2
3
4

FACILITY STATUS	% POWER	OTHER STATUS (30)	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION (32)
H (28)	0 0 0 (29)	1	D (31)	Notification by Environmental Lab.

ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
Z (33)	Z (34)	N.A.	N.A.

PERSONNEL EXPOSURES

NUMBER	TYPE	DESCRIPTION (39)
0 0 0 (37)	Z (38)	N.A.

PERSONNEL INJURIES

NUMBER	DESCRIPTION (41)
0 0 0 (40)	N.A.

LOSS OF OR DAMAGE TO FACILITY (43)

TYPE	DESCRIPTION
Z (42)	N.A.

PUBLICITY

ISSUED	DESCRIPTION (45)	NRC USE ONLY
N (44)	N.A.	

NAME OF PREPARER: M. Thomas McLoughlin PHONE: 617-746-7900

March 18, 1980

bECo Ltr.#80-43

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-009/04T-0

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-009/04T-0 "Anomolous Measurement Report is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

P. J. McGuire
Station Manager
Nuclear Operations

MJM:ap
Enclosures: (3 copies)
LER 80-009/ 04T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. G. C. Andognini
E. L. Cobb
P. A. Foulsham(2)
M. G. Hensch
J. E. Howard
C. J. Mathis
M. T. McLoughlin
J. W. Nicholson
W. F. Olsen
J. A. Seery
R. Sevigny
W. M. Sides
D. G. Stoodley
C. K. Vantrease
G. G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
P.J.M. (LB)

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

Field	Value
Licensee Code (2)	M A P P S 1
License Number (3)	00-00000-00
License Type (4)	4 1 1 1 1
CAT (5)	
Report Source (6)	L
Docket Number (7)	050-0293
Event Date (8)	031080
Report Date (9)	031880

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

On March 10, 1980, Boston Edison received an analyses report from the Yankee Atomic Electric Laboratory which indicated that reportable concentrations of Cr-51 (339 ± 14 pCi/kg) and Co-60 (167 ± 25 pCi/kg) existed in a mussel sample taken from the Pilgrim Station Discharge Canal on January 10, 1980.

These concentrations are in excess of 10 times the Lower Limit of Detection at the Control Station in Marshfield (LLD for Cr-51 was 31.pCi/kg and for Co-60 was 4.7 pCi/kg).

System Code (11)	Cause Code (12)	Cause Subcode (13)	Component Code (14)	Comp. Subcode (15)	Valve Subcode (16)
X X	X	Z	Z Z Z Z Z Z	Z	Z

(17) LER/RO REPORT NUMBER

Event Year		Sequential Report No.		Occurrence Code	Report Type		Revision No.
80	—	009	/	04	T	—	0

Action Taken (18)	Future Action (19)	Effect on Plant (20)	Shutdown Method (21)	Hours (22)	Attachment Submitted (23)	NPRD-4 Form Sub. (24)	Prime Comp. Supplier (25)	Component Manufacturer (26)
	Z	Z	Z	0000	N	N	Z	Z999

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

The maximum dose to an individual consuming seafood with these concentrations for a full year would be only 4×10^{-3} mrem to the total body and 2.4×10^{-3} mrem to the most restrictive organ. Therefore, it is concluded that there is no risk to the health and safety of the public.

Facility Status (28)	% Power (29)	Other Status (30)	Method of Discovery (31)	Discovery Description (32)
H	000	N.A.	D	Notification by Environmental Lab.

Activity Released (33)	Content of Release (34)	Amount of Activity (35)	Location of Release (36)
Z	Z	N.A.	N.A.

PERSONNEL EXPOSURES

Number (37)	Type (38)	Description (39)
000	Z	N.A.

PERSONNEL INJURIES

Number (40)	Description (41)
000	N.A.

LOSS OF OR DAMAGE TO FACILITY (43)

Type (42)	Description
Z	N.A.

PUBLICITY

Issued (44)	Description (45)
N	N.A.

NRC USE ONLY

NAME OF PREPARER M. Thomas McLoughlin PHONE: 617-746-7900

BOSTON Edison COMPANY

PILGRIM NUCLEAR POWER STATION
RFD #1 ROCKY HILL ROAD
PLYMOUTH MASSACHUSETTS 02360

April 2, 1980

BECo Ltr.#80-53

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-009/04T-1

Docket Number 50-293
License DPR-35

Gentlemen:

The attached, revised Licensee Event Report 80-009/04T-1, "Anomolous Measurement Report" is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b. This revision is being issued to correct a calculation error. The correction does not alter previous conclusions.

If there are any questions on this subject, please contact us.

Respectfully submitted,

P. J. McGuire
Station Manager
Nuclear Operations

MTM:ep
Enclosures: (3 copies)
LER 80-009/04T-1

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. G. C. Andognini
E. L. Cobb
P. A. Foulsham(2)
M. G. Hensch
J. E. Howard
C. J. Mathis
M. T. McLoughlin
J. W. Nicholson
W. F. Olsen
J. A. Seery
R. Sevigny
W. M. Sides
P. D. Smith
D. G. Stoodley
G. G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
P.J.M.(LB)

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

LICENSEE CODE		LICENSE NUMBER		LICENSE TYPE		CAT	
M A P P S 1	(2)	0 0 - 0 0 0 0 0 - 0 0	(3)	4 1 1 1 1	(4)		(5)

REPORT SOURCE		DOCKET NUMBER		EVENT DATE		REPORT DATE	
L	(6)	0 5 0 - 0 2 9 3	(7)	0 3 1 0 8 0	(8)	0 3 1 8 8 0	(9)

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

On March 10, 1980, Boston Edison received an analyses report from the Yankee Atomic Electric Laboratory which indicated that reportable concentrations of Cr-51 (339 ± 14 pCi/kg) and Co-60 (167 ± 25 pCi/kg) existed in a mussel sample taken from the Pilgrim Station Discharge Canal on January 10, 1980.

These concentrations are in excess of 10 times the Lower Limit of Detection at the Control Station in Marshfield (LLD for Cr-51 was 31.pCi/kg and for Co-60 was 4.7 pCi/kg).

SYSTEM CODE		CAUSE CODE		CAUSE SUBCODE		COMPONENT CODE		COMP. SUBCODE		VALVE SUBCODE	
X X	(11)	X	(12)	Z	(13)	Z Z Z Z Z Z	(14)	Z	(15)	Z	(16)

(17) LER RO REPORT NUMBER

EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
8 0	—	0 0 9	/	0 4	T	—	1

ACTION TAKEN		FUTURE ACTION		EFFECT ON PLANT		SHUTDOWN METHOD		HOURS		ATTACHMENT SUBMITTED		NPRD-4 FORM SUB.		PRIME COMP. SUPPLIER		COMPONENT MANUFACTURER	
Z	(18)	Z	(19)	Z	(20)	Z	(21)	0 0 0 0	(22)	N	(23)	N	(24)	Z	(25)	Z 9 9 9	(26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

The maximum dose to an individual consuming seafood with these concentrations for a full year would be only 4.4×10^{-3} mrem to the total body (child) and 3.5×10^{-2} mrem to the most restrictive organ (adult GI-LLI). Therefore, it is concluded that there is no risk to the health and safety of the public.

FACILITY STATUS		% POWER		OTHER STATUS (30)	METHOD OF DISCOVERY		DISCOVERY DESCRIPTION (32)
H	(28)	0 0 0	(29)	N.A.	D	(31)	Notification by Environmental Lab.

ACTIVITY RELEASED		CONTENT OF RELEASE		AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
Z	(33)	Z	(34)	N.A.	N.A.

PERSONNEL EXPOSURES

NUMBER		TYPE		DESCRIPTION (39)
0 0 0	(37)	Z	(38)	N.A.

PERSONNEL INJURIES

NUMBER		DESCRIPTION (41)
0 0 0	(40)	N.A.

LOSS OF OR DAMAGE TO FACILITY (43)

TYPE		DESCRIPTION
	(42)	N.A.

PUBLICITY

ISSUED		DESCRIPTION (45)	NRC USE ONLY
N	(44)	N.A.	

NAME OF PREPARER M. Thomas McLoughlin PHONE: 617-746-7900

GPO 917-926

PILGRIM NUCLEAR POWER STATION
RFD 1 REPIN ROAD
PLYMOUTH, MASSACHUSETTS 02360

April 28, 1980

BECo Ltr. #80-78

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-014/04T-0

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-014/04T-0, "Anomolous Measurement Report", is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

P. J. McGuire
Station Manager
Nuclear Operations

MTM:ep
Enclosures: (3 copies)
LER 80-014/04T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. G. C. Andognini
E. L. Cobb
P. A. Foulsham (2)
M. G. Hensch
J. E. Howard
C. J. Mathis
M. T. McLoughlin
J. W. Nicholson
W. F. Olsen
J. A. Seery
R. Sevigny
W. M. Sides
P. D. Smith
D. G. Stoodley
G. G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
P.J.M.(LB)

NRC FORM 366

LICENSEE EVENT REPORT

CONTROL BLOCK: (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

Field	Value
Licensee Code (2)	M A P P S 1
License Number (3)	0 0 - 0 0 0 0 0 - 0 0
License Type (4)	4 1 1 1 1
CAT (5)	
Report Source (6)	L
Docket Number (7)	0 5 0 - 0 2 9 3
Event Date (8)	0 4 1 8 8 0
Report Date (9)	0 4 2 8 8 0

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

On April 18, 1980, Boston Edison Company received information from the Yankee Atomic Environmental Laboratory that indicated that a sample of milk collected from an indicator station (Plimouth Plantation - 2.2 miles west of the plant) contained a concentration of Cs-137 of 24.7 pCi/kilogram. This concentration was ten (10) times the measured control station concentration of 2.45 pCi/kg (Whitman Farm - 21 miles NW).

System Code (11)	Cause Code (12)	Cause Subcode (13)	Component Code (14)	Comp. Subcode (15)	Valve Subcode (16)
X X	X	Z	Z Z Z Z Z Z	Z	Z

LER/RO Report Number (17)

Event Year		Sequential Report No.		Occurrence Code	Report Type		Revision No.
8 0	—	0 1 4	/	0 4	T	—	0

Action Taken (18)	Future Action (19)	Effect on Plant (20)	Shutdown Method (21)	Hours (22)	Attachment Submitted (23)	NPRD-4 Form Sub. (24)	Prime Comp. Supplier (25)	Component Manufacturer (26)
Z	Z	Z	Z	0 0 0 0	Y	N	Z	Z 9 9 9

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

(Refer to Attachment)

Facility Status (28)	% Power (29)	Other Status (30)	Method of Discovery (31)	Discovery Description (32)
H	0 0 0	N.A.	D	Notification by Environmental Lab.

Activity Released (33)	Content of Release (34)	Amount of Activity (35)	Location of Release (36)
Z	Z	N.A.	N.A.

PERSONNEL EXPOSURES

Number (37)	Type (38)	Description (39)
0 0 0	Z	N.A.

PERSONNEL INJURIES

Number (40)	Description (41)
0 0 0	N.A.

LOSS OF OR DAMAGE TO FACILITY (43)

Type (42)	Description
Z	N.A.

PUBLICITY

Issued (44)	Description (45)
N	N.A.

NRC USE ONLY

NAME OF PREPARER: Mr. M. Thomas McLoughlin PHONE: 617-746-7900

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
DOCKET NO. 50-293

Attachment to LER 80-014/04T-0

On April 18, 1980, Boston Edison Company received information from Yankee Atomic Environmental Laboratory that indicated that a sample of milk collected from an indicator station contained a concentration which was ten (10) times the measured control station concentration. It is very unlikely that this measurement is the result of plant effluents since the measured releases for the prior six months would have resulted in a calculated concentration of Cs-137 in milk that would be 5 orders of magnitude lower than the measured concentration (using the models presented in Regulatory Guide 1.109). The calculated dose due to consumption of milk containing the measured concentration for a full year would be 5.0 millirem to the most restrictive organ. (infant-liver) and 0.55 millirem to the total body (adult).

Edison

PILGRIM NUCLEAR POWER STATION
RFD #1 ROCKY HILL ROAD
PLYMOUTH, MASSACHUSETTS 02360

June 25, 1980

BECo Ltr #80-113

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-021/04T-0

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-021/04T-0, "Anomolous Measurement Report", is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

P. A. McGuire
Station Manager
Nuclear Operations

MTM:ep
Enclosures: (3 copies)
LER 80-021/04T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. G. C. Andognini
E. L. Cobb
P. A. Foulsham (2)
M. G. Hensch
J. E. Howard
C. J. Mathis
M. T. McLoughlin
J. W. Nicholson
W. F. Olsen
J. A. Seery
R. Sevigny
W. M. Sides
P. D. Smith
D. G. Stoodley
G. G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
P.J.M. (LB)

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | ① (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

M A P P S 1	②	0 0 - 0 0 0 0 0 - 0 0	③	4 1 1 1 1	④		⑤
LICENSEE CODE		LICENSE NUMBER		LICENSE TYPE		CAT	

REPORT SOURCE L ⑥ 0 5 0 - 0 2 9 3 (DOCKET NUMBER) ⑦ 0 5 0 8 8 0 (EVENT DATE) ⑧ 0 6 2 5 8 0 (REPORT DATE) ⑨

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES ⑩

On 6/16/80 PNPS received an analyses report from the Yankee Environmental Laboratory that indicated than an algae sample collected on 5/8/80 contained a reportable concentration of Co-60.

REFER TO ATTACHMENT FOR FURTHER INFORMATION.

SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
X X ⑪	X ⑫	Z ⑬	Z Z Z Z Z Z ⑭	Z ⑮	Z ⑯

⑰ LER/RO REPORT NUMBER

EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
8 0	—	0 2 1	/	0 4	T	—	0

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS ㉒	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
Z ⑱	Z ⑲	Z ⑳	Z ㉑	0 0 0 0	Y ㉓	N ㉔	Z ㉕	Z 9 9 9 ㉖

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS ㉗

REFER TO ATTACHMENT

FACILITY STATUS	% POWER	OTHER STATUS ㉚	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION ㉜
H ㉘	0 0 0 ㉙	N.A.	D ㉛	NOTIFICATION BY ENVIRONMENTAL LAB.

ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY ㉟	LOCATION OF RELEASE ㊱
Z ㉝	Z ㉞	N.A.	N.A.

PERSONNEL EXPOSURES

NUMBER	TYPE	DESCRIPTION ㊴
0 0 0 ㊲	Z ㊳	N.A.

PERSONNEL INJURIES

NUMBER	DESCRIPTION ㊶
0 0 0 ㊵	N.A.

LOSS OF OR DAMAGE TO FACILITY ㊸

TYPE	DESCRIPTION
Z ㊷	N.A.

PUBLICITY

ISSUED	DESCRIPTION ㊺	NRC USE ONLY
N ㊹	N.A.	

NAME OF PREPARER Mr. M. T. McLoughlin PHONE: 617-746-7900

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
DOCKET NO. 50-293

Attachment to LER 80-021/04T-0

On 6/16/80 Boston Edison received an analyses report from the Yankee Atomic Electric Laboratory which indicated that a reportable concentration of Co-60 (262 ± 8.7 pCi/kg) existed in an Irish Moss sample taken from the Pilgrim Station discharge canal outfall area on 5/8/80.

This concentration is in excess of 10 times the measured concentration at the control station in Ellisville (11.7 ± 2.7 pCi/kg).

Due to processing and market dilution it is extremely unlikely that any individual would consume any material with the measured concentration of Co-60. However, even if a person were to directly consume this algae at seafood consumption rates given in Regulatory Guide 1.109, the annual dose to that person would be about 0.01 mrem to the total body and 0.05 mrem to the maximum exposed organ (GI-LLI).

