

VERMONT YANKEE NUCLEAR POWER CORPORATION

ANNUAL RADIOLOGICAL ENVIRONMENTAL

MONITORING REPORT

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1.0 INTRODUCTION

The radiological environmental surveillance program at Vermont Yankee has been designed and carried out with specific objectives in mind. They are as follows:

- To provide an early indication of the appearance or accumulation of any radioactive material in the environment caused by the operation of the nuclear power station.
- To provide assurance to regulatory agencies and the public that the station's environmental impact is known and within anticipated limits.
- To verify the adequacy and proper functioning of station effluent controls and monitoring systems
- To provide an estimate of actual radiation exposure to the surrounding population.
- To provide standby monitoring capability for rapid assessment of risk to the general public in the event of unanticipated or accidental releases of radioactive material.

During 1984, as in the past, Aquatec, Inc., collected all of the aquatic environmental samples, while the Chemistry and Health Physics staff collected the bulk of the terrestrial environmental samples and processed all environmental thermoluminescent dosimeters (TLDs) for direct radiation measurements. After the initial processing, all non-TLD samples were sent to the Yankee Atomic Environmental Laboratory in Westboro, Massachusetts for further processing and radionuclide analysis. This report presents a summary of the findings of the radiological environmental surveillance program for 1984.

2.0 ENVIRONMENTAL SURVEILLANCE PROGRAM

In this section, Table 2.1 outlines the surveillance program as required by the plant Technical Specifications. Table 2.2 lists the sampling stations and their specific locations (distances are measured from the center of the Containment Building). The monitoring locations are shown on maps in Figures 2.1 through 2.3.

Below are listed the two-letter media codes and what they represent:

AP	Air Particulate
CF	Charcoal Filter
TM	Milk
WG	Ground Water
WR	River Water
TG	Mixed Vegetation
TC	Silage
TF	Food Crop
TZ	Meat, Poultry, Eggs
TS	Soil
SE	Sediment
FH	Finfish
AV	Aquatic Vegetation
GM	Direct Radiation (TLD)

Table 2.1

Vermont Yankee
Radiological Environmental Surveillance Program

<u>Media</u>	<u>Sampling Frequency</u>	<u>Required Analyses</u>
Air Particulate (AP)	- Weekly	Gross beta, Sr-89/90 (2)
	- Quarterly Composite	Gamma spectroscopy
Charcoal Filter (CF)	- Weekly	I-131
Milk (TM)	- Monthly	Gamma spectroscopy, I-131
	- Quarterly Composite	Sr-89/90
Mixed Vegetation (TG)	- Quarterly (1)	Gamma spectroscopy
Food Crop (TF)	- Annually (4)	Gamma spectroscopy, I-131 on green leafy portions of vegetables
Meat, Poultry, Eggs (TZ)	- Annually (3)	Gamma spectroscopy
Silage (TC)	- Annually (4)	Gamma spectroscopy
Ground Water (WG)	- Quarterly	Gross beta, H-3, gamma spectroscopy, Sr-89/90 (2)
	- Once Per 3 Years	Ra-226
River Water (WR)	- Monthly (1)	Gross beta, gamma spectroscopy
	- Quarterly Composite	H-3, Sr-89/90 (2)
Aquatic Vegetation (AV)	- Semiannually	Gamma spectroscopy, Sr-89/90 (2)
Soil (TS)	- Once Per 3 Years	Gamma spectroscopy, Sr-89/90 (2)
Sediment (SE)	- Semiannually	Gamma spectroscopy, Sr-89/90 (2)
Finfish (FH)	- Semiannually (1)	Gamma spectroscopy, Sr-89/90 (2)
Direct Radiation (GM)	- Monthly	Integrated gamma dose

(1) Collection frequency dependent upon availability of samples during winter.

(2) Performed whenever plant-related Cs-137 concentration is 10X non-plant-related Cs-137 concentration.

(3) Subject to availability at end of grazing season.

(4) Collected at harvest time in reasonable proximity to specified location; subject to availability.

Table 2.2

Vermont Yankee
Radiological Environmental Surveillance Locations

Station Code (Media - Sta. No.)	Station Description	Zone*	Distance From Plant (km)	Direction From Plant
AP/CF/TG-10	Hinsdale, NH	1	1.2	NE
AP/CF/TG-11	N. Hinsdale, NH	1	3.6	NNW
AP/CF/TG-12	Hinsdale Substation	1	3.1	E
AP/CF/TG-13	River Station No. 3.3	1	1.9	SSE
AP/CF/TG-14	Fairman Road	1	2.4	SW
AP/CF/TG-15	Tyler Hill	1	3.4	WNW
AP/CF/TG-21	Hogback Mountain	2	25.0	WNW
AP/CF/TG-22	Spofford Lake, NH	2	16.1	NNE
AP/CF/TG-23	Northfield, MA	2	11.3	SSE
TM/TC-11	Miller Farm	1	0.8	WNW
TM/TC-12	Whitaker Farm	1	2.6	S
TM/TC-13	Newton Farm	1	5.1	SSE
TM/TC-21	Brattleboro Dairy	2	15.0	N
WG-11	VY Plant Well	1	0.0	On-Site
WG-12	Vernon Nursing Well	1	2.0	SSE
WG-13	VT No. 32 Well	1	1.8	SE
WG-21	Brattleboro Well	2	12.1	NNW
WR/SE/FH-11	River Station No. 3.3	1	1.9	Down River
WR/SE/FH-12	Plant Discharge	1	0.0	On-Site
WR/SE/FH-21	Route 9 Bridge	2	12.8	Up River
AV-11	Downstream Swamp	1	0.8	Down River
AV-21	Upstream Swamp	2	0.8	Up River
TS-01	Fairman Road	1	2.4	SW
TS-02	VT No. 32 Well	1	1.8	SE
TS-03	Route 9 Bridge, NH	2	12.8	Up River
TS-04	Vernon Nursing Well	1	2.0	SSE
TS-05	Brattleboro Well	2	12.1	NNW
TS-06	N. Hinsdale, NH	1	3.6	NNW
TS-07	Hinsdale, NH	1	1.2	NE
TS-08	Hinsdale Substation	1	3.1	E
TS-09	River Station No. 3.3	1	1.9	SSE
TS-10	Hogback Mountain	2	25.0	WNW
TS-11	Spofford Lake, NH	2	16.1	NNE
TS-12	Northfield, MA	2	11.3	SSE
TS-13	Tyler Hill	1	3.4	WNW
TS-14	Plant Well	1	0.0	On-Site

Table 2.2
(continued)

Vermont Yankee
Radiological Environmental Surveillance Locations

<u>Station Code</u> (Media - Sta. No.)	<u>Station Description</u>	<u>Zone*</u>	<u>Distance</u> <u>From Plant</u> (km)	<u>Direction</u> <u>From Plant</u>
GM-1.0	Hinsdale, NH	1	1.2	NE
GM-1.1	N. Hinsdale, NH	1	3.6	NNW
GM-1.2	Hinsdale Substation	1	3.1	E
GM-1.3	River Station No. 3.3	1	1.9	SSE
GM-1.4	Fairman Road	1	2.4	SW
GM-1.5	Tyler Hill	1	3.4	WNW
GM-1.6	Site Boundary	1	0.160	NNW
GM-1.7	Site Boundary	1	0.315	WNW
GM-1.8	Site Boundary	1	0.315	SSW
GM-1.9	Site Boundary	1	0.450	S
GM-1.10	Site Boundary	1	0.630	S
GM-1.11	Site Boundary	1	0.920	S
GM-1.12	Site Boundary	1	0.760	SSE
GM-1.13	Site Boundary	1	0.480	SSE
GM-1.14	Site Boundary	1	0.315	SE
GM-1.15	Site Boundary	1	0.027	N
GM-1.16	Site Boundary	1	0.395	NW
GM-1.17	Vernon School	1	0.575	SSW
GM-2.1	Hogback Mountain	2	25.0	WNW
GM-2.2	Spofford Lake	2	16.1	NNE
GM-2.3	Northfield, MA	2	11.3	SSE

*Zone 1 = Indicator Stations; Zone 2 = Control Stations

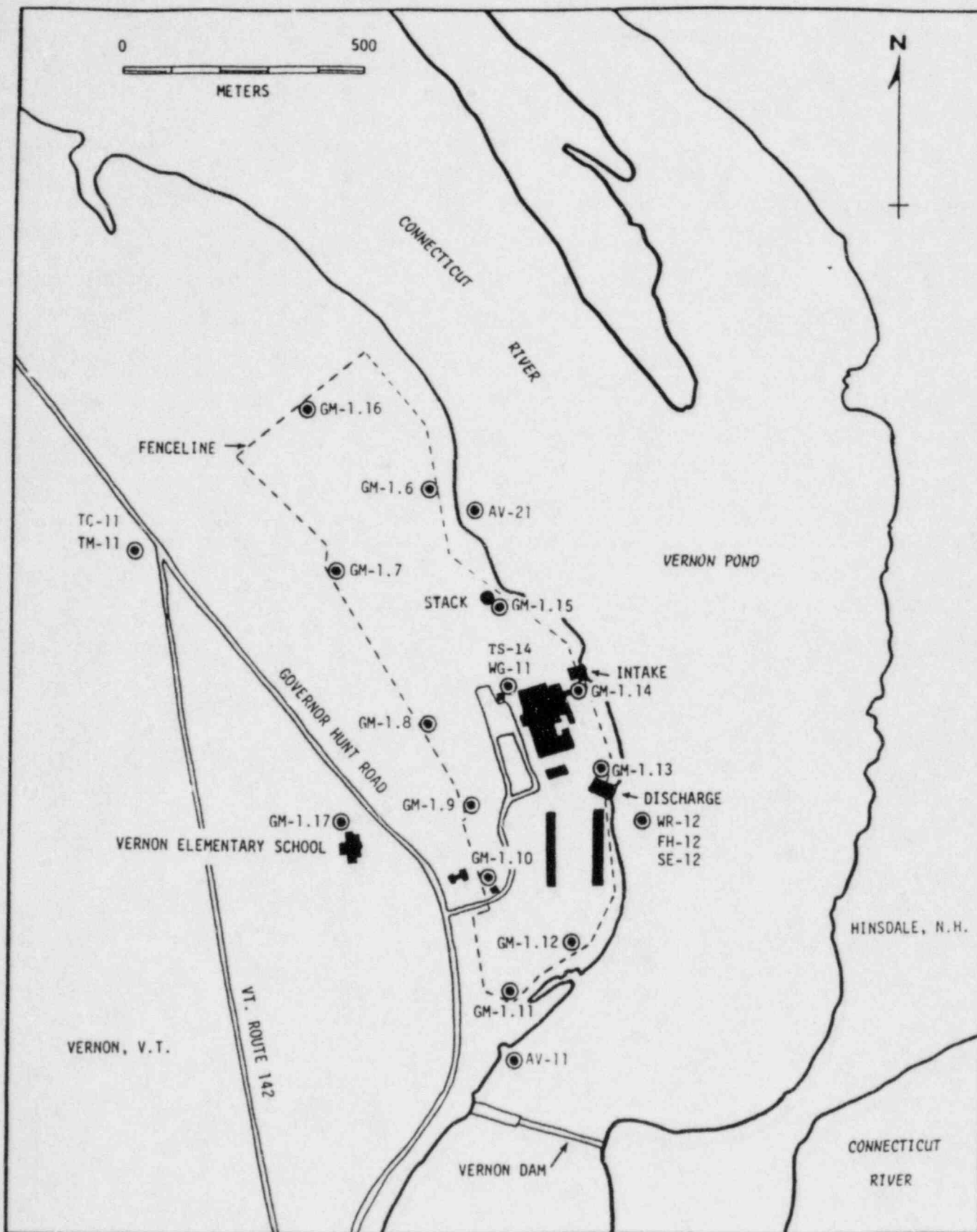


Figure 2.1 Environmental Radiological Monitoring Locations in Close Proximity to Vermont Yankee

