Pilgrim Nuclear Power Station

Radioactive Effluent and Waste Disposal Report including Meteorological Data

January 1 through June 30, 1988

Radiological Engineering Division

Date: September 1, 1988

BOSTON EDISON
ENERGY FOR TOMORROW

PILGRIM NUCLEAR POWER STATION

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT

INCLUDING METEOROLOGICAL DATA

JANUARY 1 THROUGH JUNE 30, 1988

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INTRODUCTION

This report quantifies the radioactive gaseous, liquid, and radwaste releases, and summarizes the local meteorological data for the period from January 1, 1988 to June 30, 1988. This document has been prepared in accordance with the requirements set forth in the Pilgrim Station Technical Specifications and Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light Water Cooled Nuclear Power Plants (Rev. 1)."

Amendment No. 116 to PNPS Technical Specifications, issued May 13, 1988, modified the reporting requirements for the Semi-Annual Radioactive Effluent Release and Waste Disposal Report. The change allows for the submission of a supplement to the March 1 Semi-Annual Report (reporting period for July through December) which would include the dose assessments and the associated meteorological dispersion data for the previous year. Accordingly, the attached report does not contain the radiological impact on humans, the atmospheric dispersion factors, nor the associated percent Technical Specification limits in Tables 1A and 2A.

The quantity of radioactive material released from Pilgrim Station in this report was determined from sample analyses of gaseous releases from the main stack and the reactor building vent, and liquid releases into the discharge canal. The quantity and volume of radioactive waste which was disposed from Pilgrim Station was determined from the data contained on the radwaste shipping documentation. The meteorological data was obtained from the 200ft meteorological tower located at Pilgrim Station.

GASEOUS EFFLUENTS

The gaseous radioactive releases from January 1, 1988 to June 30, 1988 are presented and quantified in Tables 1A, 1B, and 1C. Pilgrim Station was shut down during the entire reporting period; therefore, there were no releases reported for radioactive noble gases during the period. Releases from the main stack and the reactor building vent for particulates totaled less than 0.0004 curies, and for Tritium totalled less than 0.09 curies.

LIQUID EFFLUENTS

The liquid radioactive releases from January 1, 1988 to June 30, 1988 are presented and quantified in Tables 2A and 2B. Liquid effluents into the discharge canal resulted in a total release to the environment (Cape Cod Bay) of less than 0.002 curies of fission and activation products and less than 0.3 curies of Tritium. Dissolved and entrained gases were not present since, as stated previously, Pilgrim Station was shut down during the entire reporting period. Gross alpha radioactivity was not detected.

SOLID WASTE

The solid radioactive waste that has been shipped offsite during the reporting period is described and quantified in Table 3. Approximately 35 cubic meters of solid waste was shipped offsite for burial with a total activity of approximately 17 curies (major nuclides: Co-60 and Cs-137). No irradiated components were shipped offsite.

METEOROLOGICAL DATA

The meteorological data joint frequency distributions are listed in Tables 4A-1 and 4A-2. Appendix A contains the temporal variations of delta temperature, wind direction, and wind speed that were used to generate these joint frequency distributions. There were a number of instances where the data in Appendix A was not continuous. The meteorological data recovery did not meet the criteria of 90% established by the NRC in Regulatory Guide 1.23. Corrective actions have been initiated to prevent recurrence and improve data recovery. Physical improvements to the 220 ft tower and meteorological procedure revisions were completed by the end of the second quarter. Implementation of improvements including a new power supply for the tower, a link to the Boston Edison meteorological monitoring program, and new strip chart recorders in the control room will continue throughout the year. Increased data recovery associated with these improvements should become apparent during the next reporting period.

Appendix B contains wind rose diagrams. The predominate wind direction was from the southwest which occured with a frequency of approximately twenty percent during this period. The predominate wind speed range was 12 to 19 mph, which occurred thirty-six percent of the time during this period. The predominate stability class was stability Class D which occurred about fifty percent of the time during this period. These meteorological observations are consistent with past observations for this period.

CONCLUSION

The Pilgrim Station Technical Specifications contain limiting conditions for operations and operational objectives regarding radiological environmental releases. None of the limiting conditions for operations or operational objectives associated with liquid or gaseous effluents were exceeded during this reporting period. This is based on the fact that the radioactive effluent releases for this reporting period are among the lowest of the previous reporting periods. Conformance to these technical specification design objectives assures that the releases of radioactive materials in gaseous and liquid effluents were kept as low as is reasonably achievable in accordance with the Nuclear Regulatory Commission's regulation 10CFR50, Appendix I. Furthermore, compliance, with PNPS Technical Specifications demonstrates compliance with the Environmental Protection Agency (EPA), Federal Environmental Regulation, 40CFR190.10 subpart B.

1. INTRODUCTION

This report is issued for the period January 1, to June 30, 1988 in accordance with the Pilgrim Station Technical Specifications and NRC Regulatory Guide 1.21, "Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light Water Cooled Nuclear Power Plants" (Rev 1).

Amendment No. 116 to PNPS Technical Sepcifications, issued May 13, 1988, modified the reporting requirements for the Semi-Annual Radioactive Effluent Release and Waste Disposal Report. The change allows for the submission of a supplement to the March 1 Semi-Annual Report (reporting period for July through December) which would include the dose assessments and the associated meterological dispersion data for the previous year. Accordingly, the attached report does not contain the radiological impact on humans, the atmospheric dispersion factors, nor the associated percent technical specification limits in Tables 1A and 2A.

Section 5 entitled "Offsite Dose Calculation Manual Revisions" describes the changes that were made in response to NRC questions (TAC #63012) and Boston Edison Company's internal technical review. The Pilgrim Nuclear Power Station - Offsite Dose Calculation Manual, Revision 2 is contained in Appendix C.

The minimum detectable concentration required by PNPS Technical Specifications for all environmental samples from January-June 1988 was met.

2. RADIOACTIVE EFFLUENT DATA

Radioactive liquid and gaseous releases for the period January 1 to June 30, 1988 is given in Tables 1A, 1B, 1C, 2A, 2B, and supplemental information section in the standard NRC Regulatory Guide 1.21 format (Reference 1).

There were no unplanned or non-routine releases of radioactive effluents during this reporting period.

2.1 Gaseous Effluents

Gaseous radioactivity is released from Pilgrim Station to the atmosphere from the main stack and the reactor building exhaust vent. These first and second quarter gaseous effluent releases for 1988 are summarized in Table 1A. A total of less than 0.004 curies of particulates with half-lives greater than 8 days was released at an average release rate of 2.30E-05 μCi/sec. No alpha radioactivity was detected on particulate filters during this reporting period. A total of less than 0.09 curies of Tritium was released at an average release rate of 5.56E-03 μCi/sec.

The main stack is an elevated release point with a height of approximately 400 feet above mean sea level. The main stack is located about 700 feet west northwest of the reactor building. The first and second quarter elevated releases for 1988 are shown in Table 1B. Cobalt-60 was the only isotope released with a total activity of about 2 μCi.

The reactor building exhaust vent is considered a ground level release point with a height of approximately 182 feet above mean sea level. The exhuast vent is located on the west corner of the reactor building. The ground level releases for the first and second quarters of 1988 are shown in Table 1C. Approximately 0.3 mCi of Cobalt-60 and 0.04 mCi of Cesium-137 were released.

2.2 Liquid Effluents

Liquid radioactivity is released from Pilgrim Station to the Cape Cod Bay via the circulating water discharge canal. These effluent releases enter the Cape Cod Bay at the outfall of the canal which is located about 1100 feet north from the reactor building.

The liquid releases for the first and second quarters of 1988 are summarized in Table 2A. A total of 2.57E+6 liters of radioactive liquid waste (prior to dilution) containing 2 mCi (excluding Tritium, gases, and alpha) were discharged after dilution with a total of 2.71E+09 liters of water. The liquid effluents were released at a quarterly average concentration of 8.84E-06 uCi/ml during the first and second quarters. A total of 0.3 curies of Tritium was released. No alpha radioactivity was detected during this reporting period. Quarterly release estimates and principal radionuclides in the liquid effluents are given in Table 2B.

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

Supplemental Information

January - June 1988

Facility Pilgrim Nuclear Power Station Licensee DPR-35

1. **Regulatory Limits**

   a. Fission and activation gases ≤500 mrem/yr total body and 3000 mrem/yr for skin at Site Boundary
   b. Iodines
   c. Particulates [illegible] } ≤1500 mrem/yr to any organ at Site Boundary
   d. Liquid [illegible] ≤0.06 mrem/month for total body and 0.20 mrem/month for any organ without Radwaste Treatment

2. Maximum Perm[illegible]

   [illegible] allowable release rates or concentrations
   a. [illegible]
   b. [illegible]
   c. [illegible]
   d. [illegible] 10 CFR 20, Appendix B, Table II

3. [illegible]

   Provide the average [illegible] in releases of fission and activation gases, if applicable. E = 1 Mev
   13(Qc × [illegible]) ≤ 1

4. Measurements and [illegible] Radioactivity

   Provide the methods used to [illegible] approximate the total radioactivity in effluents and the methods used to determine radionuclide composition.

   a. Fission and activation gases
   b. Iodines
   c. Particulates
   d. Liquid effluents

   } GeLi Isotopic Analysis

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	78	
2. Total time period for batch releases	5825 min or 97.08 hrs	
3. Maximum time period for a batch release	385 min or 6.42 hrs	
4. Average time period for batch releases	74 min or 1.23 hrs	
5. Minimum time period for a batch release	15 min or .25 hrs	
6. Average stream flow during periods of release of effluent into a flowing stream		1.23E5 GPM

   b. **Gaseous (Not Applicable)**

6. **Abnormal Releases**

   a. Liquid - N/A
   b. Gaseous - N/A

TABLE 1A
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1988)
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
January ~ June 1988

	Unit	1st Quarter 1988	2nd Quarter 1988	Est. Total Error, %
A. Fission and activation gases				
1. Total release	Ci	*	*	*
2. Average release rate for period	μCi/sec	*	*	
3. Percent of Technical Specification limit	%	*	*	
B. Iodines				
1. Total iodine-131	Ci	NDA	NDA	30
2. Average release rate for period	μCi/sec	NDA	NDA	
3. Percent of Technical Specification limit	%	-	-	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	3.52E-4	1.11E-5	30
2. Average release rate for period	μCi/sec	4.47E-5	1.41E-6	
3. Percent of Technical Specification limit	%	-	-	
4. Gross alpha radioactivity	Ci	< 2.45E-7	NDA	
D. Tritium				
1. Total release	Ci	5.15E-2	3.61E-2	42
2. Average release rate for period	μCi/sec	6.54E-3	4.58E-3	
3. Percent of Technical Specification limit	%	-	-	

* Plant Shutdown 1st & 2nd quarters 1988
LLD's for all isotopes listed as NDA in Section B are $< 1 \times 10^{-12}$ uci/ml
Section C are $< 1 \times 10^{-11}$ uci/ml

Percent of Technical Specification limit in Sections C.3 and D.3 to be provided in the Dose Assessment supplement to the July-December Semi-Annual Report (see PNPS Technical Specifications Section 6.9.C.1 Amendment Number 116).

TABLE 1B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1988)
GASEOUS EFFLUENTS – ELEVATED RELEASE
January - June 1988

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	1st Quarter	2nd Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	NA	NA	NA	NA
krypton-85m	Ci	NA	NA	NA	NA
krypton-87	Ci	NA	NA	NA	NA
krypton-88	Ci	NA	NA	NA	NA
xenon-133	Ci	NA	NA	NA	NA
xenon-135	Ci	NA	NA	NA	NA
xenon-135m	Ci	NA	*	NA	NA
xenon-138	Ci	NA	*	NA	NA
xenon-131m	Ci	NA	*	NA	NA
xenon-137	Ci	NA	*	NA	NA
xenon-133m	Ci	NA	*	NA	NA
Total for period	Ci	NA	*	NA	NA
2. Iodines					
iodine-131	Ci	NDA	NDA	NA	NA
iodine-133	Ci	NDA	NDA	NA	NA
iodine-135	Ci	NDA	NDA	NA	NA
Total for period	Ci	NDA	NDA	NA	NA
3. Particulates					
strontium-89	Ci	NDA	NDA	NA	NA
strontium-90	Ci	NDA	NDA	NA	NA
cesium-134	Ci	NDA	NDA	NA	NA
cesium-137	Ci	NDA	NDA	NA	NA
barium-lanthanum-140	Ci	NDA	NDA	NA	NA
chromium-51	Ci	NDA	NDA	NA	NA
manganese-54	Ci	NDA	NDA	NA	NA
cobalt-58	Ci	NDA	NDA	NA	NA
iron-59	Ci	NDA	NDA	NA	NA
cobalt-60	Ci	1.06E-6	1.01E-6	NA	NA
zinc-65	Ci	NDA	NDA	NA	NA
zirconium-niobium-95	Ci	NDA	NDA	NA	NA
cerium-141	Ci	NDA	NDA	NA	NA
cerium-144	Ci	NDA	NDA	NA	NA
ruthenium-103	Ci	NDA	NDA	NA	NA
ruthenium-106	Ci	NDA	NDA	NA	NA

See footnote on page 6

TABLE 1C
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1988)
GASEOUS EFFLUENTS - GROUND LEVEL RELEASE

January - June 1988

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	1st Quarter	2nd Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	NA	NA	NA	NA
krypton-85m	Ci	NA	NA	NA	NA
krypton-87	Ci	NA	NA	NA	NA
krypton-88	Ci	NA	NA	NA	NA
xenon-133	Ci	NA	NA	NA	NA
xenon-135	Ci	NA	NA	NA	NA
xenon-135m	Ci	NA	NA	NA	NA
xenon-138	Ci	NA	NA	NA	NA
Total for period	Ci	NA	NA	NA	NA
2. Iodines					
iodine-131	Ci	NDA	NDA	NA	NA
iodine-133	Ci	NDA	NDA	NA	NA
iodine-135	Ci	NDA	NDA	NA	NA
Total for period	Ci	NDA	NDA	NA	NA
3. Particulates					
strontium-89	Ci	NDA	NDA	NA	NA
strontium-90	Ci	NDA	NDA	NA	NA
cesium-134	Ci	NDA	NDA	NA	NA
cesium-137	Ci	4.22E-5	NDA	NA	NA
barium-lanthanum-140	Ci	NDA	NDA	NA	NA
manganese-54	Ci	NDA	NDA	NA	NA
cobalt-58	Ci	NDA	NDA	NA	NA
iron-59	Ci	NDA	NDA	NA	NA
cobalt-60	Ci	3.09E-4	1.01E-5	NA	NA
zinc-65	Ci	NDA	NDA	NA	NA
zirconium-niobium-95	Ci	NDA	NDA	NA	NA
cerium-141	Ci	NDA	NDA	NA	NA
ruthenium-103	Ci	NDA	NDA	NA	NA
ruthenium-106	Ci	NDA	NDA	NA	NA

LLD'S for all isotopes listed as "NDA" in section (2) are less than 1 x 10^{-12}uci/ml and in section (3) are less than 1 x 10^{-11}uci/ml

TABLE 2A
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1988)
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
January - June 1988

	Unit	1st Quarter 1988	2nd Quarter 1988	Est. Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, noble gases, or alpha)	Ci	1.14E-2	9.74E-3	30
2. Average diluted concentration during period	μCi/ml	6.09E-6	1.16E-5	
3. Percent of applicable limit	%			
B. Tritium				
1. Total release	Ci	2.08E-1	9.05E-2	30
2. Average diluted concentration during period	μCi/ml	1.11E-4	1.08E-4	
3. Percent of applicable limit	%			
C. Dissolved and entrained gases				
1. Total release	Ci	*	*	*
2. Average diluted concentration during period	μCi/ml	*	*	
3. Percent of applicable limit	%	*	*	
D. Gross alpha radioactivity				
1. Total release	Ci	NDA	NDA	40
E. Volume of waste released (prior to dilution)	liters	1.80E+6	7.67E+5	20
F. Volume of dilution water used during period	liters	1.87E+9	8.40E+8	20

* Plant shutdown 1st and 2nd quarters 1988

LLD's for all isotopes listed as NDA in Section D are $< 1 \times 10^{-7}$ uci/ml

Percent of applicable limit in Sections A.3 and B.3 to be provided in the Dose Assessment supplement to the July-December Semiannual Report (see PNPS Technical Specifications Section 6.9.C.1 Amendment Number 116).

TABLE 2B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1988

LIQUID EFFLUENTS

January - June 1988

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	1st Quarter	2nd Quarter
strontium-89	Ci	NA	NA	NDA	NDA
strontium-90	Ci	NA	NA	3.45E-6	3.11E-6
cesium-134	Ci	NA	NA	1.52E-5	1.54E-4
cesium-137	Ci	NA	NA	1.20E-3	5.54E-3
iodine-131	Ci	NA	NA	NDA	NDA
cobalt-58	Ci	NA	NA	NDA	NDA
cobalt-60	Ci	NA	NA	4.08E-3	1.52E-3
iron-59	Ci	NA	NA	NDA	NDA
zinc-65	Ci	NA	NA	NDA	NDA
manganese-54	Ci	NA	NA	1.91E-5	4.42E-6
chromium-51	Ci	NA	NA	NDA	NDA
zirconium-niobium-95	Ci	NA	NA	NDA	NDA
molybdenum-99 technetium-99m	Ci	NA	NA	NDA	NDA
barium-lanthanum-140	Ci	NA	NA	NDA	NDA
cerium-141	Ci	NA	NA	NDA	NDA
Fe-55		NA	NA	3.21E-4	1.60E-4
iodine-133	Ci	NA	NA	NA	NA
cerium-144	Ci	NA	NA	NA	NA
silver-110m	Ci	NA	NA	NA	NA
iron-55	Ci	NA	NA	NA	NA
unidentified	Ci	NA	NA	5.74E-3	2.36E-3
Total for period (above)	Ci	NA	NA	1.14E-2	9.74E-3
xenon-133	Ci	NA	NA	NDA	NDA
xenon-135	Ci	NA	NA	NDA	NDA

LLD's for all isotopes listed as NDA are as follows:

Sr-89 $< 5 \times 10^{-8}$ uci/ml	Fe-59 $< 5 \times 10^{-7}$ uci/ml	ZrNb-95 $< 5 \times 10^{-7}$ uci/ml
I-131 $< 1 \times 10^{-6}$ uci/ml	Zn-65 $< 5 \times 10^{-7}$ uci/ml	Mo99 Tc99m $< 5 \times 10^{-7}$ uci/ml
Co-58 $< 5 \times 10^{-7}$ uci/ml	Cr-51 $< 5 \times 10^{-7}$ uci/ml	BaLa 140 $< 5 \times 10^{-7}$ uci/ml
		Ce 141 $< 5 \times 10^{-7}$ uci/ml

3. RADIOACTIVE WASTE DISPOSAL DATA

Radioactive wastes which were disposed of during the period January 1 to June 30, 1988 are given in Table 3, in the standard NRC Regulatory Guide 1.21 format (Reference 2)..

The semiannual total quantity of radioactivity in curies and the total volume in cubic meters for the following categories or waste types are listed in Table 3:

a. Spent resins, filter sludges, evaporator bottoms;

b. Dry compressible waste, contaminated equipment, etc.;

c. Irradiated components, control rods, etc; and,

d. Other.

During January to June 1988, approximately 17 curies of spent resins, filter sludges, etc. with a total volume of about 35 cubic meters were disposed of offsite from Pilgrim Station. Dry compressible waste, contaminated equipment, irradiated components or other miscellaneous low-level waste were not disposed of offsite during this reporting period.

An estimate of the major radionuclides in the spent resins and filter sludges shipped offsite is also listed in Table 3.

Six shipments were made to Barnwell, South Carolina during January to June 1988. No irradiated fuel shipments were made during this period.

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1988)
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
JANUARY - JUNE 1988

A. SOLID WASTE SHIPPED OFF SITE FOR BURIAL OR DISPOSAL. (not irradiated fuel)

1. TYPE OF WASTE	UNIT	6 MONTH PERIOD	EST. TOTAL ERROR %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	34.308	
	Ci	16.625	N/A
b. Dry compressible waste, contaminated equipment, etc.	m^3	0.00	
	Ci	0.00	N/A
c. Irradiated components, control rods, etc.	m^3	0.00	
	Ci	0.00	N/A
d. Other (Describe) miscellaneous low-level waste	m^3	0.00	
	Ci	0.00	N/A

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION. (by type of waste)		E(Curies)	%
a. Spent Resin, Filter Sludges, Evaporator Bottoms, etc.	C-14	0.005	0.030
	Cm-242	<0.001	0.006
	Co-60	6.250	37.594
	Cs-134	0.276	1.660
	Cs-137	7.240	43.549
	Fe-55	2.190	13.173
	H-3	0.014	0.084
	I-129	<0.001	0.006
	Mn-54	0.241	1.450
	Ni-63	0.392	2.358
	Pu-241	0.004	0.024
	Sr-90	0.009	0.054
	Tc-99	<0.001	0.006
	Tru	<0.001	0.006
	TOTAL	16.625	100.00

Table 3 (Continued)

b. N/A

c. N/A

d. N/A

3. SOLID WASTE DISPOSITION

# of Shipments	Mode of Transportation	Destination
6	Tractor - Trailer	Barnwell, South Carolina

4. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

4. METEOROLOGICAL DATA

Meteorological data for the period January 1 to June 30, 1988 is given in Tables 4A-1 and 4A-2 in the standard joint frequency distribution format as given in NRC Regulatory Guide 1.21 (Reference 3). Appendix A contains delta temperature, wind speed and wind direction data; and, Appendix B contains wind rose diagrams.

The predominate wind direction was from the southwest which occured with a frequency of about twenty percent during this period. The predominate wind speed range was 12 to 19 mph which occurred with a frequency of thirty-six percent during this period. The predominate stability class was stability class D which occured about fifty percent of the time during this period.

There were a number of instances where the data presented in Appendix A was not continuous. Typically, data losses were due to loss of power, malfunction of the sensor(s) and/or malfunction of the chart recorders. The net effect being that the data recovery for the period of January-June 1988 was 89.7% on the 33 foot elevation and 95.7% on the 220 foot elevation of the 220 ft meteorological tower at Pilgrim Station. Therefore, the meteorological data recovery criteria in NRC Regulatory Guide 1.23 of 90% was not met for the January -June time frame.

Corrective actions have been taken to improve data recovery. The improvements that have been completed as of the second quarter include:

1) Outfitted the 220 foot meteorological tower with new cables and the Tower Systems instrument elevator;

2) Replaced 220 foot meteorological tower guy wires and ground connections; and,

3) Revised all meteorological procedures including inspection, maintenance and calibration procedures.

The improvements that have been initiated but have not yet been completed include:

1) Install new electrical power source to the 220 foot meteorological tower instruments with emergency backup power capability;

2) Link the 220 foot meteorological tower to the Boston Edison Company's computerized network for fossil stations meteorological monitoring program; and,

3) Install new data loggers and strip chart recorders for the 220 foot meteorological tower output in the control room.

Implementation of these improvements should result in increased data recovery for the future reporting periods.