As a result of these extremely small calculated doses (as compared to the natural background dose rate of about 100 mrem/yr) we have concluded that there is no risk to public health and safety.

BOSTON Edison COMPANY

PILGRIM NUCLEAR POWER STATION
RFD #1 ROCKY HILL ROAD
PLYMOUTH, MASSACHUSETTS 02360

July 30, 1980

BECo Ltr. #80-158

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-031/04T-0

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-031/04T-0, "Anomolous Measurement", is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

P. J. McGuire
Station Manager
Nuclear Operations

MTM:ep
Enclosures: (3 copies)
LER 80-031/04T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. G. C. Andognini
E. L. Cobb
P. A. Foulsham (2)
P. F. Giardiello
M. G. Hensch
J. E. Howard
C. J. Mathis
M. T. McLoughlin
J. W. Nicholson
W. F. Olsen
J. A. Seery
R. Sevigny
W. M. Sides
P. D. Smith
D. G. Stoodley
G. G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
P.J.M. (LB)

NRC FORM 366 (7-77)

U. S. NUCLEAR REGULATORY COMMISSION

NOD 80-734, July 23.

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 | M A P P S 1 (2) | 0 0 - 0 0 0 0 0 - 0 0 (3) | 4 1 1 1 1 (4) | | (5)

LICENSEE CODE 9–14; LICENSE NUMBER 15–25; LICENSE TYPE 26–30; CAT 57–58

0 1 | REPORT SOURCE L (6) | 0 5 0 - 0 2 9 3 (7) | 0 7 2 1 8 0 (8) | 0 7 3 0 8 0 (9)

DOCKET NUMBER 61–68; EVENT DATE 69–74; REPORT DATE 75–80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 On July 21, 1980 Boston Edison received an analyses report from the Yankee Atomic

0 3 Electric Laboratory which indicated that a reportable concentration of Co-60

0 4 (48.3 $\pm$ 1.4 pCi/kg) existed in a mussel sample taken from the Pilgrim Station

0 5 discharge canal outfall area on 4/8/80. This concentration is in excess of 10 times

0 6 the lower limit of detection at the control station in Marshfield (4.7 pCi/kg).

0 7 This insignificant concentration represents no risk to the public health and

0 8 safety.

	SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
0 9	X X (11)	X (12)	Z (13)	Z Z Z Z Z Z (14)	Z (15)	Z (16)

(17) LER/RO REPORT NUMBER	EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
	8 0	—	0 3 1	/	0 4	T	—	0

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS (22)	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
Z (18)	Z (19)	Z (20)	Z (21)	0 0 0 0	N (23)	N (24)	Z (25)	Z 9 9 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 The presence of Co-60 in this discharge sample is due to operation of the Pilgrim

1 1 Station. However, even if a person were to directly consume mussels at the rate

1 2 given in Regulatory Guide 1.109, the annual dose to that person would only be

1 3 about 1.3 x 10^{-3} mrem to the total body and 9.7 x 10^{-3} mrem to the maximum exposed

1 4 organ (GE-LLI).

	FACILITY STATUS	% POWER	OTHER STATUS (30)	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION (32)
1 5	E (28)	1 0 0 (29)	N.A.	D (31)	Notification by Environmental Lab

	ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
1 6	Z (33)	Z (34)	N.A.	N.A.

PERSONNEL EXPOSURES

	NUMBER	TYPE	DESCRIPTION (39)
1 7	0 0 0 (37)	Z (38)	N.A.

PERSONNEL INJURIES

	NUMBER	DESCRIPTION (41)
1 8	0 0 0 (40)	N.A.

LOSS OF OR DAMAGE TO FACILITY (43)

	TYPE	DESCRIPTION
1 9	Z (42)	N.A.

PUBLICITY

	ISSUED	DESCRIPTION (45)	NRC USE ONLY
2 0	N (44)	N.A.	

NAME OF PREPARER Mr. M. Thomas McLoughlin PHONE: 617-746-7900

GPO 917-026

PILGRIM NUCLEAR POWER STATION
RFD #1 ROCKY HILL ROAD
PLYMOUTH, MASSACHUSETTS 02360

August 26, 1980

BECo Ltr. #80-199

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

[redacted]

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-042/04T-0,"Anomolous Measurement", is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

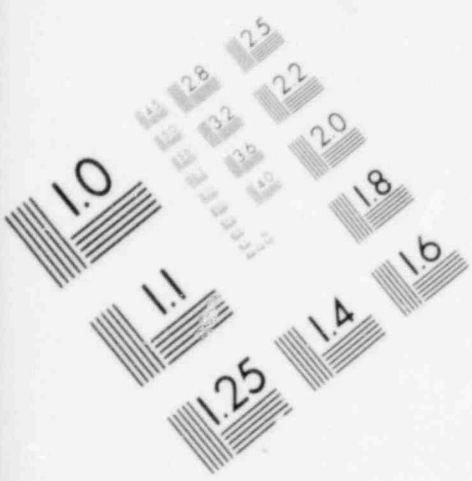
P.J. McGuire
Station Manager
Nuclear Operations

/jo

Enclosures: (3 copies)
LER 80-042/04T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. [redacted]
E.L. Cobb
P.A. Foulsham (2)
P.F. Giardiello
M.G. Hensch
J.E. Howard
C.J. Mathis
M.T. McLoughlin
J.W. Nicholson
W.F. Olsen
J.A. Seery
R. Sevigny
W.M. Sides
P.D. Smith
D.G. Stoodley
G.G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
P.J.M. (LB)
NRC (on-site)



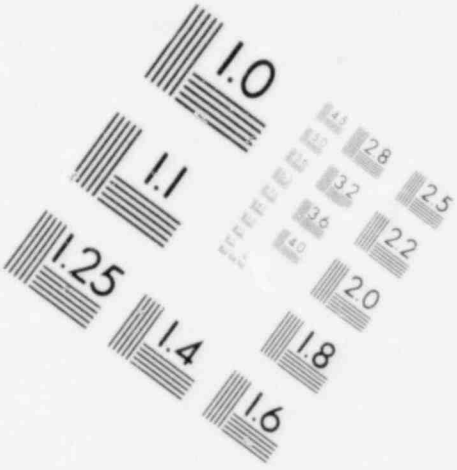
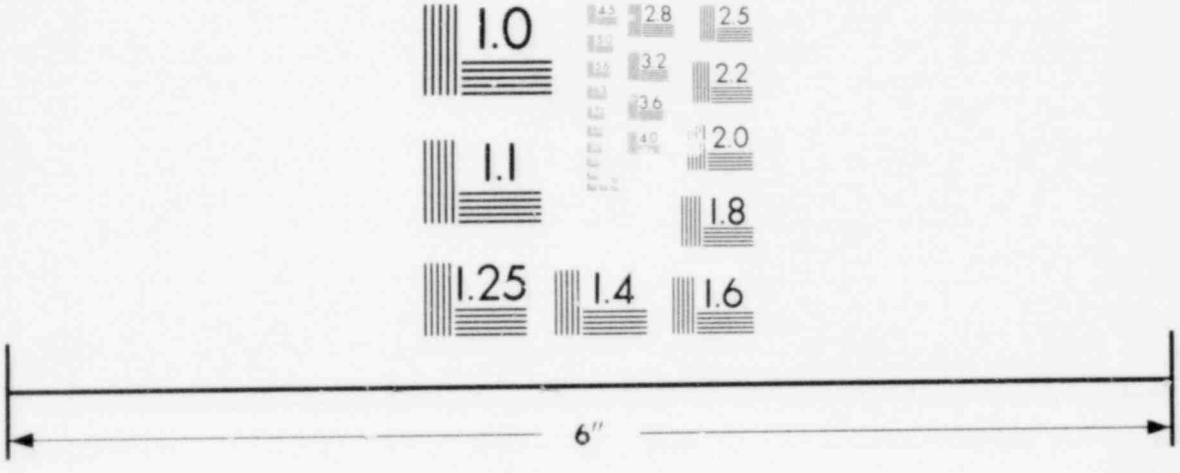
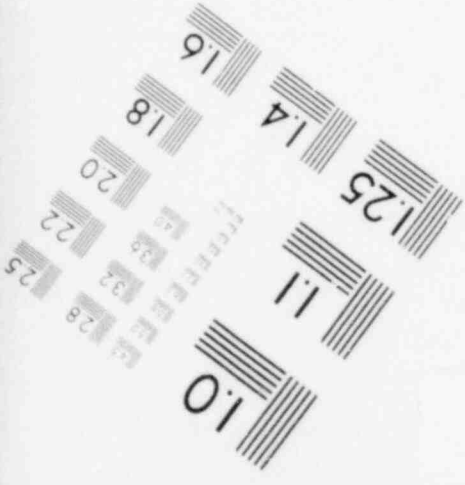
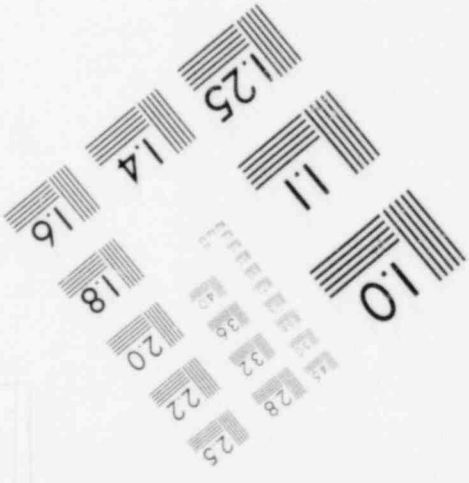
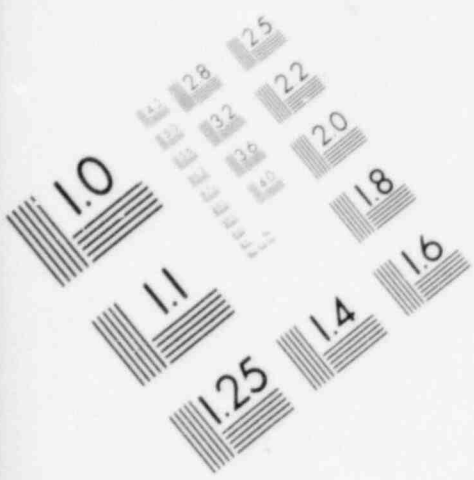


IMAGE EVALUATION TEST TARGET (MT-3)









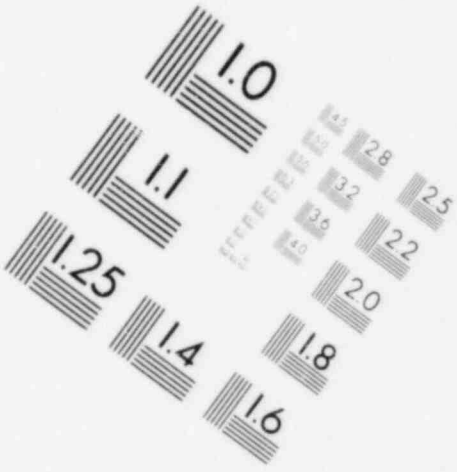
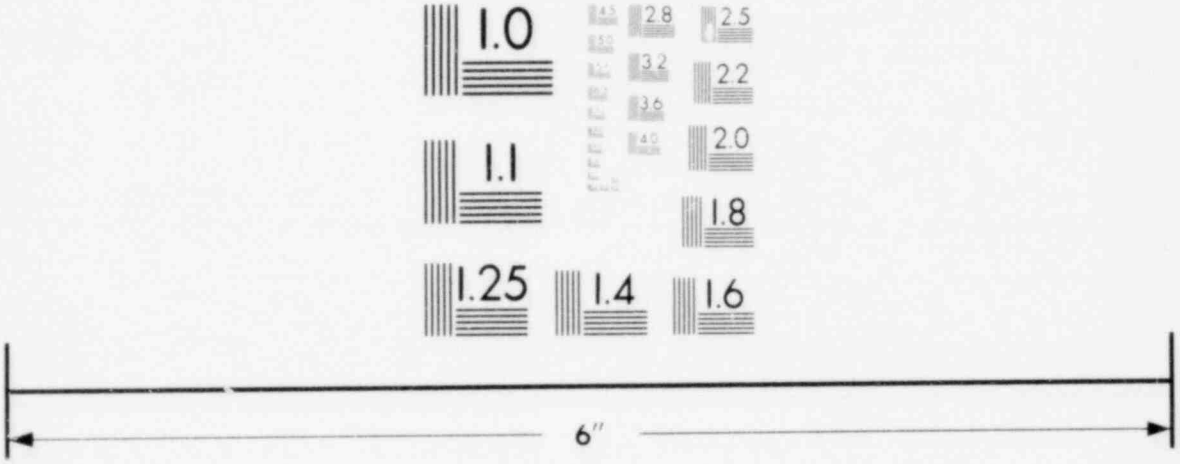
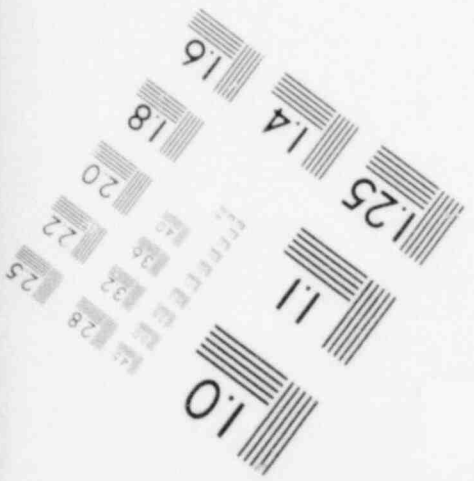
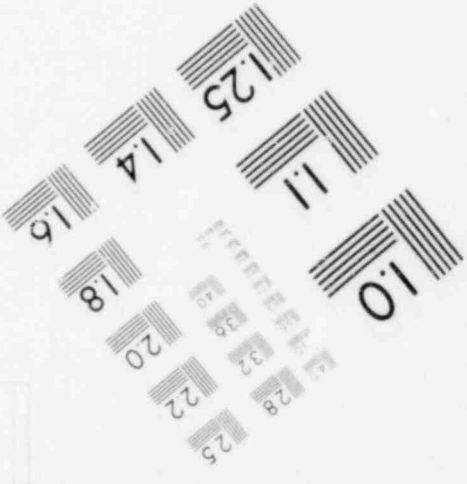


IMAGE EVALUATION TEST TARGET (MT-3)







NRC FORM 366 (7-77)

U. S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

1	M A P P S 1 (2)	0 0 - 0 0 0 0 0 - 0 0 (3)	4 1 1 1 1 (4)	(5)
	LICENSEE CODE	LICENSE NUMBER	LICENSE TYPE	CAT

1	REPORT SOURCE L (6)	0 5 0 - 0 2 9 3 (7)	0 8 2 0 8 0 (8)	0 8 2 6 8 0 (9)
		DOCKET NUMBER	EVENT DATE	REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

On August 20, 1980, Boston Edison Company received an analyses report from the Yankee Atomic Electric Laboratory which indicated that a reportable concentration of Co-60 (102.4$\pm$2.7 pCi/kg) existed in a mussel sample taken from the Pilgrim Station discharge canal outfall area on July 14, 1980. This concentration is in excess of 10 times the lower limit of detection at the control station in Marshfield (5.9 pCi/kg).

SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
X X (11)	X (12)	Z (13)	Z Z Z Z Z Z (14)	Z (15)	Z (16)

(17) LER/RO REPORT NUMBER	EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
	8 0	—	0 4 2	/	0 4	T	—	0

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS (22)	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
Z (18)	Z (19)	Z (20)	Z (21)	0 0 0 0	N (23)	N (24)	Z (25)	Z 9 9 9 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

The presence of Co-60 in this discharge canal sample is due to operation of the Pilgrim Station. However, even if a person were to directly consume mussels at the rate given in Regulatory Guide 1.109, the annual dose to that person would only be about 2.8×10^{-3} mrem to the total body and 2.1×10^{-2} mrem to the maximum exposed organ (GE-LLI).