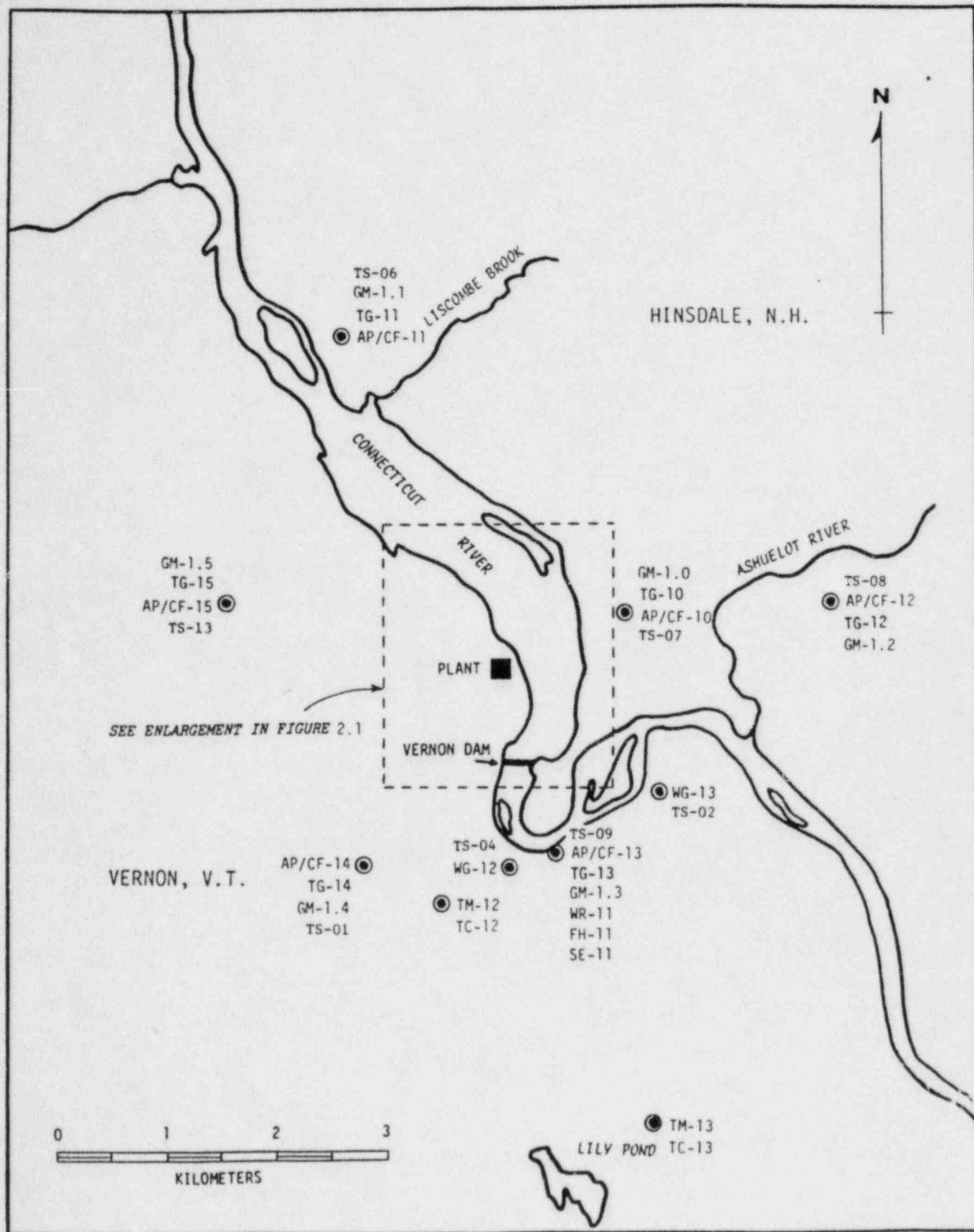


Figure 2.2 Environmental Radiological Monitoring Locations within 5 Kilometers of Vermont Yankee

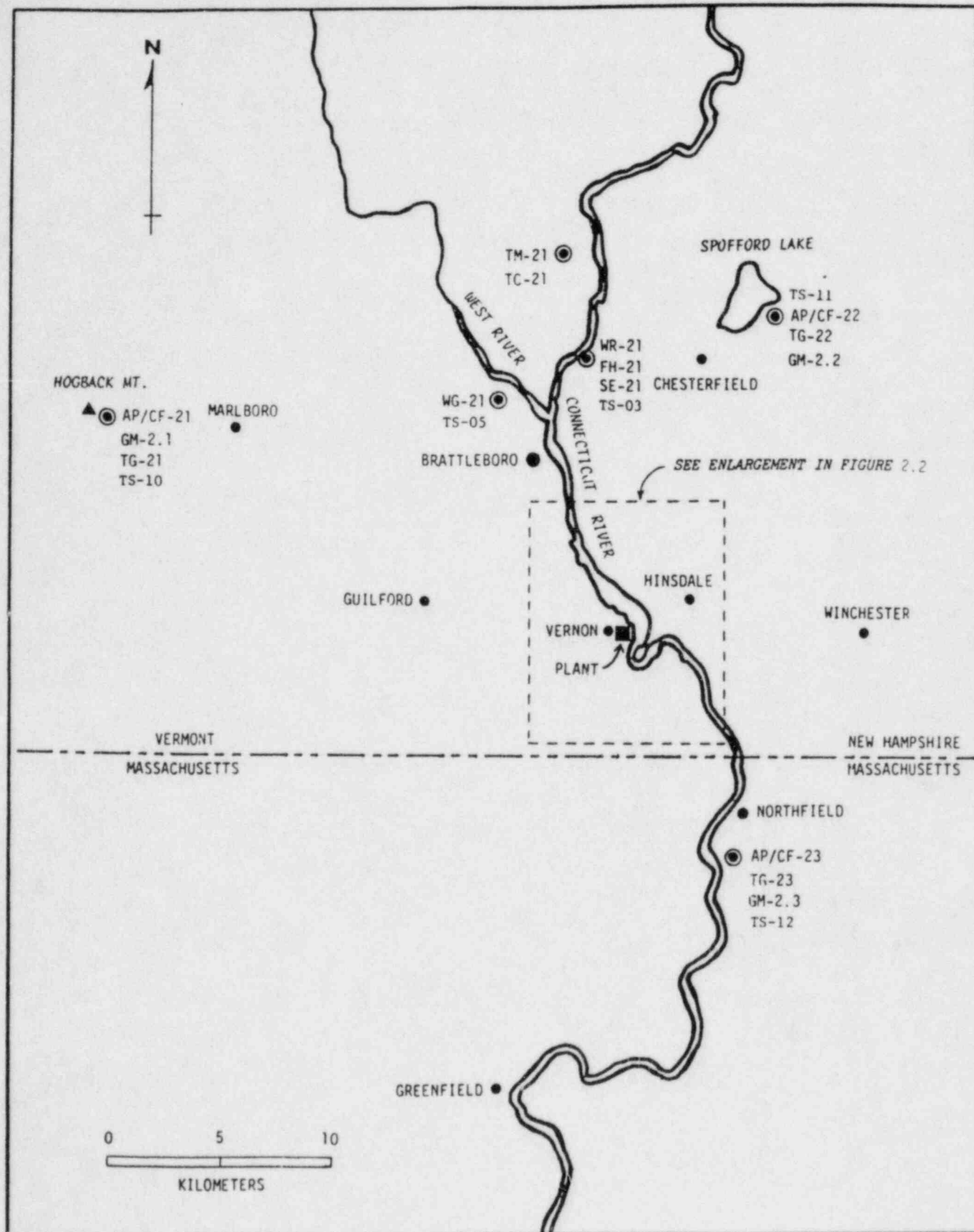


Figure 2.3 Environmental Radiological Monitoring Locations Greater Than 5 Kilometers from Vermont Yankee

3.0. SUMMARY OF 1984 ENVIRONMENTAL DATA

The following pages summarize the analytical results of all the environmental samples which were collected during 1984. Each environmental media category is presented as a separate subsection. A discussion of the sampling program and results is followed by a table which summarizes the year's data for each category. The tables, for all media but Direct Radiation, were generated by the computer program, ERMAP. At the top of each table, ERMAP lists the units of measurement for each medium. The left hand column contains the radionuclide which is being reported, total number of analyses of that radionuclide, and the number of measurements which exceeds ten times the yearly average background value. The latter are classified as "non-routine" measurements. The next column lists the Lower Limit of Detection (LLD) for those radionuclides which have detection capability requirements as specified in the USNRC's Branch Technical Position (Reference 1). (Guidance is not given for many of the radionuclides routinely measured and reported herein.) LLDs equal to or less than these values are achieved greater than 95 percent of the time. LLDs given in the Radiological Environmental Technical Specifications are not shown in the tables, nor were they used during 1984, due to the April 1, 1985, implementation date of the RETS.

Those sampling stations which are adjacent to the plant and which could conceivably be affected by the operation of Vermont Yankee are called "Indicator" or "Zone 1" stations. Distant stations, which are beyond plant influence are called "Control" or "Zone 2" stations.

ERMAP calculates a set of statistical parameters for each radionuclide. 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:

- o The mean value of all concentrations including negative values and values below LLD.
- o The square root of the mean square deviation. This is an estimate of the sample variance.

- o The lowest and highest calculated concentration.
- o The number of positive measurements (activity which is three times greater than the standard deviation) divided by the total number of measurements.

Each single radioactivity measurement datum in this report is based on a single measurement and is reported as a concentration plus or minus a one standard deviation uncertainty. The quoted uncertainty term represents only the random uncertainty associated with the radioactive decay process (counting statistics), and not the propagation of all possible uncertainties in the analytical procedure. Radioactivity is considered to be present in a sample when the concentration exceeds three times its associated standard deviation. Expressed in another way, the measurement is considered to be statistically different than normal instrument background when the plus or minus three standard deviation range surrounding the measurement does not include zero.

All data used in the generation of the data tables were used as reported from the analytical laboratory. No special treatment was given to negative values or to "less than LLD" values. This methodology is consistent with currently accepted practices in the field of radiological environmental monitoring and with the treatment given data over the past several years in Vermont Yankee's Radiological Environmental Monitoring reports.

A) Air Particulate

Air monitoring stations are established at a total of nine locations. Six of these locations are indicators, while the remaining three are control stations. Airborne particulates are collected by passing the air through a fiberglass filter. These filters are collected weekly and held for at least 100 hours before being analyzed for gross beta activity (indicated as GR-B in tables) to allow for the decay of radon and thoron daughter products. Weekly composite air filters from each location are analyzed quarterly for gamma emitting radionuclides.

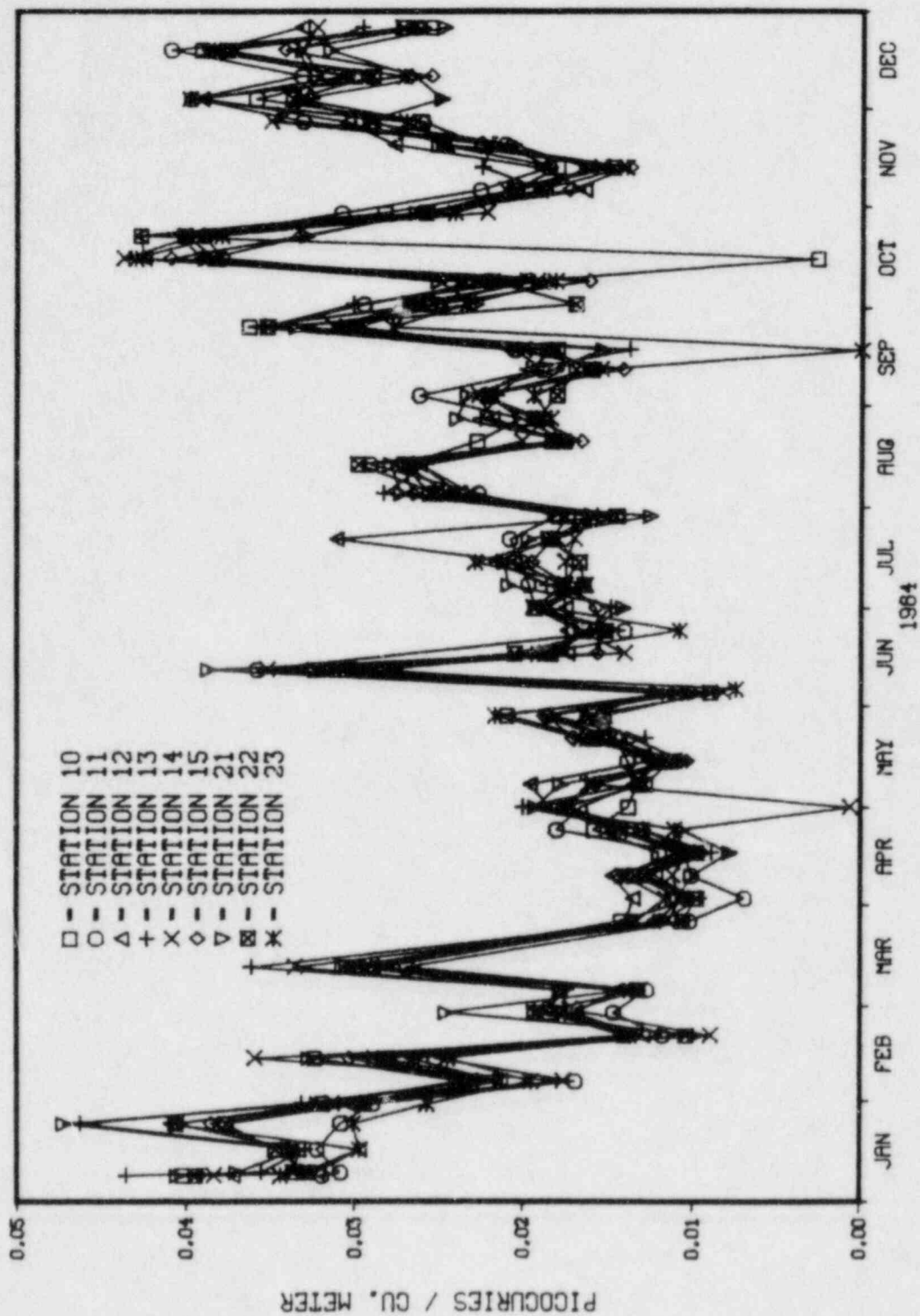
Gross-beta counts (Figure 3.1) generally showed the same fluctuations at indicator stations as at controls, thereby indicating that any plant contribution was negligible. Other than naturally-occurring Be-7, no gamma-emitting radionuclides were detected on the quarterly composite filters.

For the period March 13 to March 20, 1984, weekly air particulate samples were collected as required by Technical Specifications. The samples were prepared for shipment to the Yankee Environmental Laboratory, but were never received there. An investigation indicated that the samples were mistakenly thrown out as rubbish. A review of the records for the weeks prior to and following the missed analyses did not reveal any reason to suspect other than normal readings (see Licensee Event Report 84-04).

Following collection of the air particulate sample at Station AP-11, on June 12, 1984, the sampling pump was inadvertently left off. Consequently, no sample was collected from June 12 through June 17 (see Licensee Event Report 84-08).