TABLE 4A-1

DISTRIBUTION OF WIND DIRECTIONS AND SPEEDS FOR THE 33 FT. LEVEL OF THE 220 FT. TOWER

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS A CLASS FREQUENCY (PERCENT) = 4.97

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	5
(1)	.00	.00	.00	2.13	3.19	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.32
(2)	.00	.00	.00	.11	.16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.26
4-7	3	3	4	9	3	17	5	0	1	0	0	0	0	0	0	3	0	48
(1)	3.19	3.19	4.26	9.57	3.19	18.09	5.32	.00	1.06	.00	.00	.00	.00	.00	.00	3.19	.00	51.06
(2)	.16	.16	.21	.48	.16	.90	.26	.00	.05	.00	.00	.00	.00	.00	.00	.16	.00	2.54
8-12	8	4	5	0	0	2	2	1	2	2	0	0	0	2	1	1	0	30
(1)	8.51	4.26	5.32	.00	.00	2.13	2.13	1.06	2.13	2.13	.00	.00	.00	2.13	1.06	1.06	.00	31.91
(2)	.42	.21	.26	.00	.00	.11	.11	.05	.11	.11	.00	.00	.00	.11	.05	.05	.00	1.59
13-18	4	2	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	11
(1)	4.26	2.13	.00	.00	.00	.00	.00	.00	.00	1.06	.00	.00	.00	.00	4.26	.00	.00	11.70
(2)	.21	.11	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.21	.00	.00	.58
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	15	9	9	11	6	19	7	1	3	3	0	0	0	2	5	4	0	94
(1)	15.96	9.57	9.57	11.70	6.38	20.21	7.45	1.06	3.19	3.19	.00	.00	.00	2.13	5.32	4.26	.00	100.00
(2)	.79	.48	.48	.58	.32	1.00	.37	.05	.16	.16	.00	.00	.00	.11	.26	.21	.00	4.97

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

0= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = 2.06

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3
(1)	.00	.00	2.56	.00	.00	2.56	2.56	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	7.69
(2)	.00	.00	.05	.00	.00	.05	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.16
4-7	0	0	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	5
(1)	.00	.00	2.56	.00	.00	.00	2.56	5.13	2.56	.00	.00	.00	.00	.00	.00	.00	.00	12.82
(2)	.00	.00	.05	.00	.00	.00	.05	.11	.05	.00	.00	.00	.00	.00	.00	.00	.00	.26
8-12	1	0	2	0	0	0	0	0	3	3	0	0	0	5	4	1	0	19
(1)	2.56	.00	5.13	.00	.00	.00	.00	.00	7.69	7.69	.00	.00	.00	12.82	10.26	2.56	.00	48.72
(2)	.05	.00	.11	.00	.00	.00	.00	.00	.16	.16	.00	.00	.00	.26	.21	.05	.00	1.00
13-18	1	1	1	0	0	0	0	0	0	1	0	0	0	2	3	0	0	9
(1)	2.56	2.56	2.56	.00	.00	.00	.00	.00	.00	2.56	.00	.00	.00	5.13	7.69	.00	.00	23.08
(2)	.05	.05	.05	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.11	.16	.00	.00	.48
19-24	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
(1)	2.56	2.56	2.56	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	7.69
(2)	.05	.05	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.16
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	3	2	6	0	0	1	2	2	4	4	0	0	0	7	7	1	0	39
(1)	7.69	5.13	15.38	.00	.00	2.56	5.13	5.13	10.26	10.26	.00	.00	.00	17.95	17.95	2.56	.00	100.00
(2)	.16	.11	.32	.00	.00	.05	.11	.11	.21	.21	.00	.00	.00	.37	.37	.05	.00	2.06

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN86-MAR86 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS C CLASS FREQUENCY (PERCENT) = 3.07

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4-7	0	0	1	0	1	0	1	1	0	0	0	0	0	2	0	0	0	6
(1)	.00	.00	1.72	.00	1.72	.00	1.72	1.72	.00	.00	.00	.00	.00	3.45	.00	.00	.00	10.34
(2)	.00	.00	.05	.00	.05	.00	.05	.05	.00	.00	.00	.00	.00	.11	.00	.00	.00	.32
8-12	3	0	3	2	0	0	0	0	0	3	0	0	0	7	7	1	0	26
(1)	5.17	.00	5.17	3.45	.00	.00	.00	.00	.00	5.17	.00	.00	.00	12.07	12.07	1.72	.00	44.83
(2)	.16	.00	.16	.11	.00	.00	.00	.00	.00	.16	.00	.00	.00	.37	.37	.05	.00	1.37
13-18	2	2	2	1	0	0	0	0	0	0	1	0	1	5	6	1	0	21
(1)	3.45	3.45	3.45	1.72	.00	.00	.00	.00	.00	.00	1.72	.00	1.72	8.62	10.34	1.72	.00	36.21
(2)	.11	.11	.11	.05	.00	.00	.00	.00	.00	.00	.05	.00	.05	.26	.32	.05	.00	1.11
19-24	2	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5
(1)	3.45	.00	1.72	.00	.00	.00	.00	.00	.00	.00	3.45	.00	.00	.00	.00	.00	.00	8.62
(2)	.11	.00	.05	.00	.00	.00	.00	.00	.00	.00	.11	.00	.00	.00	.00	.00	.00	.26
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	7	2	7	3	1	0	1	1	0	3	3	0	1	14	13	2	0	58
(1)	12.07	3.45	12.07	5.17	1.72	.00	1.72	1.72	.00	5.17	5.17	.00	1.72	24.14	22.41	3.45	.00	100.00
(2)	.37	.11	.37	.16	.05	.00	.05	.05	.00	.16	.16	.00	.05	.74	.69	.11	.00	3.07

(1)=PERCENT OF ALL 8007 OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL 8007 OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 52.14

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	1	0	0	1	3	3	3	1	1	3	2	0	0	3	0	21
(1)	.00	.00	.10	.00	.00	.10	.30	.30	.30	.10	.10	.30	.20	.00	.00	.30	.00	2.13
(2)	.00	.00	.05	.00	.00	.05	.16	.16	.16	.05	.05	.16	.11	.00	.00	.16	.00	1.11
4-7	9	7	5	7	13	12	16	14	6	8	17	17	27	40	23	5	0	226
(1)	.91	.71	.51	.71	1.32	1.22	1.62	1.42	.61	.81	1.72	1.72	2.74	4.06	2.33	.51	.10	22.92
(2)	.48	.37	.26	.37	.69	.63	.85	.74	.32	.42	.90	.90	1.43	2.12	1.22	.26	.05	11.95
8-12	10	11	16	8	6	8	1	0	3	31	96	27	54	101	68	22	0	462
(1)	1.01	1.12	1.62	.81	.61	.81	.10	.00	.30	3.14	9.74	2.74	5.48	10.24	6.90	2.23	.00	46.86
(2)	.53	.58	.85	.42	.32	.42	.05	.00	.16	1.64	5.08	1.43	2.86	5.34	3.60	1.16	.00	24.43
13-18	15	10	11	3	0	0	0	0	0	15	65	6	11	45	25	18	0	224
(1)	1.52	1.01	1.12	.30	.00	.00	.00	.00	.00	1.52	6.59	.61	1.12	4.56	2.54	1.83	.00	22.72
(2)	.79	.53	.58	.16	.00	.00	.00	.00	.00	.79	3.44	.32	.58	2.38	1.32	.95	.00	11.85
19-24	2	8	9	0	0	0	0	0	0	1	12	2	0	0	5	10	0	49
(1)	.20	.81	.91	.00	.00	.00	.00	.00	.00	.10	1.22	.20	.00	.00	.51	1.01	.00	4.97
(2)	.11	.42	.48	.00	.00	.00	.00	.00	.00	.05	.63	.11	.00	.00	.26	.53	.00	2.59
GT 24	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
(1)	.00	.10	.30	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.41
(2)	.00	.05	.16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.21
ALL SPEEDS	36	37	45	18	19	21	20	17	12	56	191	55	94	186	121	58	0	986
(1)	3.65	3.75	4.56	1.83	1.93	2.13	2.03	1.72	1.22	5.68	19.37	5.58	9.53	18.86	12.27	5.88	.00	100.00
(2)	1.90	1.96	2.38	.95	1.00	1.11	1.06	.90	.63	2.96	10.10	2.91	4.97	9.84	6.40	3.07	.00	52.14

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS E CLASS FREQUENCY (PERCENT) = 31.46

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	1	1	2	0	0	2	3	5	7	3	2	5	2	4	2	1	0	40
(1)	.17	.17	.34	.00	.00	.34	.50	.84	1.18	.50	.34	.84	.34	.67	.34	.17	.00	6.72
(2)	.05	.05	.11	.00	.00	.11	.16	.26	.37	.16	.11	.26	.11	.21	.11	.05	.00	2.12
4-7	2	0	1	2	0	5	8	11	32	39	34	41	43	29	16	8	0	271
(1)	.34	.00	.17	.34	.00	.84	1.34	1.85	5.38	6.55	5.71	6.89	7.23	4.87	2.69	1.34	.00	45.55
(2)	.11	.00	.05	.11	.00	.26	.42	.58	1.69	2.06	1.80	2.17	2.27	1.53	.85	.42	.00	14.33
8-12	0	2	1	1	0	0	1	1	6	35	70	19	26	24	10	13	0	209
(1)	.00	.34	.17	.17	.00	.00	.17	.17	1.01	5.88	11.76	3.19	4.37	4.03	1.68	2.18	.00	35.13
(2)	.00	.11	.05	.05	.00	.00	.05	.05	.32	1.85	3.70	1.00	1.37	1.27	.53	.69	.00	11.05
13-18	1	1	0	1	0	0	0	2	2	14	37	4	0	2	2	2	0	68
(1)	.17	.17	.00	.17	.00	.00	.00	.34	.34	2.35	6.22	.67	.00	.34	.34	.34	.00	11.43
(2)	.05	.05	.00	.05	.00	.00	.00	.11	.11	.74	1.96	.21	.00	.11	.11	.11	.00	3.60
19-24	0	1	0	0	0	0	0	0	0	3	2	0	0	0	0	1	0	7
(1)	.00	.17	.00	.00	.00	.00	.00	.00	.00	.50	.34	.00	.00	.00	.00	.17	.00	1.18
(2)	.00	.05	.00	.00	.00	.00	.00	.00	.00	.16	.11	.00	.00	.00	.00	.05	.00	.37
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	4	5	4	4	0	7	12	19	47	94	145	69	71	59	30	25	0	595
(1)	.67	.84	.67	.67	.00	1.18	2.02	3.19	7.90	15.80	24.37	11.60	11.93	9.92	5.04	4.20	.00	100.00
(2)	.21	.26	.21	.21	.00	.37	.63	1.00	2.49	4.97	7.67	3.65	3.75	3.12	1.59	1.32	.00	31.46

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS F CLASS FREQUENCY (PERCENT) = 4.55

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	1	0	1	0	0	1	0	1	0	2	3	6	2	0	0	0	0	17
(1)	1.16	.00	1.16	.00	.00	1.16	.00	1.16	.00	2.33	3.49	6.98	2.33	.00	.00	.00	.00	19.77
(2)	.05	.00	.05	.00	.00	.05	.00	.05	.00	.11	.16	.32	.11	.00	.00	.00	.00	.90
4-7	1	0	0	0	0	0	2	1	13	8	4	12	23	0	0	1	0	65
(1)	1.16	.00	.00	.00	.00	.00	2.33	1.16	15.12	9.30	4.65	13.95	26.74	.00	.00	1.16	.00	75.58
(2)	.05	.00	.00	.00	.00	.00	.11	.05	.69	.42	.21	.63	1.22	.00	.00	.05	.00	3.44
8-12	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	0	4
(1)	.00	.00	.00	.00	.00	.00	.00	.00	2.33	1.16	.00	1.16	.00	.00	.00	.00	.00	4.65
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.11	.05	.00	.05	.00	.00	.00	.00	.00	.21
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	2	0	1	0	0	1	2	2	15	11	7	19	25	0	0	1	0	86
(1)	2.33	.00	1.16	.00	.00	1.16	2.33	2.33	17.44	12.79	8.14	22.09	29.07	.00	.00	1.16	.00	100.00
(2)	.11	.00	.05	.00	.00	.05	.11	.11	.79	.58	.37	1.00	1.32	.00	.00	.05	.00	4.55

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS G CLASS FREQUENCY (PERCENT) = 1.75

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	0	0	0	0	0	0	1	8	2	0	0	0	0	0	11
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	3.03	24.24	6.06	.00	.00	.00	.00	.00	33.33
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.42	.11	.00	.00	.00	.00	.00	.58
4-7	0	0	0	0	0	0	0	0	3	2	5	11	1	0	0	0	0	22
(1)	.00	.00	.00	.00	.00	.00	.00	.00	9.09	6.06	15.15	33.33	3.03	.00	.00	.00	.00	66.67
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.16	.11	.26	.58	.05	.00	.00	.00	.00	1.16
8-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	0	0	0	0	0	0	0	0	3	3	13	13	1	0	0	0	0	33
(1)	.00	.00	.00	.00	.00	.00	.00	.00	9.09	9.09	39.39	39.39	3.03	.00	.00	.00	.00	100.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.16	.16	.69	.69	.05	.00	.00	.00	.00	1.75

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS ALL CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	2	1	5	2	3	5	7	9	10	7	14	16	6	4	2	4	0	97
(1)	.11	.05	.26	.11	.16	.26	.37	.48	.53	.37	.74	.85	.32	.21	.11	.21	.00	5.13
(2)	.11	.05	.26	.11	.16	.26	.37	.48	.53	.37	.74	.85	.32	.21	.11	.21	.00	5.13
4-7	15	10	12	18	17	34	33	29	56	57	60	81	94	71	39	17	0	643
(1)	.79	.53	.63	.95	.90	1.80	1.75	1.53	2.96	3.01	3.17	4.28	4.97	3.75	2.06	.90	.00	34.00
(2)	.79	.53	.63	.95	.90	1.80	1.75	1.53	2.96	3.01	3.17	4.28	4.97	3.75	2.06	.90	.00	34.00
8-12	22	17	27	11	6	10	4	2	16	75	166	47	80	139	90	38	0	750
(1)	1.16	.90	1.43	.58	.32	.53	.21	.11	.85	3.97	8.78	2.49	4.23	7.35	4.76	2.01	.00	39.66
(2)	1.16	.90	1.43	.58	.32	.53	.21	.11	.85	3.97	8.78	2.49	4.23	7.35	4.76	2.01	.00	39.66
13-18	23	16	14	5	0	0	0	2	2	31	103	10	12	54	40	21	0	333
(1)	1.22	.85	.74	.26	.00	.00	.00	.11	.11	1.64	5.45	.53	.63	2.86	2.12	1.11	.00	17.61
(2)	1.22	.85	.74	.26	.00	.00	.00	.11	.11	1.64	5.45	.53	.63	2.86	2.12	1.11	.00	17.61
19-24	5	10	11	0	0	0	0	0	0	4	16	2	0	0	5	11	0	64
(1)	.26	.53	.58	.00	.00	.00	.00	.00	.00	.21	.85	.11	.00	.00	.26	.58	.00	3.38
(2)	.26	.53	.58	.00	.00	.00	.00	.00	.00	.21	.85	.11	.00	.00	.26	.58	.00	3.38
GT 24	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
(1)	.00	.05	.16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.21
(2)	.00	.05	.16	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.21
ALL SPEEDS	67	55	72	36	26	49	44	42	84	174	359	156	192	268	176	91	0	1891
(1)	3.54	2.91	3.81	1.90	1.37	2.59	2.33	2.22	4.44	9.20	18.98	8.25	10.15	14.17	9.31	4.81	.00	100.00
(2)	3.54	2.91	3.81	1.90	1.37	2.59	2.33	2.22	4.44	9.20	18.98	8.25	10.15	14.17	9.31	4.81	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR66-JUN66 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS A CLASS FREQUENCY (PERCENT) = 13.03

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	2	4	5	7	7	6	1	0	0	1	0	0	0	0	0	1	0	34
(1)	.76	1.52	1.89	2.65	2.65	2.27	.38	.00	.00	.38	.00	.00	.00	.00	.00	.38	.00	12.88
(2)	.10	.20	.25	.35	.35	.30	.05	.00	.00	.05	.00	.00	.00	.00	.00	.05	.00	1.68
4-7	19	10	11	16	15	21	29	20	6	3	0	1	0	0	0	8	0	159
(1)	7.20	3.79	4.17	6.06	5.68	7.95	10.99	7.58	2.27	1.14	.00	.38	.00	.00	.00	3.03	.00	60.23
(2)	.94	.49	.54	.79	.74	1.04	1.43	.99	.30	.15	.00	.05	.00	.00	.00	.39	.00	7.85
8-12	4	12	4	1	1	0	9	15	3	9	0	0	0	0	4	0	0	62
(1)	1.52	4.55	1.52	.38	.38	.00	3.41	5.68	1.14	3.41	.00	.00	.00	.00	1.52	.00	.00	23.48
(2)	.20	.59	.20	.05	.05	.00	.44	.74	.15	.44	.00	.00	.00	.00	.20	.00	.00	3.06
13-18	0	1	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	7
(1)	.00	.38	1.14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.14	.00	.00	2.65
(2)	.00	.05	.15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15	.00	.00	.35
19-24	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
(1)	.00	.76	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.76
(2)	.00	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	25	29	23	24	23	27	39	35	9	13	0	1	0	0	7	9	0	264
(1)	9.47	10.98	8.71	9.09	8.71	10.23	14.77	13.26	3.41	4.92	.00	.38	.00	.00	2.65	3.41	.00	100.00
(2)	1.23	1.43	1.14	1.18	1.14	1.33	1.92	1.73	.44	.64	.00	.05	.00	.00	.35	.44	.00	13.03

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR68-JUN68 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = 3.41

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	1	0	0	0	1	2	1	0	0	0	0	0	0	0	0	1	0	6
(1)	1.45	.00	.00	.00	1.45	2.90	1.45	.00	.00	.00	.00	.00	.00	.00	.00	1.45	.00	8.70
(2)	.05	.00	.00	.00	.05	.10	.05	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.30
4-7	2	2	0	2	0	1	3	2	2	1	0	0	0	0	2	5	0	22
(1)	2.90	2.90	.00	2.90	.00	1.45	4.35	2.90	2.90	1.45	.00	.00	.00	.00	2.90	7.25	.00	31.88
(2)	.10	.10	.00	.10	.00	.05	.15	.10	.10	.05	.00	.00	.00	.00	.10	.25	.00	1.09
8-12	3	1	1	0	0	0	1	0	1	3	0	0	0	0	8	2	0	20
(1)	4.35	1.45	1.45	.00	.00	.00	1.45	.00	1.45	4.35	.00	.00	.00	.00	11.59	2.90	.00	28.99
(2)	.15	.05	.05	.00	.00	.00	.05	.00	.05	.15	.00	.00	.00	.00	.39	.10	.00	.99
13-18	2	1	1	2	0	0	0	0	0	0	2	0	0	0	4	0	0	12
(1)	2.90	1.45	1.45	2.90	.00	.00	.00	.00	.00	.00	2.90	.00	.00	.00	5.80	.00	.00	17.39
(2)	.10	.05	.05	.10	.00	.00	.00	.00	.00	.00	.10	.00	.00	.00	.20	.00	.00	.59
19-24	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
(1)	.00	.00	8.70	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	8.70
(2)	.00	.00	.30	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.30
GT 24	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
(1)	.00	4.35	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	4.35
(2)	.00	.15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15
ALL SPEEDS	8	7	8	4	1	3	5	2	3	4	2	0	0	0	14	8	0	69
(1)	11.59	10.14	11.59	5.80	1.45	4.35	7.25	2.90	4.35	5.80	2.90	.00	.00	.00	20.29	11.59	.00	100.00
(2)	.39	.35	.39	.20	.05	.15	.25	.10	.15	.20	.10	.00	.00	.00	.69	.39	.00	3.41

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS C CLASS FREQUENCY (PERCENT) = 5.23

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1-3	1	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0	0	5
(1)	.94	.00	.00	.00	.94	.00	.94	1.89	.00	.00	.00	.00	.00	.00	.00	.00	.00	4.72
(2)	.05	.00	.00	.00	.05	.00	.05	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.25
4-7	4	0	1	1	5	1	1	4	2	1	0	0	1	0	3	3	0	27
(1)	3.77	.00	.94	.94	4.72	.94	.94	3.77	1.89	.94	.00	.00	.94	.00	2.83	2.83	.00	25.47
(2)	.20	.00	.05	.05	.25	.05	.05	.20	.10	.05	.00	.00	.05	.00	.15	.15	.00	1.33
8-12	3	3	0	3	0	0	0	2	4	3	2	0	0	0	8	4	0	32
(1)	2.83	2.83	.00	2.83	.00	.00	.00	1.89	3.77	2.83	1.89	.00	.00	.00	7.55	3.77	.00	30.19
(2)	.15	.15	.00	.15	.00	.00	.00	.10	.20	.15	.10	.00	.00	.00	.39	.20	.00	1.58
13-18	1	4	2	0	0	0	0	0	0	2	2	0	0	1	3	1	0	16
(1)	.94	3.77	1.89	.00	.00	.00	.00	.00	.00	1.89	1.89	.00	.00	.94	2.83	.94	.00	15.09
(2)	.05	.20	.10	.00	.00	.00	.00	.00	.00	.10	.10	.00	.00	.05	.15	.05	.00	.79
19-24	1	1	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
(1)	.94	.94	11.32	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	13.21
(2)	.05	.05	.59	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.69
GT 24	0	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
(1)	.00	6.60	4.72	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	11.32
(2)	.00	.35	.25	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.59
ALL SPEEDS	10	15	20	4	6	1	2	8	6	6	4	0	1	1	14	8	0	106
(1)	9.43	14.15	18.87	3.77	5.66	.94	1.89	7.55	5.66	5.66	3.77	.00	.94	.94	13.21	7.55	.00	100.00
(2)	.49	.74	.99	.20	.30	.05	.10	.39	.30	.30	.20	.00	.05	.05	.69	.39	.00	5.23

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 44.57

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
(1)	.00	.00	.00	.00	.00	.11	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.11
(2)	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
C-3	1	2	1	1	2	9	5	10	7	5	2	1	1	1	2	1	0	51
(1)	.11	.22	.11	.11	.22	1.00	.55	1.11	.78	.55	.22	.11	.11	.11	.22	.11	.00	5.65
(2)	.05	.10	.05	.05	.10	.44	.25	.49	.35	.25	.10	.05	.05	.05	.10	.05	.00	2.52
4-7	9	13	8	7	11	1	18	34	33	16	13	11	7	15	13	17	0	226
(1)	1.00	1.44	.89	.78	1.22	.11	1.99	3.77	3.65	1.77	1.44	1.22	.78	1.66	1.44	1.88	.00	25.03
(2)	.44	.64	.39	.35	.54	.05	.89	1.68	1.63	.79	.64	.54	.35	.74	.64	.84	.00	11.15
8-12	6	20	15	16	6	0	1	7	8	33	79	18	23	33	28	18	0	311
(1)	.66	2.21	1.66	1.77	.66	.00	.11	.78	.89	3.65	8.75	1.99	2.55	3.65	3.10	1.99	.00	34.44
(2)	.30	.99	.74	.79	.30	.00	.05	.35	.39	1.63	3.90	.89	1.14	1.63	1.38	.89	.00	15.35
13-18	12	28	45	5	0	0	0	0	0	5	87	7	1	5	5	9	0	209
(1)	1.33	3.10	4.98	.55	.00	.00	.00	.00	.00	.55	9.63	.78	.11	.55	.55	1.00	.00	23.15
(2)	.59	1.38	2.22	.25	.00	.00	.00	.00	.00	.25	4.29	.35	.05	.25	.25	.44	.00	10.32
19-24	6	30	52	2	0	0	0	0	0	0	0	0	0	0	0	4	0	94
(1)	.66	3.32	5.76	.22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.44	.00	10.41
(2)	.30	1.48	2.57	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.20	.00	4.64
GT 24	0	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
(1)	.00	1.00	.22	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.22
(2)	.00	.44	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.54
ALL SPEEDS	34	102	123	31	19	11	24	51	48	59	181	37	32	54	48	49	0	903
(1)	3.77	11.30	13.62	3.43	2.10	1.22	2.66	5.65	5.32	6.53	20.04	4.10	3.54	5.98	5.32	5.43	.00	100.00
(2)	1.68	5.03	6.07	1.53	.94	.54	1.18	2.52	2.37	2.91	8.93	1.83	1.58	2.67	2.37	2.42	.00	44.57

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR80-JUN80 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS E CLASS FREQUENCY (PERCENT) = 26.01

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.19	.00	.00	.00	.00	.00	.19
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.05
0-3	2	0	2	1	3	3	2	5	8	1	7	2	2	2	1	1	0	42
(1)	.38	.00	.38	.19	.57	.57	.38	.95	1.52	.19	1.33	.38	.38	.38	.19	.19	.00	7.97
(2)	.10	.00	.10	.05	.15	.15	.10	.25	.39	.05	.35	.10	.10	.10	.05	.05	.00	2.07
4-7	7	1	0	1	1	2	12	4	13	19	16	19	36	23	18	19	0	191
(1)	1.33	.19	.00	.19	.19	.38	2.28	.76	2.47	3.61	3.04	3.61	6.83	4.36	3.42	3.61	.00	36.24
(2)	.35	.05	.00	.05	.05	.10	.59	.20	.64	.94	.79	.94	1.78	1.14	.89	.94	.00	9.43
8-12	7	3	1	0	0	2	1	0	1	7	74	52	29	9	7	14	0	207
(1)	1.33	.57	.19	.00	.00	.38	.19	.00	.19	1.33	14.04	9.87	5.50	1.71	1.33	2.66	.00	39.28
(2)	.35	.15	.05	.00	.00	.10	.05	.00	.05	.35	3.65	2.57	1.43	.44	.35	.69	.00	10.22
13-18	5	1	3	0	0	0	0	0	0	1	35	22	2	0	0	8	0	77
(1)	.95	.19	.57	.00	.00	.00	.00	.00	.00	.19	6.64	4.17	.38	.00	.00	1.52	.00	14.61
(2)	.25	.05	.15	.00	.00	.00	.00	.00	.00	.05	1.73	1.09	.10	.00	.00	.39	.00	3.80
19-24	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	9
(1)	.38	.57	.19	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.57	.00	1.71
(2)	.10	.15	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15	.00	.44
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	23	8	7	2	4	7	15	9	22	28	132	96	69	34	26	45	0	527
(1)	4.36	1.52	1.33	.38	.76	1.33	2.85	1.71	4.17	5.31	25.05	18.22	13.09	6.45	4.93	8.54	.00	100.00
(2)	1.14	.39	.35	.10	.20	.35	.74	.44	1.09	1.38	6.52	4.74	3.41	1.68	1.28	2.22	.00	26.01