FACILITY STATUS	% POWER	OTHER STATUS (30)	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION (32)
E (28)	1 0 0 (29)	NA	D (31)	Notification by Environmental Lab

ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
Z (33)	Z (34)	NA	NA

PERSONNEL EXPOSURES

NUMBER	TYPE	DESCRIPTION (39)
0 0 0 (37)	Z (38)	NA

PERSONNEL INJURIES

NUMBER	DESCRIPTION (41)
0 0 0 (40)	NA

LOSS OF OR DAMAGE TO FACILITY (43)

TYPE	DESCRIPTION
Z (42)	NA

PUBLICITY

ISSUED	DESCRIPTION (45)	NRC USE ONLY
N (44)	NA	

NAME OF PREPARER Mr. M. Thomas McLoughlin PHONE: 617-746-7900

GPO 917-926

BOSTON Edison COMPANY

PILGRIM NUCLEAR POWER STATION
RFD #1 ROCKY HILL ROAD
PLYMOUTH, MASSACHUSETTS 02360

December 19, 1980

BECo Ltr. #80-313

R. D. MACHON
NUCLEAR OPERATIONS MANAGER
PILGRIM STATION

Director, Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Licensee Event Report 80-090/04T-0

Docket Number 50-293
License DPR-35

Gentlemen:

The attached Licensee Event Report 80-090/04T-0, entitled "Anomolous Measurements", is hereby submitted in accordance with the requirements of Pilgrim Nuclear Power Station Technical Specification 6.9.C.2.b.

If there are any questions on this subject, please contact us.

Respectfully submitted,

R. D. Machon
Nuclear Operations Manager
Pilgrim Station

MTM:ep
Enclosures: (3 copies)
LER 80-090/04T-0

cc: Director (40 copies)
Office of Management Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

bcc: Messrs. J. E. Howard
W. J. Armstrong
H. F. Brannan
E. L. Cobb
P. A. Foulsham(2)
P. F. Giardiello
M. T. McLoughlin
C. J. Mathis
A. V. Morisi
J. W. Nicholson
W. F. Olsen
K. P. Roberts
J. A. Seery
P. D. Smith
A. R. Trudeau
G. G. Whitney
Ms. K. Calderone
NOD Licensing
PNPS Records Center
NRC Resident Inspector
E. J. Ziemianski
[redacted]

LICENSEE EVENT REPORT

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

Field	Value
LICENSEE CODE (2)	M A P P S 1
LICENSE NUMBER (3)	0 0 - 0 0 0 0 0 - 0 0
LICENSE TYPE (4)	4 1 1 1 1
CAT (5)	
REPORT SOURCE (6)	L
DOCKET NUMBER (7)	0 5 0 - 0 2 9 3
EVENT DATE (8)	1 2 1 5 8 0
REPORT DATE (9)	1 2 1 9 8 0

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

On December 10, 1980, Boston Edison Co. received an analysis report from the Yankee Atomic Electric Laboratory which indicated that a reportable concentration of Co-60 (73.7± .6 pCi/kg) existed in a mussel sample taken from the Pilgrim Station discharge canal outfall area on October 1, 1980. This concentration is in excess of 10 times the lower limit of detection at the control station in Marshfield (4.5 pCi/kg).

SYSTEM CODE (11)	CAUSE CODE (12)	CAUSE SUBCODE (13)	COMPONENT CODE (14)	COMP. SUBCODE (15)	VALVE SUBCODE (16)
X X	X	Z	Z Z Z Z Z Z	Z	Z

(17) LER/RO REPORT NUMBER

EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
8 0	—	0 9 0	/	0 4	T	—	0

ACTION TAKEN (18)	FUTURE ACTION (19)	EFFECT ON PLANT (20)	SHUTDOWN METHOD (21)	HOURS (22)	ATTACHMENT SUBMITTED (23)	NPRD-4 FORM SUB. (24)	PRIME COMP. SUPPLIER (25)	COMPONENT MANUFACTURER (26)
Z	Z	Z	Z	0 0 0 0	N	N	Z	Z 9 9 9

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

The presence of Co-60 in this discharge canal sample is due to operation of the Pilgrim Station. However, even if a person were to directly consume mussels at the rate given in Regulatory Guide 1.109, the annual dose to that person would only be about $2.0X10^{-3}$ mrem to the total body (child) and $1.5x^{10-2}$ mrem to the maximum exposed organ (adult, GE-LLI).

FACILITY STATUS (28)	% POWER (29)	OTHER STATUS (30)	METHOD OF DISCOVERY (31)	DISCOVERY DESCRIPTION (32)
E	1 0 0	N.A.	D	Environmental Lab Notification

ACTIVITY RELEASED (33)	CONTENT OF RELEASE (34)	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
Z	Z	N.A.	N.A.

PERSONNEL EXPOSURES

NUMBER (37)	TYPE (38)	DESCRIPTION (39)
0 0 0	Z	N.A.

PERSONNEL INJURIES

NUMBER (40)	DESCRIPTION (41)
0 0 0	N.A.

LOSS OF OR DAMAGE TO FACILITY (43)

TYPE (42)	DESCRIPTION
Z	N.A.

PUBLICITY

ISSUED (44)	DESCRIPTION (45)
N	N.A.

NRC USE ONLY

617-746-7900

Appendix B - Radioactive Effluents

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

Supplemental Information

January - June, 1980

Facility Pilgrim Nuclear Power Station License DPR-35

1. **Regulatory Limits**

   a. Fission and activation gases: $\frac{Qs}{0.25/\bar{E}} + \frac{Qv}{0.10/\bar{E}} \leq 1$

   b. Iodines: 2 Ci/Quarter

   c. Particulates, half-lives >8 days: 13(1.8E4Qs + 1.8E5Qv) $\leq$ 1

   d. Liquid effluents: 10 Ci/Quarter

2. **Maximum Permissible Concentration**

   Provide the MPCs used in determining allowable release rates or concentrations.

   a. Fission and activation gases: } 10 CFR 20
   b. Iodines: } Appendix B
   c. Particulates, half-lives >8 days: } Table II

   d. Liquid effluents: H - 3 = 1 X 10^{-5} μCi/ml; all rest, 10 CFR 20, Appendix B, Table II

3. **Average Energy**

   Provide the average energy ($\bar{E}$) of the radionuclide mixture in releases of fission and activation gases, if applicable.

   1st Quarter, MS = 1.028 & RBV = 0.293: 2nd Quarter, MS = 0.660 & RBV = 0.622

4. **Measurements and Approximations of Total Radioactivity**

   Provide the methods used to measure or approximate the total radioactivity in effluents and the methods used to determine radionuclide composition.

   a. Fission and activation gases: } GeLi
   b. Iodines: } Istopic
   c. Particulates: } Analysis
   d. Liquid effluents: }

5. **Batch Releases**

   Provide the following information relating to batch releases of radioactive materials in liquid and gaseous effluents.

   a. **Liquid**

      1. Number of batch releases: 228
      2. Total time period for batch releases: 263.50 hrs.
      3. Maximum time period for a batch release: - 8.92 hrs.
      4. Average time period for batch releases: 1.16 hr.
      5. Minimum time period for a batch release: - 0.25 hr.
      6. Average stream flow during periods of release of effluent into a flowing stream: 1.81E + 5 GPM

   b. **Gaseous (Not Applicable)**

6. **Abnormal Releases**

   a.

   b. None

TABLE 1A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

January - June, 1980

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission and activation gases				
1. Total release	Ci	2.69E+2	4.13E+2	3.00E+1
2. Average release rate for period	μCi/sec	3.42E+1	5.25E+1	
3. Percent of Technical Specification limit	%	1.39E-2	1.73E-2	
B. Iodines				
1. Total iodine-131	Ci	< 4.12E-3	3.21E-3	2.50E+1
2. Average release rate for period	μCi/sec	< 5.24E-4	4.08E-4	
3. Percent of Technical Specification limit	%	2.06E-1	1.61E-1	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	< 3.23E-3	4.79E-3	3.00E+1
2. Average release rate for period	μCi/sec	< 4.11E-4	6.09E-4	
3. Percent of Technical Specification limit	%	8.77E-2	2.63E-2	
4. Gross alpha radioactivity	Ci	< 7.00E-7	3.90E-7	
D. Tritium				
1. Total release	Ci	3.65E0	6.75E0	3.00E+1
2. Average release rate for period	μCi/sec	4.64E-1	8.59E-1	
3. Percent of Technical Specification limit	%			

TABLE 1B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)
GASEOUS EFFLUENTS – ELEVATED RELEASE

January - June, 1980

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	6.35E-4	2.72E-3		
krypton-85m	Ci	5.70E+1	6.95E+1		
krypton-87	Ci	2.95E+1	2.62E+1		
krypton-88	Ci	1.11E+2	1.00E+2		
xenon-133	Ci	5.41E+1	5.55E+1		
xenon-135	Ci	1.54E0	1.20E+1		
xenon-135m	Ci	1.20E-1	4.55E0		
xenon-138	Ci	3.41E0	7.14E+1		
xenon-131m	Ci				
xenon-137	Ci				
xenon-133m	Ci				
Total for period	Ci	2.57E+2	3.39E+2		
2. Iodines					
iodine-131	Ci	<5.26E-4	2.73E-3		
iodine-133	Ci	<1.38E-5	2.42E-2		
iodine-135	Ci		2.83E-2		
Total for period	Ci	<5.40E-4	5.52E-2		
3. Particulates					
strontium-89	Ci	3.62E-5	8.16E-4		
strontium-90	Ci	5.50E-6	9.71E-6		
cesium-134	Ci	4.54E-7			
cesium-137	Ci	2.16E-5	1.94E-5		
barium-lanthanum-140	Ci	1.98E-4	3.25E-3		
chromium-51	Ci				
manganese-54	Ci	3.82E-6	1.08E-5		
cobalt-58	Ci				
iron-59	Ci				
cobalt-60	Ci	4.23E-5	4.07E-5		
zinc-65	Ci				
zirconium-niobium-95	Ci				
cerium-141	Ci				
cerium-144	Ci		3.42E-5		
ruthenium-103	Ci				
ruthenium-106	Ci		1.61E-4		

TABLE 1C
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)
GASEOUS EFFLUENTS - GROUND LEVEL RELEASE
January - June, 1980

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	< 3.87E-8	< 4.65E-8		
krypton-85m	Ci	9.10E-2	1.10E-1		
krypton-87	Ci	1.52E-1	1.26E0		
krypton-88	Ci	2.83E-1	4.62E0		
xenon-133	Ci	3.04E-1	8.11E0		
xenon-135	Ci	1.11E+1	6.02E+1		
xenon-135m	Ci				
xenon-138	Ci				
Total for period	Ci	1.19E+1	7.43E+1		
2. Iodines					
iodine-131	Ci	< 3.59E-3	4.76E-4		
iodine-133	Ci	2.99E-3	3.05E-3		
iodine-135	Ci	4.61E-3			
Total for period	Ci	< 1.12E-2	3.53E-3		
3. Particulates					
strontium-89	Ci	7.00E-5	6.02E-5		
strontium-90	Ci	6.21E-7	1.02E-6		
cesium-134	Ci	5.70E-6	8.82E-6		
cesium-137	Ci	6.75E-5	4.93E-5		
barium-lanthanum-140	Ci	< 2.35E-3	1.99E-4		
manganese-54	Ci	2.92E-5	1.10E-5		
cobalt-58	Ci	2.39E-6			
iron-59	Ci				
cobalt-60	Ci	3.73E-4	1.17E-4		
zinc-65	Ci		4.68E-6		
zirconium-niobium-95	Ci				
cerium-141	Ci	1.74E-5			
ruthenium-103	Ci				
ruthenium-106	Ci				

TABLE 2A
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

January - June, 1980

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, noble gases, or alpha)	Ci	8.77E-1	5.65E-1	3.00E+1
2. Average diluted concentration during period	μCi/ml	1.07E-7	2.17E-7	
3. Percent of applicable limit	%	8.77E0	5.65E0	
B. Tritium				
1. Total release	Ci	2.59E+1	9.13E0	3.00E+1
2. Average diluted concentration during period	μCi/ml	3.15E-6	3.51E-6	
3. Percent of applicable limit	%	3.15E+1	3.51E+1	
C. Dissolved and entrained gases				
1. Total release	Ci	4.53E-3	1.51E-3	4.00E+1
2. Average diluted concentration during period	μCi/ml	5.54E-10	5.81E-10	
3. Percent of applicable limit	%			
D. Gross alpha radioactivity				
1. Total release	Ci	<1.94E-4	<9.17E-5	4.00E+1
E. Volume of waste released (prior to dilution)	liters	2.59E+6	1.78E+6	2.00E+1
F. Volume of dilution water used during period	liters	8.22E+9	2.60E+9	2.00E+1

TABLE 2B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)

LIQUID EFFLUENTS

January - June, 1980

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
strontium-89	Ci			1.84E-3	5.62E-4
strontium-90	Ci			5.26E-4	5.31E-4
cesium-134	Ci			6.46E-3	2.81E-2
cesium-137	Ci			3.34E-2	9.17E-2
iodine-131	Ci			1.07E-4	7.92E-5
cobalt-58	Ci			7.51E-3	5.14E-3
cobalt-60	Ci			3.36E-1	1.57E-1
iron-59	Ci			4.31E-3	
zinc-65	Ci			2.20E-3	1.01E-3
manganese-54	Ci			3.41E-2	1.39E-2
chromium-51	Ci			1.61E-2	
zirconimum-niobium-95	Ci			8.81E-4	1.78E-5
molybdenum 99-technetium 99m	Ci			2.08E-3	
barium-lanthanum-140	Ci			6.36E-3	
cerium-141	Ci			4.52E-3	
iodine-133	Ci			2.35E-4	4.77E-5
cerium-144	Ci			5.62E-4	1.35E-4
silver-110m	Ci				
iron-55	Ci			2.12E-1	1.87E-1
unidentified	Ci			2.08E-1	7.95E-2
Total for period (above)	Ci			8.77E-1	5.65E-1
xenon-133	Ci			8.85E-4	3.97E-4
xenon-135	Ci			3.66E-3	1.11E-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

Supplemental Information

July - December, 1980

Facility Pilgrim Nuclear Power Station License DPR-35

1. **Regulatory Limits**

   a. Fission and activation gases: $\frac{Qs}{0.25/\bar{E}} + \frac{Qv}{0.10/\bar{E}} \leq 1$

   b. Iodines: 2 Ci/Quarter

   c. Particulates, half-lives >8 days: 13 (1.8E4Qs + 1.8E5Qv) - ≤ 1

   d. Liquid effluents: 10 Ci/Quarter

2. **Maximum Permissible Concentration**

   Provide the MPC's used in determining allowable release rates or concentrations.

   a. Fission and activation gases: } 10 CFR 20 Appendix B Table II

   b. Iodines: }

   c. Particulates, half-lives >8 days: }

   d. Liquid effluents: H - 3 = 1 X 10^{-5} μCi/ml; all rest, 10 CFR 20, Appendix B, Table II

3. **Average Energy**

   Provide the average energy ($\bar{E}$) of the radionuclide mixture in releases of fission and activation gases, if applicable. ~~$\bar{E}$ = ? Mev~~

   3rd Quarter, MS = 0.631 &RBV = 0.484; 4th Quarter, MS = 0.507 & RBV = 0.283

4. **Measurements and Approximations of Total Radioactivity**

   Provide the methods used to measure or approximate the total radioactivity in effluents and the methods used to determine radionuclide composition.