At Station AP-12, no sample was collected from July 22 to July 23, 1984, due to a malfunctioning sampling pump following a lightning strike (see Licensee Event Report 84-14).

FIGURE 3.1
GROSS BETA MEASUREMENTS OF AIR PARTICULATE FILTERS
VERMONT YANKEE



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: AIR PARTICULATE

UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
GR-B (458) (0)	.01	(2.3 ± .1)E -2 (6.2 - 462.0)E -4 *(302/305)*	12	(2.4 ± .1)E -2 (1.0 - 4.3)E -2 *(51/ 51)*	(9.2 ± 13.0)E -3 (-2.0 - .0)E 0 *(152/153)*
BE-7 (36) (0)		(4.5 ± .2)E -2 (2.9 - 5.6)E -2 *(24/ 24)*	21	(5.1 ± .2)E -2 (4.6 - 5.6)E -2 *(4/ 4)*	(4.5 ± .2)E -2 (2.5 - 5.6)E -2 *(12/ 12)*
K-40 (36) (0)		(3.7 ± .7)E -3 (-2.1 - 10.2)E -3 *(0/ 24)*	11	(5.8 ± 2.7)E -3 (-1.3 - 10.2)E -3 *(0/ 4)*	(3.4 ± .8)E -3 (-5.9 - 94.6)E -4 *(0/ 12)*
MN-54 (36) (0)		(4.9 ± 5.0)E -5 (-5.8 - 4.7)E -4 *(0/ 24)*	13	(1.7 ± .9)E -4 (-6.0 - 38.0)E -5 *(0/ 4)*	(-1.4 ± 3.9)E -5 (-2.3 - 2.1)E -4 *(0/ 12)*
CO-58 (36) (0)		(-6.0 ± 54.4)E -6 (-4.9 - 8.2)E -4 *(0/ 24)*	10	(9.9 ± 24.8)E -5 (-2.7 - 8.2)E -4 *(0/ 4)*	(-3.9 ± 7.9)E -5 (-5.9 - 3.2)E -4 *(0/ 12)*
CO-60 (36) (0)		(1.2 ± .6)E -4 (-5.6 - 7.8)E -4 *(0/ 24)*	14	(3.5 ± 1.4)E -4 (-4.2 - 59.0)E -5 *(0/ 4)*	(6.7 ± 4.1)E -5 (-2.2 - 2.8)E -4 *(0/ 12)*
ZN-65 (36) (0)		(4.0 ± 110.7)E -6 (-1.3 - 1.3)E -3 *(0/ 24)*	12	(1.6 ± 3.8)E -4 (-3.0 - 12.8)E -4 *(0/ 4)*	(-9.5 ± 11.8)E -5 (-9.2 - 4.8)E -4 *(0/ 12)*
ZR-95 (36) (0)		(-3.0 ± 8.3)E -5 (-6.6 - 7.6)E -4 *(0/ 24)*	22	(2.1 ± 1.9)E -4 (-1.6 - 7.2)E -4 *(0/ 4)*	(6.6 ± 14.9)E -5 (-7.4 - 10.4)E -4 *(0/ 12)*
RU-103 (36) (0)		(8.0 ± 7.5)E -5 (-9.2 - 11.3)E -4 *(0/ 24)*	11	(4.8 ± 2.4)E -4 (1.8 - 113.0)E -5 *(0/ 4)*	(1.3 ± .4)E -4 (-4.5 - 44.2)E -5 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: AIR PARTICULATE

UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
RU-106 (36) (0)		(-5.3 ± 4.5)E -4 (-6.3 - 4.3)E -3 *(0/ 24)*	21	(5.0 ± 6.1)E -4 (-8.5 - 21.3)E -4 *(0/ 4)*	(8.7 ± 31.9)E -5 (-1.4 - 2.1)E -3 *(0/ 12)*
CS-134 (36) (0)	.05	(-1.3 ± .5)E -4 (-8.2 - 2.9)E -4 *(0/ 24)*	15	(8.6 ± 102.9)E -6 (-2.7 - 2.3)E -4 *(0/ 4)*	(-1.7 ± .6)E -4 (-4.0 - 2.6)E -4 *(0/ 12)*
CS-137 (36) (0)	.06	(1.2 ± .3)E -4 (-1.3 - 4.8)E -4 *(0/ 24)*	12	(2.3 ± .9)E -4 (8.6 - 48.3)E -5 *(0/ 4)*	(2.4 ± 5.3)E -5 (-3.3 - 3.1)E -4 *(0/ 12)*
BA-140 (36) (0)		(-5.3 ± 2.7)E -4 (-3.6 - 2.3)E -3 *(0/ 24)*	11	(6.2 ± 8.9)E -4 (-1.1 - 2.3)E -3 *(0/ 4)*	(-3.7 ± 3.1)E -4 (-2.0 - 1.5)E -3 *(0/ 12)*
CE-141 (36) (0)		(7.9 ± 11.0)E -5 (-1.1 - 1.4)E -3 *(0/ 24)*	21	(4.3 ± 1.0)E -4 (2.6 - 7.3)E -4 *(0/ 4)*	(3.0 ± .7)E -4 (-2.5 - 72.8)E -5 *(0/ 12)*
CE-144 (36) (0)		(-2.5 ± 1.6)E -4 (-2.0 - 1.4)E -3 *(0/ 24)*	22	(5.3 ± 3.1)E -4 (1.3 - 14.7)E -4 *(0/ 4)*	(3.0 ± 2.1)E -4 (-7.9 - 16.6)E -4 *(0/ 12)*
TH-232 (36) (0)		(1.0 ± 15.3)E -5 (-2.0 - 1.3)E -3 *(0/ 24)*	10	(4.5 ± 1.7)E -4 (9.6 - 85.0)E -5 *(0/ 4)*	(-9.4 ± 190.1)E -6 (-8.9 - 10.7)E -4 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

B) Charcoal Filters

Charcoal filter cartridges are situated in series with the air particulate fiber filters. Monitoring stations are located at a total of nine stations, six of which are indicators and three of which are controls. Charcoal filters from the nine air sampling stations were collected and analyzed weekly for I-131 activity. No radioactive I-131 was detected on any 1984 charcoal filter sample.

For the period March 13 to March 20, 1984, weekly charcoal filter samples were collected as required by Technical Specifications. The samples were prepared for shipment to the Yankee Environmental Laboratory, but were never received there. An investigation indicated that the samples were mistakenly thrown out as rubbish. A review of the records for the weeks prior to and following the missed analyses did not reveal any reason to suspect other than normal readings (see Licensee Event Report 84-04).

Following collection of the charcoal sample at Station CF-11 on June 12, 1984, the sampling pump was inadvertently left off. Consequently, no sample was collected from June 12 through June 17 (see Licensee Event Report 84-08).

At Station CF-12, no sample was collected from July 22 to July 23, 1984, due to a malfunctioning sampling pump following a lightning strike (see Licensee Event Report 84-14).

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: CHARCOAL FILTER

UNITS: PCI/CU. M

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
I-131 (458) (0)	.07	(-5.0 ± 8.1)E -4 (-6.2 - 17.0)E -2 *(0/305)*	14	(4.1 ± 3.6)E -3 (-2.7 - 17.0)E -2 *(0/ 51)*	(-6.3 ± 6.1)E -2 (-9.4 - .0)E 0 *(0/153)*

* 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

C) Milk

Milk samples were collected and analyzed monthly for low level I-131 and gamma-emitting radionuclides. Monthly samples were composited quarterly and analyzed for Sr-89 and Sr-90.

Detectable concentrations of Cs-137 and Sr-90 were measured in milk samples submitted from the indicator and control locations. Concentrations were similar to those detected in 1983. The detected levels are consistent with those measured in cow milk at other New England locations. Such levels have been well documented and are attributed to fallout from nuclear weapons tests.

In addition to these radionuclides, naturally occurring K-40 was detected in all samples.

FIGURE 3.2
CESIUM-137 IN COW MILK
VERMONT YANKEE

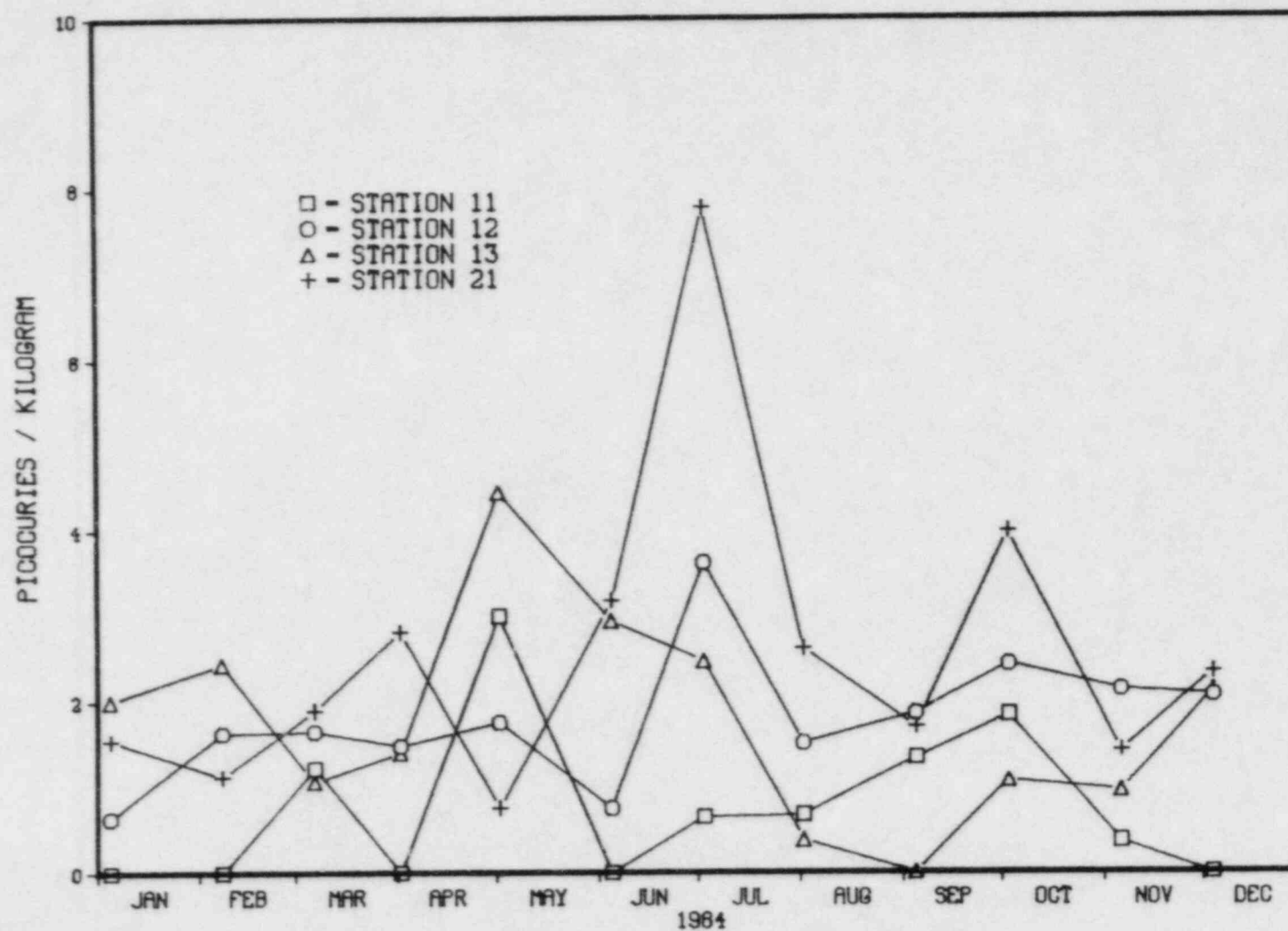
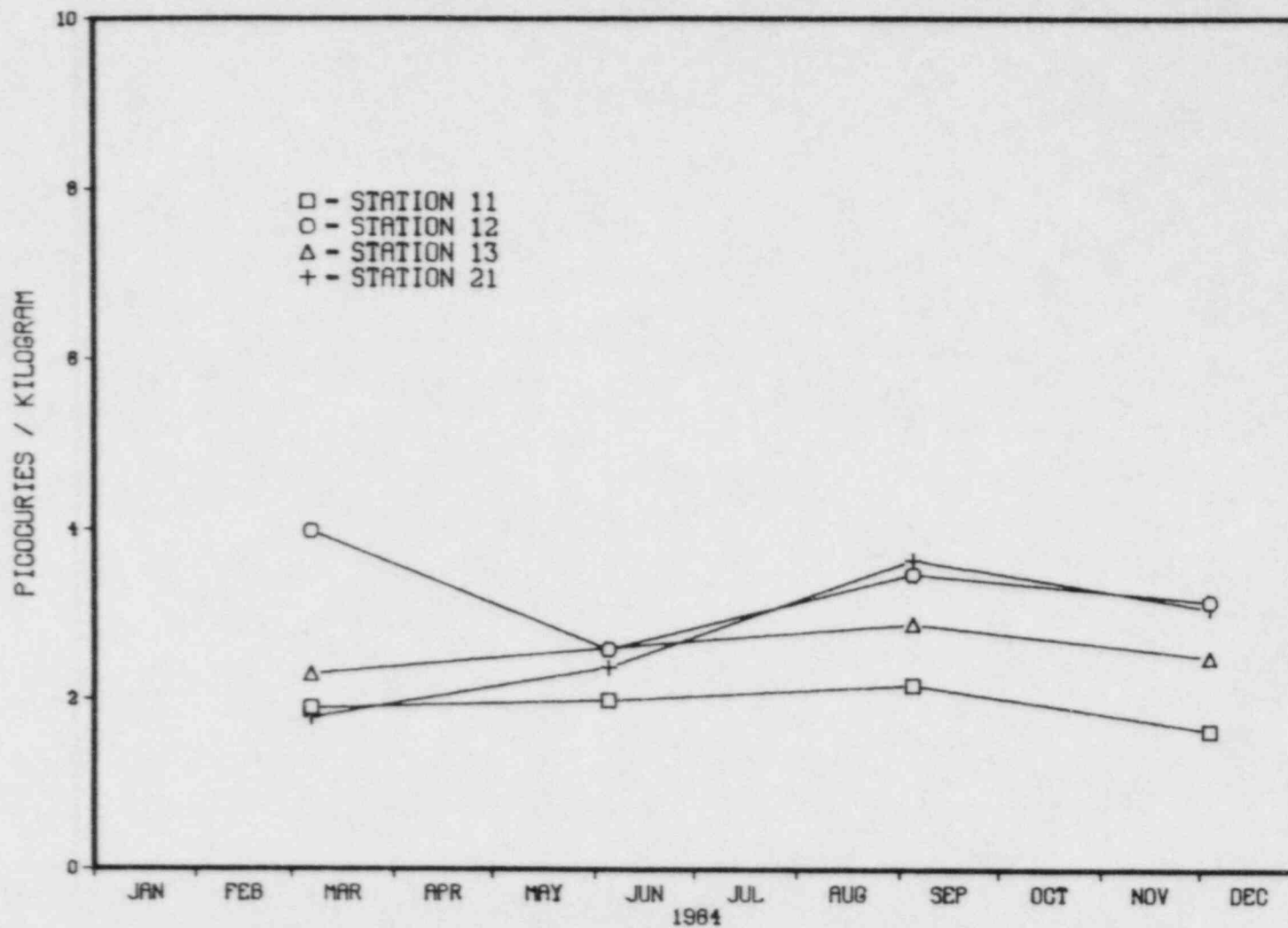