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR86-JUN86 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS F CLASS FREQUENCY (PERCENT) = 6.02

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
(1)	.00	.00	.00	.00	.00	.00	.82	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.82
(2)	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
C-3	0	2	0	2	0	2	3	5	1	0	3	2	1	1	1	0	0	23
(1)	.00	1.64	.00	1.64	.00	1.64	2.46	4.10	.82	.00	2.46	1.64	.82	.82	.82	.00	.00	18.85
(2)	.00	.10	.00	.10	.00	.10	.15	.25	.05	.00	.15	.10	.05	.05	.05	.00	.00	1.14
4-7	3	2	0	0	0	2	7	2	9	6	4	6	9	4	0	4	0	58
(1)	2.46	1.64	.00	.00	.00	1.64	5.74	1.64	7.38	4.92	3.28	4.92	7.38	3.28	.00	3.28	.00	47.54
(2)	.15	.10	.00	.00	.00	.10	.35	.10	.44	.30	.20	.30	.44	.20	.00	.20	.00	2.86
8-12	2	0	0	0	0	0	2	0	0	0	1	15	10	2	0	0	0	32
(1)	1.64	.00	.00	.00	.00	.00	1.64	.00	.00	.00	.82	12.30	8.20	1.64	.00	.00	.00	26.23
(2)	.10	.00	.00	.00	.00	.00	.10	.00	.00	.00	.05	.74	.49	.10	.00	.00	.00	1.58
13-18	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0	8
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	4.10	2.46	.00	.00	.00	.00	.00	6.56
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.25	.15	.00	.00	.00	.00	.00	.39
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	5	4	0	2	0	4	13	7	10	6	13	26	20	7	1	4	0	122
(1)	4.10	3.28	.00	1.64	.00	3.28	10.66	5.74	8.20	4.92	10.66	21.31	16.39	5.74	.82	3.28	.00	100.00
(2)	.25	.20	.00	.10	.00	.20	.64	.35	.49	.30	.64	1.28	.99	.35	.05	.20	.00	6.02

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR68-JUN68 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS G CLASS FREQUENCY (PERCENT) = 1.73

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	1	0	0	0	0	0	0	3	1	2	8	1	0	1	0	0	17
(1)	.00	2.86	.00	.00	.00	.00	.00	.00	8.57	2.86	5.71	22.86	2.86	.00	2.86	.00	.00	48.57
(2)	.00	.05	.00	.00	.00	.00	.00	.00	.15	.05	.10	.39	.05	.00	.05	.00	.00	.84
4-7	0	0	1	0	0	1	0	0	3	2	3	2	2	0	0	1	0	15
(1)	.00	.00	2.86	.00	.00	2.86	.00	.00	8.57	5.71	8.57	5.71	5.71	.00	.00	2.86	.00	42.86
(2)	.00	.00	.05	.00	.00	.05	.00	.00	.15	.10	.15	.10	.10	.00	.00	.05	.00	.74
8-12	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	8.57	.00	.00	.00	.00	.00	8.57
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15	.00	.00	.00	.00	.00	.15
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	0	1	1	0	0	1	0	0	6	3	5	13	3	0	1	1	0	35
(1)	.00	2.86	2.86	.00	.00	2.86	.00	.00	17.14	8.57	14.29	37.14	8.57	.00	2.86	2.86	.00	100.00
(2)	.00	.05	.05	.00	.00	.05	.00	.00	.30	.15	.25	.64	.15	.00	.05	.05	.00	1.73

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-1 (continued)

PILGRIM STATION APR80-JUN80 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

33.0 FT WIND DATA STABILITY CLASS ALL CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	3
(1)	.00	.00	.00	.00	.00	.05	.05	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.15
(2)	.00	.00	.00	.00	.00	.05	.05	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.15
C-3	7	9	8	11	14	22	13	22	19	8	14	13	5	4	5	4	0	178
(1)	.35	.44	.39	.54	.69	1.09	.64	1.09	.94	.39	.69	.64	.25	.20	.25	.20	.00	8.79
(2)	.35	.44	.39	.54	.69	1.09	.64	1.09	.94	.39	.69	.64	.25	.20	.25	.20	.00	8.79
4-7	44	28	21	27	32	29	70	66	68	48	36	39	55	42	36	57	0	698
(1)	2.17	1.38	1.04	1.33	1.58	1.43	3.46	3.26	3.36	2.37	1.78	1.92	2.71	2.07	1.78	2.81	.00	34.45
(2)	2.17	1.38	1.04	1.33	1.58	1.43	3.46	3.26	3.36	2.37	1.78	1.92	2.71	2.07	1.78	2.81	.00	34.45
8-12	25	39	21	20	7	2	14	24	17	55	156	88	62	44	55	38	0	667
(1)	1.23	1.92	1.04	.99	.35	.10	.69	1.18	.84	2.71	7.70	4.34	3.06	2.17	2.71	1.88	.00	32.92
(2)	1.23	1.92	1.04	.99	.35	.10	.69	1.18	.84	2.71	7.70	4.34	3.06	2.17	2.71	1.88	.00	32.92
13-18	20	35	54	7	0	0	0	0	0	8	131	32	3	6	15	18	0	329
(1)	.99	1.73	2.67	.35	.00	.00	.00	.00	.00	.39	6.47	1.58	.15	.30	.74	.89	.00	16.24
(2)	.99	1.73	2.67	.35	.00	.00	.00	.00	.00	.39	6.47	1.58	.15	.30	.74	.89	.00	16.24
19-24	9	36	71	2	0	0	0	0	0	0	0	0	0	0	0	7	0	125
(1)	.44	1.78	3.50	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.35	.00	6.17
(2)	.44	1.78	3.50	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.35	.00	6.17
GT 24	0	19	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
(1)	.00	.94	.35	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.28
(2)	.00	.94	.35	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.28
ALL SPEEDS	105	166	182	67	53	54	98	112	104	119	337	173	125	96	111	124	0	2026
(1)	5.18	8.19	8.98	3.31	2.62	2.67	4.84	5.53	5.13	5.87	16.63	8.54	6.17	4.74	5.48	6.12	.00	100.00
(2)	5.18	8.19	8.98	3.31	2.62	2.67	4.84	5.53	5.13	5.87	16.63	8.54	6.17	4.74	5.48	6.12	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2

DISTRIBUTION OF WIND DIRECTIONS AND SPEEDS FOR THE 220 FT. LEVEL OF THE 220 FT. TOWER

PILGRIM STATION JAN66-MAR66 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS A CLASS FREQUENCY (PERCENT) = 4.75

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
(1)	.00	.00	.00	.00	5.21	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.21
(2)	.00	.00	.00	.00	.25	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.25
4-7	2	2	4	8	3	6	5	1	0	0	0	0	0	1	1	2	0	35
(1)	2.08	2.08	4.17	8.33	3.13	6.25	5.21	1.04	.00	.00	.00	.00	.00	1.04	1.04	2.08	.00	36.46
(2)	.10	.10	.20	.40	.15	.30	.25	.05	.00	.00	.00	.00	.00	.05	.05	.10	.00	1.73
8-12	6	2	6	0	0	8	6	3	1	1	0	0	0	0	0	0	0	33
(1)	6.25	2.08	6.25	.00	.00	8.33	6.25	3.13	1.04	1.04	.00	.00	.00	.00	.00	.00	.00	34.38
(2)	.30	.10	.30	.00	.00	.40	.30	.15	.05	.05	.00	.00	.00	.00	.00	.00	.00	1.63
13-18	7	6	0	0	0	0	0	1	2	2	0	0	0	0	3	1	0	22
(1)	7.29	6.25	.00	.00	.00	.00	.00	1.04	2.08	2.08	.00	.00	.00	.00	3.13	1.04	.00	22.92
(2)	.35	.30	.00	.00	.00	.00	.00	.05	.10	.10	.00	.00	.00	.00	.15	.05	.00	1.09
19-24	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
(1)	1.04	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.04
(2)	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	16	10	10	8	8	14	11	5	3	3	0	0	0	1	4	3	0	96
(1)	16.67	10.42	10.42	8.33	8.33	14.58	11.46	5.21	3.13	3.13	.00	.00	.00	1.04	4.17	3.13	.00	100.00
(2)	.79	.49	.49	.40	.40	.69	.54	.25	.15	.15	.00	.00	.00	.05	.20	.15	.00	4.75

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JAN88-MAR88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = 1.93

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4-7	0	1	1	0	0	2	0	2	1	0	0	0	0	0	0	0	0	7
(1)	.00	2.56	2.56	.00	.00	5.13	.00	5.13	2.56	.00	.00	.00	.00	.00	.00	.00	.00	17.95
(2)	.00	.05	.05	.00	.00	.10	.00	.10	.05	.00	.00	.00	.00	.00	.00	.00	.00	.35
8-12	0	1	0	0	0	1	0	0	0	1	0	0	0	3	0	0	0	6
(1)	.00	2.56	.00	.00	.00	2.56	.00	.00	.00	2.56	.00	.00	.00	7.69	.00	.00	.00	15.38
(2)	.00	.05	.00	.00	.00	.05	.00	.00	.00	.05	.00	.00	.00	.15	.00	.00	.00	.30
13-18	1	4	0	0	0	0	0	0	2	3	0	0	1	3	5	0	0	19
(1)	2.56	10.26	.00	.00	.00	.00	.00	.00	5.13	7.69	.00	.00	2.56	7.69	12.82	.00	.00	48.72
(2)	.05	.20	.00	.00	.00	.00	.00	.00	.10	.15	.00	.00	.05	.15	.25	.00	.00	.94
19-24	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	5
(1)	2.56	.00	2.56	.00	.00	.00	.00	.00	.00	2.56	.00	.00	.00	2.56	2.56	.00	.00	12.82
(2)	.05	.00	.05	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.05	.05	.00	.00	.25
GT 24	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
(1)	.00	5.13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.13
(2)	.00	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10
ALL SPEEDS	2	8	2	0	0	3	0	2	3	5	0	0	1	7	6	0	0	39
(1)	5.13	20.51	5.13	.00	.00	7.69	.00	5.13	7.69	12.82	.00	.00	2.56	17.95	15.38	.00	.00	100.00
(2)	.10	.40	.10	.00	.00	.15	.00	.10	.15	.25	.00	.00	.05	.35	.30	.00	.00	1.93

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JANES-MARES METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS C CLASS FREQUENCY (PERCENT) = 2.77

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4-7	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	3
(1)	.00	.00	1.79	.00	.00	1.79	.00	.00	.00	.00	.00	.00	.00	.00	1.79	.00	.00	5.36
(2)	.00	.00	.05	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.15
8-12	1	1	2	1	0	0	0	2	0	0	0	0	0	1	2	0	0	10
(1)	1.79	1.79	3.57	1.79	.00	.00	.00	3.57	.00	.00	.00	.00	.00	1.79	3.57	.00	.00	17.86
(2)	.05	.05	.10	.05	.00	.00	.00	.10	.00	.00	.00	.00	.00	.05	.10	.00	.00	.49
13-18	3	3	2	1	0	0	0	0	1	2	0	0	6	8	7	0	0	27
(1)	5.36	5.36	3.57	1.79	.00	.00	.00	.00	1.79	3.57	.00	.00	.00	14.29	12.50	.00	.00	48.21
(2)	.15	.15	.10	.05	.00	.00	.00	.00	.05	.10	.00	.00	.00	.40	.35	.00	.00	1.33
19-2	0	1	0	0	0	0	0	0	0	0	1	0	0	2	3	0	0	7
(1)	.00	1.79	.00	.00	.00	.00	.00	.00	.00	.00	1.79	.00	.00	3.57	5.36	.00	.00	12.50
(2)	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.10	.15	.00	.00	.35
GT 24	0	3	1	0	0	0	0	0	0	0	2	0	0	3	0	0	0	9
(1)	.00	5.36	1.79	.00	.00	.00	.00	.00	.00	.00	3.57	.00	.00	5.36	.00	.00	.00	16.07
(2)	.00	.15	.05	.00	.00	.00	.00	.00	.00	.00	.10	.00	.00	.15	.00	.00	.00	.44
ALL SPEEDS	4	8	6	2	0	1	0	2	1	2	3	0	0	14	13	0	0	56
(1)	7.14	14.29	10.71	3.57	.00	1.79	.00	3.57	1.79	3.57	5.36	.00	.00	25.00	23.21	.00	.00	100.00
(2)	.20	.40	.30	.10	.00	.05	.00	.10	.05	.10	.15	.00	.00	.69	.64	.00	.00	2.77

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JAN68-MAR68 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 52.55

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
(1)	.00	.00	.00	.00	.09	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09
(2)	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
0-3	0	0	0	4	0	0	0	0	0	2	0	2	0	0	0	0	0	8
(1)	.00	.00	.00	.38	.00	.00	.00	.00	.00	.19	.00	.19	.00	.00	.00	.00	.00	.75
(2)	.00	.00	.00	.20	.00	.00	.00	.00	.00	.10	.00	.10	.00	.00	.00	.00	.00	.40
4-7	6	3	3	8	7	5	2	7	5	2	5	4	9	8	6	4	0	84
(1)	.56	.28	.28	.75	.66	.47	.19	.66	.47	.19	.47	.38	.85	.75	.56	.38	.00	7.90
(2)	.30	.15	.15	.40	.35	.25	.10	.35	.25	.10	.25	.20	.44	.40	.30	.20	.00	4.15
8-12	3	10	14	10	7	14	5	8	9	7	37	26	37	46	56	8	0	297
(1)	.28	.94	1.32	.94	.66	1.32	.47	.75	.85	.66	3.48	2.45	3.48	4.33	5.27	.75	.00	27.94
(2)	.15	.49	.69	.49	.35	.69	.25	.40	.44	.35	1.83	1.29	1.83	2.27	2.77	.40	.00	14.68
13-18	6	5	19	4	1	9	6	3	1	21	102	31	64	98	64	25	0	459
(1)	.56	.47	1.79	.38	.09	.85	.56	.28	.09	1.98	9.60	2.92	6.02	9.22	6.02	2.35	.00	43.18
(2)	.30	.25	.94	.20	.05	.44	.30	.15	.05	1.04	5.04	1.53	3.16	4.84	3.16	1.24	.00	22.69
19-24	9	5	5	1	0	8	0	0	0	16	37	4	6	32	18	7	0	148
(1)	.85	.47	.47	.09	.00	.75	.00	.00	.00	1.51	3.48	.38	.56	3.01	1.69	.66	.00	13.92
(2)	.44	.25	.25	.05	.00	.40	.00	.00	.00	.79	1.83	.20	.30	1.58	.89	.35	.00	7.32
GT 24	3	5	8	0	0	7	0	0	0	1	21	1	0	3	6	11	0	66
(1)	.28	.47	.75	.00	.00	.66	.00	.00	.00	.09	1.98	.09	.00	.28	.56	1.03	.00	6.21
(2)	.15	.25	.40	.00	.00	.35	.00	.00	.00	.05	1.04	.05	.00	.15	.30	.54	.00	3.26
ALL SPEEDS	27	28	49	27	16	43	13	18	15	49	202	68	116	187	150	55	0	1063
(1)	2.54	2.63	4.61	2.54	1.51	4.05	1.22	1.69	1.41	4.61	19.00	6.40	10.91	17.59	14.11	5.17	.00	100.00
(2)	1.33	1.38	2.42	1.33	.79	2.13	.64	.89	.74	2.42	9.99	3.36	5.73	9.24	7.41	2.72	.00	52.55

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JAN82-MAR82 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS E CLASS FREQUENCY (PERCENT) = 32.08

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
(1)	.00	.00	.00	.00	.15	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15
(2)	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
C-3	0	1	1	1	0	1	1	0	1	2	0	1	0	1	2	1	0	13
(1)	.00	.15	.15	.15	.00	.15	.15	.00	.15	.31	.00	.15	.00	.15	.31	.15	.00	2.00
(2)	.00	.05	.05	.05	.00	.05	.05	.00	.05	.10	.00	.05	.00	.05	.10	.05	.00	.64
4-7	2	1	2	3	5	1	3	8	10	8	9	13	9	6	8	3	0	91
(1)	.31	.15	.31	.46	.77	.15	.46	1.23	1.54	1.23	1.39	2.00	1.39	.92	1.23	.46	.00	14.02
(2)	.10	.05	.10	.15	.25	.05	.15	.40	.49	.40	.44	.64	.44	.30	.40	.15	.00	4.50
8-12	5	3	0	4	2	5	7	2	14	41	31	31	39	35	20	10	0	249
(1)	.77	.46	.00	.62	.31	.77	1.08	.31	2.16	6.32	4.78	4.78	6.01	5.39	3.08	1.54	.00	38.37
(2)	.25	.15	.00	.20	.10	.25	.35	.10	.69	2.03	1.53	1.53	1.93	1.73	.99	.49	.00	12.31
13-18	2	0	0	2	0	2	1	0	9	38	79	20	19	22	11	13	0	218
(1)	.31	.00	.00	.31	.00	.31	.15	.00	1.39	5.86	12.17	3.08	2.93	3.39	1.69	2.00	.00	33.59
(2)	.10	.00	.00	.10	.00	.10	.05	.00	.44	1.88	3.91	.99	.94	1.09	.54	.64	.00	10.78
19-24	2	1	0	0	0	0	1	3	0	7	27	7	1	1	1	7	0	58
(1)	.31	.15	.00	.00	.00	.00	.15	.46	.00	1.08	4.16	1.08	.15	.15	.15	1.08	.00	8.94
(2)	.10	.05	.00	.00	.00	.00	.05	.15	.00	.35	1.33	.35	.05	.05	.05	.35	.00	2.87
GT 24	0	1	0	0	0	0	0	2	1	6	6	3	0	0	0	0	0	19
(1)	.00	.15	.00	.00	.00	.00	.00	.31	.15	.92	.92	.46	.00	.00	.00	.00	.00	2.93
(2)	.00	.05	.00	.00	.00	.00	.00	.10	.05	.30	.30	.15	.00	.00	.00	.00	.00	.94
ALL SPEEDS	11	7	3	10	8	9	13	15	35	102	152	75	68	65	42	34	0	649
(1)	1.69	1.08	.46	1.54	1.23	1.39	2.00	2.31	5.39	15.72	23.42	11.56	10.48	10.02	6.47	5.24	.00	100.00
(2)	.54	.35	.15	.49	.40	.44	.64	.74	1.73	5.04	7.51	3.71	3.36	3.21	2.08	1.68	.00	32.08

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JAN58-MAR58 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS F CLASS FREQUENCY (PERCENT) = 4.30

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0		0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00			.0	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00			.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	1	0	1	0	1	0	2	0	0	0	0	0	0	1	0	6
(1)	.00	.00	1.15	.00	1.15	.00	1.15	.00	2.30	.00	.00	.00	.00	.00	.00	1.15	.00	6.90
(2)	.00	.00	.05	.00	.05	.00	.05	.00	.10	.00	.00	.00	.00	.00	.00	.05	.00	.30
4-7	0	2	1	0	2	1	0	1	6	0	3	1	9	8	5	3	0	42
(1)	.00	2.30	1.15	.00	2.30	1.15	.00	1.15	6.90	.00	3.45	1.15	10.34	9.20	5.75	3.45	.00	48.28
(2)	.00	.10	.05	.00	.10	.05	.00	.05	.30	.00	.15	.05	.44	.40	.25	.15	.00	2.08
8-12	1	0	0	0	0	1	0	2	6	8	2	1	5	5	2	0	0	33
(1)	1.15	.00	.00	.00	.00	1.15	.00	2.30	6.90	9.20	2.30	1.15	5.75	5.75	2.30	.00	.00	37.93
(2)	.05	.00	.00	.00	.00	.05	.00	.10	.30	.40	.10	.05	.25	.25	.10	.00	.00	1.63
13-18	0	0	0	0	0	0	0	0	1	4	0	1	0	0	0	0	0	6
(1)	.00	.00	.00	.00	.00	.00	.00	.00	1.15	4.60	.00	1.15	.00	.00	.00	.00	.00	6.90
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.0	.20	.00	.05	.00	.00	.00	.00	.00	.30
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	1	2	2	0	3	2	1	3	15	12	5	3	14	13	7	4	0	87
(1)	1.15	2.30	2.30	.00	3.45	2.30	1.15	3.45	17.24	13.79	5.75	3.45	16.09	14.94	8.05	4.60	.00	100.00
(2)	.05	.10	.10	.00	.15	.10	.05	.15	.74	.59	.25	.15	.69	.64	.35	.20	.00	4.30

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JAN'68-MAR'80 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS G CLASS FREQUENCY (PERCENT) = 1.63

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	1	1	0	0	0	1	0	1	0	1	1	0	1	0	0	7
(1)	.00	.00	3.03	3.03	.00	.00	.00	3.03	.00	3.03	.00	3.03	3.03	.00	3.03	.00	.00	21.21
(2)	.00	.00	.05	.05	.00	.00	.00	.05	.00	.05	.00	.05	.05	.00	.05	.00	.00	.35
4-7	2	2	2	0	0	2	1	2	0	0	3	4	0	1	3	1	0	23
(1)	6.06	6.06	6.06	.00	.00	6.06	3.03	6.06	.00	.00	9.09	12.12	.00	3.03	9.09	3.03	.00	69.70
(2)	.10	.10	.10	.00	.00	.10	.05	.10	.00	.00	.15	.20	.00	.05	.15	.05	.00	1.14
8-12	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	3
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	3.03	.00	3.03	3.03	.00	.00	.00	.00	9.09
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.05	.05	.00	.00	.00	.00	.15
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	2	2	3	1	0	2	1	3	0	2	3	6	2	1	4	1	0	33
(1)	6.06	6.06	9.09	3.03	.00	6.06	3.03	9.09	.00	6.06	9.09	18.18	6.06	3.03	12.12	3.03	.00	100.00
(2)	.10	.10	.15	.05	.00	.10	.05	.15	.00	.10	.15	.30	.10	.05	.20	.05	.00	1.63