   a. Fission and activation gases: } GeLi Istopic Analysis

   b. Iodines: }

   c. Particulates: }

   d. Liquid effluents: }

5. **Batch Releases**

   Provide the following information relating to batch releases of radioactive materials in liquid and gaseous effluents.

   a. **Liquid**

      1. Number of batch releases: 84
      2. Total time period for batch releases: 109.82 hrs.
      3. Maximum time period for a batch release: - 10.33 hrs.
      4. Average time period for batch releases: 1.31 hrs.
      5. Minimum time period for a batch release: - 0.33 hrs.
      6. Average stream flow during periods of release of effluent into a flowing stream: 2.97E+5GPM

   b. **Gaseous** (Not Applicable)

6. **Abnormal Releases**

   a.

   b. None

TABLE 1A
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

July - December, 1980

	Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and activation gases				
1. Total release	Ci	1.02E+4	1.53E+4	2.50E+1
2. Average release rate for period	μCi/sec	1.28E+3	1.92E+3	
3. Percent of Technical Specification limit	%	3.26E-1	3.91E-1	
B. Iodines				
1. Total iodine-131	Ci	2.19E-2	6.27E-2	2.50E+1
2. Average release rate for period	μCi/sec	2.76E-3	7.89E-3	
3. Percent of Technical Specification limit	%	1.10E0	3.14E0	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	5.91E-3	5.75E-3	3.00E+1
2. Average release rate for period	μCi/sec	7.43E-4	7.23E-4	
3. Percent of Technical Specification limit	%	7.89E-2	1.18E-1	
4. Gross alpha radioactivity	Ci	<4.19E-7	<5.92E-1	
D. Tritium				
1. Total release	Ci	1.40E+1	1.94E+1	3.25E+1
2. Average release rate for period	μCi/sec	1.76E0	2.43E0	
3. Percent of Technical Specification limit	%	N/A	N/A	

TABLE 1B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)
GASEOUS EFFLUENTS – ELEVATED RELEASE

July - December, 1980

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	2.37E-2	2.74E-2		
krypton-85m	Ci	1.85E+3	2.55E+3		
krypton-87	Ci	4.86E+2	8.29E+2		
krypton-88	Ci	2.29E+3	3.21E+3		
xenon-133	Ci	5.24E+3	7.77E+3		
xenon-135	Ci	1.33E+2	5.33E+2		
xenon-135m	Ci	< 8.00E0	< 6.43E0		
xenon-138	Ci	< 1.85E+1	< 1.49E+1		
xenon-131m	Ci				
xenon-137	Ci				
xenon-133m	Ci	5.87E+1	1.66E+2		
Total for period	Ci	1.01E+4	1.51E+4		
2. Iodines					
iodine-131	Ci	1.57E-2	4.41E-2		
iodine-133	Ci	3.99E-2	4.07E-2		
iodine-135	Ci	4.00E-2	4.61E-2		
Total for period	Ci	9.56E-2	1.31E-1		
3. Particulates					
strontium-89	Ci	6.98E-4	4.67E-4		
strontium-90	Ci	8.21E-6	6.05E-6		
cesium-134	Ci				
cesium-137	Ci	2.01E-5	2.80E-5		
barium-lanthanum-140	Ci	2.47E-3	1.35E-3		
chromium-51	Ci	3.96E-5			
manganese-54	Ci	6.84E-5	1.84E-5		
cobalt-58	Ci	5.59E-5	3.71E-6		
iron-59	Ci	4.90E-5	3.24E-6		
cobalt-60	Ci	1.47E-4	5.83E-5		
zinc-65	Ci				
zirconium-niobium-95	Ci	2.23E-6			
cerium-141	Ci				
cerium-144	Ci		1.92E-5		
ruthenium-103	Ci				
ruthenium-106	Ci	3.05E-5			

TABLE 1C

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)

GASEOUS EFFLUENTS - GROUND LEVEL RELEASE

July - December, 1980

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	< 8.07E-7	< 5.59E-6		
krypton-85m	Ci	< 2.06E0	< 1.68E+1		
krypton-87	Ci	< 4.26E0	< 3.72E0		
krypton-88	Ci	< 7.83E0	< 5.79E0		
xenon-133	Ci	9.69E0	2.83E+1		
xenon-135	Ci	6.33E+1	1.13E+2		
xenon-135m	Ci				
xenon-138	Ci				
Total for period	Ci	< 8.71E+1	< 1.68E+2		
2. Iodines					
iodine-131	Ci	6.21E-3	1.86E-2		
iodine-133	Ci	2.52E-2	2.86E-2		
iodine-135	Ci	2.88E-2	3.77E-2		
Total for period	Ci	6.02E-2	8.49E-2		
3. Particulates					
strontium-89	Ci	3.46E-4	1.26E-3		
strontium-90	Ci	1.44E-6	4.36E-6		
cesium-134	Ci	3.08E-6	1.90E-6		
cesium-137	Ci	3.72E-5	2.66E-5		
barium-lanthanum-140	Ci	1.41E-3	2.27E-3		
manganese-54	Ci	2.31E-5	2.87E-5		
cobalt-58	Ci	1.71E-4	3.49E-6		
iron-59	Ci				
cobalt-60	Ci	2.29E-4	1.09E-4		
~~zinc-65~~ Chromium-51	Ci	8.60E-5	5.29E-5		
zirconium-niobium-95	Ci	3.23E-6			
cerium-141	Ci	1.27E-5	3.64E-5		
ruthenium-103	Ci				
ruthenium-106	Ci				

TABLE 2A
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
July - December, 1980

	Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, noble gases, or alpha)	Ci	8.11E-1	4.78E-1	3.00E+1
2. Average diluted concentration during period	μCi/ml	1.53E-7	2.25E-7	
3. Percent of applicable limit	%	8.11E0	4.78E0	
B. Tritium				
1. Total release	Ci	3.81E0	1.12E0	3.00E+1
2. Average diluted concentration during period	μCi/ml	7.20E-7	5.28E-7	
3. Percent of applicable limit	%	7.20E0	5.28E0	
C. Dissolved and entrained gases				
1. Total release	Ci	4.98E-4		4.00E+1
2. Average diluted concentration during period	μCi/ml	9.41E-11		
3. Percent of applicable limit	%			
D. Gross alpha radioactivity				
1. Total release	Ci	<5.64E-5	<1.85E-5	4.00E+1
E. Volume of waste released (prior to dilution)	liters	6.80E+5	2.69E+5	2.00E+1
F. Volume of dilution water used during period	liters	5.29E+9	2.12E+9	2.00E+1

TABLE 2B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1980)

LIQUID EFFLUENTS

July - December, 1980

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
strontium-89	Ci			1.25E-2	1.47E-3
strontium-90	Ci			7.62E-4	2.81E-4
cesium-134	Ci			3.88E-2	3.61E-2
cesium-137	Ci			2.08E-1	1.98E-1
iodine-131	Ci			5.04E-3	
cobalt-58	Ci			1.43E-2	8.79E-3
cobalt-60	Ci			1.89E-1	7.28E-2
iron-59	Ci			6.44E-3	8.01E-4
zinc-65	Ci			1.83E-3	5.60E-4
manganese-54	Ci			1.73E-2	7.18E-3
chromium-51	Ci			2.47E-2	4.83E-3
zirconimum-niobium-95	Ci			9.33E-6	7.00E-5
molybdenum 99-technetium 99m	Ci			1.42E-3	9.79E-5
barium-lanthanum-140	Ci			3.82E-3	5.76E-4
cerium-141	Ci			2.60E-4	
iodine-133	Ci			1.39E-3	
cerium-144	Ci			5.71E-5	
silver-110m	Ci				
iron-55	Ci			7.53E-2	8.71E-2
unidentified	Ci			2.10E-1	5.98E-2
Total for period (above)	Ci			8.11E-1	4.78E-1
xenon-133	Ci			1.23E-4	
xenon-135	Ci			3.75E-4	

Appendix C -1979 Soil Survey

INTRODUCTION

In order to comply with Boston Edison's technical specification 4.8 for environmental monitoring of soil, gamma *in situ* spectrometry analyses were performed at the 11 stations listed on Table A during the period from the 25th to 27th of July, 1979. The gamma *in situ* spectra analyses were generated using the mobile van equipped with the downlooker Ge(Li) detector, its associated electronic equipment and computer software according to Reference 1. Ion chamber measurements at the 11 stations and core sampling at 3 stations were also performed according to Reference 1 to augment the *in situ* measurements. All spectral data obtained is available and on file at the environmental lab. The final tabulated results of the soil analyses are presented in this report.

RESULTS

Tables 1 to 11 were generated for each soil surveillance station to contain the date, counting time of analysis and both exposure rates (μR/hr) and concentrations (pCi/Kg) for natural, fission, fallout and plant related activation nuclides. The exposure rates were derived using the exposure rate method in Reference 1. For the natural emitters, a uniform distribution throughout the soil was assumed ($\alpha/\rho = 0$). If a nuclide gamma peak was found for the fission, fallout and plant-related nuclides an exponential depth distribution was assumed ($\alpha/\rho = .206$). If a nuclide peak was not found for these manmade nuclides, a planar distribution was assumed ($\alpha/\rho = \infty$) for the apparent exposure rate calculation. The conversion factors used in transforming the exposure rates to activity concentrations (pCi/Kg) are listed in Table B. Table B was generated from Tables 8 and 9 of HASL-258, Reference 5. The data format[1], standard deviations and LLDs used in Tables 1 to 11 are quoted based on Reference 4.

Table 12 compares the gamma *in situ* result (μR/hr) with the ion chamber measurement (μR/hr) that was obtained at each of the 11 stations. The positive gamma *in situ* exposure rates are divided into five categories, the exposure rate for the U-238 series, Th-232 series, Cs-137, K-40 and others. The "other" category notes other nuclides found positive by the *in situ* analyses. If the source term of the "other" nuclides could not be assumed to be soil, then the detector efficiency is unknown for these nuclides and the exposure rates were not reported or included in the gamma *in situ* exposure rate subtotal. A sealevel cosmic exposure rate of 3.6μR/hr was added to the subtotal of the positive nuclide exposure rates in order to facilitate the comparison of the *in situ* results to the ion chamber results.

As shown by inspection of Table 12, the gamma *in situ* exposure rates were calculated to be greater than the ion chamber measurements at all eleven sites evaluated at eight of the sites not directly adjacent or possibly influenced by the plant's operation or rad waste storage facilities, the *in situ* measurements were higher by 0.4 to 3μR/hr (or 5% to 37.5% greater) than the ion chamber results.

[1] 6E-02 = 6×10^{-02}

The other three measurement sites were in close proximity to the plant and, as a consequence of the plant's influence, the ion chamber results at these sites were found to be 1.6 to 5.5 times greater than the calculated in situ results.

Tables 13 - 15 present the results obtained when the gamma field measurement of two on-site stations and the control station were compared to laboratory analyses of core samples obtained from the same station. Only the naturally-occurring radionuclides were compared. A comparison for the naturally-occurring radionuclides was made between the in situ result (pCi/Kg) and the average of the laboratory analyses of the core sections by using Equation 1.

$$\left[\% \text{ Difference} = \frac{I-X}{X} * 100 \right]$$

Equation 1.

I = In situ result (pCi/Kg)

X = $\frac{A+I}{2}$ (pCi/Kg)

A = Average laboratory soil results (pCi/Kg)

Equation 1 was derived using the assumption that the in situ and the laboratory measurement were duplicate analyses.

All the calculated percent differences listed in Tables 13 - 15 are less than 15%.

DISCUSSION

Data concerning six of the eleven stations will be commented on in this discussion. These six stations either had a high ion chamber result relative to the *in situ* result, showed positive Co-60, Mn-54 or Cs-134 in the gamma measurement, or had both a high ion chamber measurement and showed Co-60, Mn-54 or Cs-134.

The stations with the relatively high ionization chamber measurements were the Warehouse, Pedestrian Bridge and Overlook Area. According to Table A, these stations are the closest to the reactor and therefore, the high ion chamber measurements at these sites were probably due to some source other than the soil.

The *in situ* gamma results at the Warehouse and Pedestrian Bridge showed positive Co-60, Mn-54 or Cs-134. For the Warehouse and Pedestrian Bridge the source term for the positive Co-60, Mn-54 or Cs-134 was quoted as unknown. Because of these station's relatively high ion chamber measurement with respect to the *in situ* result and the stations closeness to the reactor, the source term of the positive plant related nuclides was not assumed to be the soil. Since the source term is unknown the exposure rates for these nuclides were not reported. However, the source term of the positive Co-60 or Mn-54 at the Property Line, East Brenkwater, and Clift Rock Area sites was assumed to be the soil. The soil was assumed to be the source term for these stations because of the agreement of the two independent measurements and the distance the sites were from the facility.

Table A

Soil Surveillance Stations

Station Number*	Sampling Location	Distance and Direction from Reactor
00	Warehouse (WS)	.03 miles SSE
01	Rocky Hill Road (ER)	0.8 miles SE
03	Rocky Hill Road (WR)	0.3 miles W-WNW
06	Property Line (PL)	0.34 miles NW
07	Pedestrian Bridge (PB)	0.14 miles N
08	Overlook Area (OA)	0.03 miles W
09	East Breakwater (EB)	0.35 miles ESE
10	Cleft Rock Area (CR)	0.9 miles S
15	Plymouth Center (PC)	4.5 miles W-WNW
17	Manomet Substation (MS)	2.5 miles SE
21	East Weymouth (EW)**	2.3 miles NW*

*Obtained from the air particulate station codes.

**Control Station.

Table B

Exposure Rate to Concentration
Conversion Values

Nuclide Name	Energy (Kev)	Conversion $\alpha/\rho=0.206$ (μR/hr/pCi/gm)	Conversion $\alpha/\rho=\infty$ (μR/hr/pCi/gm)	Conversion $\alpha/\rho=0$ (μR/hr/pCi/gm)
Ce-144	133.50	0.00913	0.02229	
Ce-141	145.44	0.03709	0.09291	
I-131	364.46	0.29314	0.73085	
Sb-125	427.88	0.35482	0.88332	
Ru-103	497.09	0.41724	1.05107	
Ba-140	537.30	0.17021	0.42963	
Rh-106	622.00	0.17813	0.45466	
Cs-137	661.61	0.55007	1.35915	
Zr-95	756.72	0.75624	1.85287	
Nb-95	765.80	0.79129	1.94376	
Mn-54	834.84	0.89883	2.20063	
Co-60	1332.51	3.24207	7.78098	
La-140	1596.20	3.22581	7.83693	
K-40	1460.76			0.179
Th-232	Average			2.82
U-238	Average			1.82

In Situ Counting Results — Table I — Date of Count: 07/29/79

Location: Warehouse — Station Number 00 — Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	5E-03	4E-03	15E-03	2E+02	2E+02	7E+02
Ce-141	145.44	9E-03	4E-03	13E-03	9E+01	4E+01	14E+01
I-131	364.50	-13E-03	7E-03	26E-03	-2E+01	1E+01	4E+01
Nb-125	427.84	3E-02	2E-02	8E-02	3E+01	3E+01	9E+01
Ru-103	497.09	-2E-03	7E-03	26E-03	-2E+0	7E+0	25E+0
Ba-140	537.30	-20E-03	10E-03	36E-03	-5E+01	2E+01	8E+01
Cs-134	604.70	-	-	-	-	-	-
Ru-106	622.10	2E-02	2E-02	7E-02	4E+01	4E+01	16E+01
Cs-137*	661.61	76E-03	7E-03	23E-03	14E+01	1E+01	4E+01
Zr-95	756.72	-3E-02	1E-02	4E-02	-16E+0	6E+0	24E+0
Nb-95	765.80	-0.5E-03	7E-03	24E-03	-0.3E+0	3E+0	13E+0
Mn-54	834.84	8E-03	7E-03	24E-03	4E+0	3E+0	11E+0
Co-60+	1332.51	-	-	-	-	-	-
K-40**	1460.75	226E-02	3E-02	4E-02	126E+02	2E+02	2E+02
La-140	1596.20	-3E-02	1E-02	4E-02	-3E+0	1E+0	6E+0
Th-232**		160E-02	5E-02		57E+01	2E+01	
U-238 **		87E-02	5E-02		48E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (α/β = .206)