FIGURE 3.3
STRONTIUM-90 IN COW MILK
VERMONT YANKEE



ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: MILK

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STA. NO.	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**		MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
SR-89 (16) (0)		(-2.7 ± 1.2)E -1 (-1.1 - .3)E 0 *(0/ 12)*	21	(5.9 ± 3.4)E -1 (-1.3 - 14.1)E -1 *(0/ 4)*	(5.9 ± 3.4)E -1 (-1.3 - 14.1)E -1 *(0/ 4)*
SR-90 (16) (0)		(2.6 ± .2)E 0 (1.6 - 4.0)E 0 *(12/ 12)*	12	(3.3 ± .3)E 0 (2.6 - 4.0)E 0 *(4/ 4)*	(2.7 ± .4)E 0 (1.8 - 3.7)E 0 *(4/ 4)*
K-40 (48) (0)		(1.4 ± .0)E 3 (1.2 - 1.6)E 3 *(36/ 36)*	13	(1.4 ± .0)E 3 (1.3 - 1.6)E 3 *(12/ 12)*	(1.2 ± .0)E 3 (1.1 - 1.3)E 3 *(12/ 12)*
MN-54 (48) (0)		(-1.5 ± 2.0)E -1 (-2.9 - 2.6)E 0 *(0/ 36)*	11	(1.3 ± 4.2)E -1 (-2.9 - 2.6)E 0 *(0/ 12)*	(-1.1 ± 2.6)E -1 (-1.5 - 1.6)E 0 *(0/ 12)*
CO-58 (48) (0)		(-1.6 ± 1.9)E -1 (-1.9 - 2.8)E 0 *(0/ 36)*	11	(1.3 ± 3.5)E -1 (-1.7 - 2.8)E 0 *(0/ 12)*	(-7.3 ± 2.1)E -1 (-1.8 - .4)E 0 *(0/ 12)*
CO-60 (48) (0)		(-1.6 ± 1.8)E -1 (-1.8 - 2.6)E 0 *(0/ 36)*	12	(5.9 ± 36.2)E -2 (-1.6 - 2.6)E 0 *(0/ 12)*	(5.4 ± 33.9)E -2 (-1.6 - 2.5)E 0 *(0/ 12)*
ZN-65 (48) (0)		(6.2 ± 4.6)E -1 (-4.1 - 6.5)E 0 *(0/ 36)*	12	(1.3 ± .9)E 0 (-3.5 - 6.5)E 0 *(0/ 12)*	(-2.8 ± 6.5)E -1 (-3.6 - 3.7)E 0 *(0/ 12)*
ZR-95 (48) (0)		(-2.6 ± 3.3)E -1 (-5.3 - 5.6)E 0 *(0/ 36)*	11	(7.8 ± 6.0)E -1 (-2.2 - 5.6)E 0 *(0/ 12)*	(-6.5 ± 4.0)E -1 (-3.5 - 1.1)E 0 *(0/ 12)*
RU-103 (48) (0)		(-9.3 ± 1.8)E -1 (-4.1 - 1.4)E 0 *(0/ 36)*	12	(-7.0 ± 3.4)E -1 (-1.9 - 1.4)E 0 *(0/ 12)*	(-1.1 ± .2)E 0 (-2.5 - -.3)E 0 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()#.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: MILK

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO. MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
RU-106 (48) (0)		(-4.1 ± 14.3)E -1 (-1.8 - 2.0)E 1 *(0/ 36)*	21 (9.2 ± 19.4)E -1 (-7.1 - 17.5)E 0 *(0/ 12)*	(9.2 ± 19.4)E -1 (-7.1 - 17.5)E 0 *(0/ 12)*
I-131 (48) (0)	1.	(-2.8 ± 4.8)E -3 (-6.0 - 6.5)E -2 *(0/ 36)*	21 (5.3 ± 8.7)E -3 (-4.2 - 5.5)E -2 *(0/ 12)*	(5.3 ± 8.7)E -3 (-4.2 - 5.5)E -2 *(0/ 12)*
CS-134 (48) (0)	15.	(-7.0 ± 1.2)E -1 (-2.0 - .6)E 0 *(0/ 36)*	12 (-2.8 ± 1.7)E -1 (-1.3 - .6)E 0 *(0/ 12)*	(-3.6 ± 3.7)E -1 (-1.9 - 2.0)E 0 *(0/ 12)*
CS-137 (48) (0)	18.	(1.3 ± .2)E 0 (-2.1 - 4.5)E 0 *(3/ 36)*	21 (2.6 ± .5)E 0 (7.5 - 77.8)E -1 *(6/ 12)*	(2.6 ± .5)E 0 (7.5 - 77.8)E -1 *(6/ 12)*
BA-140 (48) (0)	60.	(-3.7 ± 3.7)E -1 (-8.2 - 3.2)E 0 *(0/ 36)*	11 (-2.7 ± 6.0)E -1 (-3.3 - 2.7)E 0 *(0/ 12)*	(-7.8 ± 3.3)E -1 (-2.6 - .9)E 0 *(0/ 12)*
CE-141 (48) (0)		(3.0 ± 3.9)E -1 (-4.3 - 5.1)E 0 *(0/ 36)*	12 (1.1 ± .9)E 0 (-4.3 - 5.1)E 0 *(0/ 12)*	(-8.5 ± 68.6)E -2 (-4.9 - 3.2)E 0 *(0/ 12)*
CE-144 (48) (0)		(-1.2 ± 8.7)E -1 (-1.0 - 1.2)E 1 *(0/ 36)*	12 (2.3 ± 1.1)E 0 (-5.9 - 8.0)E 0 *(0/ 12)*	(-7.3 ± 20.7)E -1 (-1.1 - .8)E 1 *(0/ 12)*
TH-232 (48) (0)		(9.2 ± 5.8)E -1 (-5.4 - 9.8)E 0 *(0/ 36)*	12 (9.6 ± 8.9)E -1 (-3.5 - 5.9)E 0 *(0/ 12)*	(-3.1 ± 9.4)E -1 (-5.0 - 5.4)E 0 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

D) Mixed Vegetation

Mixed vegetation samples were collected during June, August, and October from the nine air sampling locations. The vegetation consisted of various types of grasses and were analyzed for gamma emitting nuclides. The results of the gamma spectroscopy analysis on each sample showed that in addition to naturally occurring Be-7, K-40, and Th-232, Cs-137 was detected on many samples. The levels detected in 1984 are consistent with those measured in previous years, which were shown to have originated from nuclear weapons testing fallout.

Snow cover and lack of the proper vegetation prevented a fourth quarterly sample from being collected during 1984.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: MIXED VEGETATION

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	MEAN RANGE STA. NO. NO. DETECTED**	MEAN RANGE NO. DETECTED**
BE-7 (27) (0)		(1.5 ± .4)E 3 (3.6 - 76.1)E 2 *(17/ 18)*	14 (3.0 ± 2.3)E 3 (7.1 - 76.1)E 2 *(3/ 3)*	(8.8 ± 1.2)E 2 (4.0 - 14.0)E 2 *(9/ 9)*
K-40 (27) (0)		(4.4 ± .3)E 3 (2.5 - 7.4)E 3 *(18/ 18)*	12 (5.7 ± 1.1)E 3 (3.5 - 7.4)E 3 *(3/ 3)*	(5.1 ± .4)E 3 (2.7 - 6.7)E 3 *(9/ 9)*
MN-54 (27) (0)		(3.2 ± 1.4)E 0 (-5.7 - 18.9)E 0 *(0/ 18)*	23 (1.2 ± .7)E 1 (2.5 - 26.5)E 0 *(0/ 3)*	(1.0 ± 3.8)E 0 (-1.4 - 2.7)E 1 *(0/ 9)*
CO-58 (27) (0)		(-1.4 ± 4.4)E 0 (-3.3 - 4.1)E 1 *(0/ 18)*	13 (1.2 ± 1.6)E 1 (-1.1 - 4.1)E 1 *(0/ 3)*	(-3.8 ± 33.9)E -1 (-1.5 - 1.9)E 1 *(0/ 9)*
CO-60 (27) (0)		(1.3 ± 2.7)E 0 (-2.7 - 2.0)E 1 *(0/ 18)*	15 (1.4 ± .2)E 1 (1.3 - 1.7)E 1 *(0/ 3)*	(4.8 ± 3.5)E 0 (-9.9 - 20.8)E 0 *(0/ 9)*
ZN-65 (27) (0)		(6.0 ± 10.6)E 0 (-6.5 - 9.1)E 1 *(0/ 18)*	12 (3.8 ± 1.3)E 1 (1.9 - 6.3)E 1 *(0/ 3)*	(-5.1 ± 11.6)E 0 (-5.8 - 5.9)E 1 *(0/ 9)*
ZR-95 (27) (0)		(8.0 ± 39.8)E -1 (-2.2 - 3.9)E 1 *(0/ 18)*	12 (9.5 ± 14.5)E 0 (-5.7 - 38.5)E 0 *(0/ 3)*	(-8.8 ± 7.0)E 0 (-4.5 - 2.3)E 1 *(0/ 9)*
RU-103 (27) (0)		(-1.1 ± 1.4)E 0 (-9.4 - 9.3)E 0 *(0/ 18)*	23 (3.9 ± 9.9)E 0 (-1.4 - 2.0)E 1 *(0/ 3)*	(-8.0 ± 5.9)E 0 (-4.0 - 2.0)E 1 *(0/ 9)*
RU-106 (27) (0)		(1.5 ± 1.8)E 1 (-8.5 - 18.7)E 1 *(0/ 18)*	12 (7.7 ± 6.0)E 1 (-4.3 - 14.0)E 1 *(0/ 3)*	(2.1 ± 49.3)E 0 (-3.1 - 1.5)E 2 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: MIXED VEGETATION

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
I-131 (27) (0)		(2.1 ± 2.5)E 1 (-1.2 - 3.0)E 2 *(0/ 18)*	11	(1.2 ± .8)E 2 (-7.9 - 254.0)E 0 *(0/ 3)*	(5.3 ± 3.3)E 1 (-1.7 - 26.2)E 1 *(0/ 9)*
CS-134 (27) (0)		(-1.4 ± .3)E 1 (-5.1 - .7)E 1 *(0/ 18)*	21	(3.4 ± 1.4)E 0 (7.9 - 54.2)E -1 *(0/ 3)*	(-6.2 ± 6.4)E 0 (-4.9 - .9)E 1 *(0/ 9)*
CS-137 (27) (3)		(8.3 ± 3.0)E 1 (6.6 - 528.0)E 0 *(10/ 18)*	15	(2.1 ± 1.6)E 2 (1.3 - 52.8)E 1 *(2/ 3)*	(1.2 ± 1.2)E 1 (-4.4 - 9.7)E 1 *(1/ 9)*
BA-140 (27) (0)		(-2.4 ± 1.3)E 1 (-1.5 - .6)E 2 *(0/ 18)*	21	(2.8 ± 4.4)E 1 (-2.9 - 11.4)E 1 *(0/ 3)*	(-3.2 ± 3.3)E 1 (-2.3 - 1.1)E 2 *(0/ 9)*
CE-141 (27) (0)		(1.6 ± .8)E 1 (-1.9 - 9.4)E 1 *(0/ 18)*	14	(3.4 ± 3.1)E 1 (-3.5 - 94.3)E 0 *(0/ 3)*	(6.2 ± 10.5)E 0 (-4.8 - 5.7)E 1 *(0/ 9)*
CE-144 (27) (0)		(1.4 ± 1.1)E 1 (-5.7 - 11.4)E 1 *(0/ 18)*	15	(4.1 ± 2.9)E 1 (8.3 - 97.6)E 0 *(0/ 3)*	(-1.2 ± 2.3)E 1 (-9.9 - 8.8)E 1 *(0/ 9)*
TH-232 (27) (0)		(6.7 ± 2.0)E 1 (-4.0 - 34.9)E 1 *(1/ 18)*	14	(1.3 ± 1.1)E 2 (8.9 - 349.0)E 0 *(1/ 3)*	(6.2 ± 2.0)E 1 (-1.3 - 16.3)E 1 *(1/ 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

E) Food Crop

No samples were available locally during 1984.