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION JAN68-MAR68 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS ALL CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
(1)	.00	.00	.00	.00	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10
(2)	.00	.00	.00	.00	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10
C-3	0	1	3	6	6	1	2	1	3	5	0	4	1	1	3	2	0	39
(1)	.00	.05	.15	.30	.30	.05	.10	.05	.15	.25	.00	.20	.05	.05	.15	.10	.00	1.93
(2)	.00	.05	.15	.30	.30	.05	.10	.05	.15	.25	.00	.20	.05	.05	.15	.10	.00	1.93
4-7	12	11	14	19	17	18	11	21	22	10	20	22	27	24	24	13	0	285
(1)	.59	.54	.69	.94	.84	.89	.54	1.04	1.09	.49	.99	1.09	1.33	1.19	1.19	.64	.00	14.09
(2)	.59	.54	.69	.94	.84	.89	.54	1.04	1.09	.49	.99	1.09	1.33	1.19	1.19	.64	.00	14.09
8-12	16	17	22	15	9	29	18	17	30	59	70	59	82	90	80	18	0	631
(1)	.79	.84	1.09	.74	.44	1.43	.89	.84	1.48	2.92	3.46	2.92	4.05	4.45	3.95	.89	.00	31.19
(2)	.79	.84	1.09	.74	.44	1.43	.89	.84	1.48	2.92	3.46	2.92	4.05	4.45	3.95	.89	.00	31.19
13-18	19	18	21	7	1	11	7	6	16	70	181	52	84	131	90	39	0	751
(1)	.94	.89	1.04	.35	.05	.54	.35	.20	.79	3.46	8.95	2.57	4.15	6.48	4.45	1.93	.00	37.12
(2)	.94	.89	1.04	.35	.05	.54	.35	.20	.79	3.46	8.95	2.57	4.15	6.48	4.45	1.93	.00	37.12
19-24	13	7	6	1	0	8	1	3	0	24	65	11	7	36	23	14	0	219
(1)	.64	.35	.30	.05	.00	.40	.05	.15	.00	1.19	3.21	.54	.35	1.78	1.14	.69	.00	10.83
(2)	.64	.35	.30	.05	.00	.40	.05	.15	.00	1.19	3.21	.54	.35	1.78	1.14	.69	.00	10.83
GT 24	3	11	9	0	0	7	0	2	1	7	29	4	0	6	6	11	0	96
(1)	.15	.54	.44	.00	.00	.35	.00	.10	.05	.35	1.43	.20	.00	.30	.30	.54	.00	4.75
(2)	.15	.54	.44	.00	.00	.35	.00	.10	.05	.35	1.43	.20	.00	.30	.30	.54	.00	4.75
ALL SPEEDS	63	65	75	48	35	74	39	48	72	175	365	152	201	288	226	97	0	2023
(1)	3.11	3.21	3.71	2.37	1.73	3.66	1.93	2.37	3.56	8.65	18.04	7.51	9.94	14.24	11.17	4.79	.00	100.00
(2)	3.11	3.21	3.71	2.37	1.73	3.66	1.93	2.37	3.56	8.65	18.04	7.51	9.94	14.24	11.17	4.79	.00	100.00

ALL GOOD OBSERVATIONS FOR THIS PAGE

(1) PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS 4 CLASS FREQUENCY (PERCENT) = 13.00

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	6	8	2	0	0	0	0	0	0	0	0	0	0	C	16
(1)	.00	.00	.00	2.14	2.85	.71	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.69
(2)	.00	.00	.00	.28	.37	.09	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.74
4-7	4	14	10	19	17	14	10	3	2	0	0	0	0	0	0	0	0	93
(1)	1.42	4.98	3.56	6.76	6.05	4.98	3.56	1.07	.71	.00	.00	.00	.00	.00	.00	.00	.00	33.10
(2)	.19	.65	.46	.88	.79	.65	.46	.14	.09	.00	.00	.00	.00	.00	.00	.00	.00	4.30
8-12	13	17	4	3	1	7	21	26	10	5	0	0	1	0	1	2	0	111
(1)	4.63	6.05	1.42	1.07	.36	2.49	7.47	9.25	3.56	1.78	.00	.00	.36	.00	.36	.71	.00	39.50
(2)	.60	.79	.19	.14	.05	.32	.97	1.20	.46	.23	.00	.00	.05	.00	.05	.09	.00	5.14
13-18	3	8	2	0	0	0	15	10	1	6	1	0	0	1	7	2	0	56
(1)	1.07	2.85	.71	.00	.00	.00	5.34	3.56	.36	2.14	.36	.00	.00	.36	2.49	.71	.00	19.93
(2)	.14	.37	.09	.00	.00	.00	.69	.46	.05	.28	.05	.00	.00	.05	.32	.09	.00	2.59
19-24	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
(1)	.00	.71	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.71	.00	.00	1.42
(2)	.00	.09	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.00	.00	.19
GT 24	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
(1)	.00	.00	.36	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.36
(2)	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
ALL SPEEDS	20	41	17	28	26	23	46	39	13	11	1	0	1	1	10	4	0	281
(1)	7.12	14.59	6.05	9.96	9.25	8.19	16.37	13.88	4.63	3.91	.36	.00	.36	.36	3.56	1.42	.00	100.00
(2)	.93	1.90	.79	1.30	1.20	1.06	2.13	1.80	.60	.51	.05	.00	.05	.05	.46	.19	.00	13.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR68-JUN68 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = 3.38

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	C	1	2	0	0	0	0	0	0	0	0	0	0	0	3
(1)	.00	.00	.00	.00	1.37	2.74	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	4.11
(2)	.00	.00	.00	.00	.05	.09	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.14
4-7	1	2	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	6
(1)	1.37	2.74	.00	1.37	.00	.00	.00	1.37	.00	1.37	.00	.00	.00	.00	.00	.00	.00	8.22
(2)	.05	.09	.00	.05	.00	.00	.00	.05	.00	.05	.00	.00	.00	.00	.00	.00	.00	.28
8-12	2	2	1	2	1	1	3	1	3	3	0	0	0	0	7	2	0	28
(1)	2.74	2.74	1.37	2.74	1.37	1.37	4.11	1.37	4.11	4.11	.00	.00	.00	.00	9.59	2.74	.00	38.36
(2)	.09	.09	.05	.09	.05	.05	.14	.05	.14	.14	.00	.00	.00	.00	.32	.09	.00	1.30
13-18	4	4	1	0	0	0	1	1	0	1	1	0	0	1	5	1	0	20
(1)	5.48	5.48	1.37	.00	.00	.00	1.37	1.37	.00	1.37	1.37	.00	.00	1.37	6.85	1.37	.00	27.40
(2)	.19	.19	.05	.00	.00	.00	.05	.05	.00	.05	.05	.00	.00	.05	.23	.05	.00	.93
19-24	0	3	5	1	0	0	0	0	0	1	0	0	0	0	3	0	0	13
(1)	.00	4.11	6.85	1.37	.00	.00	.00	.00	.00	1.37	.00	.00	.00	.00	4.11	.00	.00	17.81
(2)	.00	.14	.23	.05	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.14	.00	.00	.60
GT 24	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
(1)	.00	.00	4 11	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	4.11
(2)	.00	.00	.14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.14
ALL SPEEDS	7	11	10	4	2	3	4	3	3	6	1	0	0	1	15	3	0	73
(1)	9.59	15.07	13.70	5.48	2.74	4.11	5.48	4.11	4.11	8.22	1.37	.00	.00	1.37	20.55	4.11	.00	100.00
(2)	.32	.51	.46	.19	.09	.14	.19	.14	.14	.28	.05	.00	.00	.05	.69	.14	.00	3.38

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS C CLASS FREQUENCY (PERCENT) = 5.23

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4-7	4	1	1	2	4	2	1	0	1	0	0	0	0	0	0	1	0	17
(1)	3.54	.88	.88	1.77	3.54	1.77	.88	.00	.88	.00	.00	.00	.00	.00	.00	.88	.00	15.04
(2)	.19	.05	.05	.09	.19	.09	.05	.00	.05	.00	.00	.00	.00	.00	.00	.05	.00	.79
8-12	1	4	0	1	0	1	1	7	6	3	0	0	1	0	6	1	0	32
(1)	.88	3.54	.00	.88	.00	.88	.88	6.19	5.31	2.65	.00	.00	.88	.00	5.31	.88	.00	28.32
(2)	.05	.19	.00	.05	.00	.05	.05	.32	.28	.14	.00	.00	.05	.00	.28	.05	.00	1.48
13-18	3	3	1	0	0	0	0	1	1	3	2	0	0	3	9	0	0	26
(1)	2.65	2.65	.88	.00	.00	.00	.00	.88	.88	2.65	1.77	.00	.00	2.65	7.96	.00	.00	23.01
(2)	.14	.14	.05	.00	.00	.00	.00	.05	.05	.14	.09	.00	.00	.14	.42	.00	.00	1.20
19-24	0	3	11	1	0	0	0	1	0	0	1	0	0	0	5	1	0	23
(1)	.00	2.65	9.73	.88	.00	.00	.00	.88	.00	.00	.88	.00	.00	.00	4.42	.88	.00	20.35
(2)	.00	.14	.51	.05	.00	.00	.00	.05	.00	.00	.05	.00	.00	.00	.23	.05	.00	1.06
GT 24	2	2	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
(1)	1.77	1.77	9.73	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	13.27
(2)	.09	.09	.51	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.69
ALL SPEEDS	10	13	24	4	4	3	2	9	8	6	3	0	1	3	20	3	0	113
(1)	8.85	11.50	21.24	3.54	3.54	2.65	1.77	7.96	7.08	5.31	2.65	.00	.88	2.65	17.70	2.65	.00	100.00
(2)	.46	.60	1.11	.19	.19	.14	.09	.42	.37	.28	.14	.00	.05	.14	.93	.14	.00	5.23

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

0= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR66-JUN66 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 45.63

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	1	1	3	3	6	2	4	1	3	3	5	1	0	3	4	1	0	41
(1)	.10	.10	.30	.30	.61	.20	.41	.10	.30	.30	.51	.10	.00	.30	.41	.10	.00	4.13
(2)	.05	.05	.14	.14	.28	.09	.19	.05	.14	.14	.23	.05	.00	.14	.19	.05	.00	1.90
4-7	5	7	8	5	13	5	8	11	14	5	7	8	1	5	2	5	0	109
(1)	.51	.71	.81	.51	1.32	.51	.81	1.12	1.42	.51	.71	.81	.10	.51	.20	.51	.00	11.05
(2)	.23	.32	.37	.23	.60	.23	.37	.51	.65	.23	.32	.37	.05	.23	.09	.23	.00	5.04
8-12	15	7	13	14	9	2	9	16	29	30	23	11	11	26	18	15	0	248
(1)	1.52	.71	1.32	1.42	.91	.20	.91	1.62	2.94	3.04	2.33	1.12	1.12	2.64	1.83	1.52	.00	25.15
(2)	.69	.32	.60	.65	.42	.09	.42	.74	1.34	1.39	1.06	.51	.51	1.20	.83	.69	.00	11.48
13-18	7	10	40	15	1	0	5	10	3	39	88	19	22	37	27	15	0	338
(1)	.71	1.01	4.06	1.52	.10	.00	.51	1.01	.30	3.96	8.92	1.93	2.23	3.75	2.74	1.52	.00	34.28
(2)	.32	.46	1.85	.69	.05	.00	.23	.46	.14	1.80	4.07	.88	1.02	1.71	1.25	.69	.00	15.64
19-24	9	12	45	14	0	0	0	1	0	4	53	4	0	4	4	17	0	167
(1)	.91	1.22	4.56	1.42	.00	.00	.00	.10	.00	.41	5.38	.41	.00	.41	.41	1.72	.00	16.94
(2)	.42	.56	2.09	.65	.00	.00	.00	.05	.00	.19	2.45	.19	.00	.19	.19	.79	.00	7.73
GT 24	10	21	33	3	0	0	0	0	0	0	5	4	0	0	0	7	0	83
(1)	1.01	2.13	3.35	.30	.00	.00	.00	.00	.00	.00	.51	.41	.00	.00	.00	.71	.00	8.42
(2)	.46	.97	1.53	.14	.00	.00	.00	.00	.00	.00	.23	.19	.00	.00	.00	.32	.00	3.84
ALL SPEEDS	47	58	142	54	29	9	26	39	49	81	181	47	34	75	55	60	0	986
(1)	4.77	5.88	14.40	5.48	2.94	.91	2.64	3.96	4.97	8.22	18.36	4.77	3.45	7.61	5.58	6.09	.00	100.00
(2)	2.17	2.68	6.57	2.50	1.34	.42	1.20	1.80	2.27	3.75	8.38	2.17	1.57	3.47	2.55	2.78	.00	45.63

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS E CLASS FREQUENCY (PERCENT) = 25.45

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	2	0	2	2	1	1	0	0	2	1	0	1	2	0	1	5	0	20
(1)	.36	.00	.36	.36	.18	.18	.00	.00	.36	.18	.00	.18	.36	.00	.18	.91	.00	3.64
(2)	.09	.00	.09	.09	.05	.05	.00	.00	.09	.05	.00	.05	.09	.00	.05	.23	.00	.93
4-7	4	1	0	0	1	2	5	3	7	5	4	2	6	3	6	9	0	58
(1)	.73	.18	.00	.00	.18	.36	.91	.55	1.27	.91	.73	.36	1.09	.55	1.09	1.64	.00	10.55
(2)	.19	.05	.00	.00	.05	.09	.23	.14	.32	.23	.19	.09	.28	.14	.28	.42	.00	2.68
8-12	2	0	0	0	0	1	5	8	8	15	16	27	39	21	17	9	0	168
(1)	.36	.00	.00	.00	.00	.18	.91	1.45	1.45	2.73	2.91	4.91	7.09	3.82	3.09	1.64	.00	30.55
(2)	.09	.00	.00	.00	.00	.05	.23	.37	.37	.69	.74	1.25	1.80	.97	.79	.42	.00	7.77
13-18	9	4	1	0	0	0	0	2	1	5	49	36	32	13	7	27	0	186
(1)	1.64	.73	.18	.00	.00	.00	.00	.36	.18	.91	8.91	6.55	5.82	2.36	1.27	4.91	.00	33.82
(2)	.42	.19	.05	.00	.00	.00	.00	.09	.05	.23	2.27	1.67	1.48	.60	.32	1.25	.00	8.61
19-24	3	6	1	0	0	0	0	0	0	1	49	26	4	0	0	9	0	99
(1)	.55	1.09	.18	.00	.00	.00	.00	.00	.00	.18	8.91	4.73	.73	.00	.00	1.64	.00	18.00
(2)	.14	.28	.05	.00	.00	.00	.00	.00	.00	.05	2.27	1.20	.19	.00	.00	.42	.00	4.58
GT 24	3	1	3	0	0	0	0	0	0	0	1	9	0	0	0	2	0	19
(1)	.55	.18	.55	.00	.00	.00	.00	.00	.00	.00	.18	1.64	.00	.00	.00	.36	.00	3.45
(2)	.14	.05	.14	.00	.00	.00	.00	.00	.00	.00	.05	.42	.00	.00	.00	.09	.00	.88
ALL SPEEDS	23	12	7	2	2	4	10	13	18	27	119	101	83	37	31	61	0	550
(1)	4.18	2.18	1.27	.36	.36	.73	1.82	2.36	3.27	4.91	21.64	18.36	15.09	6.73	5.64	11.09	.00	100.00
(2)	1.06	.56	.32	.09	.09	.19	.46	.60	.83	1.25	5.51	4.67	3.84	1.71	1.43	2.82	.00	25.45

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS F CLASS FREQUENCY (PERCENT) = 5.69

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	0	1	0	0	1	0	0	1	1	2	2	1	1	0	0	0	0	10
(1)	.00	.81	.00	.00	.81	.00	.00	.81	.81	1.63	1.63	.81	.81	.00	.00	.00	.00	8.13
(2)	.00	.05	.00	.00	.05	.00	.00	.05	.05	.09	.09	.05	.05	.00	.00	.00	.00	.46
4-7	2	0	0	0	0	0	2	3	4	3	3	3	3	2	1	2	0	28
(1)	1.63	.00	.00	.00	.00	.00	1.63	2.44	3.25	2.44	2.44	2.44	2.44	1.63	.81	1.63	.00	22.76
(2)	.09	.00	.00	.00	.00	.00	.09	.14	.19	.14	.14	.14	.14	.09	.05	.09	.00	1.30
8-12	2	0	0	0	0	1	2	4	4	4	8	2	6	5	2	0	0	40
(1)	1.63	.00	.00	.00	.00	.81	1.63	3.25	3.25	3.25	6.50	1.63	4.88	4.07	1.63	.00	.00	32.52
(2)	.09	.00	.00	.00	.00	.05	.09	.19	.19	.19	.37	.09	.28	.23	.09	.00	.00	1.85
13-18	3	0	0	0	0	0	0	0	0	0	1	5	14	7	1	1	0	32
(1)	2.44	.00	.00	.00	.00	.00	.00	.00	.00	.00	.81	4.07	11.38	5.69	.81	.81	.00	26.02
(2)	.14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.23	.65	.32	.05	.05	.00	1.48
19-24	0	1	0	0	0	0	0	0	0	0	0	7	3	0	0	0	0	11
(1)	.00	.81	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.69	2.44	.00	.00	.00	.00	8.94
(2)	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.32	.14	.00	.00	.00	.00	.51
GT 24	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.63	.00	.00	.00	.00	.00	1.63
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.00	.00	.00	.00	.00	.09
ALL SPEEDS	7	2	0	0	1	1	4	8	9	9	14	20	27	14	4	3	0	123
(1)	5.69	1.63	.00	.00	.81	.81	3.25	6.50	7.32	7.32	11.38	16.26	21.95	11.38	3.25	2.44	.00	100.00
(2)	.32	.09	.00	.00	.05	.05	.19	.37	.42	.42	.65	.93	1.25	.65	.19	.14	.00	5.69

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR88-JUN88 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS G CLASS FREQUENCY (PERCENT) = 1.62

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
0-3	2	2	1	0	1	0	0	0	0	0	0	0	0	1	0	4	0	11
(1)	5.71	5.71	2.86	.00	2.86	.00	.00	.00	.00	.00	.00	.00	.00	2.86	.00	11.43	.00	31.43
(2)	.09	.09	.05	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.19	.00	.51
4-7	1	0	0	0	0	0	0	2	1	1	1	1	2	1	3	4	0	17
(1)	2.86	.00	.00	.00	.00	.00	.00	5.71	2.86	2.86	2.86	2.86	5.71	2.86	8.57	11.43	.00	48.57
(2)	.05	.00	.00	.00	.00	.00	.00	.09	.05	.05	.05	.05	.09	.05	.14	.19	.00	.79
8-12	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3
(1)	.00	.00	.00	.00	.00	.00	.00	.00	2.86	2.86	2.86	.00	.00	.00	.00	.00	.00	8.57
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.05	.05	.05	.00	.00	.00	.00	.00	.00	.14
13-18	1	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	4
(1)	2.86	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.71	2.86	.00	.00	.00	.00	11.43
(2)	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.05	.00	.00	.00	.00	.19
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	4	2	1	0	1	0	0	2	2	2	2	3	3	2	3	8	0	35
(1)	11.43	5.71	2.86	.00	2.86	.00	.00	5.71	5.71	5.71	5.71	8.57	8.57	5.71	8.57	22.86	.00	100.00
(2)	.19	.09	.05	.00	.05	.00	.00	.09	.09	.09	.09	.14	.14	.09	.14	.37	.00	1.62

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

TABLE 4A-2 (Continued)

PILGRIM STATION APR85-JUN85 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

220.0 FT WIND DATA STABILITY CLASS ALL CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	5	4	6	11	18	7	4	2	6	6	7	3	3	4	5	10	0	101
(1)	.23	.19	.28	.51	.83	.32	.19	.09	.28	.28	.32	.14	.14	.19	.23	.46	.00	4.67
(2)	.23	.19	.28	.51	.83	.32	.19	.09	.28	.28	.32	.14	.14	.19	.23	.46	.00	4.67
4-7	21	25	19	27	35	23	26	23	29	15	15	14	12	11	12	21	0	328
(1)	.97	1.16	.88	1.25	1.62	1.06	1.20	1.06	1.34	.69	.69	.65	.56	.51	.56	.97	.00	15.18
(2)	.97	1.16	.88	1.25	1.62	1.06	1.20	1.06	1.34	.69	.69	.65	.56	.51	.56	.97	.00	15.18
8-12	35	30	18	20	11	13	41	62	61	61	48	40	58	52	51	29	0	630
(1)	1.62	1.39	.83	.93	.51	.60	1.90	2.87	2.82	2.82	2.22	1.85	2.68	2.41	2.36	1.34	.00	29.15
(2)	1.62	1.39	.83	.93	.51	.60	1.90	2.87	2.82	2.82	2.22	1.85	2.68	2.41	2.36	1.34	.00	29.15
13-18	30	29	45	15	1	0	21	24	6	54	142	62	69	62	56	46	0	662
(1)	1.39	1.34	2.08	.69	.05	.00	.97	1.11	.28	2.50	6.57	2.87	3.19	2.87	2.59	2.13	.00	30.63
(2)	1.39	1.34	2.08	.69	.05	.00	.97	1.11	.28	2.50	6.57	2.87	3.19	2.87	2.59	2.13	.00	30.63
19-24	12	27	62	16	0	0	0	2	0	6	103	37	7	4	14	27	0	317
(1)	.56	1.25	2.87	.74	.00	.00	.00	.09	.00	.28	4.77	1.71	.32	.19	.65	1.25	.00	14.67
(2)	.56	1.25	2.87	.74	.00	.00	.00	.09	.00	.28	4.77	1.71	.32	.19	.65	1.25	.00	14.67
GT 24	15	24	51	3	0	0	0	0	0	0	6	15	0	0	0	9	0	123
(1)	.69	1.11	2.36	.14	.00	.00	.00	.00	.00	.00	.28	.69	.00	.00	.00	.42	.00	5.69
(2)	.69	1.11	2.36	.14	.00	.00	.00	.00	.00	.00	.28	.69	.00	.00	.00	.42	.00	5.69
ALL SPEEDS	118	139	201	92	65	43	92	113	102	142	321	171	149	133	138	142	0	2161
(1)	5.46	6.43	9.30	4.26	3.01	1.99	4.26	5.23	4.72	6.57	14.85	7.91	6.89	6.15	6.39	6.57	.00	100.00
(2)	5.46	6.43	9.30	4.26	3.01	1.99	4.26	5.23	4.72	6.57	14.85	7.91	6.89	6.15	6.39	6.57	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .50 MPH)

5. OFF-SITE DOSE CALCULATION MANUAL REVISIONS

The PNPS Offsite Dose Calculation Manual (ODCM) was revised during this reporting period (See Appendix C). The revisions to the ODCM were reviewed by the PNPS Operations Review Committee (ORC) on August 19, 1988 per ORC Meeting No. 88-87. These changes will become effective in September of 1988.

The PNPS Semiannual Radioactive Effluent and Waste Disposal Report for January 1 through June 30, 1987 was submitted to the NRC in September 1, 1987. Appendix D of this report contained revisions to the ODCM updating distances and directions to the TLD and air sampling locations. As part of an ongoing review of licensee ODCMs, the NRC subcontracted with EG&G Idaho, Inc. The PNPS ODCM Rev.1 was reviewed in its entirety as part of their technical assistance contract program. A Safety Evaluation Report and the results of the Technical Evaluation Report (TAC #63012) were transmitted to Boston Edison on October 28, 1987 (Reference 4). A number of concerns were listed and a 6 month response was requested (Reference 5).

Attachment A lists the concerns identified in the NRC's contractor evaluation report. The concerns have been numbered in the order in which they appear in Section 4 of the Technical Evaluation Report. The corresponding change or justification for not making the change is described under each item.

In addition, a technical review was performed on the ODCM by Boston Edison Company (Reference 6). This internal review resulted in administrative and technical changes. The major technical improvements made as a result of the internal technical review are described in Attachment B. Major improvements were made in the sections dealing with calculation methods, radiological environmental sampling and measurement locations, and description of radwaste systems.

Attachment A

Pilgrim Nuclear Power Station's Offsite Dose Calculation Manual
Boston Edison Company's Response to Nuclear Regulatory Commission Concerns
Identified in the NRC's Technical Evaluation Report (TAC #63012)

The attached is a listing of the concerns listed in Section 4.0 of Supplement 1 to Appendix D of NRC letter to Ralph G. Bird from Richard H. Messman, dated October 28, 1987. The associated changes to the PNPS ODCM or justification for not making changes are listed following each item.

NRC Concern No. 1 — In Section 4.1, it is uncertain if the dose rate to the child's thyroid is identified as the maximum organ dose since the bases statement in Technical Specification 3.8.D identified the infant age group instead of the child age group.

Response No. 1 — A proposed Technical Specification revision to Section 3.8.D will be submitted following startup that will provide clarification. The clarification will indicate the current practice of considering all age groups in the organ dose calculation for iodines and particulates with a half life greater than 8 days, and Tritium. The age group with the maximum estimated organ dose will continue to be used to ensure dose rates from gaseous effluents are within PNPS Technical Specifications.

NRC Concern No. 2 — In Section 3.1.3, the location of the environmental release point for liquid radwaste batch releases from sources other than the liquid radwaste treatment system should be identified in the ODCM.

Response No. 2 — The following clarification has been added to Section 3.1.3:

"All batch releases which are not processed through the liquid radwaste treatment system are also discharged through the outlet to the circulating water discharge canal. These untreated liquid effluent releases also enter the Cape Cod Bay at the outfall of the discharge canal."

NRC Concern No. 3 — Figures 3.1, 3.2, and 3.3 contain diagrams showing the radiation monitoring systems. These radiation monitoring system diagrams are illegible and should be replaced.