**Calculated based on weighted average (α/β = 0) for Th-232 & U-238 and single peak (α/β = 0) for K-40.

+Unknown Source Term

In Situ Counting Results

Table 2

Date of Count: 07/25/79

Location: East Rocky Hill Station Number 01 Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	-0E-03	1E-03	4E-03	0E+01	5E+01	16E+01
Ce-141	145.44	16E-04	9E-04	32E-04	2E+01	1E+01	3E+01
I-131	364.50	-0.4E-03	3E-03	10E-03	-0.6E+0	4E+0	13E+0
Sb-125	427.88	18E-03	10E-03	34E-03	2E+01	1E+01	4E+01
Ru-103	497.09	2E-03	3E-03	12E-03	2E+0	3E+0	11E+0
Ba-140	537.30	2E-03	5E-03	18E-03	0.4E+01	1E+01	4E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	-0.2E-02	1E-02	4E-02	-0.4E+01	2E+01	9E+01
Cs-137*	661.61	363E-03	8E-03	16E-03	66E+01	1E+01	3E+01
Zr-95	756.72	1E-03	7E-03	26E-03	0.5E+01	4E+01	1E+01
Nb-95	765.80	17E-03	4E-03	14E-03	9E+0	2E+0	7E+0
Mn-54	834.84	3E-03	5E-03	16E-03	1E+0	2E+0	7E+0
Co-60	1332.51	3E-02	1E-02	4E-02	4E+0	2E+0	5E+0
K-40**	1460.75	207E-02	3E-02	3E-02	116E+02	2E+02	2E+02
La-140	1596.20	-6E-02	1E-02	4E-02	-7E+0	1E+0	6E+0
Th-232**		237E-02	5E-02		84E+01	2E+01	
U-238 **		141E-02	4E-02		78E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (r/ = .206)

**Calculated based on weighted average (r/ = 0) for Th-232 & U-238 and single peak (r/ = 0) for K-40.

In Situ Counting Results — Table 3 — Date of Count: 07/27/79

Location: West Rocky Hill — Station Number 03 — Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	0.8E-03	1E-03	4E-03	4E+01	5E+01	16E+01
Ce-141	145.44	23E-04	9E-04	33E-04	2E+01	1E+01	4E+01
I-131	364.50	-5E-03	3E-03	10E-03	-7E+0	4E+0	14E+0
Sb-125	427.88	-9E-03	10E-03	36E-03	-1E+01	1E+01	4E+01
Ru-103	497.09	2E-03	3E-03	12E-03	2E+0	3E+0	12E+0
Ba-140	537.30	-2E-03	5E-03	19E-03	-0.4E+01	1E+01	5E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	0.9E-02	1E-02	4E-02	2E+01	3E+01	9E+01
Cs-137*	661.61	77E-03	6E-03	17E-03	14E+01	1E+01	3E+01
Zr-95	756.72	6E-03	8E-03	29E-03	3E+0	4E+0	15E+0
Nb-95	765.80	0.3E-03	5E-03	17E-03	0.2E+0	2E+0	9E+0
Mn-54	834.84	-5E-03	5E-03	19E-03	-2E+0	2E+0	9E+0
Co-60	1332.51	1E-02	1E-02	5E-02	1E+0	2E+0	6E+0
K-40**	1460.76	290E-02	4E-02	3E-02	162E+02	2E+02	2E+02
La-140	1596.20	0.9E-02	1E-02	4E-02	1E+0	1E+0	5E+0
Th-232**		292E-02	6E-02		104E+01	2E+01	
U-238**		146E-02	4E-02		80E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (c/ = .206)

**Calculated based on weighted average (c/ = 0) for Th-232 & U-238 and single peak (c/ = 0) for K-40.

[redacted] Counting Sheets [redacted] [redacted] [redacted] [redacted] [redacted] Date C[redacted]: 07/26/[redacted]

Location: Property Line Station Number 06 Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (pR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	0.2E-03	1E-03	4E-03	0.7E+01	5E+01	17E+01
Ce-141	145.44	0.1E-04	9E-04	33E-04	0.2E+01	1E+01	4E+01
I-131	364.56	1E-03	3E-03	9E-03	2E+0	4E+0	13E+0
Sb-125	427.85	0.9E-03	9E-03	34E-03	0.1E+01	1E+01	4E+01
Ru-103	497.09	-2E-03	3E-03	12E-03	-2E+0	3E+0	11E+0
Ba-140	537.30	7E-03	5E-03	17E-03	2E+01	1E+01	4E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	-1E-02	1E-02	4E-02	-3E+01	2E+01	9E+01
Cs-137*	661.61	155E-03	7E-03	16E-03	28E+01	1E+01	3E+01
Zr-95	756.72	4E-03	7E-03	25E-03	2E+0	4E+0	13E+0
Nb-95	765.90	4E-03	4E-03	15E-03	2E+0	2E+0	8E+0
Mn-54	834.84	5E-03	4E-03	16E-03	2E+0	2E+0	7E+0
Co-60+	1332.51	0.9E-02	1E-02	4E-02	1E+0	1E+0	5E+0
K-40**	1460.75	208E-02	3E-02	3E-02	116E+02	2E+02	2E+02
La-140	1596.20	-10E-03	10E-03	38E-03	-1E+0	1E+0	5E+0
Th-232**		196E-02	5E-02		70E+01	2E+01	
U-238 **		112E-02	3E-02		61E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (σ/μ = .20)

**Calculated based on weighted average (σ/μ = 0) for Th-232 & U-238 and single peak (σ/μ = 0) for K-40.

+Source Term assumed to be soil.

In Situ Counting Results — Table 5 — Date of Count: 07/20/79

Location: Pedestrian Bridge — Station Number 07 — Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	2E-03	4E-03	13E-03	0.9E+02	2E+02	6E+02
Ce-141	145.44	-5E-03	3E-03	11E-03	-5E+01	3E+01	12E+01
I-131	364.46	4E-03	6E-03	20E-03	6E+0	8E+0	27E+0
Sb-125	427.88	2E-02	2E-02	6E-02	2E+01	2E+01	7E+01
Ru-103	497.09	-2E-03	6E-03	20E-03	-2E+0	5E+0	19E+0
Ba-140	537.30	-2E-03	8E-03	28E-03	-0.4E+01	2E+01	6E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	5E-02	2E-02	6E-02	11E+01	4E+01	13E+01
Cs-137*	661.61	319E-03	10E-03	24E-03	58E+01	2E+01	4E+01
Zr-95	756.72	-1E-03	10E-03	36E-03	-0.5E+0	5E+0	20E+0
Nb-95	765.80	-4E-03	6E-03	22E-03	-2E+0	3E+0	11E+0
Mn-54+	834.84						
Co-60+	1332.51						
K-40**	1460.76	218E-02	3E-02	4E-02	122E+02	2E+02	2E+02
La-140	1596.29	-2E-02	1E-02	5E-02	-2E+0	2E+0	6E+0
Th-232**		243E-02	6E-02		86E+01	2E+01	
U-238 **		129E-02	4E-02		71E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (α/β = .206)

**Calculated based on weighted average (α/β = 0) for Th-232 & U-238 and single peak (α/β = 0) for K-40.

+Source Term Unknown.

In Situ Counting Results

Table 6

Date of Count: 07/27/79

Location: Overlook Area Station Number 08 Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	-2E-03	2E-03	7E-03	9E+01	10E+01	34E+01
Ce-141	145.44	3E-03	2E-03	7E-03	3E+01	2E+01	7E+01
I-131	364.46	-0.7E-03	4E-03	15E-03	-1E+0	6E+0	21E+0
Sb-125	427.85	-0.1E-02	1E-02	5E-02	-0.1E+01	2E+01	6E+01
Ru-103	497.09	-11E-03	5E-03	17E-03	-10E+0	5E+0	16E+0
Ba-140	537.30	0.6E-03	7E-03	24E-03	0.2E+01	2E+01	5E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	2E-02	1E-02	5E-02	4E+01	3E+01	11E+01
Cs-137*	661.61	79E-03	6E-03	18E-03	14E+01	1E+01	3E+01
Zr-95	756.72	12E-03	9E-03	31E-03	7E+0	5E+0	16E+0
Nb-95	765.80	-11E-03	5E-03	19E-03	-6E+0	3E+0	10E+0
Mn-54	834.84	2E-03	5E-03	18E-03	1E+0	2E+0	8E+0
Co-60	1332.51	4E-02	1E-02	4E-02	5E+0	2E+0	6E+0
K-40**	1460.76	207E-02	3E-02	3E-02	116E+02	2E+02	2E+02
La-140	1596.20	2E-02	1E-02	4E-02	3E+0	1E+0	5E+0
Th-232**		264E-02	6E-02	-	94E+01	2E+01	-
U-238 **		153E-02	4E-02	-	84E+01	2E+01	-

*Calculated based on peak and baseline counts in the actual peak found assuming (a/b = .206)

**Calculated based on weighted average (a/b = 0) for Th-232 & U-238 and single peak (a/b = 0) for K-40.

In Situ Counting Results — Table 7 — Date of Count: 07/25/79

Location: East Breakwater — Station Number 09 — Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	0.6E-03	1E-03	4E-03	3E+01	5E+01	19E+01
Ce-141	145.44	0.2E-03	1E-03	4E-03	0.2E+01	1E+01	4E+01
I-131	364.50	1E-03	3E-03	10E-03	2E+0	4E+0	14E+0
Sb-125	427.88	0.9E-02	1E-02	4E-02	1E+01	1E+01	4E+01
Ru-103	497.09	-7E-03	4E-03	13E-03	-6E+0	3E+0	13E+0
Ba-140	537.30	-2E-03	5E-03	19E-03	-0.5E+01	1E+01	4E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	2E-02	1E-02	4E-02	4E+01	3E+01	9E+01
Cs-137*	661.61	91E-03	5E-03	15E-03	165E+0	10E+0	27E+0
Zr-95	756.72	-0.7E-03	8E-03	28E-03	-0.4E+0	4E+0	15E+0
Nb-95	765.80	1E-03	5E-03	16E-03	0.6E+0	2E+0	8E+0
Mn-54	834.84	-5E-03	5E-03	18E-03	-2E+0	2E+0	8E+0
Co-60+	1332.51	4E-02	1E-02	3E-02	10E+0	3E+0	9E+0
K-40**	1460.79	287E-02	4E-02	3E-02	160E+02	2E+02	2E+02
La-140	1596.20	-6E-02	1E-02	5E-02	-7E+0	1E+0	6E+0
Th-232**		256E-02	6E-02		91E+01	2E+01	
U-238 **		140E-02	4E-02		77E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (σ/μ = .206)

**Calculated based on weighted average (σ/μ = 0) for Th-232 & U-238 and single peak (σ/μ = 0) for K-40.

+Source Term assumed to be soil.

In Situ Counting Results — Table 8 — Date of Count: [redacted]

Location: Cleft Rock — Station Number 10 — Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	-10E-04	10E-04	35E-04	-4E+01	4E+01	15E+01
Ce-141	145.44	-6E-04	9E-04	31E-04	-6E+0	9E+0	33E+0
I-131	364.50	-3E-03	3E-03	9E-03	-4E+0	4E+0	13E+0
Sb-125	427.88	22E-03	9E-03	33E-03	3E+01	1E+01	4E+01
Ru-103	497.09	-3E-03	3E-03	12E-03	-3E+0	3E+0	12E+0
Ba-140	537.30	-3E-03	5E-03	18E-03	-.7E+01	1E+01	4E+0
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	.5E-02	1E-02	4E-02	1E+01	2E+01	9E+01
Cs-137*	661.61	134E-03	6E-03	16E-03	24E+01	1E+01	3E+01
Zr-95	756.72	10E-03	7E-03	26E-03	5E+0	4E+0	14E+0
Nb-95	765.80	7E-03	4E-03	16E-03	4E+0	2E+0	8E+0
In-54+	834.84	19E-03	4E-03	14E-03	21E+0	5E+0	16E+0
Co-60	1332.51	-.3E-02	1E-02	5E-02	-.3E+0	2E+0	6E+0
K-40**	1460.76	278E-02	4E-02	3E-02	155E+02	2E+02	2E+02
La-140	1596.20	.7E-02	1E-02	4E-02	.9E+0	1E+0	5E+0
Th-232**		274E-02	6E-02		97E+01	2E+01	
U-238 **		142E-02	4E-02		78E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (α/β = .206)

**Calculated based on weighted average (α/β = 0) for Th-232 & U-238 and single peak (α/β = 0) for K-40.

+Source Term assumed to be soil.

In Situ Counting Results — Table 9 — Date of Count: 3/24/..

Location: Plymouth Center — Station Number 15 — Counting Time: 6000 (s

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	- 5E-04	10E-04	34E-04	2E+01	4E+01	15E+01
Ce-141	145.44	-8E-04	9E-04	31E-04	-8E+0	10E+0	33E+0
I-131	364.49	-1E-03	3E-03	9E-03	-2E+0	4E+0	12E+0
Sb-125	427.88	-4E-03	9E-03	34E-03	-.5E+01	1E+01	4E+01
Ru-103	497.09	2E-03	3E-03	12E-03	2E+0	3E+0	11E+0
Ba-140	537.30	-8E-03	5E-03	18E-03	-2E+01	1E+01	4E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	-.6E-02	1E-02	4E-02	-1E+01	2E+01	9E+01
Cs-137*	661.61	243E-03	8E-03	18E-03	44E+01	1E+01	3E+01
Zr-95	756.72	3E-03	.7E-03	26E-03	2E+0	4E+0	14E+0
Nb-95	765.80	8E-03	4E-03	15E-03	4E+0	2E+0	8E+0
Mn-54	834.83	-7E-03	5E-03	17E-03	-3E+0	2E+0	8E+0
Co-60	1332.51	-.9E-02	1E-02	4E-02	-1E+0	2E+0	6E+0
K-40**	1460.76	194E-02	3E-02	3E-02	109E+02	2E+02	2E+02
La-140	1596.20	1E-02	1E-02	4E-02	1E+0	1E+0	5E+0
Th-232**		258E-02	6E-02		91E+01	2E+01	
U-238 **		154E-02	4E-02		84E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming $\sigma_b/\sigma_s = .206$

**Calculated based on weighted average ($\sigma_b/\sigma_s = 0$) for Th-232 & U-238 and single peak ($\sigma_b/\sigma_s = 0$) for K-40.