F) Meat, Poultry, Eggs

No meat, poultry, or egg samples were available locally during 1984.

G) Silage

Silage samples were collected at the four milk sampling stations during 1984. Each sample was analyzed for gamma-emitting radionuclides, Sr-89 and Sr-90.

Naturally-occurring Be-7 and K-40 were detected in all samples. The only man-made radionuclide detected in silage was Sr-90 (in two of the four samples). The highest concentration, 43 ± 4.6 pCi/kg, was in a sample from Station TC-13. Strontium-90 is associated with fallout from atmospheric nuclear weapons tests and the above level is consistent with well-documented environmental levels.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: SILAGE

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
SR-89 (4) (0)		(3.4 ± 55.8)E -1 (-9.1 - 10.2)E 0 *(0/ 3)*	21	(1.3 ± 1.0)E 1 *(0/ 1)*	(1.3 ± 1.0)E 1 *(0/ 1)*
SR-90 (4) (2)		(2.3 ± 1.0)E 1 (8.0 - 43.1)E 0 *(2/ 3)*	13	(4.3 ± .5)E 1 *(1/ 1)*	(6.8 ± 3.4)E 0 *(0/ 1)*
BE-7 (4) (0)		(3.4 ± 1.1)E 2 (2.2 - 5.5)E 2 *(3/ 3)*	13	(5.5 ± .6)E 2 *(1/ 1)*	(2.1 ± .4)E 2 *(1/ 1)*
K-40 (4) (0)		(2.3 ± .2)E 3 (2.0 - 2.7)E 3 *(3/ 3)*	11	(2.7 ± .1)E 3 *(1/ 1)*	(1.4 ± .1)E 3 *(1/ 1)*
PN-54 (4) (0)		(6.0 ± 3.1)E 0 (2.3 - 12.2)E 0 *(0/ 3)*	12	(1.2 ± .4)E 1 *(0/ 1)*	(3.4 ± 3.6)E 0 *(0/ 1)*
CO-58 (4) (0)		(-2.7 ± .3)E 0 (-3.3 - -2.1)E 0 *(0/ 3)*	11	(-2.1 ± 3.7)E 0 *(0/ 1)*	(-4.3 ± 4.1)E 0 *(0/ 1)*
CO-60 (4) (0)		(-1.9 ± 4.3)E 0 (-9.0 - 5.8)E 0 *(0/ 3)*	12	(5.8 ± 6.0)E 0 *(0/ 1)*	(-3.5 ± 6.2)E 0 *(0/ 1)*
ZN-65 (4) (0)		(6.4 ± 3.6)E 0 (7.4 - 131.0)E -1 *(0/ 3)*	12	(1.3 ± 1.2)E 1 *(0/ 1)*	(3.7 ± 8.2)E 0 *(0/ 1)*
ZR-95 (4) (0)		(-1.1 ± 3.9)E 0 (-8.8 - 3.7)E 0 *(0/ 3)*	13	(3.7 ± 10.4)E 0 *(0/ 1)*	(1.5 ± 7.7)E 0 *(0/ 1)*

* 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: SILAGE

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
RU-103 (4) (0)		(1.1 ± 2.1)E 0 (-2.5 - 4.6)E 0 *(0/ 3)*	12	(4.6 ± 5.6)E 0 *(0/ 1)*	(-6.5 ± 4.3)E 0 *(0/ 1)*
RU-106 (4) (0)		(1.3 ± 2.0)E 1 (-1.9 - 4.8)E 1 *(0/ 3)*	12	(4.8 ± 3.7)E 1 *(0/ 1)*	(-5.7 ± 3.6)E 1 *(0/ 1)*
I-131 (4) (0)		(-5.5 ± 24.6)E 0 (-3.5 - 4.3)E 1 *(0/ 3)*	13	(4.3 ± 2.1)E 1 *(0/ 1)*	(3.8 ± 16.7)E 0 *(0/ 1)*
CS-134 (4) (0)		(-2.4 ± 1.3)E 0 (-5.1 - -.7)E 0 *(0/ 3)*	12	(-6.8 ± 53.9)E -1 *(0/ 1)*	(-1.2 ± .5)E 1 *(0/ 1)*
CS-137 (4) (0)		(2.7 ± 3.6)E 0 (-2.9 - 9.3)E 0 *(0/ 3)*	13	(9.3 ± 4.6)E 0 *(0/ 1)*	(4.7 ± 3.9)E 0 *(0/ 1)*
BA-140 (4) (0)		(-1.1 ± 1.0)E 1 (-3.1 - .1)E 1 *(0/ 3)*	12	(5.7 ± 128.0)E -1 *(0/ 1)*	(-1.2 ± 1.1)E 1 *(0/ 1)*
CE-141 (4) (0)		(5.1 ± 6.8)E 0 (-7.3 - 16.1)E 0 *(0/ 3)*	13	(1.6 ± .7)E 1 *(0/ 1)*	(8.1 ± 6.7)E 0 *(0/ 1)*
CE-144 (4) (0)		(4.2 ± 3.0)E 0 (8.9 - 103.0)E -1 *(0/ 3)*	21	(1.6 ± 2.0)E 1 *(0/ 1)*	(1.6 ± 2.0)E 1 *(0/ 1)*
TH-232 (4) (0)		(1.0 ± 1.1)E 1 (-9.7 - 26.3)E 0 *(0/ 3)*	12	(2.6 ± 1.7)E 1 *(0/ 1)*	(-1.2 ± 1.8)E 1 *(0/ 1)*

* 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

H) Ground Water

Ground water grab samples were collected from three indicator and one control station on a quarterly basis. These samples were analyzed for H-3, gross-beta, and gamma-emitting radionuclides. Gross-beta radioactivity was detected in indicator and control stations during 1984 and the concentrations are typical of those made over the past few years.

No other radionuclides were detected in the 1984 ground water samples.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: GROUND WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**		
			STA. NO.	MEAN RANGE NO. DETECTED**
GR-B (16) (1)	4.	(7.3 ± 1.7)E 0 (1.3 - 17.9)E 0 *(11/ 12)*	13	(1.4 ± .2)E 1 (8.0 - 17.9)E 0 *(4/ 4)*
BE-7 (16) (0)		(-1.3 ± 19.3)E -1 (-1.2 - .9)E 1 *(0/ 12)*	11	(3.8 ± 1.7)E 0 (3.0 - 84.0)E -1 *(0/ 4)*
K-40 (16) (0)		(-1.4 ± 3.2)E 0 (-2.2 - 1.5)E 1 *(0/ 12)*	21	(3.1 ± 12.1)E 0 (-2.6 - 2.5)E 1 *(0/ 4)*
MN-54 (16) (0)	15.	(2.0 ± 1.6)E -1 (-8.5 - 10.5)E -1 *(0/ 12)*	13	(7.6 ± 1.0)E -1 (6.2 - 10.5)E -1 *(0/ 4)*
CO-58 (16) (0)	15.	(-3.9 ± 3.0)E -1 (-2.0 - 1.1)E 0 *(0/ 12)*	13	(-6.4 ± 70.6)E -2 (-2.0 - 1.1)E 0 *(0/ 4)*
CO-60 (16) (0)	15.	(-3.2 ± 2.6)E -1 (-2.0 - 1.0)E 0 *(0/ 12)*	21	(3.1 ± 6.4)E -1 (-7.9 - 17.4)E -1 *(0/ 4)*
ZN-65 (16) (0)	30.	(1.1 ± .3)E 0 (-5.9 - 29.4)E -1 *(0/ 12)*	13	(1.1 ± .8)E 0 (-5.9 - 29.4)E -1 *(0/ 4)*
ZR-95 (16) (0)	30.	(-1.6 ± 4.1)E -1 (-2.4 - 2.0)E 0 *(0/ 12)*	12	(3.8 ± 6.7)E -1 (-1.1 - 1.9)E 0 *(0/ 4)*
RU-103 (16) (0)		(-1.1 ± .1)E 0 (-1.9 - -.4)E 0 *(0/ 12)*	21	(-6.3 ± 2.5)E -1 (-1.1 - .1)E 0 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: GROUND WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
RU-106 (16) (0)		(-7.2 ± 21.3)E -1 (-1.1 - 1.2)E 1 *(0/ 12)*	12	(1.6 ± 40.5)E -1 (-5.3 - 12.2)E 0 *(0/ 4)*	(-6.6 ± 13.1)E -1 (-3.6 - 2.8)E 0 *(0/ 4)*
I-131 (16) (0)	1.	(-7.0 ± 10.7)E -1 (-7.5 - 3.9)E 0 *(0/ 12)*	12	(2.5 ± 2547.1)E -3 (-7.5 - 3.9)E 0 *(0/ 4)*	(-1.8 ± .6)E 0 (-2.6 - .1)E 0 *(0/ 4)*
CS-134 (16) (0)	15.	(-2.0 ± 1.7)E -1 (-1.5 - .5)E 0 *(0/ 12)*	13	(1.2 ± 1.5)E -1 (-1.6 - 4.7)E -1 *(0/ 4)*	(-3.5 ± 2.7)E -1 (-1.1 - .2)E 0 *(0/ 4)*
CS-137 (16) (0)	18.	(-2.4 ± 34.1)E -2 (-1.9 - 1.4)E 0 *(0/ 12)*	12	(6.8 ± 2.8)E -1 (1.7 - 13.2)E -1 *(0/ 4)*	(-2.5 ± 4.4)E -1 (-1.4 - .6)E 0 *(0/ 4)*
BA-140 (16) (0)	60.	(-1.1 ± .5)E 0 (-4.4 - 1.3)E 0 *(0/ 12)*	21	(-3.2 ± 13.7)E -1 (-2.6 - 3.2)E 0 *(0/ 4)*	(-3.2 ± 13.7)E -1 (-2.6 - 3.2)E 0 *(0/ 4)*
CE-141 (16) (0)		(3.4 ± 4.0)E -1 (-3.5 - 2.0)E 0 *(0/ 12)*	11	(9.1 ± 2.1)E -1 (3.3 - 13.3)E -1 *(0/ 4)*	(-1.1 ± .4)E 0 (-1.8 - -.2)E 0 *(0/ 4)*
CE-144 (16) (0)		(4.1 ± 14.5)E -1 (-6.7 - 11.3)E 0 *(0/ 12)*	11	(4.9 ± 2.5)E 0 (3.4 - 113.0)E -1 *(0/ 4)*	(-3.3 ± 1.2)E 0 (-6.3 - -.5)E 0 *(0/ 4)*
RA-226 (4) (0)		(2.5 ± .5)E -1 (1.6 - 3.4)E -1 *(0/ 3)*	11	(3.4 ± 1.8)E -1 *(0/ 1)*	(2.7 ± 1.6)E -1 *(0/ 1)*
TH-232 (16) (0)		(5.2 ± 9.7)E -1 (-6.8 - 4.9)E 0 *(0/ 12)*	11	(2.3 ± .6)E 0 (8.3 - 37.0)E -1 *(0/ 4)*	(1.6 ± 1.4)E 0 (-1.0 - 5.5)E 0 *(0/ 4)*
H-3 (16) (0)	2000.	(1.5 ± .4)E 2 (-1.1 - 4.1)E 2 *(0/ 12)*	11	(1.9 ± .8)E 2 (-1.1 - 36.3)E 1 *(0/ 4)*	(9.0 ± 4.3)E 1 (0.0 - 2.0)E 2 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

I) River Water

River water is analyzed monthly for gross-beta and gamma-emitting radionuclides. The monthly samples are composited and analyzed for H-3 on a quarterly basis. A composite sampler is used at Station WR-11 and grab samples are taken at the other two stations.

Gross-beta radioactivity was detected in all but four samples during 1984. The mean value, as well as the range of values, for the indicator stations was similar to that of the control station, indicating that those radionuclides detected are not due to plant operations.

Tritium (H-3) was detected in one sample from Station WR-11 (420 ± 140 pCi/kg). This concentration is marginally detectable, and will in any case have no impact on man since the river water is used neither for drinking water or irrigation. It is unlikely that the radioactivity could have originated from the plant, since there were no liquid effluents released during 1984.