Response No. 3

Figures for the radiation monitoring systems are not required by NUREG-0133 or "General Contents of the Offsite Dose Calculation Manual," Revision 1, issued by a Branch Technical Position from the Radiological Assessment Branch dated February 8, 1979. Since the information on the radiation monitoring systems recommended by the Branch Technical Position is contained in the text of ODCM Section 3.2, Figures 3.1, 3.2, and 3.3 have been deleted. The location of these drawings have been listed in the text of ODCM Section 3.2 (i.e., Section 7.12 of the PNPS Updated FSAR).

NRC Concern No. 4

In Section 4.A, the option for determining the quantity C_{wi} in the concentration equation by "estimates based on prior experience" is not consistent with liquid sampling Table 4.8-1 of the technical specifications.

Response No. 4

Section 4.A has been revised and renumbered as 4.1. The definition of C_{wi} has been changed to be consistent with liquid effluent sampling described in PNPS Technical Specifications as follows:

"C_{wi} = Concentration of nuclide i in the liquid waste discharge volume prior to any dilution as determined by current isotopic analysis for gamma emitting nuclides and most recent results from pure beta and alpha emitters, (μCi/cc)."

NRC Concern No. 5

In the equations of Sections 4.B and 4.C, the dilution flow is represented by "F" and "M_p" and should be replaced with the average condenser cooling flow for the period to change the dilution flow to the average flow of the discharge canal during the reporting period.

Response No. 5

The use of a mixing ratio value was maintained to allow for additional dilution in seawater at a given location of interest. The value has been designated "M_l" and is defined as follows:

"M_l is the mixing ratio (reciprocal of dilution factor) at location l of exposure or harvest of aquatic food, from Table A-3 (dimensionless);"

In addition, the dilution flow (F) has been replaced with the volumetric flow rate in liters/yr (V). The definition of V specifies summing both the liquid effluent and condenser cooling/dilution water volumes. The revised units (liter/yr) resulted in changing the conversion constant to be dimensionally consistent. The change does not reduce the accuracy of the equation.

NRC Concern No. 6

In Sections 4.D through 4.L, it is not clear from the equations that simultaneous dose rate contributions from the main stack and the reactor building vent are included.

Response No. 6

The equations in Sections 4.D through 4.L have been revised and now correspond to the equations in Sections 4.3.1 and 4.3.2. The following clarification of existing practices for summation of the two dose rate contribitions has been added to Section 4.3:

"Summation of the doses from the equations below should be performed for all significant pathways and all release points from which significant radioactive effluent releases have occurred (i.e., Main Stack and Reactor Building Exhaust Vent)."

NRC Concern No. 7

In Sections 4.H through 4.L, the titles identify "Halogens, Particulates and others" instead of "iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days".

Response No. 7

The titles in Sections 4.H through 4.L have been revised and now fall under the title in Section 4.3.2 which is:

"Gaseous Pathway Annual Dose Rates for Iodine 131 and 133, Particulates with Half-Life Greater than 8 days, and Tritium".

NRC Concern No. 8

In Section 4.H, the equation for the annual dose rate from ground deposition contains an "1" in the denominator, whereas it should be λ_i.

Response No. 8

The equation in Section 4.H has been revised and now corresponds to equation 4.3.2.1. The missing lambda symbol has been included into the equation for the annual dose rate from ground deposition.

NRC Concern No. 9

In Sections 4.J through 4.L, the constants 1.2×10^7, 2.2×10^7, 5.5×10^7, and 1.1×10^8 are not defined.

Response No. 9

The constants in the equations in Sections 4.J through 4.L have been changed. These constants are defined in Section 4.3.3 as follows:

"1.19E7 - is equal to 1.00E12 pCi/Ci divided by 3.15E7 sec/yr and multiplied by 1.00E3 g/kg and by 0.5 g H-3 in plant water per g H-3 in atmospheric water from Reference 23 (dimensionless) and by 0.75 g water per g plant (dimensionless) as calculated in Reference 1 equation C-9, (pCi-yr-g/Ci-sec-kg);

2.18E7 - is equal to 1.00E12 pCi/Ci divided by 3.15E7 sec/yr and multiplied by 1.00E3 g/kg and by 0.11 g Carbon/g plant mass from References 24 and 25 divided by 0.16 g Carbon/m^3 of air, as calculated in Reference 1 equation C-8, ($pCi-yr-m^3/Ci-sec-kg$);

5.71E7 - is the conversion factor to correct for activity units, time units, and elemental forms of radioiodines, equal to the particulate nuclide conversion factor 1.14E8 multiplied by an elemental iodine fraction of 0.5 from Reference 26, (pCi-yr/Ci-hr);

1.14E8 - is the conversion factor to correct activity units and time units for particulate radionuclides, equal to 1.00E12 pCi/Ci multiplied by 1 yr/8760 hr, (pCi-yr/Ci-hr);"

NRC Concern No. 10 — In Section 4.L, the definition for the quantity Q_i should not include the word "annual" since the air dose or air dose rate is already being considered "for the period".

Response No. 10 — The definition of Q_i in Section 4.L has been revised and now appears in Section 4.3.3 as follows:

"Q_i - is the annual release rate of nuclide i in gaseous effluents, (Ci/yr);"

The use of the word "annual" has been maintained for clarity and dimensional consistency. For purposes of performing calculations, all input and output values (activity, use factors, dose rates) are normalized to a 1 year period to prevent inconsistencies in time factors. Thus, the air dose rate and the quantity Q_i definitions are consistent in that they are both expressed as an annual rate.

NRC Concern No. 11 — In Section 4.L, the time unit "hours" has been omitted from the definition for t_e.

Response No. 11 — The definition of t_e in Section 4.L has been revised and now appears in Section 4.3.3 as follows:

"t_e - is the time period that crops are exposed to radio-nuclide deposition during the growing season, from Table E-15 (hr);"

The time unit "(hr)" is now indicated in this definition.

NRC Concern No. 12

In Section 6.1, the setpoint for the liquid radwaste monitor is set to the level determined from the prerelease grab sample with no margin allowed. It is not clear if plant operation is consistent with the ODCM description since the monitor should be alarming continuously during a release, thus preventing the release.

Response No. 12

Technical Specification 3.8.B.1.a allows for the setpoint of the effluent monitor to be set to a more conservative level to allow for the discharge of radioactive liquid.

Pilgrim Station Procedure 7.9.2, "Liquid Radioactive Waste Discharge", directs the chemistry technician to recalculate the monitor trip setpoint by utilizing form CH - 11.A.2. This calculation uses detector efficiency and background, actual data of the discharge in question, and available dilution flow to determine an acceptable alarm setpoint that will allow the discharge and at the same time ensure that it will not exceed 10CFR20 limits as prescribed in Section 3.8.A.1 of Technical Specifications.

This methodology also ensures that the monitor does not inadvertently alarm continuously because of the conservative method used to determine the discharge flow rate of the tank.

NRC Concern No. 13

In Section 6.1.3, the documentation for estimating the monitor's efficiency "based on prior release experience" is not referenced.

Reponse No. 13

The following sentence has been added to Section 6.1 Item 3 to provide clarification and additional detail on efficiency determination:

"PNPS Chemistry Procedure 7.3.38 entitled, 'Determination of Conversion Factors for Liquid PRM's', describes the method to determine the efficiency".

NRC Concern No. 14

In Section 6.2, items 3) and 4) reference the equation of Section 4.D and should reference the equations in Sections 4.F and 4.G

Response No. 14

Section 6.2 items 3) and 4) have been revised to reference the correct equations. These sections now reference Sections 4.3.1.3 and 4.3.1.4 for noble gas immersion total body dose and noble gas immersion skin dose, respectively. These sections correspond to the equations in Sections 4.F and 4.G.

NRC Concern No. 15 — A calculation should be included in the ODCM to project doses due to the release of radioactivity in liquid effluents to satisfy the requirement of Technical Specification 3.8.C.1

Response No. 15 — The equations used to project the monthly doses due to releases of radioactivity in liquid effluents were given in Section 4.E and are now referenced in Section 4.2. These equations as well as all other dose rate equations presented in the ODCM yield annual dose rate in mrem/yr or mrad/yr. The final result of any equation(s) must be scaled appropriately for the period of concern. Such scaling is described at the introduction of Sections 4.2 and 4.3. For example, the following statement occurs in the introduction to Section 4.2:

"Modification of final results is necessary for comparison to dose rate limits for periods different than one year. For comparison to monthly limits and quarterly limits, results would be scaled by 1/12 and 1/4, respectively. To determine the dose or dose commitment for a desired period, multiply the annual dose rate by the fraction of the year for the dose period desired."

For purposes of projecting resulting dose estimates for the subsequent month, the release rates and concentrations are assumed to be equal to the previous month's release. Such a position was previously agreed upon in the RETS submittal and in associated meetings with Nuclear Regulatory Commission staff.

NRC Concern No. 16 — A simplified diagram illustrating the solid waste treatment system is not included in the ODCM.

Response No. 16 — A simplified diagram illustrating the solid waste treatment system is not included in the ODCM because Pilgrim Nuclear Power Station does not have a solid waste treatment system.

NRC Concern No. 17 — There is no separate section in the ODCM addressing the total dose limits of Technical Specification 7.5 with methodology for calculating the total dose from the liquid, gaseous, and direct radiation contributions.

Response No. 17 — A new section has been added to Section 4.0. Section 4.4, entitled, "Total Dose to a Member of the Public", which describes the methodology which was and is currently being utilized for calculating the total dose from the liquid, gaseous, and direct radiation contributions. In addition, it addresses the conditions for when an assessment of the total dose must be performed.

NRC Concern No. 18

The direction for Duxbury is NW of the plant site instead of "SSW-SW" as indicated in Table 7-3.

Response No. 18

The direction for the Duxbury sampling location as well as all other sampling locations have been reviewed and revised. The corrected distances and directions were obtained by physical verification of exact positions of sampling location on maps, followed by map generation on computer and computer scaling techniques. The distances and directions were obtained from the "to scale" digitized maps shown in Figures 7-1 through 7-5.

NRC Concern No. 19

Figures 7.1 through 7.4 are illegible and should be replaced.

Response No. 19

Figures 7.1 through 7.4 have been replaced. The new digitized maps showing the radiological environmental sampling and measurement locations appear as Figures 7-1 through 7-5.

NRC Concern No. 20

Figure 8-1 should be modified to show the one-inch and the two-inch discharge lines, the release pathway to the discharge canal, and the environmental release point for liquid radwastes released without treatment.

Response No. 20

Figure 8-1 has been replaced with the corresponding figure from the PNPS Technical Specifications (Figure 4.8-1).

It was not considered reasonable to modify the corresponding figure in PNPS Technical Specifications to add this level of detail. Instead a description of the one-inch low flow line and two inch high flow line was added to Section 3.1.3 as follows:

"The header provides controlled discharge through either a low flow discharge path or a high flow discharge path. The high flow path is normally used with a variable liquid radwaste effluent flow from 1-200 gpm. The common discharge header extends from both the low and high flow-paths and is monitored for radiation prior to discharge".

The release pathway to the discharge canal and the environmental release point for liquid radwaste released without treatment were clarified in Section 3.1.3 as described in Response No. 2.

NRC Concern No. 21	Figure 8-2 in the ODCM shows the drywell effuents being released to the reactor building vent whereas Figure 4.8-2 in the Technical Specifications shows these effluents being released to the main stack. The figures should be correct and consistent.
Response No. 21	Figure 8-2 has been replaced with the corresponding figure from the PNPS Technical Specifications (Figure 4.8-2), which is correct.

Attachment B

Pilgrim Nuclear Power Station's Offsite Dose Calculation Manual
Boston Edison Company's Radiological Engineering Division
Technical Review Summary

The attached is a listing of the major technical improvements made to Pilgrim Nuclear Power Station (PNPS) ODCM, Revision 2. This technical review was performed by the Boston Edison Company's Radiological Engineering Division. This review was performed in July - August 1988 (See Reference 7).

Section 2
- Included limiting conditions for operations and operational objectives for radioactive effluents in the Technical Specification/ODCM Crossreference Table 2-1 of the PNPS ODCM to be more consistent with the PNPS Technical Specifications.

Section 3
- Expanded the technical detail in the text of Section 3.0. for effluent flow rates, mixed MPC definition, and effluent radiation monitor descriptions.

Section 4
- The use of subscripts and superscripts in the equations in Section 4.0 have been revised. A protocal has been established so as to remove past inconsistencies and ambiquities, thereby avoiding confusion in the application of the variables and equations.
- The grouping of constant parameters and variables in the equations in Section 4.0 have been revised. The constants, parameters and variables used to calculate the concentration in various environmental media have been consistently grouped together. This will facilitate calculation of these concentrations as well as facilitate the calculation of dose from measurement results of environmental media concentrations.
- Some new annual dose rate equations have been added. The relatively negligible dose pathways which were analyzed in the PNPS Appendix I Evaluation, were not included in the original PNPS ODCM. These equations were added for completeness and consistency.
- The usage factors for the various pathways were reviewed for applicable site specific data. Some of the usage factors were revised to conform to the more site specific values in the PNPS Unit 1 Appendix I Evaluation. In addition, other usage factors were incorporated to accomodate the dose pathways as mentioned above.

- The values for the shore width factor and mixing ratios were reviewed for site specific data. Some of the shore width factors and mixing ratios were revised to conform to the more site specific values used in the PNPS Unit 1 Appendix I Evaluation. In addition, other shore width factors and mixing ratios were incorporated to accomodate the dose pathways as mentioned above.

- The equation for the ground level concentration utilized in the calculation of the inhalation annual dose rate has been divided into two options. The first for gaseous and H-3 which utilizes the undepleted (X/Q)c dispersion factor. The second is for particulates with half-lives greater than 8 days and I-131 and I-133, which utilized the depleted (X/Q)d dispersion factor.

- The equation for the concentration on stored feed and pasture grass has been divided into two options. The first, which is used for both stored feed and pasture grass concentrations, is specific for I-131 and I-133. The second is specific for particulates with half-lives greater than 8 days.

Section 7.0 Section 7.0 has been expanded to summarize the description of the existing Radiological Environmental Monitoring Program. In addition, the tables in Section 7.0 have all been reviewed and revised to indicate the current program and the existing sampling and measurement locations. A Technical Specification change will be submitted in the future to address the applicable items.

Section 8.0 Section 8.0 concerning Treated Gaseous Radwaste System was expanded. The description of the Augmented Offgas System from the PNPS Updated FSAR was incorporated.

6. REFERENCES

1. D. W. Fountain letter to B. J. Dionne dated August 25, 1988, entitled "Semi-Annual 1.21 Report."

2. W. P. Mullins letter to C. E. Bowman dated August 10, 1988 entitled "Table 3 of Regulatory Guide 1.21 Report for January 1988 to June 1988."

3. R. B. Harvey letter to B. J. Dionne dated August 4, 1988, entitled "PNPS January-March 1988 and April-June 1988 Met Data Joint Frequency Distribution."

4. USNRC letter to Ralph G. Bird from Richard H. Wessman, dated October 28, 1987, entitled, "Pilgrim Nuclear Power Station Acceptance of the Offsite Dose Calculation Manual - Revision 1, updated to June 30, 1987 (TAC #63012)."

5. Boston Edison Company letter to USNRC from Ralph G. Bird, dated May 2, 1988, entitled, "Response to NRC Questions on the Pilgrim ODCM (TAC #63012)".

6. M. S. Strum letter to C. E. Bowman, dated August 16, 1988, entitled "Technical Review of the PNPS ODCM".

7. C. E. Bowman letter to J. Seery/R. N. Swanson, dated August 29, 1988, entitled, "PNPS Offsite Dose Calculation Manual - Final Revision 2".

8. "Pilgrim Station Unit 1 Appendix I Evaluation," Submitted in Accordance with 10CFR50 Appendix I, April 1977.

7. APPENDICES

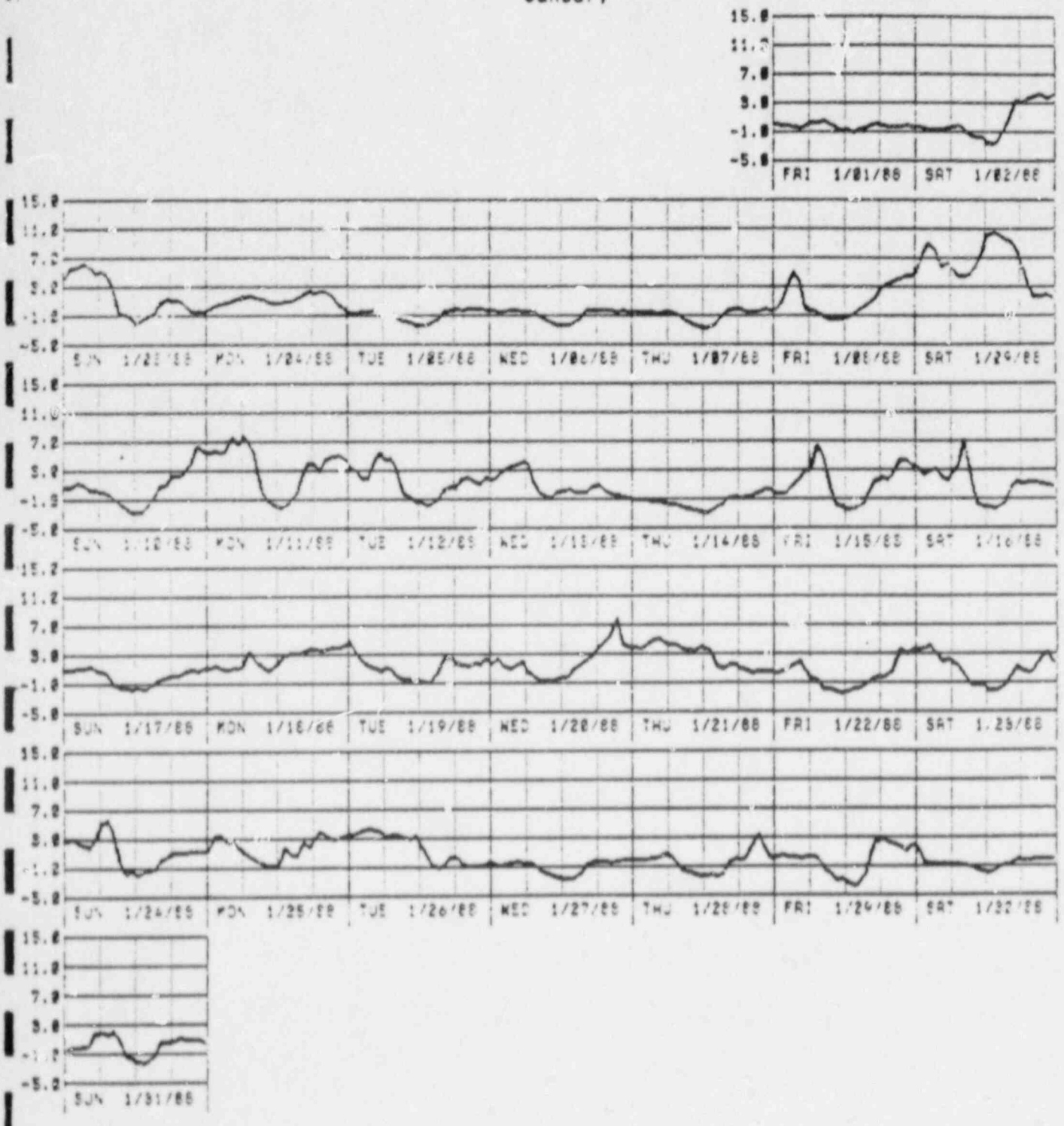
APPENDIX A

Meteorological Data from the 220 Ft. Tower for January - June 1988

APPENDIX A-1

Delta Temperature from the 220 Ft. Tower for January - June 1988

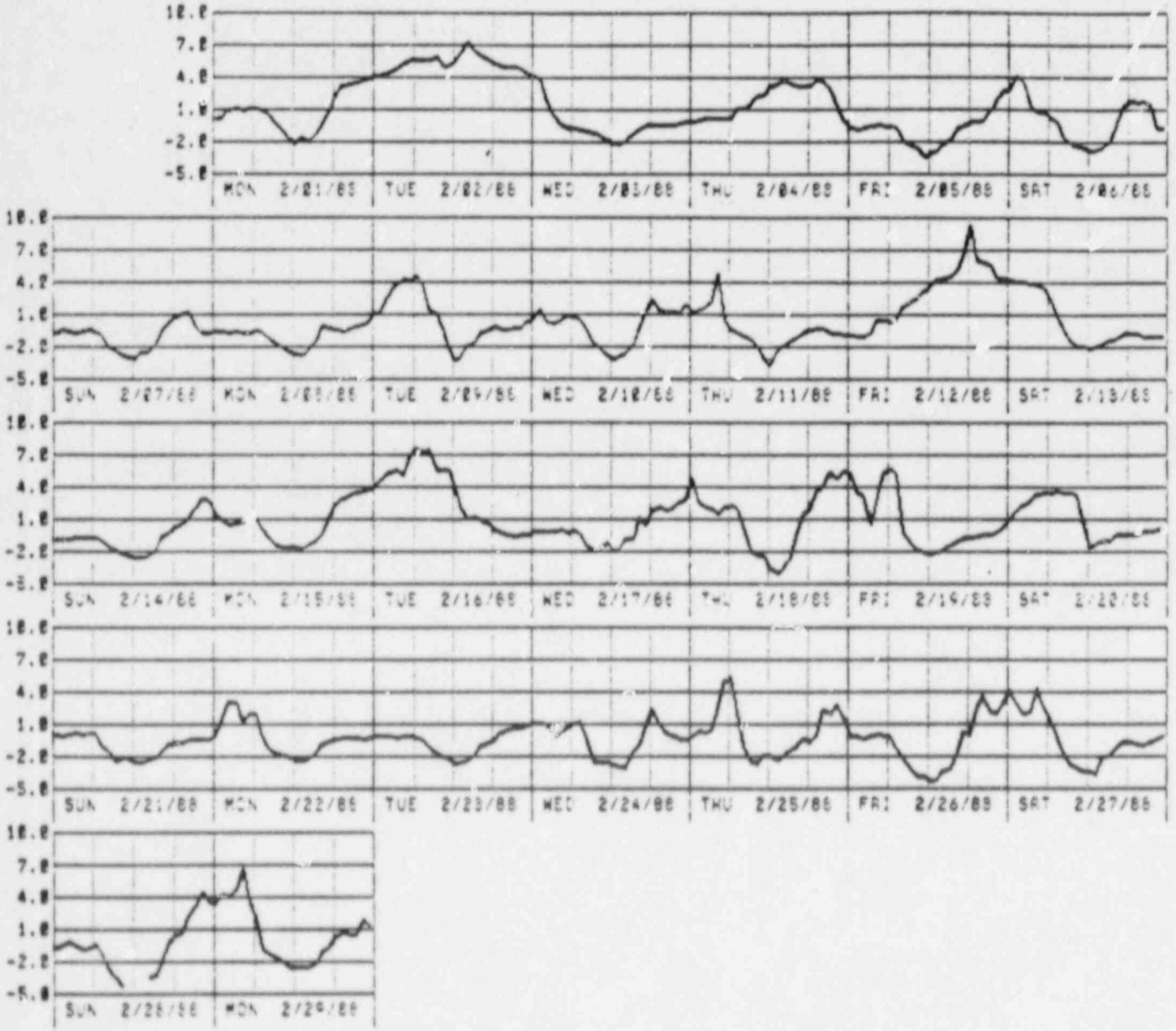
January



T2 DELTA TEMPERATURE (DEG. F) 220-33

Delta Temperature from the 220 Ft. Tower for January - June 1988

February

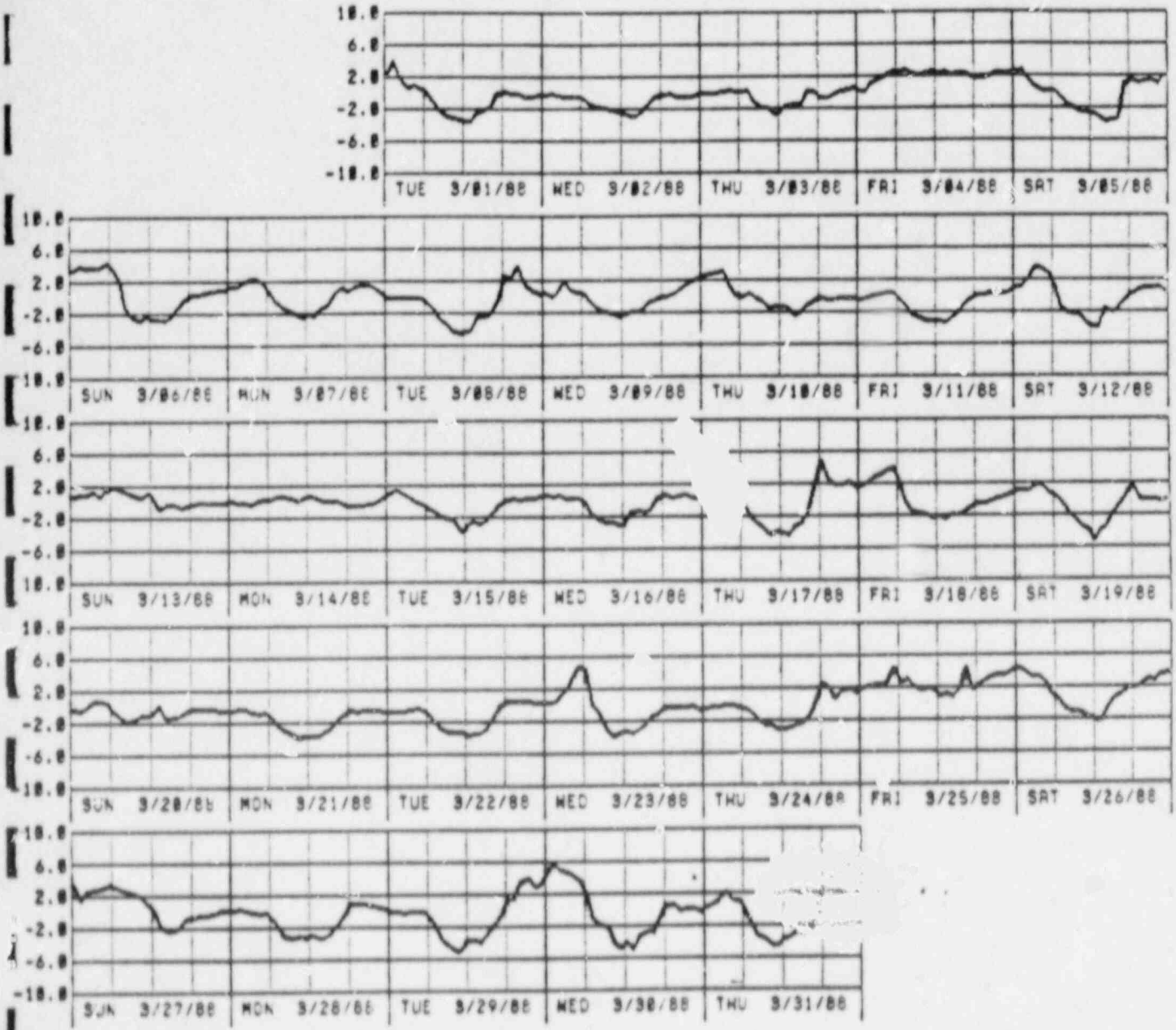


DT2 DELTA TEMPERATURE (DEG. F) 220-33

APPENDIX A-1
(continued)