In Situ Counting Results

Table [illegible]

Location: Monomet Substation Station Number 17 Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	-0.4E-03	1E-03	4E-03	-2E+01	5E+01	16E+01
Ce-141	145.44	-22E-04	9E-04	32E-04	-24E+0	10E+0	34E+0
I-131	364.50	-0.7E-03	3E-03	10E-03	-1E+0	4E+0	13E+0
Sb-125	427.85	6E-03	10E-03	36E-03	0.6E+01	1E+01	4E+01
Ru-103	497.09	-0.7E-03	3E-03	13E-03	-0.7E+0	3E+0	12E+0
Ba-140	537.30	5E-03	5E-03	18E-03	1E+01	1E+01	4E+01
Cs-134	604.70	-	-	-	-	-	-
Rh-106	622.10	-0.2E-02	1E-02	4E-02	-0.5E+01	3E+01	10E+01
Cs-137*	661.61	336E-03	8E-03	18E-03	61E+01	2E+01	3E+01
Zr-95	756.72	5E-03	8E-03	28E-03	3E+0	4E+0	15E+0
Nb-95	765.80	7E-03	4E-03	16E-03	4E+0	2E+0	8E+0
Mn-54	834.84	14E-03	5E-03	17E-03	6E+0	2E+0	7E+0
Co-60	1332.51	1E-02	1E-02	5E-02	1E+0	2E+0	6E+0
K-40**	1460.75	293E-02	4E-02	3E-02	164E+02	2E+02	2E+02
La-140	1596.20	29E-02	10E-03	34E-03	4E+0	1E+0	4E+0
Th-232**		255E-02	6E-02		91E+01	2E+01	
U-238 **		131E-02	4E-02		72E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (a/b = .206)

**Calculated based on weighted average (a/b = 0) for Th-232 & U-238 and single peak (a/b = 0) for K-40.

In Situ Counting Results

Location: East Weymouth Station Number 21 Counting Time: 6000 (sec)

Nuclide Identification		Exposure Rate (μR/hr)			Concentration (pCi/Kg)		
Nuclide Name	Energy (Kev)	Exposure Rate	Standard Deviation	LLD	Conc.	Standard Deviation	LLD
Ce-144	133.50	-0.5E-03	1E-03	4E-03	-2E+01	5E+01	17E+01
Ce-141	145.44	4E-04	9E-04	33E-04	0.5E+01	1E+01	4E+01
I-131	364.50	3E-03	3E-03	10E-03	4E+0	4E+0	13E+01
Sb-125	427.87	1E-02	1E-02	4E-02	1E+01	1E+01	4E+01
Ru-103	497.09	-0.8E-03	4E-03	13E-03	-0.7E+0	3E+0	12E+0
Ba-140	537.30	-7E-03	5E-03	19E-03	-2E+01	1E+01	4E+01
Cs-134	604.70	-	-	-	-	-	-
Ru-106	622.10	3E-02	1E-02	4E-02	7E+01	3E+01	9E+01
Cs-137	661.61	51E-02	1E-02	2E-02	93E+01	2E+01	4E+01
Zr-95	756.72	-9E-03	8E-03	29E-03	-5E+0	4E+0	16E+0
Nb-95	765.80	8E-03	5E-03	17E-03	4E+0	2E+0	8E+0
Mn-54	834.84	1E-03	5E-03	18E-03	0.5E+0	2E+0	8E+0
Co-60	1332.51	0.5E-02	1E-02	5E-02	0.6E+0	2E+0	6E+0
K-40	1460.75	317E-02	4E-02	3E-02	177E+02	2E+02	2E+02
La-140	1596.20	0E-02	1E-02	4E-02	0E+0	1E+0	5E+0
Th-232		262E-02	6E-02		93E+01	2E+01	
U-238		143E-02	4E-02		79E+01	2E+01	

*Calculated based on peak and baseline counts in the actual peak found assuming (c/f = .206)
**Calculated based on weighted average (c/f = 0) for Th-232 & U-238 and single peak (c/f = 0) for K-40.

Table 12: Comparison of [redacted] Sites vs. [redacted] Cha[redacted] Me[redacted]me

	Station 00		Station 01		Station 03		Station 06	
	µR/hr	1-σ	µR/hr	1-σ	µR/hr	1-σ	µR/hr	1-σ
U-238	0.87	0.05	1.41	0.04	1.46	0.04	1.12	0.03
Th-232	1.60	0.05	2.37	0.05	2.92	0.06	1.96	0.05
CS-137	0.08	0.01	0.36	0.01	0.08	0.01	0.16	0.01
K-40	2.26	0.03	2.07	0.04	2.90	0.04	2.08	0.03
Others	c		---	---	---	---	0.01	*d 0.01
Subtotal	4.81	0.08	6.22	0.07	7.36	0.08	5.32	0.07
Cosmic	3.6		3.6		3.6		3.6	
Total	8.4		9.8		11.0		8.9	
Ion Chamber	46.0		8.3		8.0		8.5	

	Station07		Station 08		Station09		Station 10	
	µR/hr	1-σ	µR/hr	1-σ	µR/hr	1-σ	µR/hr	1-σ
U-238	1.29	0.04	1.53	0.04	1.40	0.04	1.42	0.04
Th-232	2.43	0.06	2.64	0.06	2.56	0.06	2.74	0.06
CS-137	0.32	0.01	0.08	0.01	0.09	0.01	0.13	0.01
K-40	2.18	0.03	2.07	0.03	2.87	0.04	2.78	0.04
Others	a		---	---	*b 0.04	0.01	*f .002	0.004
Subtotal	6.22	0.08	6.31	0.08	6.97	0.08	7.09	0.08
Cosmic	3.6		3.6		3.6		3.6	
Total	9.8		9.9 e		10.6		10.7	
Ion Chamber	30.0		16.2		9.1		8.1	

	Station15		Station17		Station 21	
	µR/hr	1-σ	µR/hr	1-σ	µR/hr	1-σ
U-238	1.54	0.04	1.31	0.04	1.43	0.04
Th-232	2.58	0.06	2.55	0.06	2.62	0.06
CS-137	0.24	0.01	0.34	0.01	0.51	0.01
K-40	1.94	0.03	2.93	0.04	3.17	0.04
Others	---	---	---	---	---	---
Subtotal	6.30	0.07	7.13	0.08	7.73	0.08
Cosmic	3.6		3.6		3.6	
Total	9.9		10.7		11.3	
Ion Chamber	8.1		8.0		8.4	

Notes

a) Mn-54, C-60 & Cs-134 gamma peaks were found
b) Co-60's 1332 Kev gamma peak was found
c) Co-60's gamma peaks were found
d) Co-60's 1173 Kev gamma peak was found
e) Overlook Station beside stack
f) Mn-54 peak was found
* Source term assumed to be soil.

Table 13: COMPARISON OF LABORATORY SOIL RESULTS vs. IN SITU COUNTING RESULTS

Location: Pedestrian Bridge Station Number: 07

Nuclide Identification		Laboratory Soil Results (pCi/kg) Wet				In-Situ (pCi/kg)	Positive Uniform Concentration % Difference
		Core Depth					
Nuclide Name	Energy (KeV)	0-2"	2-4"	4-6"	Average*		
Ce-144	133.50	(-7±3)E+01	(-5±7)E+01			(.9±2)E+02	
Ce-141	145.44	(5±1)E+01	(-.2±5)E+01			(-5±3)E+01	
I-131	346.46	(-.3±2)E+02	(0±2)E+03			(6±8)E+0	
Sb-125	427.88	(-1±2)E+01	(2±3)E+01			(2±2)E+01	
Ru-103	497.09	(-.6±1)E+01	(4±3)E+01			(-2±5)E+0	
Ba-140[a]	537.30						
Cs-134	604.70						
Rh-106	622.10	(-4±6)E+0	(0±1)E+02			(11±4)E+01	
Cs-137	661.61	(320±10)E+0	(7±1)E+01			(58±2)E+01	
Zr-95	756.72	(3±2)E+01	(-1±4)E+01			(-.5±5)E+0	
Nb-95[f]	765.80						
Mn-54	834.84	(6±7)E+0	(-1±1)E+01			(37±7)E+0[e]	
Co-60	1332.51	(45±8)E+0	(0±2)E+01			(316±9)E+0[d]	
K-40	1460.76	(109±2)E+02	(134±4)E+02		(122±18)E+02	(122±2)E+02	0%
La-140[a]	1596.20						
Th-232		(67±3)E+01[b]	(94±6)E+01[b]		(81±19)E+01[b]	(86±2)E+01	+3%
U-238		(53±2)E+01[c]	(57±3)E+01[c]		(55±3)E+01[c]	(71±2)E+01	+13%

[a] The laboratory and In-Situ computation analysis are different for these nuclides (see Reference 2).

[b] This calculation is based on the 911 Kev peak area.

[c] This calculation is based on the 609 Kev peak area.

[d] Assuming a planar source the Co-60 concentration = (99±3)E+0 pCi/kg.

[e] Assuming a planar source the Mn-54 concentration = (11±2)E+0 pCi/kg.

[f] The laboratory and In Situ computation analysis are different for this nuclide (see Reference 3).

*The standard deviation is the 1-sigma deviation of the data.

Table 14:

COMPARISON OF LABORATORY SOIL RESULTS vs. IN SITU COUNTING RESULTS

Location: Overlook Area

Station Number: 08

Nuclide Identification		Laboratory Soil Results (pCi/kg) Wet				In-Situ (pCi/kg)	Positive Uniform Concentration % Difference
		Core Depth					
Nuclide Name	Energy (KeV)	0-2"	2-4"	4-6"	Average *		
Ce-144	133.50	(4±6)E+01	(-22±7)E+01	(6±6)E+01		(9±10)E+01	
Ce-141	145.44	(-1±2)E+01	(4±4)E+01	(3±3)E+01		(3±2)E+01	
I-131	346.46	(2±1)E+02	(5±4)E+02	(.8±2)E+02		(-1±6)E+0	
Sb-125	427.88	(2±3)E+01	(4±4)E+01	(2±4)E+01		(-0.1±2)E01	
Ru-103	497.09	(-.4±2)E+01	(7±2)E+01	(2±2)E+01		(-10±5)E0	
Ba-140[a]	537.30						
Cs-134	604.70						
Rh-106	622.10	(-.7±1)E+02	(.9±1)E+02	(7±1)E+02		(4±3)E+01	
Cs-137	661.61	(11±2)E+01	(14±2)E+01	(12±2)E+01		(14±1)E+01	
Zr-95	756.72	(3±2)E+01	(2±4)E+01	(-2±3)E+01		(7±5)E+0	
Nb-95[f]	765.80						
Mn-54	834.84	(2±1)E+01	(-.7±2)E+01	(-1±1)E+01		(1±2)E+0	
Co-60	1332.51	(.6±1)E+01	(-.4±2)E+01	(0±2)E+01		(5±2)E+0	
K-40	1460.76	(107±3)E+02	(101±5)E+02	(112±4)E+02	(107±6)E+02	(116±2)E+02	+4%
La-140[a]	1596.20						
Th-232		(96±6)E+01[b]	(78±7)E+01[b]	(100±7)E+01[b]	(91±12)E+01[b]	(94±2)E+01	+2%
U-238		(66±3)E+01[c]	(71±4)E+01[c]	(103±6)E+01[c]	(8[illegible]20)E+01[c]	(84±2)E+01	+2%

[a]The laboratory and In Situ computation analysis are different for these nuclides (see Reference 2 and 3).

[b]This calculation is based on the 911 kev peak area.

[c]This calculation is based on the 609 Kev peak area.

[f]The laboratory and In Situ computation analysis are different for this nuclide (see Reference 3).

*The standard deviation is the 1-sigma deviation of the data.

Table 15:

COMPARISON OF LABORATORY SOIL RESULTS vs. IN SITU COUNTING RESULTS

Location: East Weymouth Station Number: 21

Nuclide Identification		Laboratory Soil Results (pCi/kg) Wet				In-Situ (pCi/kg)	Positive Uniform Concentration % Difference
		Core Depth					
Nuclide Name	Energy (KeV)	0-2"	2-4"	4-6"	Average		
Ce-144	133.50	(2±6)E+01				(-2±5)E+01	
Ce-141	145.44	(-4±4)E+01				(5±1)E+01	
I-131	346.46	(-6±5)E+02				(4±4)E+0	
Sb-125	427.88	(6±3)E+01				(1±1)E+01	
Ru-103	497.09	(-.3±3)E+01				(-.7±3)E+0	
Ba-140[a]	537.30						
Cs-134	604.70						
Rh-106	622.10	(.3±1)E+02				(7±3)E+01	
Cs-137	661.61	(127±3)E+01				(93±2)E+01	
Zr-95	756.72	(4±4)E+01				(-5±4)E+0	
Nb-95[f]	765.80						
Mn-54	834.84	(.8±1)E+01				(.5±2)E+0	
Co-60	1332.51	(.1±2)E+01				(.6±2)E+0	
K-40	1460.76	(156±5)E+02				(177±2)E+02	+6%
La-140[a]	1596.20						
Th-232		(70±6)E+01[b]				(93±2)E+01	+14%
U-238		(64±4)E+01[c]				(79±2)E+01	+10%

[a] The laboratory and In-Situ computation analysis are different for these nuclides (see references 2 and 3).

[b] This calculation is based on the 911 KeV peak area.

[c] This calculation is based on the 609 KeV peak area.

[f] The laboratory and In Situ computation analysis are different for this nuclide (see Reference 3).

Appendix D - Radiological Environmental Monitoring Program

APPENDIX D

4.8.D Environmental Monitoring Program

An environmental monitoring program shall be conducted as follows:

1. Environmental samples shall be selected and analyzed according to Table 4.8.1 at the locations described in Tables 4.8.2 and 4.8.3 and shown in Figures 4.8.1, 4.8.2 and 4.8.3.

2. Analytical techniques used shall be such that the detection capabilities in Table 4.8.4 are achieved.

3. A census of gardens producing fresh leafy vegetables for human consumption (e.g., lettuce, spinach, etc.) shall be conducted near the end of the growing season to determine or verify the location of the garden (available for sampling) yielding the highest calculated thyroid dose. This census is limited to gardens having an area of 500 square feet or more and shall be conducted under the following conditions as necessary to meet the above requirement:

   a. Within a 1-mile radius of the plant site, enumeration by a door-to-door, or equivalent counting technique.

   b. If no milk-producing animals are located in the vicinity of the site, as determined by item 4 below, the census described in item 3a above shall be extended to a distance of 5 miles from the site.

   If the census indicates the existence of a garden at a location yielding a calculated thyroid dose greater than that from the previously sampled garden, the new location shall replace the garden previously having the maximum calculated iodine concentration. Also, any location from which fresh leafy vegetables can no longer be obtained may be dropped from the surveillance program as long as the NRC is notified in writing, as soon as possible that such vegetables are no longer grown or no longer available at that location.

4. A census of animals producing milk for human consumption shall be conducted at or near the middle of the grazing season to determine or verify the location yielding the highest calculated annual average thyroid dose. The census shall be conducted under the following conditions as necessary to meet the above requirement:

   a. Within a 1-mile radius from the plant site or within the 15 mrem/yr isodose line, whichever is larger, enumeration by a door-to-door or equivalent, counting technique.

   b. Within a 5-mile radius for cows and for goats, enumeration derived from referenced information from county agricultural agents or other reliable sources.

   If it is learned from this census that animals are present at a location which yields a calculated thyroid dose greater than from previously sampled animals, the new location shall be added to the surveillance program as soon as practicable. The sampling location having the lowest calculated dose may then be dropped from the surveillance program at the end of the grazing season during which the census was conducted. Also, any location from which milk can no longer be obtained may be dropped from the surveil-

lance program as long as the NRC is notified in writing, as soon as practicable, that milk-producing animals are no longer present, or milk samples are no longer available at that location.

5. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability or to malfunction of automatic sampling equipment. In the event of equipment malfunction, every reasonable effort shall be made to complete corrective action prior to the end of the next sampling period. Any significant deviations from the sampling schedule shall be explained in the annual report.

6. Detailed written procedures, including applicable check lists and instructions, shall be prepared and followed for all activities involved in carrying out the environmental monitoring program. Procedures shall include sampling, data recording and storage, instrument calibration, measurements and analyses, and actions to be taken when anomalous measurements are discovered.

Procedures shall be prepared for insuring the quality of program results, including analytical measurements. These procedures will identify the responsible organizations, include purchased services (e.g., contractual lab), include independent audits, and include systems (such as participation in IAEA and/or NBS intercalibration exercises and submission of "blind" quality control samples for analyses by the contractors) to identify and correct deficiencies, investigate anomalous or suspect results, and review and evaluate program results and reports. **

BASES 3.8.D and 4.8.D Environmental Monitoring Program

An Environmental radiological monitoring program is conducted to verify the adequacy of in-plant controls on the release of radioactive materials. The program is designed to detect radioactivity concentrations which could result in radiation doses to individuals not exceeding the levels set forth in 10CFR50 Appendix I.