No other radionuclides were detected in the 1984 river water samples.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: RIVER WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
CR-B (36) (0)	4.	(2.0 ± .1)E 0 (8.3 - 30.0)E -1 *(21/ 24)*	12 (2.2 ± .2)E 0 (1.6 - 3.0)E 0 *(12/ 12)*	(2.0 ± .2)E 0 (7.1 - 33.8)E -1 *(11/ 12)*
BE-7 (36) (0)		(-1.3 ± 15.0)E -1 (-1.4 - 1.7)E 1 *(0/ 24)*	21 (4.1 ± 2.0)E 0 (-9.3 - 15.0)E 0 *(0/ 12)*	(4.1 ± 2.0)E 0 (-9.3 - 15.0)E 0 *(0/ 12)*
K-40 (36) (0)		(-2.3 ± 2.5)E 0 (-3.1 - 1.5)E 1 *(0/ 24)*	12 (2.8 ± 2.2)E 0 (-1.3 - 1.5)E 1 *(0/ 12)*	(-2.7 ± 3.5)E 0 (-2.6 - 1.4)E 1 *(0/ 12)*
MN-54 (36) (0)	15.	(-6.9 ± 18.5)E -2 (-2.1 - 1.6)E 0 *(0/ 24)*	12 (2.0 ± 1.9)E -1 (-1.1 - 1.4)E 0 *(0/ 12)*	(9.8 ± 203.6)E -3 (-1.5 - 1.1)E 0 *(0/ 12)*
CO-58 (36) (0)	15.	(-5.4 ± 1.8)E -1 (-2.2 - 1.0)E 0 *(0/ 24)*	21 (-2.9 ± 2.3)E -1 (-2.1 - .6)E 0 *(0/ 12)*	(-2.9 ± 2.3)E -1 (-2.1 - .6)E 0 *(0/ 12)*
CU-60 (36) (0)	15.	(-5.2 ± 2.1)E -1 (-2.3 - 1.5)E 0 *(0/ 24)*	11 (-3.8 ± 3.1)E -1 (-2.1 - 1.3)E 0 *(0/ 12)*	(-4.3 ± 2.7)E -1 (-2.4 - 1.0)E 0 *(0/ 12)*
ZN-65 (36) (0)	30.	(4.7 ± 34.7)E -2 (-4.2 - 3.5)E 0 *(0/ 24)*	12 (2.8 ± 5.9)E -1 (-4.2 - 3.5)E 0 *(0/ 12)*	(-9.5 ± 4.2)E -1 (-3.6 - 1.6)E 0 *(0/ 12)*
ZR-95 (36) (0)	30.	(-1.6 ± 2.7)E -1 (-3.4 - 2.1)E 0 *(0/ 24)*	12 (-9.6 ± 29.4)E -2 (-1.7 - 1.1)E 0 *(0/ 12)*	(-5.5 ± 6.2)E -1 (-3.9 - 4.6)E 0 *(0/ 12)*
RU-103 (36) (0)		(-1.1 ± .1)E 0 (-2.7 - .8)E 0 *(0/ 24)*	11 (-8.3 ± 2.1)E -1 (-1.8 - .8)E 0 *(0/ 12)*	(-1.1 ± .4)E 0 (-3.7 - .5)E 0 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: RIVER WATER

UNITS: PCI/KG

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
RU-106 (36) (0)		(-4.3 ± 1.2)E 0 (-1.8 - .5)E 1 *(0/ 24)*	21	(2.6 ± 21.7)E -1 (-1.8 - 1.2)E 1 *(0/ 12)*	(2.6 ± 21.7)E -1 (-1.8 - 1.2)E 1 *(0/ 12)*
I-131 (36) (0)		(1.4 ± .5)E 0 (-1.8 - 9.4)E 0 *(0/ 24)*	11	(1.6 ± .9)E 0 (-1.8 - 9.4)E 0 *(0/ 12)*	(-6.2 ± 7.8)E -1 (-6.4 - 3.4)E 0 *(0/ 12)*
CS-134 (36) (0)	15.	(-3.2 ± 1.6)E -1 (-2.3 - 1.0)E 0 *(0/ 24)*	12	(-2.7 ± 2.6)E -1 (-1.7 - 1.0)E 0 *(0/ 12)*	(-9.5 ± 3.0)E -1 (-2.5 - 1.0)E 0 *(0/ 12)*
CS-137 (36) (0)	18.	(-1.4 ± 1.7)E -1 (-1.8 - 1.2)E 0 *(0/ 24)*	12	(1.4 ± 20.1)E -2 (-1.1 - .9)E 0 *(0/ 12)*	(-5.1 ± 17.3)E -2 (-1.1 - .6)E 0 *(0/ 12)*
BA-140 (36) (0)	60.	(-4.4 ± 5.0)E -1 (-5.9 - 4.7)E 0 *(0/ 24)*	11	(-5.9 ± 76.4)E -2 (-4.2 - 4.7)E 0 *(0/ 12)*	(-5.1 ± 4.4)E -1 (-2.7 - 1.4)E 0 *(0/ 12)*
CE-141 (36) (0)		(1.5 ± 3.2)E -1 (-3.1 - 3.4)E 0 *(0/ 24)*	21	(4.2 ± 4.5)E -1 (-2.5 - 2.6)E 0 *(0/ 12)*	(4.2 ± 4.5)E -1 (-2.5 - 2.6)E 0 *(0/ 12)*
CF-144 (36) (0)		(-8.0 ± 10.7)E -1 (-10. - 11.2)E 0 *(0/ 24)*	11	(-3.9 ± 13.4)E -1 (-10. - 7.9)E 0 *(0/ 12)*	(-1.5 ± 1.4)E 0 (-7.9 - 4.9)E 0 *(0/ 12)*
TH-232 (36) (0)		(7.3 ± 6.0)E -1 (-4.3 - 8.7)E 0 *(0/ 24)*	11	(1.9 ± .8)E 0 (-2.2 - 8.7)E 0 *(0/ 12)*	(-6.1 ± 7.7)E -1 (-4.3 - 4.1)E 0 *(0/ 12)*
H-3 (12) (1)	2000.	(6.8 ± 7.1)E 1 (-2.2 - 4.2)E 2 *(1/ 8)*	11	(1.3 ± 1.4)E 2 (-2.2 - 4.2)E 2 *(1/ 4)*	(3.7 ± 10.0)E 1 (-2.4 - 2.3)E 2 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

J) Aquatic Vegetation

Twice during 1984, cattail samples were collected from one indicator and one control location. Each sample was analyzed for gamma-emitting radionuclides. Other than naturally-occurring K-40 and Be-7, no radionuclides were detected.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: AQUATIC VEGETATION

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STA. NO.	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**		MEAN RANGE NO. DETECTED**	
BE-7 (4) (0)		(2.6 ± 1.9)E 2 (6.6 - 44.9)E 1 *(1/ 2)*	11	(2.6 ± 1.9)E 2 (6.6 - 44.9)E 1 *(1/ 2)*	(2.5 ± 2.2)E 2 (2.6 - 46.9)E 1 *(1/ 2)*
K-40 (4) (0)		(2.6 ± 1.0)E 3 (1.6 - 3.6)E 3 *(2/ 2)*	21	(4.4 ± 1.1)E 3 (3.3 - 5.6)E 3 *(2/ 2)*	(4.4 ± 1.1)E 3 (3.3 - 5.6)E 3 *(2/ 2)*
MN-54 (4) (0)		(-3.9 ± 7.6)E 0 (-1.1 - .4)E 1 *(0/ 2)*	11	(-3.9 ± 7.6)E 0 (-1.1 - .4)E 1 *(0/ 2)*	(-1.2 ± 1.4)E 1 (-2.6 - .2)E 1 *(0/ 2)*
CO-58 (4) (0)		(5.9 ± 1.0)E 0 (4.9 - 6.9)E 0 *(0/ 2)*	21	(2.1 ± .7)E 1 (1.4 - 2.8)E 1 *(0/ 2)*	(2.1 ± .7)E 1 (1.4 - 2.8)E 1 *(0/ 2)*
CO-60 (4) (0)		(-6.6 ± 7.2)E 0 (-1.4 - .1)E 1 *(0/ 2)*	11	(-6.6 ± 7.2)E 0 (-1.4 - .1)E 1 *(0/ 2)*	(-1.5 ± 1.0)E 1 (-2.5 - -.5)E 1 *(0/ 2)*
ZN-65 (4) (0)		(1.4 ± 23.2)E 0 (-2.2 - 2.5)E 1 *(0/ 2)*	11	(1.4 ± 23.2)E 0 (-2.2 - 2.5)E 1 *(0/ 2)*	(5.2 ± 83.3)E -1 (-7.8 - 8.9)E 0 *(0/ 2)*
ZR-95 (4) (0)		(-1.3 ± .3)E 1 (-1.7 - -1.0)E 1 *(0/ 2)*	21	(2.4 ± 4.9)E 0 (-2.5 - 7.3)E 0 *(0/ 2)*	(2.4 ± 4.9)E 0 (-2.5 - 7.3)E 0 *(0/ 2)*
RU-103 (4) (0)		(-3.9 ± 13.0)E -1 (-1.7 - .9)E 0 *(0/ 2)*	21	(7.9 ± 17.7)E 0 (-9.9 - 25.6)E 0 *(0/ 2)*	(7.9 ± 17.7)E 0 (-9.9 - 25.6)E 0 *(0/ 2)*
RU-106 (4) (0)		(2.3 ± 4.0)E 1 (-1.6 - 6.3)E 1 *(0/ 2)*	11	(2.3 ± 4.0)E 1 (-1.6 - 6.3)E 1 *(0/ 2)*	(-6.1 ± 11.7)E 1 (-1.8 - .6)E 2 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: AQUATIC VEGETATION

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**		
			MEAN RANGE STA. NO. NO. DETECTED**	MEAN RANGE NO. DETECTED**
I-131 (4) (0)		(2.0 ± 3.7)E 1 (-1.7 - 5.7)E 1 *(0/ 2)*	11 (2.0 ± 3.7)E 1 (-1.7 - 5.7)E 1 *(0/ 2)*	(-1.0 ± 4.7)E 1 (-5.7 - 3.7)E 1 *(0/ 2)*
CS-134 (4) (0)		(-6.3 ± 9.7)E 0 (-1.6 - .3)E 1 *(0/ 2)*	11 (-6.3 ± 9.7)E 0 (-1.6 - .3)E 1 *(0/ 2)*	(-9.2 ± .2)E 0 (-9.4 - -9.0)E 0 *(0/ 2)*
CS-137 (4) (0)		(8.8 ± 9.0)E 0 (-1.7 - 178.0)E -1 *(0/ 2)*	11 (8.8 ± 9.0)E 0 (-1.7 - 178.0)E -1 *(0/ 2)*	(-4.3 ± 2.1)E -1 (-6.4 - -2.2)E -1 *(0/ 2)*
BA-140 (4) (0)		(-4.8 ± 6.7)E 1 (-1.1 - .2)E 2 *(0/ 2)*	21 (1.5 ± 107.5)E -1 (-1.1 - 1.1)E 1 *(0/ 2)*	(1.5 ± 107.5)E -1 (-1.1 - 1.1)E 1 *(0/ 2)*
CE-141 (4) (0)		(3.0 ± .7)E 1 (2.2 - 3.7)E 1 *(0/ 2)*	11 (3.0 ± .7)E 1 (2.2 - 3.7)E 1 *(0/ 2)*	(2.5 ± 3.1)E 1 (-6.6 - 56.4)E 0 *(0/ 2)*
CE-144 (4) (0)		(-5.9 ± 2.8)E 1 (-8.7 - -3.1)E 1 *(0/ 2)*	21 (-4.2 ± 8.0)E 1 (-1.2 - .4)E 2 *(0/ 2)*	(-4.2 ± 8.0)E 1 (-1.2 - .4)E 2 *(0/ 2)*
TH-232 (4) (0)		(-6.6 ± 8.6)E 0 (-1.5 - .2)E 1 *(0/ 2)*	21 (1.2 ± 1.4)E 1 (-1.5 - 26.4)E 0 *(0/ 2)*	(1.2 ± 1.4)E 1 (-1.5 - 26.4)E 0 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

K) Sediment

During 1984, sediment samples were collected from three locations in June and October. Each sample was analyzed for gamma-emitting radionuclides.

Cesium-137 was detected in all samples. As has been discussed in previous Vermont Yankee Radiological Environmental Surveillance Reports, this radioactivity has been due to nuclear weapons testing fallout. Since there were no liquid releases during 1982, 1983, or 1984, it can be concluded that the lower levels of Cs-137 in 1984 sediment samples were due also to nuclear weapons testing fallout. This is further supported by the fact that the highest levels were detected at Station Se-21, a control station.