Delta Temperature from the 220 Ft. Tower for January - June 1988

March

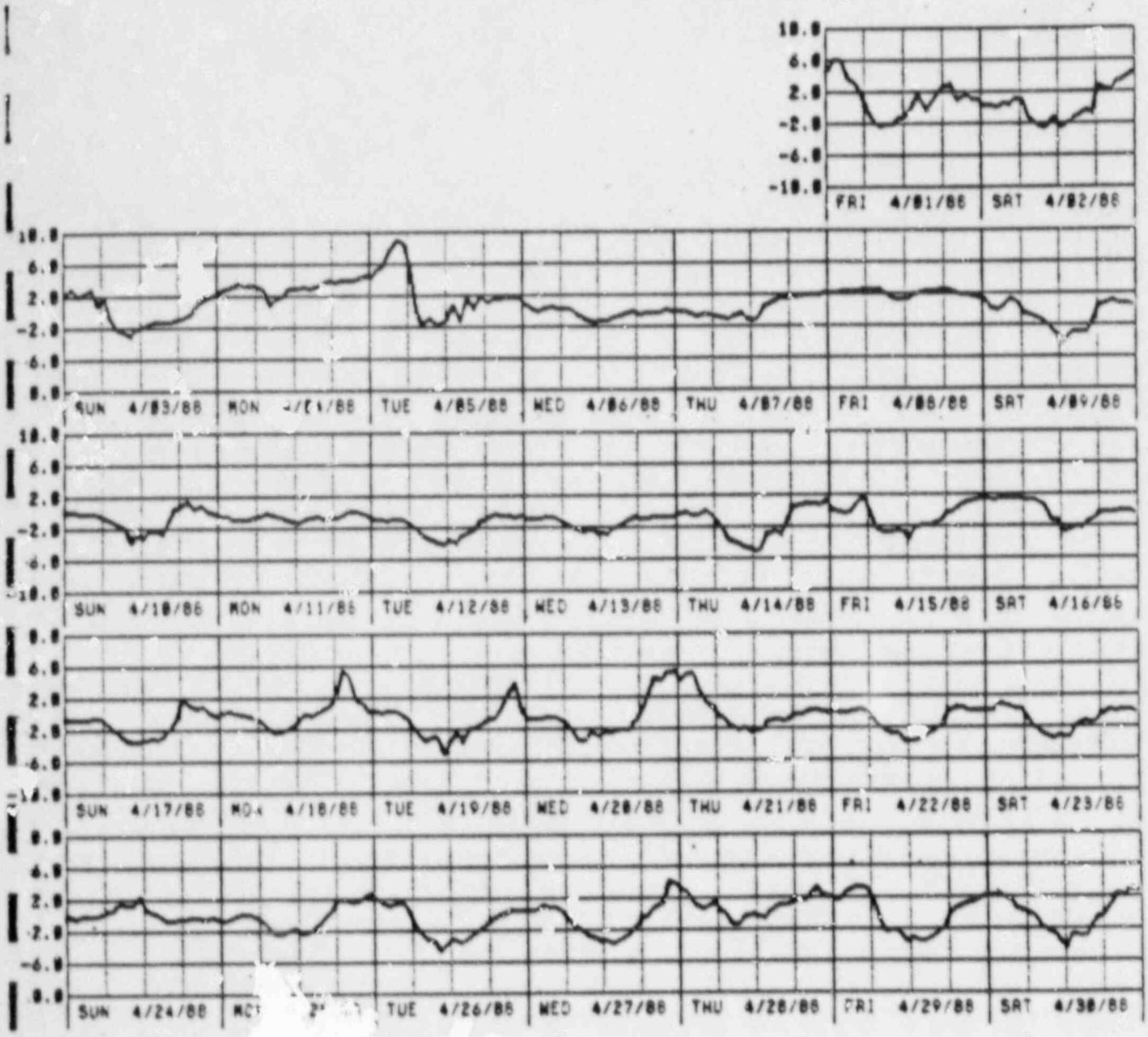


DT2 DELTA TEMPERATURE (DEG. F) 220-33

APPENDIX A-1
(continued)

Delta Temperature from the 220 Ft. Tower for January - June 1988

April

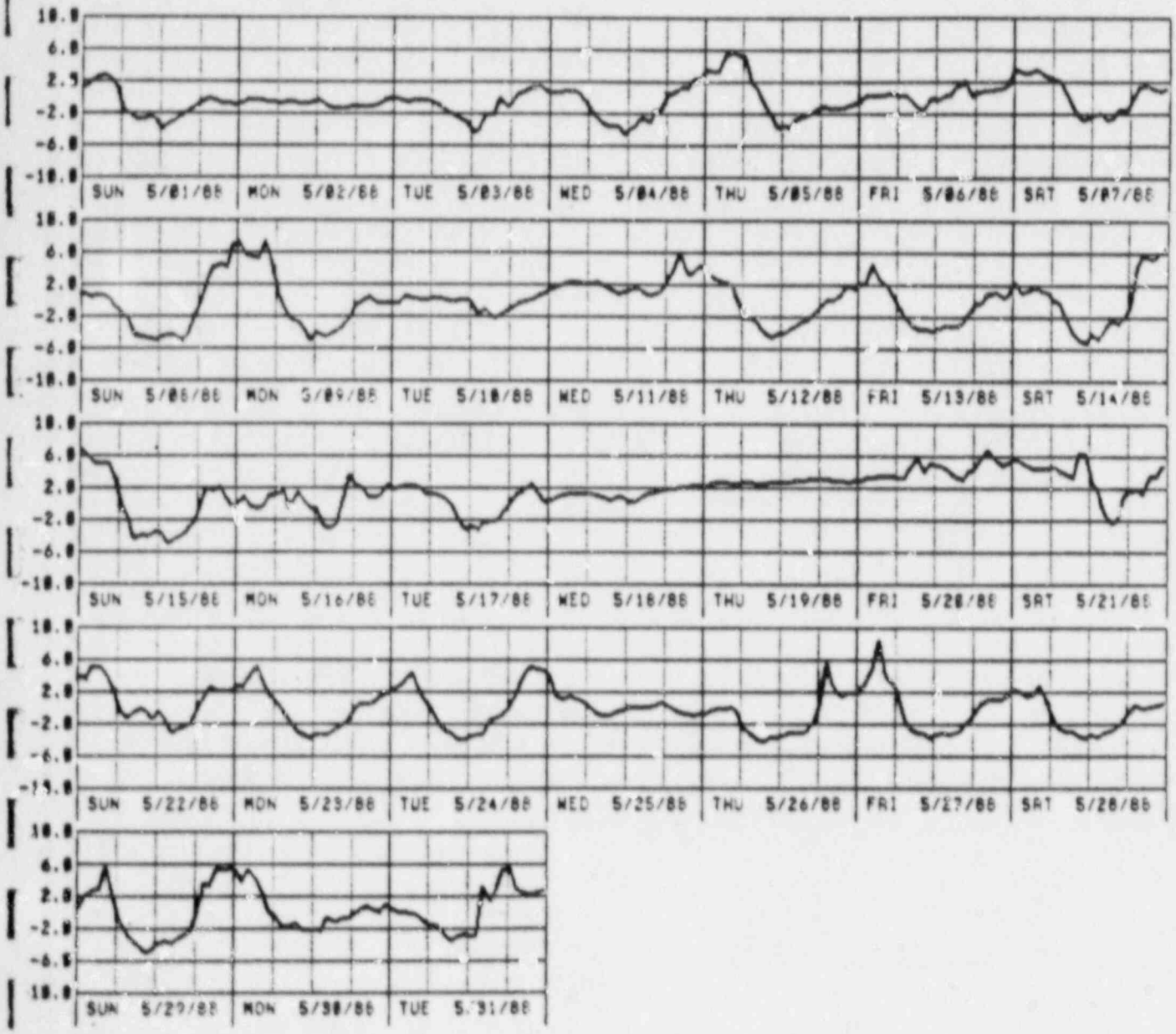


2 220 FT URE (DEG. F)

APPENDIX A-1
(continued)

Delta Temperature from the 220 Ft. Tower for January - June 1988

May

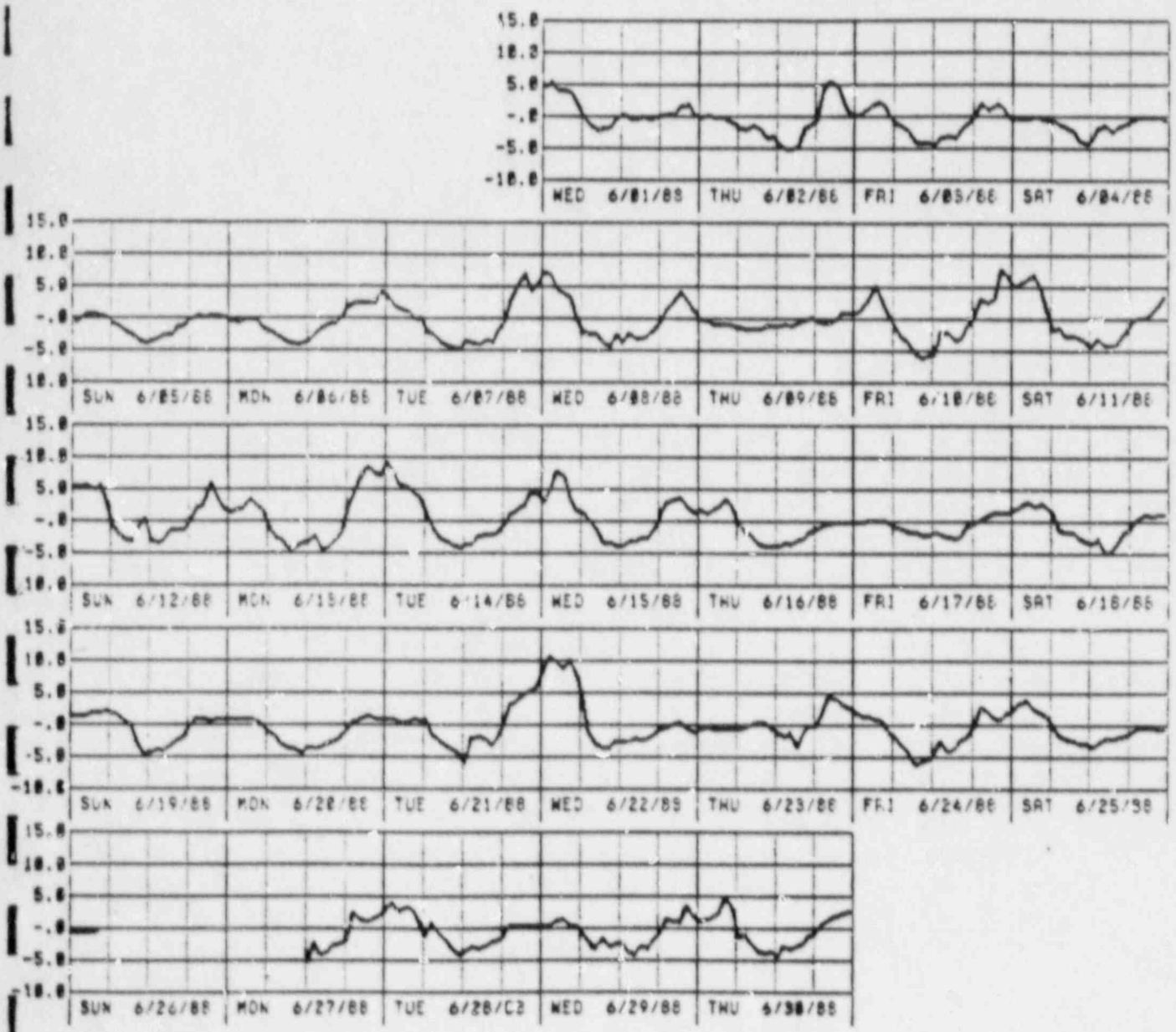


DT2 220 FT DELTA TEMPERATURE (DEG. F)

APPENDIX A-1
(continued)

Delta Temperature from the 220 Ft. Tower for January - June 1988

June

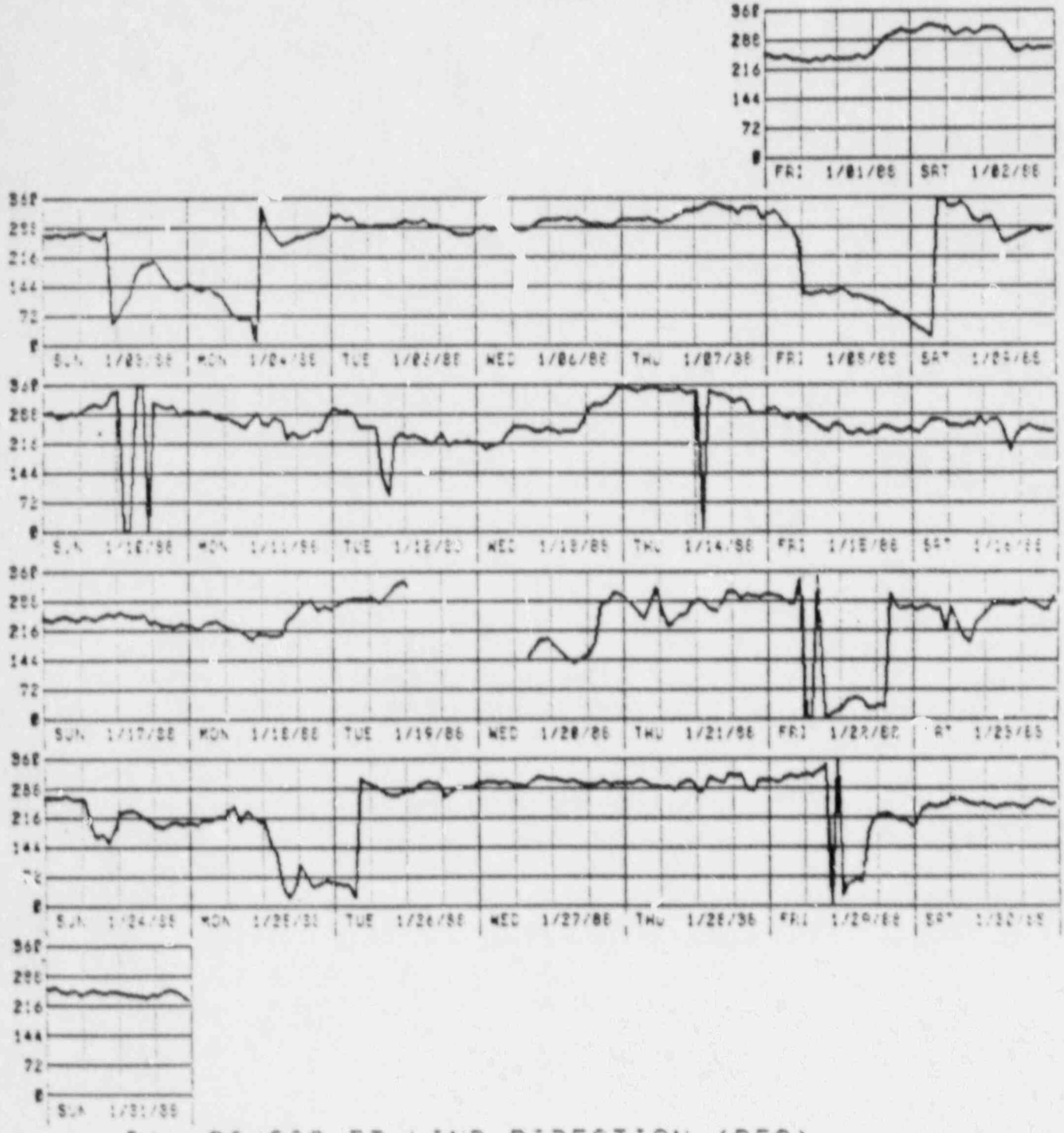


T2 220 FT DELTA TEMPERATURE (DEG. F)

APPENDIX A-2

Wind Direction at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

January

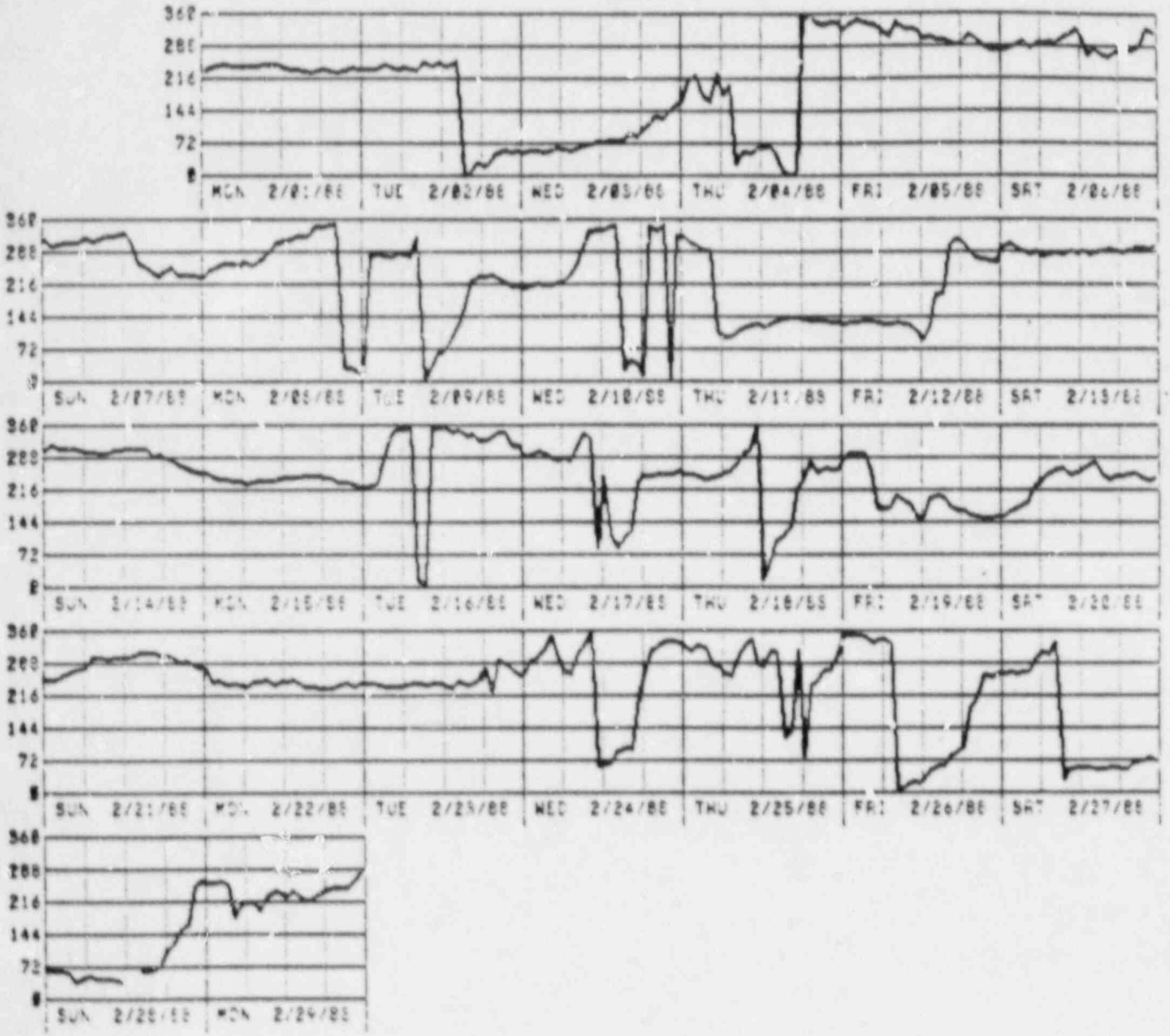


WD4 33/220 FT WIND DIRECTION (DEG)

APPENDIX A-2
(continued)