An example of this is the detection of I-131 in milk. Calculational Models (Regulatory Guide 1.109 March 1976) have shown that a constant concentration of 3.5 pCi I-131 per liter milk would result in a dose of 15 millirem to the thyroid of an infant consuming that milk for a year. Allowing for an open grazing season of six months, and a maximum of two half-lives between event and sampling, the lower limit of detection at time of sampling must be 2 pCi/l (3.5 x 12/6 x 1/4 = 1.8).

A supplemental monitoring program for sediments and mussels has been incorporated into the basic program (see notes f and g to Table 4.8.1) as a result of an agreement with the Massachusetts Wildlife Federation. This supplemental program is designed to provide information on radioactivity levels at substantially higher sensitivity levels in selected samples to verify the adequacy (or, alternatively, to provide a basis for later modifications) of the long-term marine sampling schedules. As part of the supplemental program, analysis of mussels for isotopes of plutonium will be performed if radiocesium activity should exceed 200 pCi/Kgm in the edible portions. **

**supplemental provision

The 200 pCi/Kgm radiocesium "action level" is based on calculations which showed that if radiocesium from plant releases reached this level, plutonium could possibly appear at levels of potential interest.* The calculations also showed that the dose delivered from these levels of plutonium would not be a significant portion of the total dose attributable to liquid effluents.

The program was also designed to be consistent, wherever applicable with Regulatory Guide 4.8 (Issued for comment December 1975). The following exceptions to the generic recommendations stated in Regulatory Guide 4.8 are justified due to site specific considerations:

1. The required detection capability for I-131 in milk is about twice the value suggested in Regulatory Guide 4.8. The justification for the higher value is presented in the second paragraph of this section. This is a conservative estimate of the capability of the milk surveillance program to detect concentrations at the appropriate annual dose level since the annual dose is proportional to the annual average concentration in milk. The detection limit for a group of samples is less than that for a single sample and is inversely proportional to the square root of the number of samples. The conservatism in this case is approximately $\sqrt{12}$, or about a factor of 3.

2. Air particulates are not analyzed for radiostrontium. The program instead calls for this analysis in milk samples. This is justified because the air-cow-milk exposure pathway can be better monitored at Pilgrim after the very low level releases of radiostrontium are reconcentrated in cow's milk (Ref. 1).

3. Soils and sediments are not routinely analyzed for Sr-90, but rather the analysis is done on a contingency basis. The rationale behind this is that Sr-90 will not contribute to long-term radionuclide buildup until the more abundant gamma emitting nuclides appear in relatively large concentrations. Both Items 2 and 3 reflect the fact that in 3½ years of operation, Pilgrim Station liquid releases of Sr-90 have amounted to only 1/1000 of the Sr-90 inventory in Cape Cod Bay water (from weapons testing fallout) and about 4/1000,000 of the direct deposition on the Bay. Also, gaseous releases of Sr-90 have been only 1/100,000 of the terrestrial Sr-90 inventory within five miles of the station (Ref. 1).

4. Surveys are conducted annually, if necessary, to determine appropriate locations for sampling of leafy vegetables and milk. The objective of these surveys is to ensure that the environmental samples are representative of realistic food chain pathways, considering local conditions. Results of the monitoring program will be used as "benchmarks" to verify calculational models used to predict the consequences of effluent releases from the station. The models can then be employed to predict doses attributable to radiation deposition at any other location of interest. The combination of monitoring results and calculational model predictions is a practical method of demonstrating compliance with 10CFR50 Appendix I. This approach does not require (nor is it always practical) that environmental media always be sampled from the "worst case" locations: although sensitivity of the monitoring results might be improved by sampling from locations which are reasonably close to "worst case" conditions.

* in measurable quantities having a potential dose (human food chain) significance comparable to other nuclides if present at their detection limits.

Verification of the appropriate milk sampling locations on an annual basis is satisfactory as there are very few locations suitable for the grazing of dairy herds in the vicinity of the plant (Ref. 2). This situation makes it unlikely the location of the nearest dairy herd (3.5 miles-W) will change.

5. Annual sampling of beef forage (in place of beef) is adequate because beef cattle are not raised commercially in the vicinity of the site. However, dairy cows from the Plymouth County Farm are periodically sold for beef. Feed (hay) from this location will be sampled to monitor this potential pathway for ingestion of radioactivity. If beef cattle feeding on local forage are found at locations closer to the site, forage samples from the closer location will replace the sample from the County Farm.

6. Goundwater flow at the plant site is into Cape Cod Bay; therefore, terrestrial monitoring of groundwater is not included in this program.

7. Poultry sampling is not performed because poultry in Plymouth County feed almost exclusively on imported grain and are usually raised under shelter.

8. Field gamma isotopic surveys are conducted to monitor radioactivity in soil in lieu of laboratory analysis of soil samples. The technique has several advantages over laboratory analysis. First, analysis can be performed on the same plot of land from survey to survey, and radioactivity build-up at the location can be accurately determined. Secondly, gamma exposure rate is determined directly from this technique: hence compliance with 10CFR50 Appendix I levels can be investigated directly rather than indirectly through soil sampling.

References:

1. Wrenn, M.E., "Review of Sr-90 Releases from Pilgrim 1 Nuclear Plant and a Comparison with Extant Environmental Levels", 1976.

2. Pilgrim Station Unit #2 PSAR, Appendix 11F, pp. 11FC-11 and 11A, amended June 15, 1976.

TABLE 4.8.1

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample Type	Locations (Direction-Distance) from Reactor	Sampling and Collection Frequency	Type and Frequency of Analysis
AIRBORNE			
Particulates	11 (see Table 4.8.2)	Continuous sampling over one week	Gross beta radioactivity at least 24 hours after filter change. (a) Quarterly composite (by location) for gamma isotopic. (b)
Radioiodine	11 (see Table 4.8.2)	Continuous sampling with canister collection weekly	Analyze weekly for I-131
Soil	11 (see Table 4.8.2)	Once per three years	Field gamma isotopic. (c)
DIRECT	20 (see Table 4.8.3)	Quarterly	Gamma exposure quarterly.
	Plymouth Beach and Priscilla/White Horse Beach	Annually (Spring)	Gamma exposure survey *
WATERBORNE	Discharge Canal	Continuous Composit Sample	Gamma isotopic (b) monthly; and composite for H-3 analysis quarterly, (c).
	Bartlett Pond (SE-1.7 mi.)	Weekly grab sample	
	Powder Point (NNW-7.8 mi.)(d)	Weekly grab sample	
AQUATIC			
Shellfish	Discharge outfall Duxbury Bay Manomet Pt. Plymouth or Kingston Harbor Marshfield (d)	Quarterly (at approximate 3-month intervals)	Gamma isotopic (b); also see note (f). *

* Note (f) and beach surveys are supplemental provision.

TABLE 4.8.1
(Cont'd)

Exposure Pathway or Sample Type	Locations (Direction-Distance) from Reactor	Sampling and Collection Frequency	Type and Frequency of Analysis
Irish Moss	Discharge outfall Manomet Pt. Ellisville (d)	Semi-annually	Gamma isotopic (b)
Lobster	Vicinity of discharge point Offshore (d)	Four times per season Once per season	Gamma isotopic (b) on edible portions.
Fish	Vicinity of discharge point Offshore (d)	Quarterly, Groups I and II (e) In season, Groups III and IV (e) Annually, each group	Gamma isotopic (b) on edible portions (e)
Sediments	Rocky Point Plymouth Harbor Duxbury Bay Plymouth Beach Manomet Pt. Marshfield (d)	Semi-annually	Gamma isotopic (b) (c), see also note (g) *
INGESTION (Terrestrial)			
Milk	Plymouth County Farm (W-3.5 mi.)(h); Whitman Farm (NW-21 mi.) (d)	Semi-monthly during periods when animals are on pasture, otherwise monthly	Gamma isotopic (b) Sr-89, 90 monthly; radioiodine analysis all samples.
Cranberries	Manomet Pt. Bog (SE-2.6 mi.) Bartlett Rd. Bog (SSE/S-2.8 mi.) Pine St. Bog (WNW-17 mi.) (d)	At time of harvest	Gamma isotopic (b) on edible portions.

*Note (g) is supplemental provision

TABLE 4.8.1
(Cont'd)

Exposure Pathway or Sample Type	Locations (Direction-Distance) from Reactor	Sampling and Collection Frequency	Type and Frequency of Analysis
Tuberous and green leafy vegetables	Karbott Farm (SSE-2.0 mi.)(h) Bridgewater Farm (W-20 mi.) (d)	At time of harvest	Gamma isotopic (b) on edible portions.
Beef Forage	Plymouth County Farm (W-3.5 mi.) (h)	Annually	Gamma isotopic (b)

Notes

(a) If gross beta radioactivity is greater than 10 times the control value, gamma isotopic will be performed on the sample.

(b) Gamma isotopic means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

(c) If integrated gamma activity (less K-40) is greater than 10 times the control value (less K-40), strontium-90 analysis will be performed on the sample.

(d) Indicates control location.

(e) Fish analyses will be performed on a minimum of 2 sub-samples, consisting of approximately 400 grams each from each of the following groups:

I. Bottom Oriented	II. NearBottom Distribution	III. Anadromous	IV. Coastal Migratory
Winter flounder	Tautog	Alewife	Bluefish
Yellowtail flounder	Cunner	Rainbow smelt	Atlantic herring
	Atlantic cod	Striped bass	Atlantic menhaden
	Pollock		Atlantic mackerel
	Hakes		

(f)* Mussel samples from four locations (immediate vicinity of discharge outfall, Manomet Pt., Plymouth or Kingston Harbor, and Green Harbor in Marshfield) will be analyzed quarterly as follows:

One kilogram wet weight of mussel bodies, including fluid within shells will be collected. Bodies will be reduced in volume by drying at about 100°C. Sample will be compacted and analyzed by GE(Li) gamma spectrometry or alternate technique, if necessary, to achieve a sensitivity** of 5 pCi/kg for Cs-134, Cs-137, Co-60, Zn-65 and Zr-95 and 15 pCi/kg for Ce-144.

The mussel shell sample from one location (the location nearest the discharge canal unless otherwise specified pursuant to licensee's agreement with Mass, Wildlife Federation) will be analyzed each quarter. One additional mussel shell sample (from the Green Harbor location, unless otherwise specified pursuant to Licensee's agreement with Mass Wildlife Federation) will be analyzed semi-annually. Unscrubbed shells to be analyzed will be dried, processed, and analyzed similarly to the mussel bodies.

Because of the small volume reduction in pre-processing of shells, sensitivities attained will be less than that for mussel bodies. The equipment and counting times to be employed for analyses of shells will be the same or comparable to that employed for mussel bodies so that the reduction in sensitivities (relative to those for mussel bodies) will be strictly limited to the effects of poorer geometry related to lower sample volume reduction. Shell samples not scheduled for analysis will be reserved (unscrubbed) for possible later analysis, depending upon recommendations of the review committee.

* Supplemental provision.

**All sensitivity values to be determined in accordance with footnote (a) to Table 4.8.4., viz., LLD at 95% confidence level on K_{MC} ; 50% confidence level on K_{MC} (See HASL-300 for definitions).

Notes (Cont'd)

If radiocesium (Cs-134 and Cs-137) activity exceeds 200 pCi/kg (wet) in mussel bodies, these samples will be analyzed by radiochemical spearation, electrodeposition, and alpha spectrometry for radioisotopes of plutonium, with a sensitivity of 0.4 pCi/kg.

(g)* Sediment samples from four locations (Manomet Pt., Rocky Pt., Plymouth Harbor, and head of Duxbury Bay) will be analyzed once per year (preferably early summer) as follows:

Cores will be taken to depths of 30-cm, minimum depth wherever sediment conditions permit by a hand-coring sampling device. If sediment conditions do not permit 30-cm deep cores, the deepest cores achievable with a hand-coring device will be taken. In any case, core depths will not be less than 14-cm. Core samples will be sectioned into 2-cm increments, and surface and alternate increments analyzed, others reserved. Sediment sample volumes (determined by core diameter and/or number of individual cores taken from any single location) and counting technique will be sufficient to achieve sensitivities of 50 pCi/kg dry sediment for Cs-134, Cs-137, Co-60, Zn-65, and Zr-95 and 150 pCi/kg for Ce-144. In any case individual core diameters will not be less than 2 inches.

The top 2-cm section from each core will be analyzed for Pu isotopes (Pu-238, Pu-239, 240) using radiochemical separations, electrodeposition, and alpha spectrometry with target sensitivity of 25 pCi/kg dry sediment. Two additional core slices per year (mid-depth slice from core samples taken at Rocky Point and Plymouth Harbor, unless otherwise specified pursuant to licensee's agreement with Mass Wildlife Federation) will be similarly analyzed.

(h) These locations may be altered in accordance with results of surveys discussed in paragraphs 4.8.D-3 and 4.8.D-4.

* Supplemental provision

TABLE 4.8.2

AIR PARTICULATES, GASEOUS RADIOIODINE AND SOIL SURVEILLANCE STATIONS

Sampling Location (Sample Designation)	Distance and Direction from Reactor
Offsite Stations	
East Weymouth (EW) *	23 miles NW *
Plymouth Center (PC)	4.5 miles W-WNW
Manomet Substation (MS)	2.5 miles SE
Cleft Rock Area (CR)	0.9 miles S
Onsite Stations	
Rocky Hill Road (ER)	0.8 miles SE
Rocky Hill Road (WR)	0.3 miles W-WNW
Overlook Area (OA)	0.03 miles W
Property Line (PL)	0.34 miles NW
Pedestrian Bridge (PB)	0.14 miles N
East Breakwater (EB)	0.35 miles ESE
Warehouse (WS)	0.03 miles SSE

* Control Station

TABLE 4.8.3

EXTERNAL GAMMA EXPOSURE SURVEILLANCE STATIONS (TLD)

Dosimeter Location (Designation)	Distance and Direction from Station
Offsite Stations	
East Weymouth (EW)*	23 miles NW *
Kingston (KS)	10 miles WNW
Sagamore (CS)	10 miles SSE-S
Plymouth Airport (SA)	8 miles WSW
North Plymouth (NP)	5.5 miles WNW
Plymouth Center (PC)	4.5 miles W-WNW
South Plymouth (SP)	3 miles WSW
Manomet (MS)	2.5 miles SSE
Manomet (ME)	2.5 miles SE
Manomet (MP)	2.25 miles ESE-S
Cleft Rock Area (CR)	0.9 miles S
Saquish Neck (SN)**	4.6 miles NNW ***
Onsite Stations	
Rocky Hill Road (ER)	0.8 miles SE
Microwave Tower (MT)	0.38 miles S
Rocky Hill Road (WR)	0.3 miles W-WNW
Rocky Hill Road (B)	0.26 miles SSE
Property Line (H)	0.21 miles SSW
Property Line (I)	0.14 miles W
Public Parking Area (PA)	0.07 miles N-NNE
Overlook Area (OA)	0.03 miles W

* Control Station

** Data from this surveillance station is subject to detector maintenance and retrieval by a private party not subject to control by the licensee. Therefore, the requirement to maintain this station is contingent on station availability and maintenance by the outside party.