Except for naturally-occurring Be-7, K-40, and Th-232, and the Cs-137 discussed above, no radionuclides were detected in sediment samples during 1984.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: SEDIMENT

UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	MEAN RANGE STA. NO. NO. DETECTED**	MEAN RANGE NO. DETECTED**
BE-7 (6) (1)		(4.5 ± 5.8)E 1 (-9.9 - 18.0)E 1 *(1/ 4)*	11 (9.9 ± 8.1)E 1 (1.7 - 18.0)E 1 *(1/ 2)*	(5.4 ± 6.6)E 1 (-1.2 - 12.0)E 1 *(0/ 2)*
K-40 (6) (0)		(10.0 ± .9)E 3 (7.8 - 11.8)E 3 *(4/ 4)*	11 (1.1 ± .1)E 4 (9.4 - 11.8)E 3 *(2/ 2)*	(8.8 ± .0)E 3 (8.8 - 8.8)E 3 *(2/ 2)*
MN-54 (6) (0)		(-1.6 ± .3)E 1 (-2.4 - -1.1)E 1 *(0/ 4)*	21 (-4.5 ± 6.6)E 0 (-1.1 - .2)E 1 *(0/ 2)*	(-4.5 ± 6.6)E 0 (-1.1 - .2)E 1 *(0/ 2)*
CO-58 (6) (0)		(-4.2 ± 4.9)E 0 (-1.3 - .9)E 1 *(0/ 4)*	12 (-2.2 ± 11.0)E 0 (-1.3 - .9)E 1 *(0/ 2)*	(-1.1 ± .3)E 1 (-1.4 - -.8)E 1 *(0/ 2)*
CO-60 (6) (0)		(-3.6 ± 3.8)E 0 (-9.8 - 6.9)E 0 *(0/ 4)*	21 (4.0 ± 4.1)E 0 (-9.5 - 815.0)E -2 *(0/ 2)*	(4.0 ± 4.1)E 0 (-9.5 - 815.0)E -2 *(0/ 2)*
ZN-65 (6) (0)		(2.0 ± 9.1)E 0 (-2.2 - 2.2)E 1 *(0/ 4)*	11 (1.3 ± .9)E 1 (3.6 - 22.2)E 0 *(0/ 2)*	(4.6 ± 10.2)E 0 (-5.5 - 14.8)E 0 *(0/ 2)*
ZR-95 (6) (0)		(-2.3 ± 7.0)E 0 (-1.9 - 1.0)E 1 *(0/ 4)*	21 (3.5 ± 1.6)E 1 (1.8 - 5.1)E 1 *(0/ 2)*	(3.5 ± 1.6)E 1 (1.8 - 5.1)E 1 *(0/ 2)*
RU-103 (6) (0)		(2.2 ± 8.2)E 0 (-2.2 - 1.3)E 1 *(0/ 4)*	11 (9.6 ± 3.4)E 0 (6.1 - 13.0)E 0 *(0/ 2)*	(2.5 ± 3.5)E 0 (-9.8 - 60.6)E -1 *(0/ 2)*
RU-106 (6) (0)		(1.8 ± 1.5)E 1 (-1.2 - 5.9)E 1 *(0/ 4)*	12 (3.9 ± 2.0)E 1 (1.9 - 5.9)E 1 *(0/ 2)*	(-2.5 ± 5.8)E 1 (-8.3 - 3.3)E 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: SEDIMENT

UNITS: PCI/KG DRY

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STA. NO.	STATION WITH HIGHEST MEAN *****	CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**		MEAN RANGE NO. DETECTED**	
I-131 (6) (0)		(-1.5 ± 1.2)E 2 (-4.8 - .4)E 2 *(0/ 4)*	11	(-5.7 ± 9.3)E 1 (-1.5 - .4)E 2 *(0/ 2)*	(-5.8 ± 2.9)E 1 (-8.6 - -2.9)E 1 *(0/ 2)*
CS-134 (6) (0)	150.	(1.9 ± 4.1)E 0 (-4.8 - 13.9)E 0 *(0/ 4)*	12	(6.8 ± 7.1)E 0 (-2.8 - 139.0)E -1 *(0/ 2)*	(-8.0 ± 7.7)E 0 (-1.6 - -.0)E 1 *(0/ 2)*
CS-137 (6) (0)	180.	(8.0 ± 1.9)E 1 (3.7 - 11.9)E 1 *(4/ 4)*	21	(1.2 ± 0.0)E 2 *(2/ 2)*	(1.2 ± 0.0)E 2 *(2/ 2)*
BA-140 (6) (0)		(-1.4 ± 5.1)E 1 (-9.7 - 13.6)E 1 *(0/ 4)*	12	(4.4 ± 9.2)E 1 (-4.8 - 13.6)E 1 *(0/ 2)*	(-8.9 ± 1.5)E 1 (-1.0 - -7.7)E 2 *(0/ 2)*
CE-141 (6) (0)		(2.0 ± .5)E 1 (1.1 - 3.4)E 1 *(0/ 4)*	11	(2.2 ± 1.1)E 1 (1.1 - 3.4)E 1 *(0/ 2)*	(-1.6 ± 45.3)E -1 (-4.7 - 4.4)E 0 *(0/ 2)*
CE-144 (6) (0)		(-4.3 ± 1.8)E 1 (-7.7 - .6)E 1 *(0/ 4)*	21	(-6.6 ± 12.7)E 0 (-1.9 - .6)E 1 *(0/ 2)*	(-6.6 ± 12.7)E 0 (-1.9 - .6)E 1 *(0/ 2)*
TH-232 (6) (0)		(4.9 ± .4)E 2 (3.8 - 5.9)E 2 *(4/ 4)*	11	(5.5 ± .4)E 2 (5.1 - 5.9)E 2 *(2/ 2)*	(5.2 ± .2)E 2 (5.0 - 5.4)E 2 *(2/ 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

L) Finfish

Twice during 1984, finfish samples were collected from each of three locations. Each sample consisted of mixed freshwater species. All were analyzed for gamma-emitting radionuclides. Cesium-137 was detected in four of the six samples collected. As can be seen in the following data table, the mean and range for indicator stations are lower than those for the control stations, indicating that the radioactivity is not due to plant operations but to nuclear weapons testing fallout. The levels are lower than those detected in 1983, and are consistent with well documented environmental levels. No other radionuclides were detected except for naturally-occurring K-40.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: FISH

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
BE-7 (6) (0)		(6.6 ± 2.3)E 1 (5.9 - 118.0)E 0 *(0/ 4)*	11	(7.0 ± .2)E 1 (6.8 - 7.3)E 1 *(0/ 2)*	(-6.7 ± 6.1)E 1 (-1.3 - -.1)E 2 *(0/ 2)*
K-40 (6) (0)		(3.0 ± .2)E 3 (2.5 - 3.5)E 3 *(4/ 4)*	21	(3.5 ± .3)E 3 (3.2 - 3.7)E 3 *(2/ 2)*	(3.5 ± .3)E 3 (3.2 - 3.7)E 3 *(2/ 2)*
MN-54 (6) (0)	130.	(-2.6 ± 1.4)E 0 (-6.1 - .8)E 0 *(0/ 4)*	12	(-5.7 ± 13.9)E -1 (-2.0 - .8)E 0 *(0/ 2)*	(-3.0 ± 6.7)E 0 (-9.7 - 3.8)E 0 *(0/ 2)*
CO-58 (6) (0)	130.	(3.1 ± 2.7)E 0 (-3.4 - 9.0)E 0 *(0/ 4)*	12	(3.4 ± 2.4)E 0 (1.0 - 5.8)E 0 *(0/ 2)*	(2.8 ± 4.0)E 0 (-1.2 - 6.7)E 0 *(0/ 2)*
CO-60 (6) (0)	130.	(3.8 ± 11.3)E 0 (-1.5 - 3.7)E 1 *(0/ 4)*	21	(2.2 ± .7)E 1 (1.4 - 2.9)E 1 *(0/ 2)*	(2.2 ± .7)E 1 (1.4 - 2.9)E 1 *(0/ 2)*
ZN-65 (6) (0)	260.	(8.9 ± 16.6)E 0 (-2.1 - 4.3)E 1 *(0/ 4)*	21	(2.0 ± .1)E 1 (1.8 - 2.1)E 1 *(0/ 2)*	(2.0 ± .1)E 1 (1.8 - 2.1)E 1 *(0/ 2)*
ZR-95 (6) (0)		(1.2 ± .6)E 1 (-2.6 - 25.5)E 0 *(0/ 4)*	12	(1.8 ± .7)E 1 (1.1 - 2.6)E 1 *(0/ 2)*	(5.9 ± 6.3)E 0 (-4.2 - 122.0)E -1 *(0/ 2)*
RU-103 (6) (0)		(1.0 ± .4)E 1 (3.2 - 19.8)E 0 *(0/ 4)*	11	(1.5 ± .5)E 1 (9.8 - 19.8)E 0 *(0/ 2)*	(-1.7 ± 14.6)E 0 (-1.6 - 1.3)E 1 *(0/ 2)*
RU-106 (6) (0)		(8.9 ± 23.1)E 0 (-3.6 - 6.2)E 1 *(0/ 4)*	12	(4.7 ± 1.4)E 1 (3.3 - 6.2)E 1 *(0/ 2)*	(-7.7 ± 3.4)E 1 (-1.1 - -.4)E 2 *(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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

ENVIRONMENTAL RADIOLOGICAL PROGRAM SUMMARY
VERMONT YANKEE NUCLEAR POWER STATION, VERNON, VT
JANUARY - DECEMBER 1984

MEDIUM: FINFISH

UNITS: PCI/KG WET

RADIONUCLIDES (NO. ANALYSES) (NON-ROUTINE)*	REQUIRED LLD	INDICATOR STATIONS *****	STATION WITH HIGHEST MEAN *****		CONTROL STATIONS *****
		MEAN RANGE NO. DETECTED**	STA. NO.	MEAN RANGE NO. DETECTED**	MEAN RANGE NO. DETECTED**
I-131 (6) (0)		(1.1 ± .4)E 1 (4.6 - 21.1)E 0 *(0/ 4)*	21	(2.2 ± 1.9)E 1 (3.2 - 41.7)E 0 *(0/ 2)*	(2.2 ± 1.9)E 1 (3.2 - 41.7)E 0 *(0/ 2)*
CS-134 (6) (0)	130.	(3.4 ± 6.1)E 0 (-6.8 - 20.8)E 0 *(0/ 4)*	12	(7.0 ± 13.8)E 0 (-6.8 - 20.8)E 0 *(0/ 2)*	(-3.7 ± 2.2)E 0 (-5.9 - -1.5)E 0 *(0/ 2)*
CS-137 (6) (0)	150.	(2.5 ± .6)E 1 (1.8 - 4.2)E 1 *(2/ 4)*	21	(6.4 ± 2.3)E 1 (4.1 - 8.6)E 1 *(2/ 2)*	(6.4 ± 2.3)E 1 (4.1 - 8.6)E 1 *(2/ 2)*
BA-140 (6) (0)		(-1.9 ± .9)E 1 (-3.0 - .7)E 1 *(0/ 4)*	21	(2.4 ± 6.8)E 0 (-4.4 - 9.2)E 0 *(0/ 2)*	(2.4 ± 6.8)E 0 (-4.4 - 9.2)E 0 *(0/ 2)*
CE-141 (6) (0)		(-5.2 ± 3.4)E 0 (-1.5 - .1)E 1 *(0/ 4)*	12	(-8.0 ± 20.8)E -1 (-2.9 - 1.3)E 0 *(0/ 2)*	(-4.5 ± 3.7)E 0 (-8.2 - -.9)E 0 *(0/ 2)*
CE-144 (6) (0)		(5.9 ± 16.6)E 0 (-3.0 - 3.5)E 1 *(0/ 4)*	12	(9.3 ± 24.2)E 0 (-1.5 - 3.4)E 1 *(0/ 2)*	(-1.6 ± 4.5)E 1 (-6.1 - 2.9)E 1 *(0/ 2)*
TH-232 (6) (0)		(6.7 ± 14.1)E 0 (-3.5 - 2.3)E 1 *(0/ 4)*	12	(2.0 ± .2)E 1 (1.8 - 2.3)E 1 *(0/ 2)*	(6.4 ± 19.0)E 0 (-1.3 - 2.5)E 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. >3 STD DEVIATIONS) IS INDICATED WITH *()*.

M) Direct Radiation

Direct gamma radiation exposure was determined from the use of thermoluminescent dosimeters (TLDs). Two $\text{CaF}_2:\text{Mn}$ TLDs were placed at each of the monitoring stations. The dosimeters at eighteen indicator stations and three control stations were collected and read out on a monthly schedule.

During August of 1984, the TLD reader was forced to be taken out of service for repairs. The manufacturer returned the repaired reader in October. Consequently, the field cycle for the TLDs placed in the field on July 27 was extended through October 15. The following field cycle was shortened (October 15 to November 6) to put the program back on the regular schedule. The TLDs from these two field cycles were read out at a higher voltage setting recommended by the manufacturer. Subsequent calibrations (with a Co-60 source), along with communication with the manufacturer led to the conclusion that the TLD data from the above-mentioned field cycles were 28% high and that the high voltage setting should be changed. Consequently, that data was reduced by 28 percent to estimate the true exposure for the period.

Three TLD badges were lost (apparently stolen while in the field) during 1984. These badges were from Station GM 1.13 (July) and GM 1.14 (March and August). Annual average exposure rates for the respective stations were assumed during the periods in question.

Summaries of the results for 1984 can be seen in the table below. Annual average exposure rates are given for each station in Table 3.1.

Environmental Radiological Program Summary
Vermont Yankee Nuclear Power Station, Vernon, Vermont
January - December 1984

Medium: Direct Radiation
Measurements (TLD)

Units: Micro-R per
Hour

<u>Indicator Stations **</u>	<u>Site Boundary Stations</u>		<u>Station With Highest Mean</u>	<u>Control Stations</u>
<u>Mean</u>	<u>Mean</u>		<u>Mean</u>	<u>Mean</u>
<u>Range</u>	<u>Range</u>	<u>Station</u>	<u>Range</u>	<u>Range</u>
<u>(No. Meas.)*</u>	<u>(No. Meas.)*</u>	<u>No.</u>	<u>(No. Meas.)*</u>	<u>(No. Meas.)*</u>
9.8	12.0		24.3	9.2
5.4 - 14.6	6.0 - 39.0	1.14	19.6 - 39.0	6.5 - 15.8
(77)	(118)		(11)	(33)

*Most measurements based on readings from two TLD chips.

**Does not include site boundary locations.

In Table 3.2, the annual average exposure rate for each Zone 1 station, and for all of them combined, were compared to the mean of the three Zone 2 stations for that year(s). By comparing the 1984 ratios with those from other years, it is evident that the Zone 1 ambient radiation levels have not changed significantly over the last six years with respect to the Zone 2 levels. This approach was used to eliminate any influence from global or regional changes in ambient radiation levels or from changes in the performance of the TLD system. Zone 1 site boundary stations were not included in the comparison since they are on-site locations and are subject to plant-related variations that could obscure seasonal or annual trends.