Wind Direction at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

February

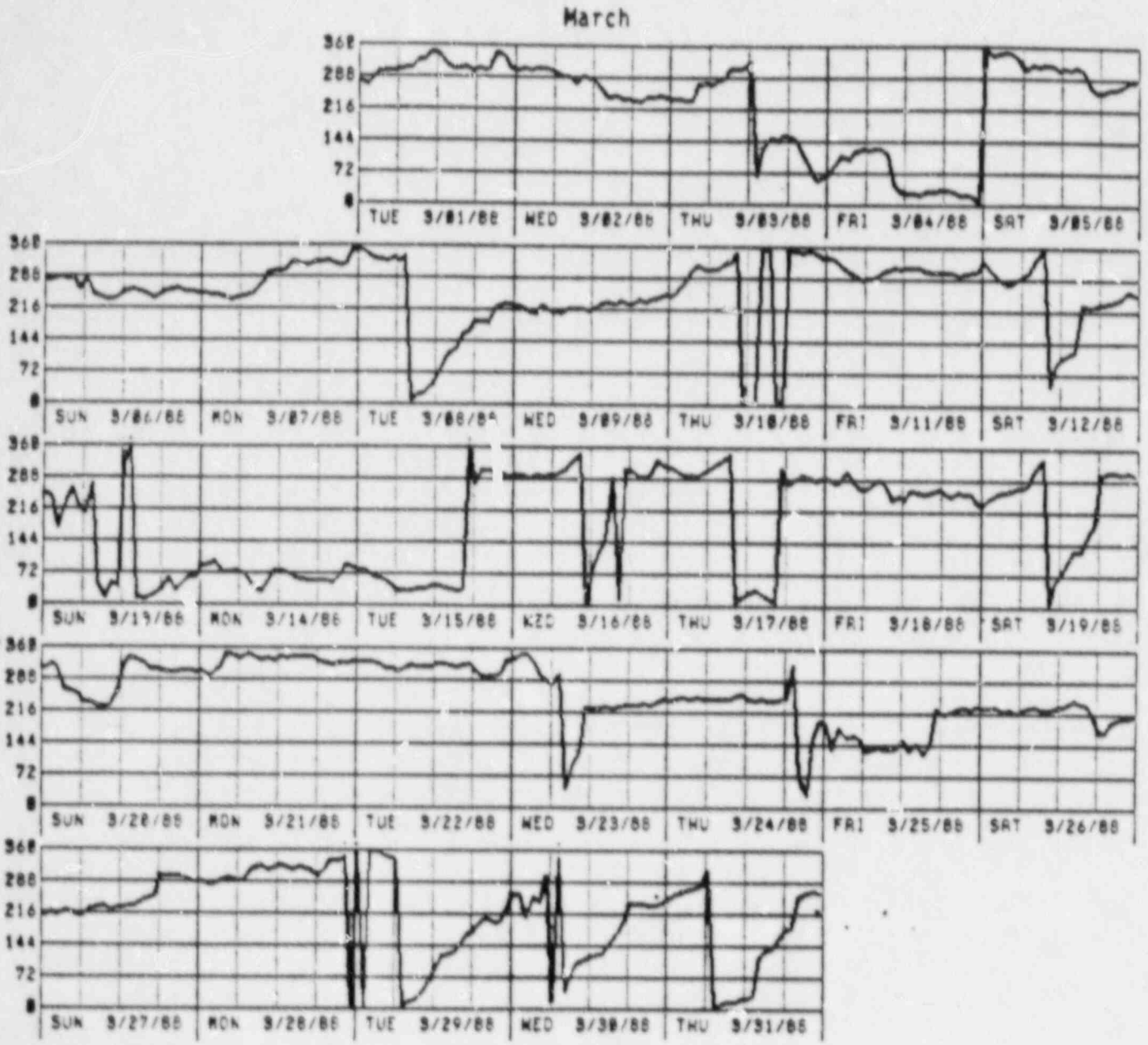


04 33/220 FT WIND DIRECTION (DEG)

APPENDIX A-2
(continued)

Wind Direction at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

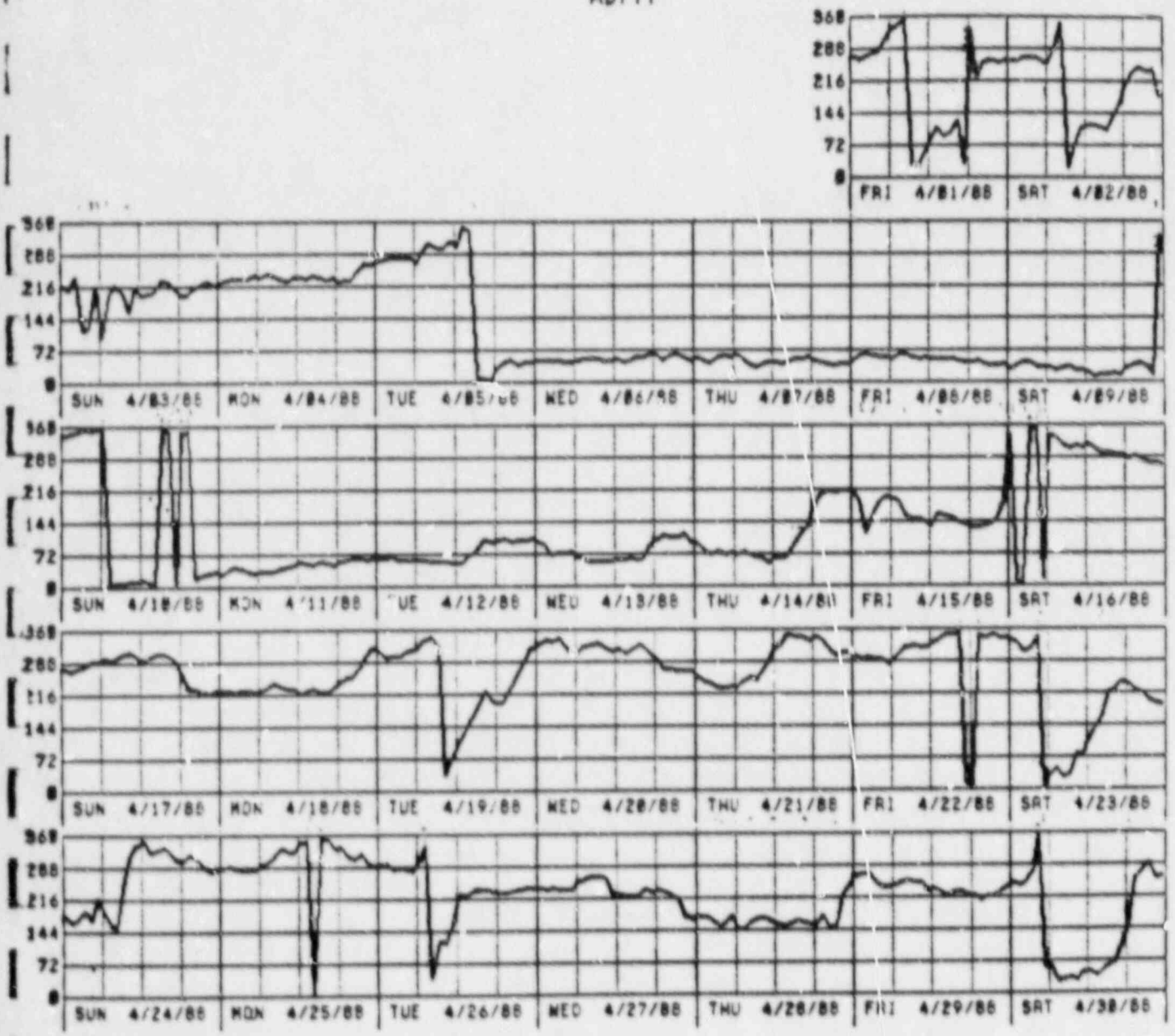
March



D4 33/220 FT WIND DIRECTION (DEG)

Wind Direction at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

April

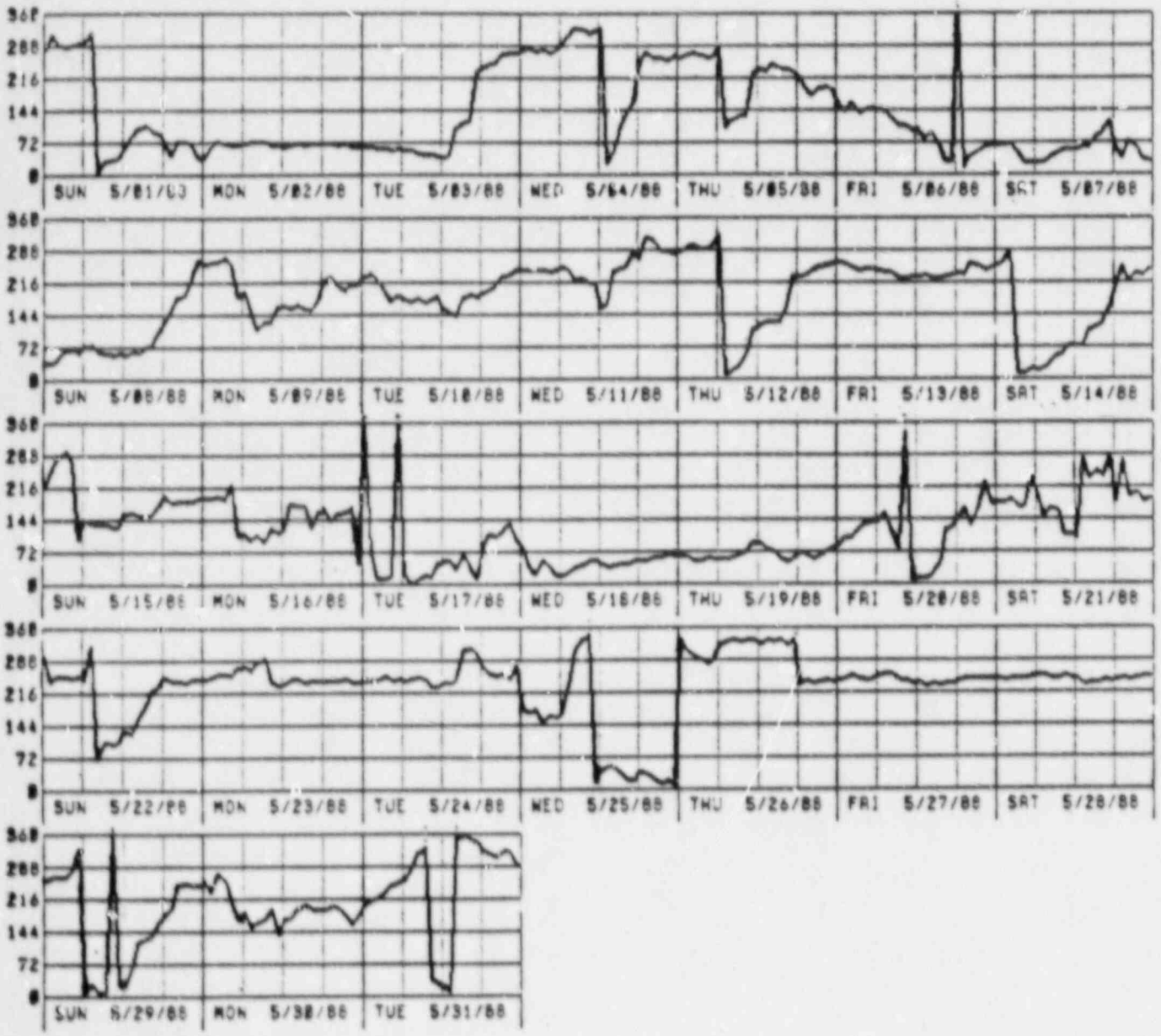


4 33/220 FT WIND DIRECTION (DEG)

APPENDIX A-2
(continued)

Wind Direction at 33 Ft. Level from the 220.Ft. Tower for January - June 1988

May

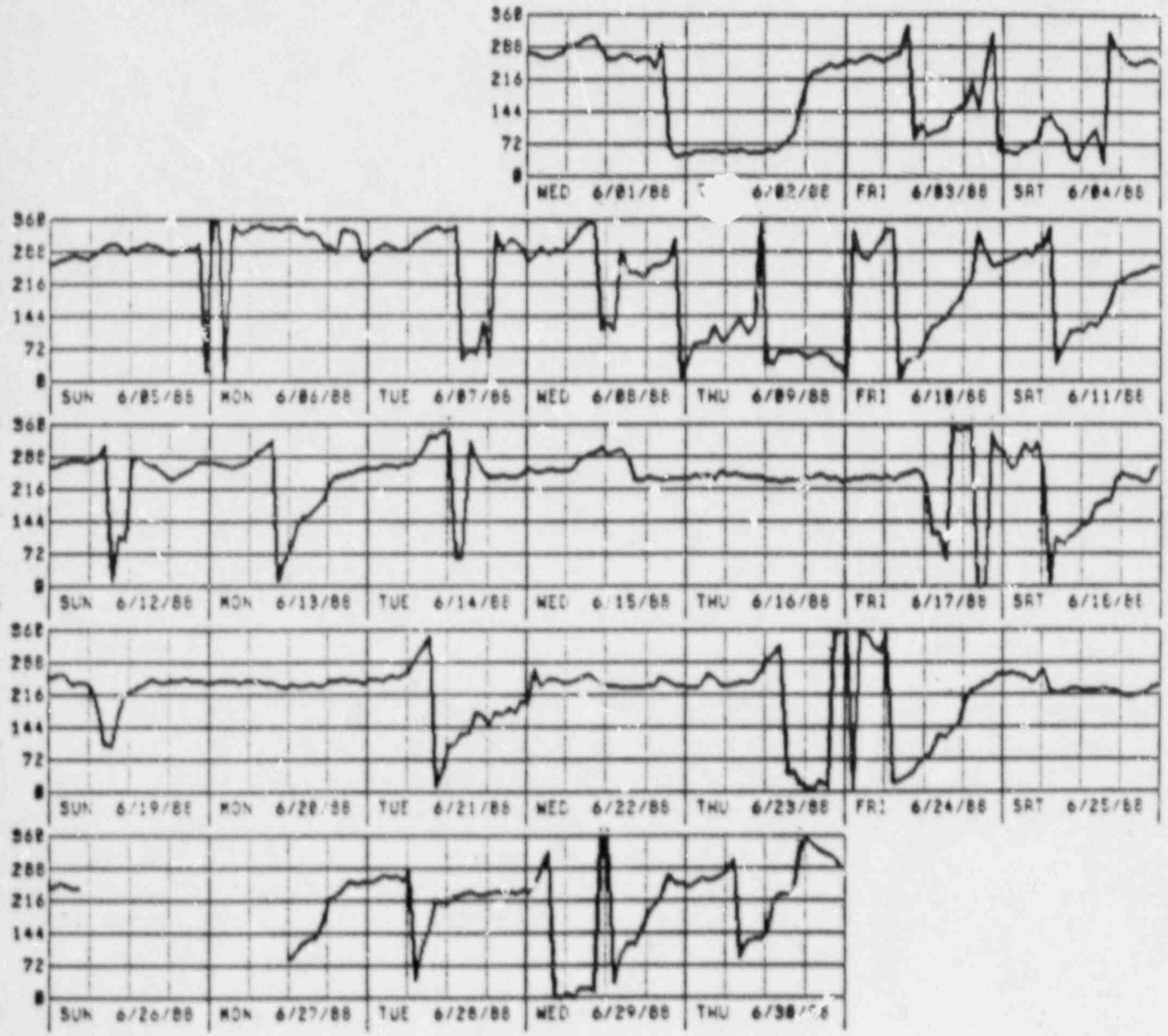


J4 33/220 FT WIND DIRECTION (DEG)

APPENDIX A-2
(continued)

Wind Direction at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

June

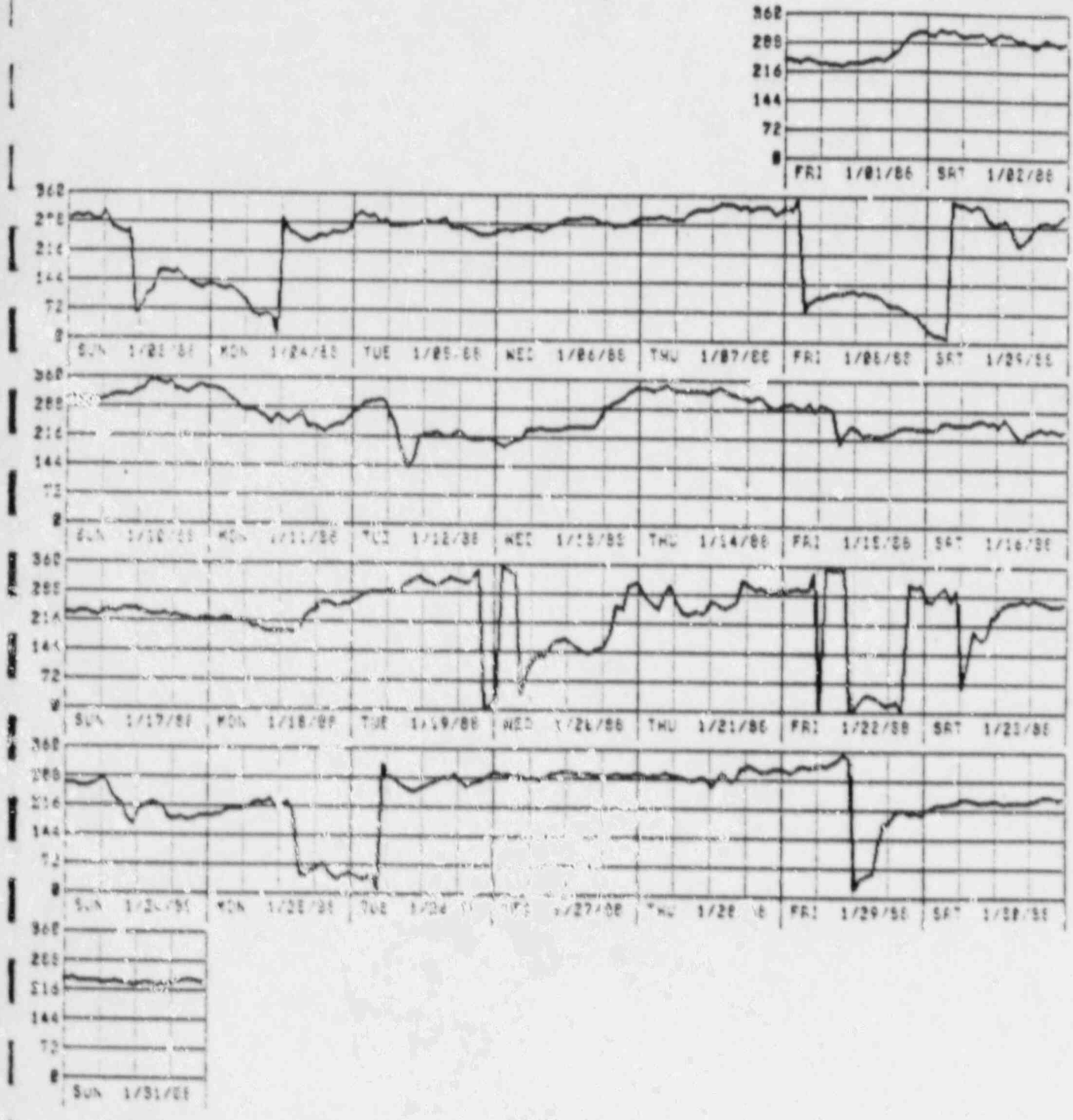


D4 33/220 FT WIND DIRECTION (DEG)

APPENDIX A-3

Wind Direction at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

January

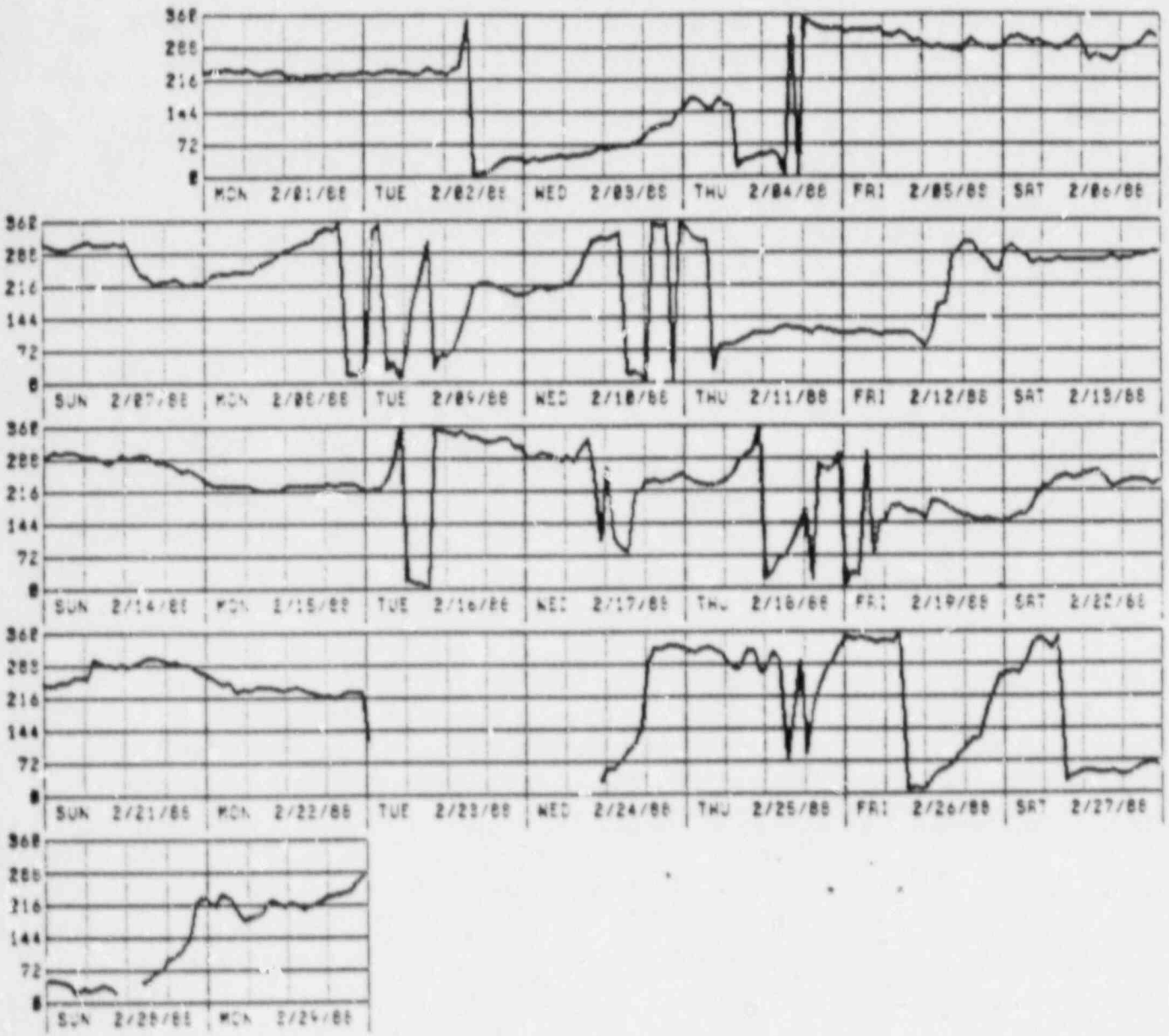


220 FT WIND DIRECTION (DEG)

APPENDIX A-3
(continued)

Wind Direction at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

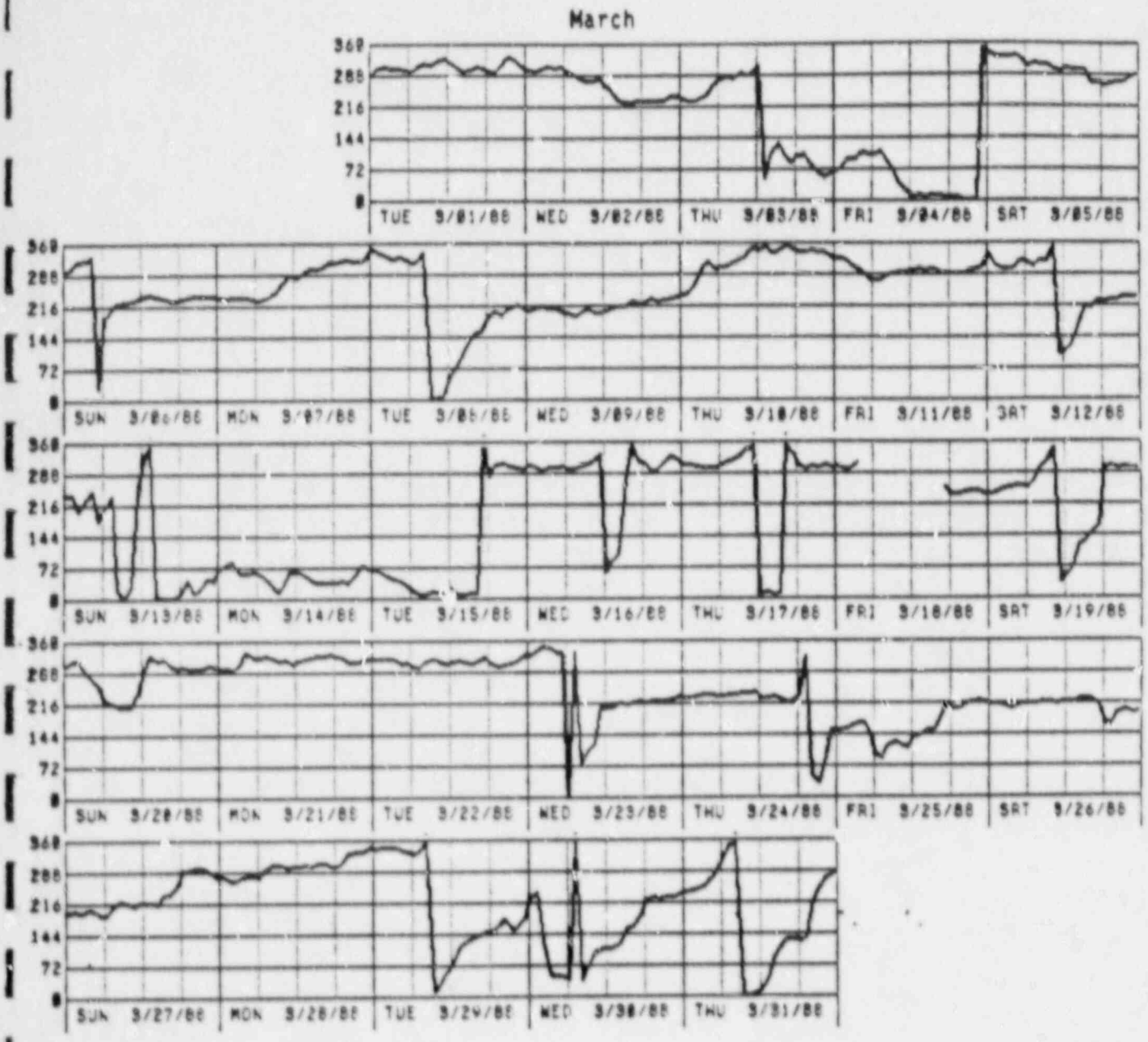
February



02 220 FT WIND DIRECTION (DEG)