*** Supplemental provision

TABLE 4.8.4

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS (d)

Analysis	Lower Limit of Detection (a) Water pCi/l	Airborne particulate or gas - pCi/M^3	Wet solids pCi/Kg	Dry solids pCi/Kg	Milk pCi/l
Gross beta	2	1×10^{-2}			
H-3	330				
Mn-54	15		130	60	
Fe-59	30		260	120	
CO-58,60	15	2×10^{-2}	130	60	
Zn-65	30		260	120	
Sr-89	10		40		10
Sr-90	2		8	150	2
Zr/Nb-95	10				
I-131		7×10^{-2}	80(b)		2 (c)
Cs-134,137	15	1×10^{-2}	80	150	15
Ba/La-140	15				15

(a) The nominal lower limits of detection at the 95% confidence level (defined in the ERDA Health and Safety Laboratory procedures manual, HASL-300).

(b) Applies only to analysis of green leafy vegetables.

(c) Sensitivity with 25% error at the 95% confidence level.

(d) This table applies to all analyses other than those for which higher sensitivities appl in accordance with Notes (f) and (g) to Table 4.8.1.

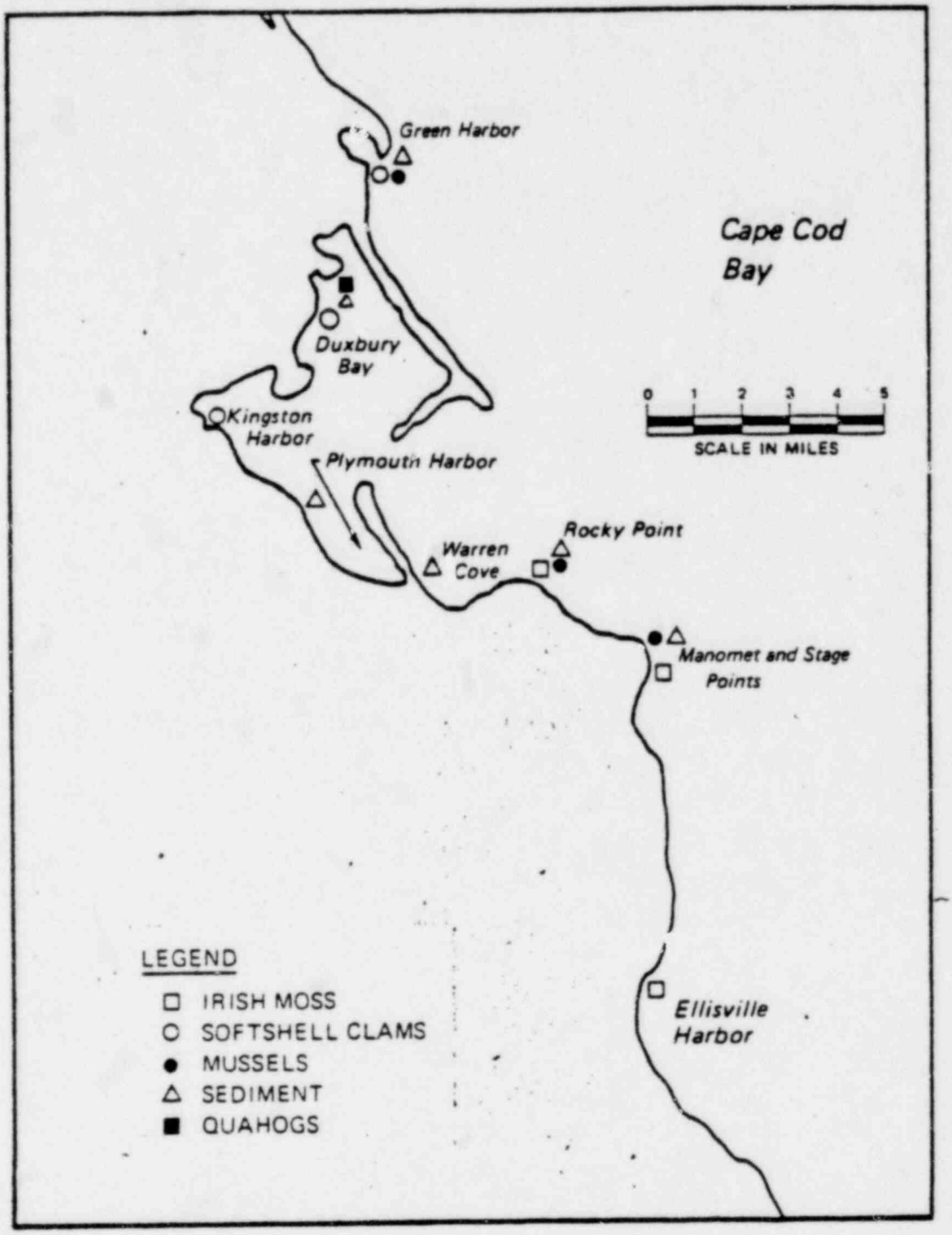


Figure 4.8-1 Typical Mollusc, Algae and Sediment Sampling Stations

6.9.C Unique Reporting Requirements

***

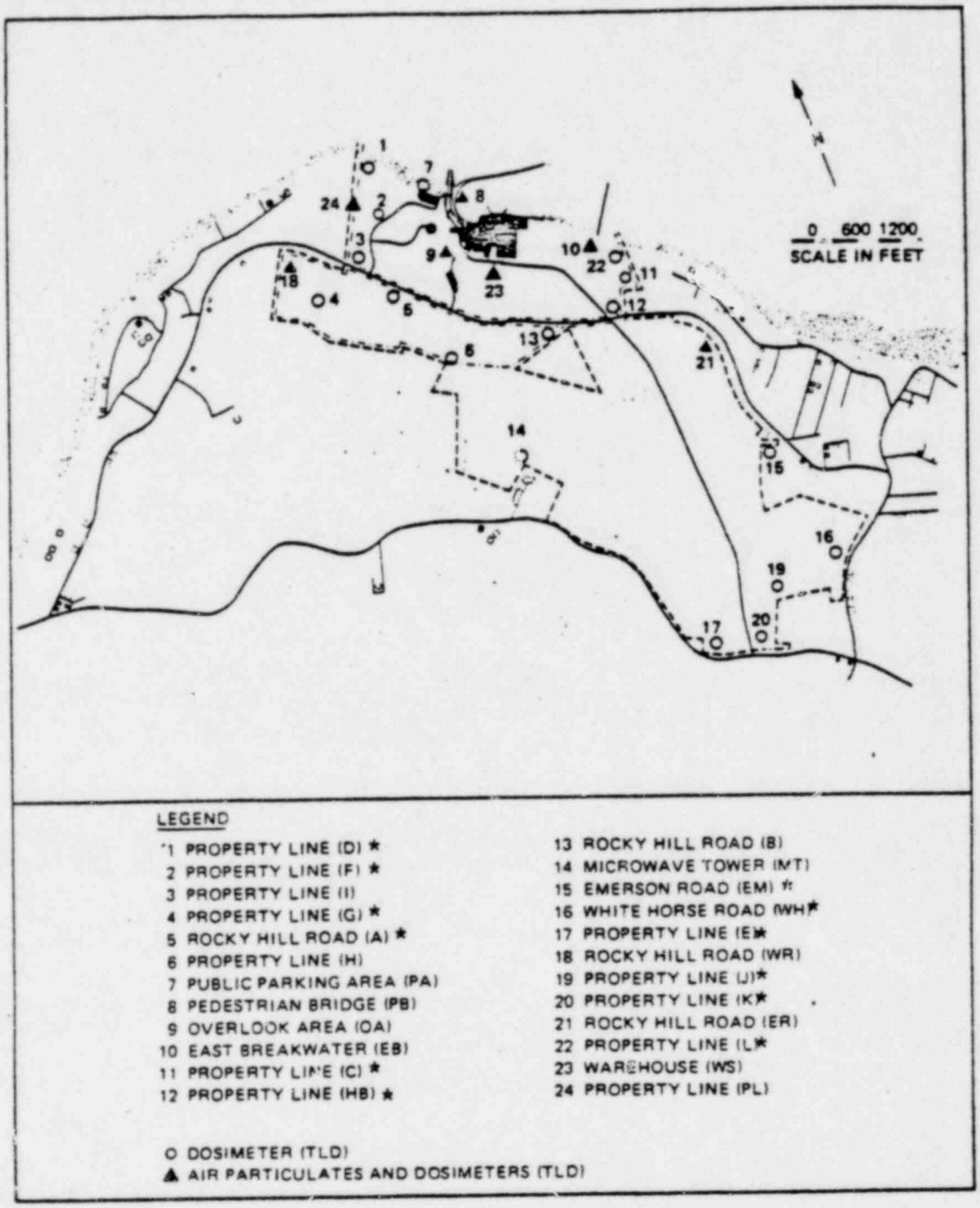
2. Environmental Program Data

a. Annual Report. A report on the radiological environmental surveillance program for the previous 12 months of operation shall be submitted to the Director of the NRC Regional Office (with a copy to the Director, Office of Nuclear Reactor Regulation) as a separate document within 90 days after January 1 of each year. The reports shall include summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, operational controls (as appropriate), and previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of any land use surveys which affect the choice of sample locations. If harmful effects or evidence of irreversible damage are detected by the monitoring, the licensee shall provide an analysis of the problem and a proposed course of action to alleviate the problem.

Results of all radiological environmental samples shall be summarized and tabulated on an annual basis. In the event that some results are not available within the 90-day period, the report shall be submitted, noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

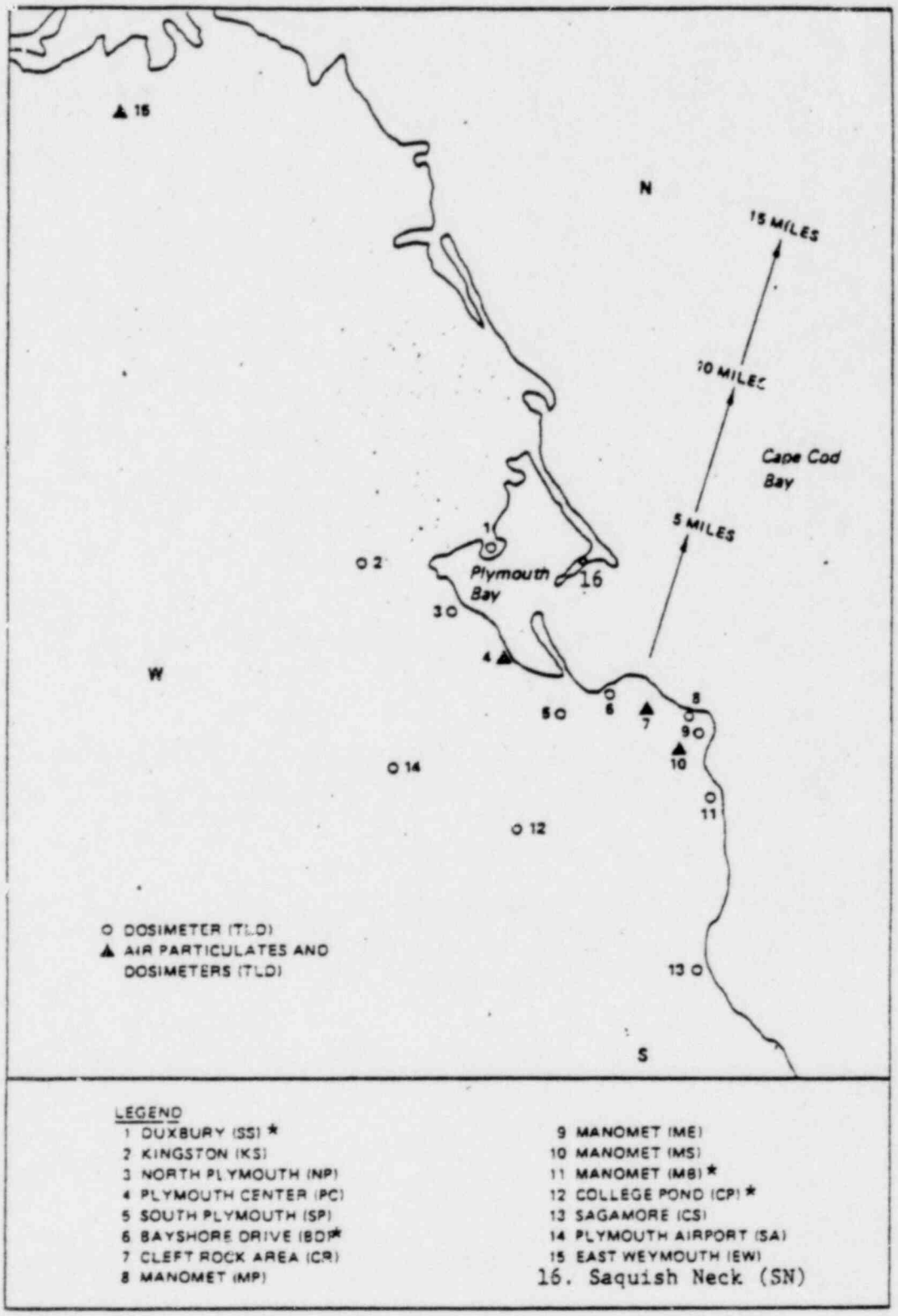
b. Anomalous measurement report. If radioactivity in an indicator medium from an off-site location is found and confirmed at a level exceeding ten times the control station value, a written report shall be submitted to the Director of the NRC Regional Office (with a copy to the Director, Office of Nuclear Reactor Regulation) within 10 days after confirmation.** This report shall include an evaluation of any release conditions, environmental factors, or other aspects necessary to explain the anomalous result.

** A confirmatory reanalysis of the original, a duplicate, or a new sample may be desirable, as appropriate. The results of the confirmatory analysis shall be completed at the earliest time consistent with the analysis, but in any case within 30 days of receipt of the anomalous result.



*additional station not required by Specification 4.8.D.1

Figure 4.8.2 Location of Onsite Monitoring Stations



*additional stations not required by Specification 4.8.D.1

Figure 4.8.3 Location of Offsite Monitoring Stations

APPENDIX E - 1980 GARDEN AND MILK ANIMAL SURVEY

(memo on results of survey)

NOD #80-924

FORM 738
BOSTON EDISON COMPANY

OFFICE MEMORANDUM

FILE PERMANENT TEMPORARY TRANSIENT

TO E. J. Ziemianski FROM T. L. Sowdon DATE 9/15/80

MAIL PHONE

1980 GARDEN & MILK ANIMAL CENSUS

As required by PNPS #1 Environmental Technical Specification, on 9/10/80 and 9/11/80 I conducted the 1980 Census.

I confirmed the existance of gardens near the site boundaries 0.7 miles west and 0.6 miles ESE from which I obtained samples. These gardens are the closest and largest in the vicinity of PNPS (although they are problably less than 500 ft^2). They do represent conservative garden locations for sampling analyses and dose calculation.

I conducted a street by street search of the area within 1 mile of PNPS to determine the locations of any cows or goats. I found no such animals or structures which would indicate the presence of such animals within 1 mile. In addition, I contacted the Plymouth County Animal Inspector, Ms. Carolyn Daum, (224-2826) who gave me the following locations of cows and goats:

Owner	Animal	Location
John Davis	3 beef cows	Beaver Dam Road, Manomet
Warren Raymond (224-2398)	2 goats	Off White Horce Road, Manomet
John Almeida (746-3896)	2 goats	White Oak Drive, Plymouth
Nancy Lloyd (224-8719)	5 goats	Lond Pond Road, Plymouth
Plymouth Plantation	1 cow	Warren Avenue, Plymouth

I contacted the owners of the milk producing animals and found the following:

Warren Raymond (Ms. Florence Raymond) - Sold the goats in the spring.

John Almeida - Presently has no milk producing animals.

Nancy Lloyd - Her goats do not presently produce milk, although they have in the past. She does not sell the milk, but uses it for personnel consumption. When the animals give milk it is normally very little since they are miniature goats (not full size).

I have concluded that our present location for milk sampling (Plymouth Plantation-2.2 miles West) continues to be the best indicator station.

/gn