Table 3.1

Vermont Yankee
Summary of Direct Radiation Measurements, 1984

<u>Station</u>	<u>Description</u>	<u>Zone</u>	<u>Micro-R Per Hour*</u>
GM-1.0	Hinsdale, NH	1	9.7
GM-1.1	N. Hinsdale, NH	1	8.7
GM-1.2	Hinsdale Sub.	1	10.2
GM-1.3	River Sta. No. 3.3	1	9.1
GM-1.4	Fairman Road	1	10.2
GM-1.5	Tyler Hill	1	10.5
GM-1.6	Site Boundary	1	10.0
GM-1.7	Site Boundary	1	9.6
GM-1.8	Site Boundary	1	10.7
GM-1.9	Site Boundary	1	11.2
GM-1.10	Site Boundary	1	10.4
GM-1.11	Site Boundary	1	9.9
GM-1.12	Site Boundary	1	10.2
GM-1.13	Site Boundary	1	12.2
GM-1.14	Site Boundary	1	24.3
GM-1.15	Site Boundary	1	12.8
GM-1.16	Site Boundary	1	10.4
GM-1.17	Vernon School	1	9.9
GM-2.1	Hogback Mt.	2	9.0
GM-2.2	Spofford Lake	2	9.7
GM-2.3	Northfield, MA	2	9.0

*Annual average exposure rate.

Table 3.2

Vermont Yankee
Ratio* of Zone 1** to Zone 2 Exposures

<u>Station</u>	<u>Description</u>	<u>1984 Ratio</u>	<u>1983 Ratio</u>	<u>1982 Ratio</u>	<u>1978-82 Ratio</u>
GM-1.0	Hinsdale, NH	1.05	1.04	1.05	1.04
GM-1.1	N. Hinsdale, NH	0.95	1.02	1.02	1.00
GM-1.2	Hinsdale Sub.	1.11	1.09	1.09	1.10
GM-1.3	River Sta. No. 3.3	0.98	1.00	1.03	1.05
GM-1.4	Fairman Road	1.10	1.03	1.09	1.08
GM-1.5	Tyler Hill	1.14	1.08	1.08	1.08
GM-1.17	Vernon School	1.04	1.06	1.08	1.10
All Zone 1** stations		1.05	1.05	1.06	1.06

*Ratio of the annual average direct radiation exposure for a station to the mean of the Zone 2 (control) stations for that year.

**Site boundary stations were not included.

N) Soil

During September 1984, soil at 14 locations was analyzed for gamma emitting radionuclides in accordance with Vermont Yankee's Technical Specifications. In situ measurements involving both a high purity germanium (HPGe) detector and a high pressure ionization chamber (PIC) were performed at 13 of the sites. Core samples were taken at one of the sites for analysis at the Environmental Laboratory, as the close proximity of the plant turbine building made the in situ technique inappropriate. With the exception of this one location, the only man-made radionuclide detected in the soil analyzed was Cs-137, which is associated with fallout from atmospheric weapons testing and was detected at levels consistent with well documented environmental levels. The results of these analyses are summarized in Tables 3.3 and 3.4.

Table 3.3

Vermont Yankee Nuclear Power Station, Vernon, VT
Summary of In Situ Soil Analyses
September 1984

Exposure Rate (Micro-R Per Hour)

Location	Cs-137	K-40	Th-232	U-238	Total*
01 Fairman Road	.38 ± .01	1.6 ± .04	1.8 ± .06	.95 ± .04	8.0 ± .08
02 VT No. 32 Well	.14 ± .01	1.8 ± .04	1.8 ± .06	1.1 ± .04	8.1 ± .08
03 Rt. 9 Bridge	.06 ± .01	2.4 ± .04	2.0 ± .06	1.3 ± .04	9.1 ± .09
04 Vernon Nursing Well	.14 ± .01	2.0 ± .03	2.6 ± .07	1.4 ± .04	9.4 ± .09
05 Brattleboro Well	.29 ± .01	1.5 ± .04	1.3 ± .05	.88 ± .03	7.2 ± .07
06 N. Hinsdale, NH	.22 ± .01	1.4 ± .03	1.9 ± .06	1.4 ± .04	8.2 ± .08
07 Hinsdale, NH	.16 ± .01	2.1 ± .04	1.9 ± .06	1.2 ± .04	8.6 ± .09
08 Hinsdale Substation	.29 ± .01	1.9 ± .04	2.4 ± .07	1.4 ± .04	9.3 ± .09
09 River Cta. No. 3.3	.11 ± .01	1.8 ± .04	1.9 ± .06	1.2 ± .04	8.3 ± .08
10 Hogback Mt.	.28 ± .01	1.2 ± .03	1.4 ± .05	.74 ± .03	6.9 ± .07
11 Spofford Lake, NH	.03 ± .01	2.5 ± .05	2.8 ± .08	1.4 ± .04	10.1 ± .10
12 Northfield, MA	.31 ± .01	1.2 ± .03	1.5 ± .06	1.2 ± .04	7.8 ± .07
13 Tyler Hill	.31 ± .01	2.2 ± .05	2.7 ± .09	1.4 ± .05	10.0 ± .12
14 Plant Well	**	**	**	**	**

* Includes 3.3 uR/hr cosmic component.

** In Situ analysis not performed due to on-site location.

Table 3.4

Vermont Yankee Nuclear Power Station, Vernon, VT
Summary of In Situ Soil Analyses
September 1984

Concentration (pCi Per Kilogram)

Location	Cs-137	K-40	Th-232	U-238
01 Fairman Road	700 \pm 18	8700 \pm 200	630 \pm 23	530 \pm 21
02 VT No. 32 Well	260 \pm 11	10000 \pm 220	640 \pm 22	570 \pm 20
03 Rt. 9 Bridge	110 \pm 12	13000 \pm 250	710 \pm 23	730 \pm 23
04 Vernon Nursing Well	260 \pm 15	11000 \pm 240	940 \pm 27	760 \pm 24
05 Brattleboro Well	530 \pm 15	8400 \pm 200	470 \pm 18	460 \pm 17
06 N. Hinsdale, NH	410 \pm 17	8100 \pm 190	670 \pm 22	748 \pm 21
07 Hinsdale, NH	310 \pm 16	12000 \pm 240	690 \pm 24	640 \pm 22
08 Hinsdale Substation	530 \pm 16	11000 \pm 220	840 \pm 25	790 \pm 23
09 River Sta. No. 3.3	210 \pm 14	10000 \pm 220	670 \pm 22	630 \pm 21
10 Hogback Mt.	520 \pm 15	6600 \pm 190	490 \pm 19	410 \pm 16
11 Spofford Lake, NH	53 \pm 8	14000 \pm 260	1000 \pm 28	790 \pm 24
12 Northfield, MA	570 \pm 16	6500 \pm 180	550 \pm 21	680 \pm 20
13 Tyler Hill	560 \pm 21	12000 \pm 310	980 \pm 33	800 \pm 30
14 Plant Well*	295 \pm 18	12000 \pm 380	560 \pm 58	—

* Based on 0-2 inch segment of soil core.

4.0 QUALITY ASSURANCE PROGRAM

Three separate Quality Assurance programs were performed during 1984 to demonstrate the validity of laboratory analyses by the Yankee Atomic Environmental Laboratory (YAEL).

YAEL participates in the EPA Interlaboratory Comparison (cross-check) program for those species and matrices routinely analyzed by the laboratory. This provides an independent check of accuracy and precision of the laboratory analysis. When the results of the cross-check analysis fall outside of the control limit, an investigation is made to determine the cause of the problem and corrective measures are taken.

YAEL maintains an intralaboratory quality control program to assure the validity and reliability of the data. This program includes quality control of laboratory equipment, use of reference standards for calibration, and analysis of blank and spiked samples. The records of the quality control program are reviewed by the responsible cognizant individual, and corrective measures are taken whenever applicable.

A blind duplicate/replicate program is maintained in which samples are prepared from split or homogenous media and sent to the laboratory for analysis. The results from this blind duplicate program are used to check for precision in laboratory analyses.

EPA Interlaboratory and Intralaboratory Results

The Quality Assurance program implemented at the analytical laboratory indicated good precision and accuracy in reported values. Table 4.1 shows the results of accuracy and precision for laboratory analyses in 1984 for intralaboratory analyses, and EPA interlaboratory cross-check analyses. For accuracy, 55.2 and 84.4 percent of the results were within 5 and 10 percent of the known values, respectively, with 96.4 percent of all results falling within the laboratory criteria of 15 percent or two sigma. For precision,

82.2 and 97.2 percent of the results were within 5 and 10 percent of the mean, respectively, with 100 percent of all results meeting the laboratory criteria of 15 percent or two sigma.

The results of the EPA Interlaboratory Comparison program, when considered apart from the remainder of the Quality Assurance program, were satisfactory with respect to accuracy and precision in 1984. One-hundred seventeen samples were analyzed (air particulate filters, food, milk, and water). A total of 294 analyses were performed (beta, Sr-89, Sr-90, I-131, Ba-140, K, Cs-137, Cr-51, Co-60, Zn-65, Ru-106, Cs-134, Ra-226, Ra-228, and H-3).

Of the 294 analyses, 3 (1.0 percent) did not meet the EPA acceptance criteria for accuracy. The first two of these were beta analyses of air filters. The use of an artificially prepared matrix by EPA, for which no reference nuclide has been quoted and no background air filters have been supplied, has caused the YAEL to question the EPA's results. The problem has been well documented in the past (Reference 2). The third of these was a Sr-90 analysis of a milk sample. After a re-milk, the results were acceptable. All of the analyses met the EPA acceptance criteria for precision. Details on all of the above cases may be found in References 3 and 4.

Table 4.1

EPA Interlaboratory and Intralaboratory Results - 1984

<u>Accuracy</u>			
<u>Total Number of Samples</u>	<u>0 to 5%</u>	<u>0 to 10%</u>	<u>0 to 15%* (or within 2 sigma)</u>
868	479 (55.2%)	733 (84.4%)	837 (96.4%)
<u>Precision</u>			
<u>Total Number of Samples</u>	<u>0 to 5%</u>	<u>0 to 10%</u>	<u>0 to 15%* (or within 2 sigma)</u>
850	699 (82.2%)	826 (97.2%)	850 (100%)

*This category also contains those samples having a verified zero concentration which were analyzed and found not to contain the isotope of interest.

Blind Duplicate-Replicate Program

A total of 57 paired samples were submitted by the five participating plants for analysis during 1984. The data base used for the duplicate-replicate analysis consisted of paired measurements of 26 gamma emitting nuclides, H-3, Sr-89, Sr-90, low level I-131 and gross beta. A dual level criteria for agreement was established. If the paired measurements fall within ± 15 percent of their average value, then agreement between the measurements has been met. If the value falls outside of the ± 15 percent, then a two standard deviation range (95 percent confidence level) for duplicates and a three standard deviation range (99 percent confidence level) for replicates is established for each of the analyses. If the ranges overlap, agreement is obtained. One thousand four hundred and fifty-nine paired duplicate and replicate measurements were analyzed for 1984. A total of 99.5 percent of all measurements fell within the established criteria discussed above. The seven measurements that did not meet the criteria were measurements of TeI-132 in river water, Fe-59 in milk, Cr-51 in ground water, Cr-51 in mussel bodies, Ce-141 in milk, Co-58 in seawater, and I-131 in seawater. Each was a single measurement in a 26-radionuclide gamma spectrometry analysis. The seven duplicate measurements represent 0.5 percent of all the blind duplicate-replicate measurements made during 1984. In all of the above cases, the radionuclide in question was not present at a detectable level in the sample, and a three-standard deviation acceptance criteria was met. No trend was evident with respect to repeated failings of measurements for the above radionuclides.

5.0 LAND USE CENSUS

The Vermont Yankee Radiological Effluent Technical Specifications were implemented on April 1, 1985. Prior to this date, there was no Technical Specification requirement for a land use census. Consequently, there are no census results to report for the calendar year 1984.

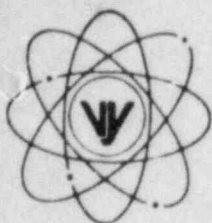
6.0 SUMMARY

During 1984, samples collected as a part of the radiological environmental monitoring program at Vermont Yankee showed detectable levels of man-made radionuclides in milk, mixed vegetation, cattle feed, river water, finfish, and sediment. In all cases, the low levels detected were shown to originate from fallout from atmospheric nuclear weapons tests. The radiological environmental monitoring program has therefore demonstrated that plant operations have had no measureable effect on the environment.

7.0 REFERENCES

1. USNRC Radiological Assessment Branch Technical Position, Revision 1, November 1979.
2. YAEL Quarterly Status Report, October-December 1983, Environmental Laboratory Group, Yankee Atomic Electric Company.
3. YAEL Quarterly Status Report, April-June 1984, Environmental Laboratory Group, Yankee Atomic Electric Company.
4. YAEL Quarterly Status Report, October-December 1984, Environmental Laboratory Group, Yankee Atomic Electric Company.

VERMONT YANKEE NUCLEAR POWER CORPORATION



RD 5, Box 169, Ferry Road, Brattleboro, VT 05301

REPLY TO:
ENGINEERING OFFICE

1671 WORCESTER ROAD
FRAMINGHAM, MASSACHUSETTS 01701
TELEPHONE 617-872-8100

April 30, 1985
FVY 85-39

United States Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, PA 19406

Attention: Dr. Thomas E. Murley
Regional Administrator

References: (a) License No. DPR-28 (Docket No. 50-271)

Subject: Vermont Yankee Annual Radiological Environmental Surveillance
Report

Dear Sir:

Enclosed please find three (3) copies of the Annual Radiological Environmental Surveillance Report for Vermont Yankee Nuclear Power Corporation, as required by our Technical Specification 6.7.C.3, Paragraph One. This report contains a summary and analysis of the radiological environmental data collected for the calendar year 1984.

Should you have any questions regarding this submittal, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

R. W. Capstick
Licensing Engineer

RWC/mep

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