APPENDIX A-3
(continued)

Wind Direction at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

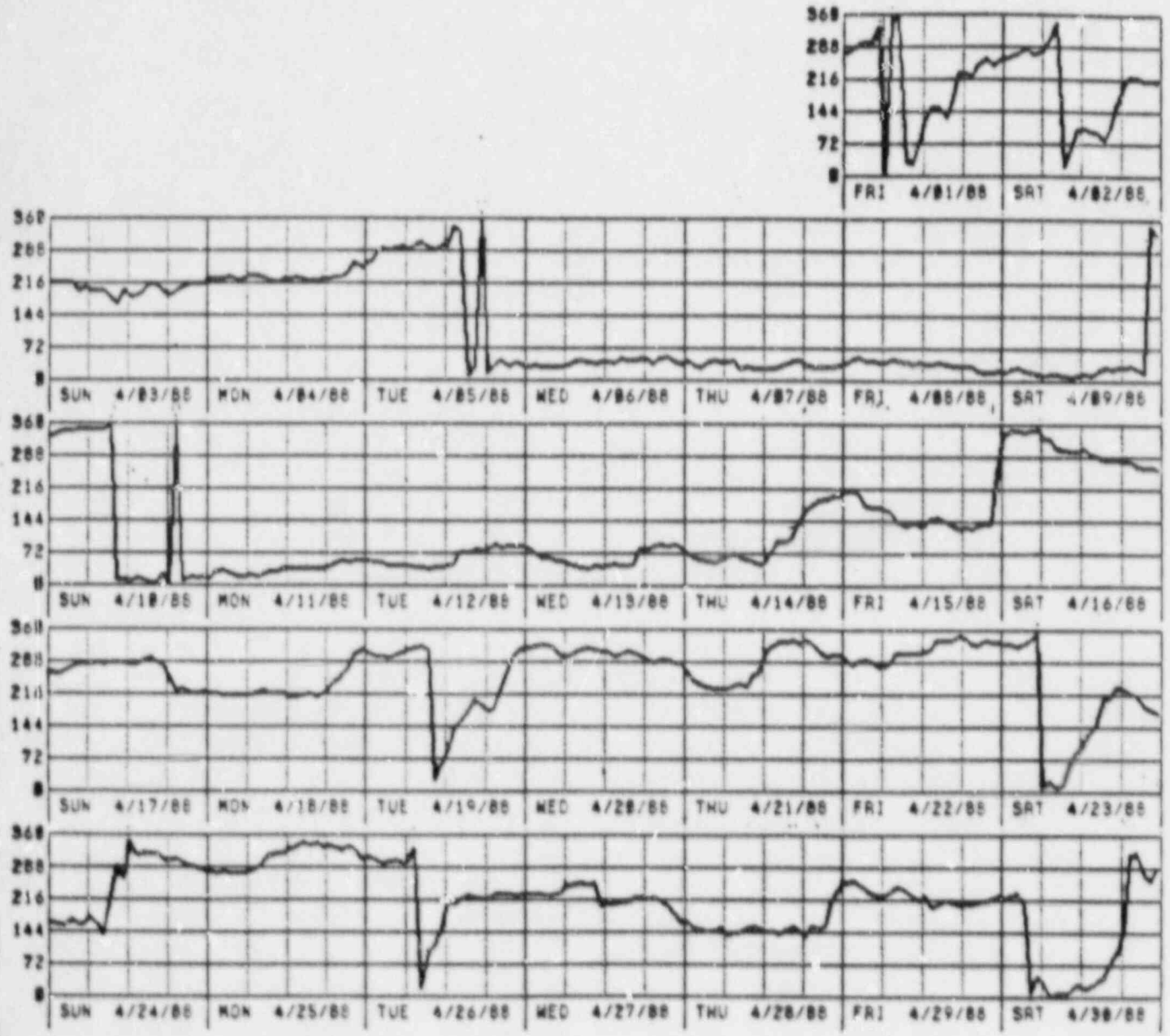


D2 220 FT WIND DIRECTION (DEG)

APPENDIX A-3
(continued)

Wind Direction at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

April

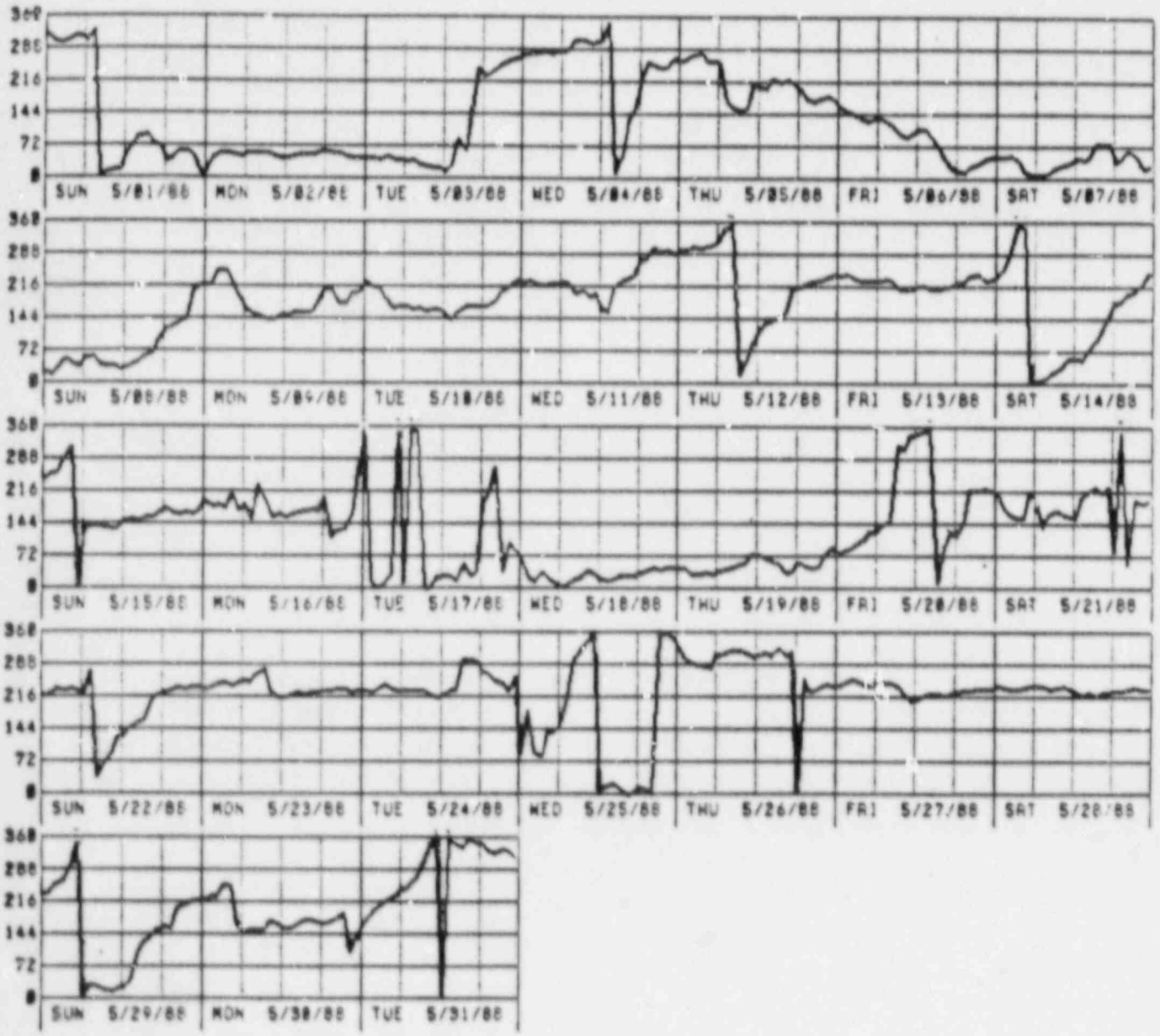


P2 220/220 FT WIND DIRECTION (DEG)

APPENDIX A-3
(continued)

Wind Direction at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

May

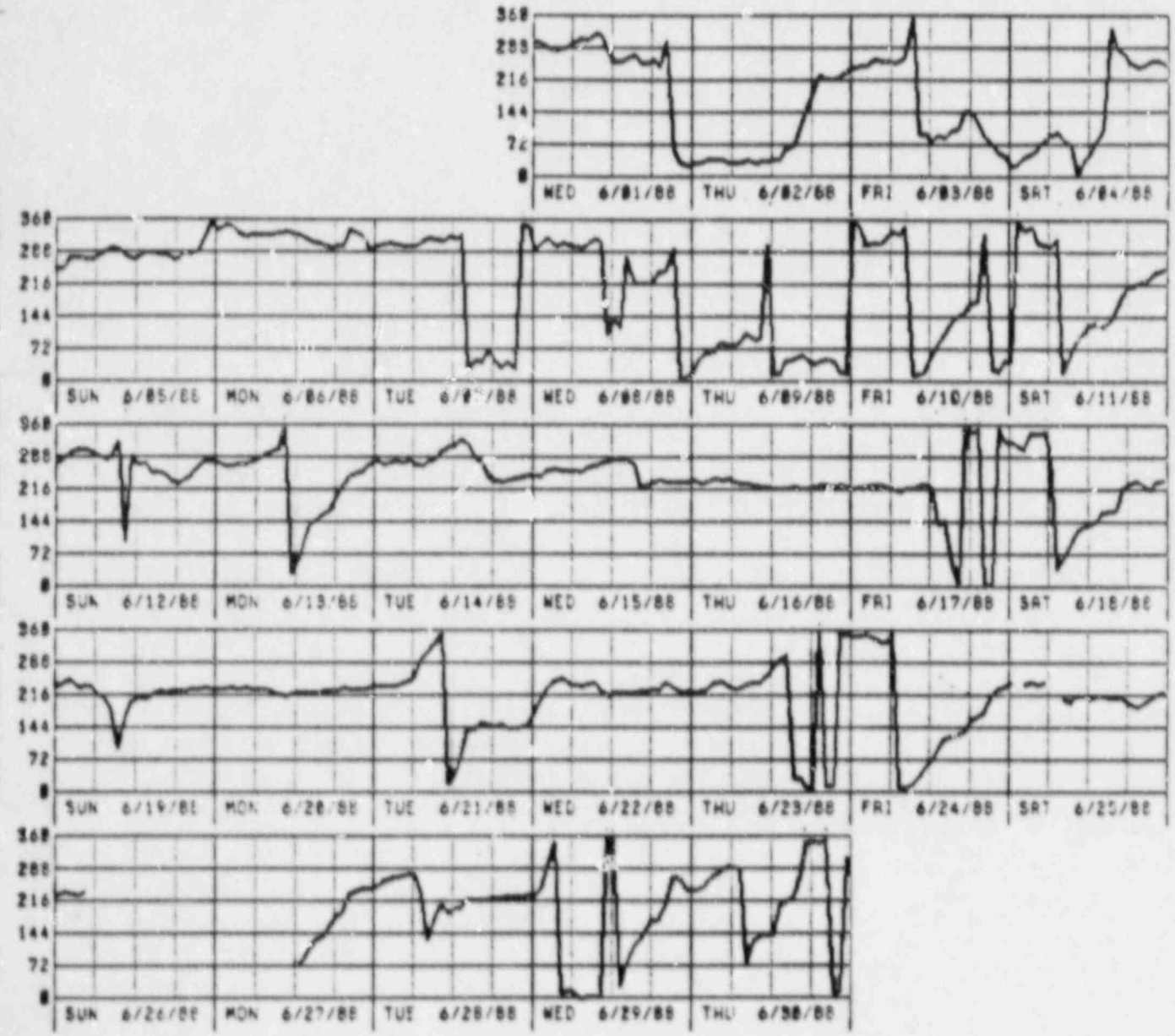


12 220/220 FT WIND DIRECTION (DEG)

APPENDIX A-3
(continued)

Wind Direction at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

June

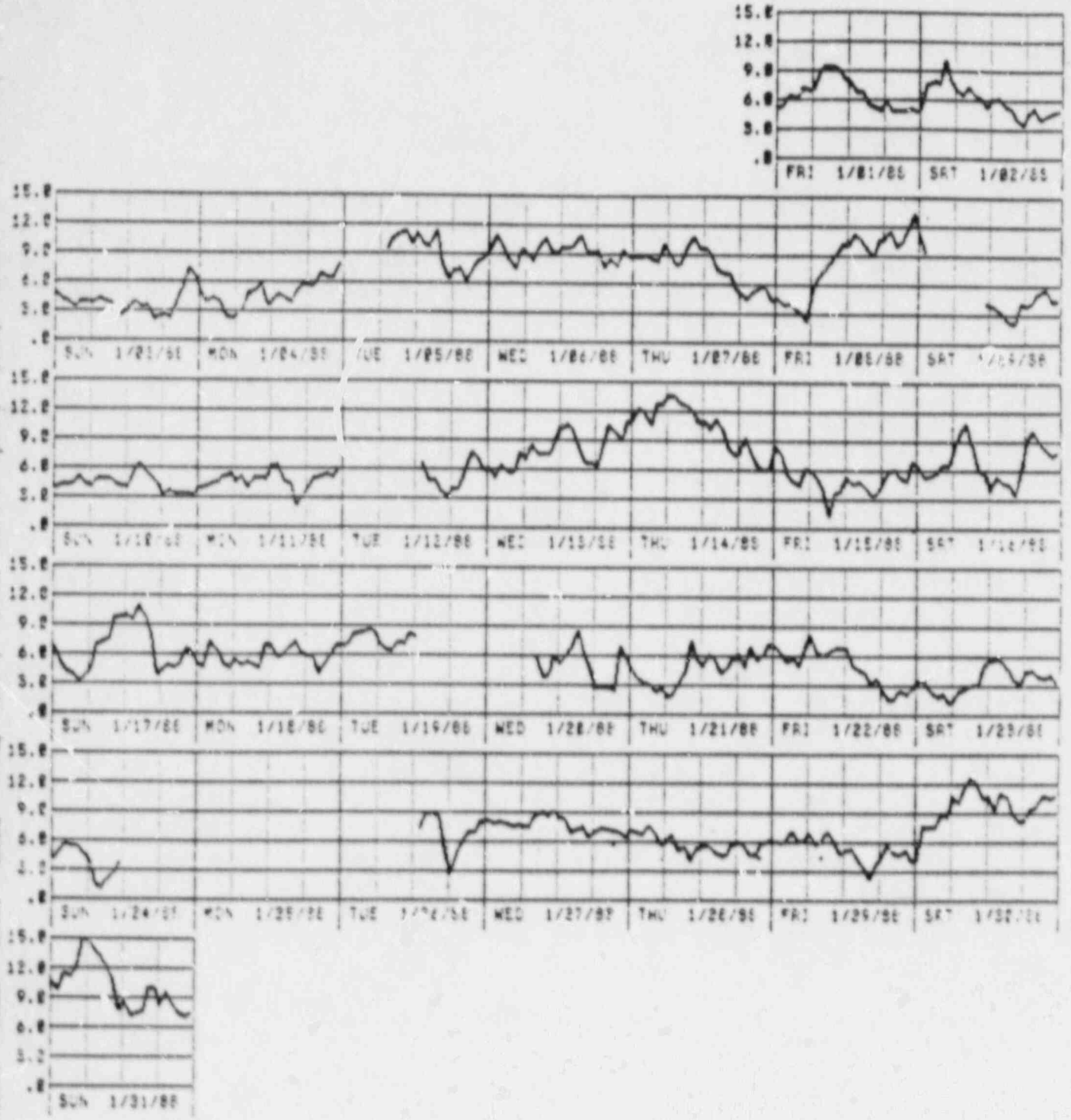


220/220 FT WIND DIRECTION (DEG)

APPENDIX A-4

Wind Speed at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

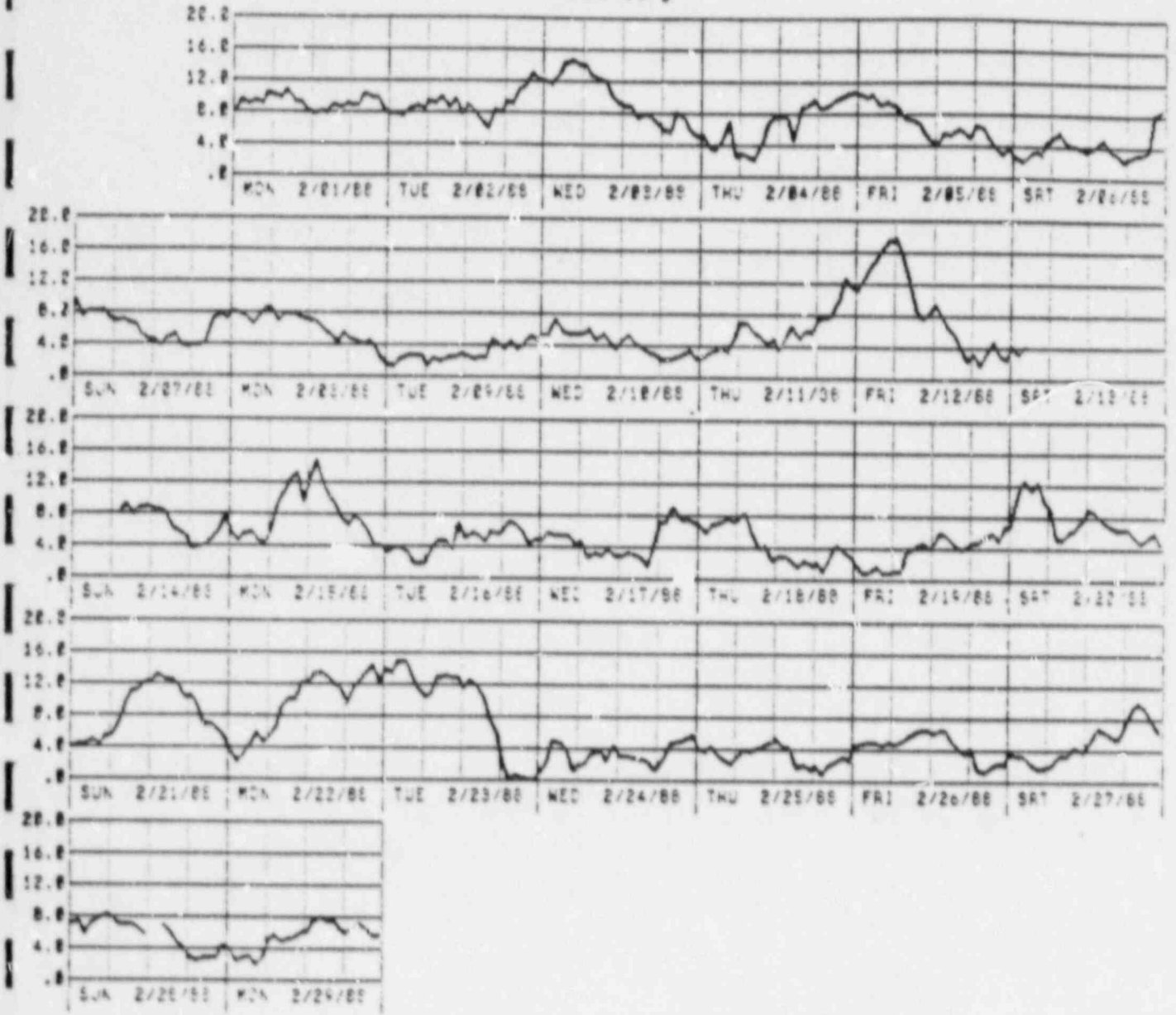
January



4 33/220 FT WIND SPEED (MILES/HR)

Wind Speed at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

February

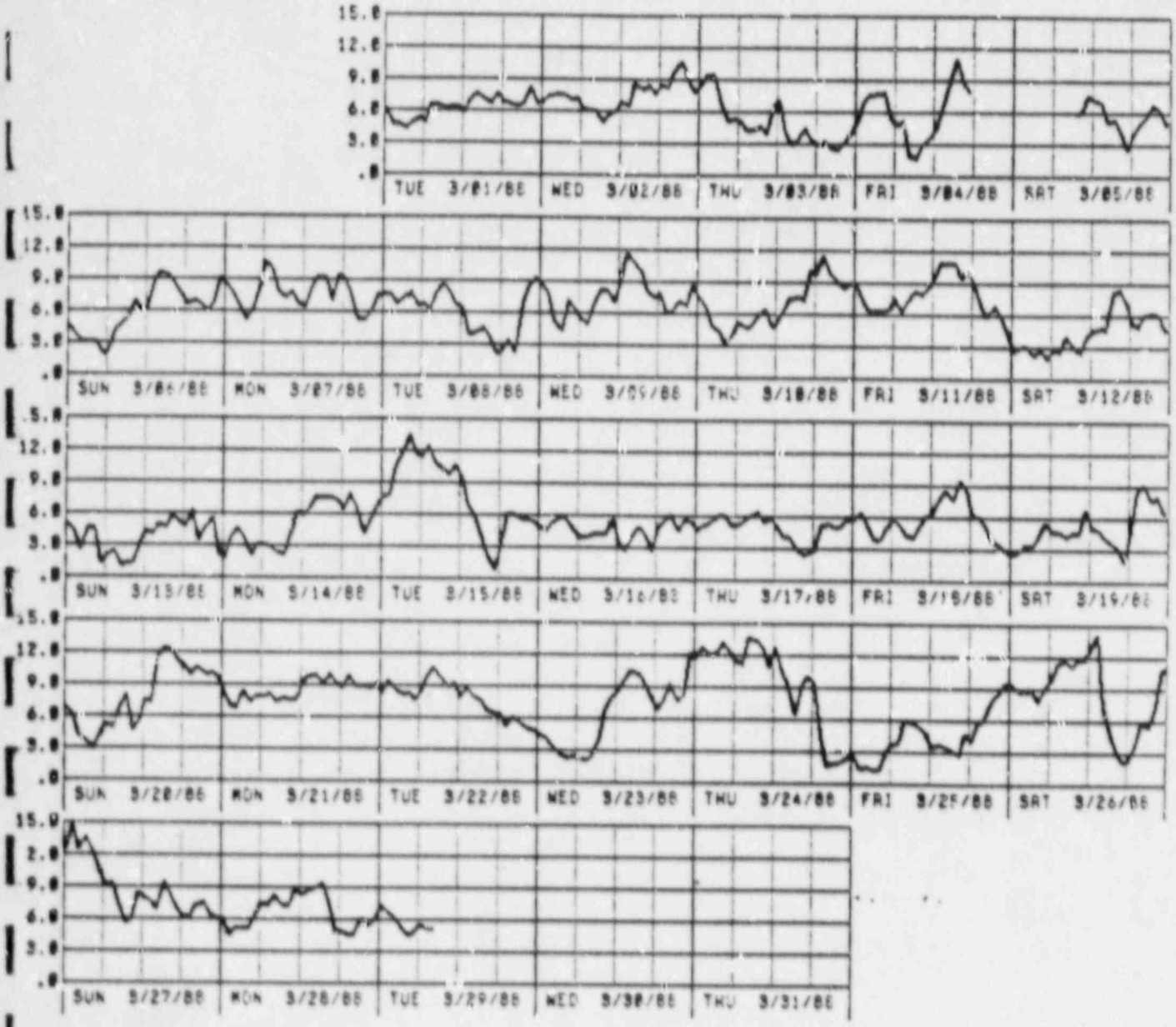


VS4 33/220 FT WIND SPEED (MILES/HR)

APPENDIX A-4
(continued)

Wind Speed at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

March

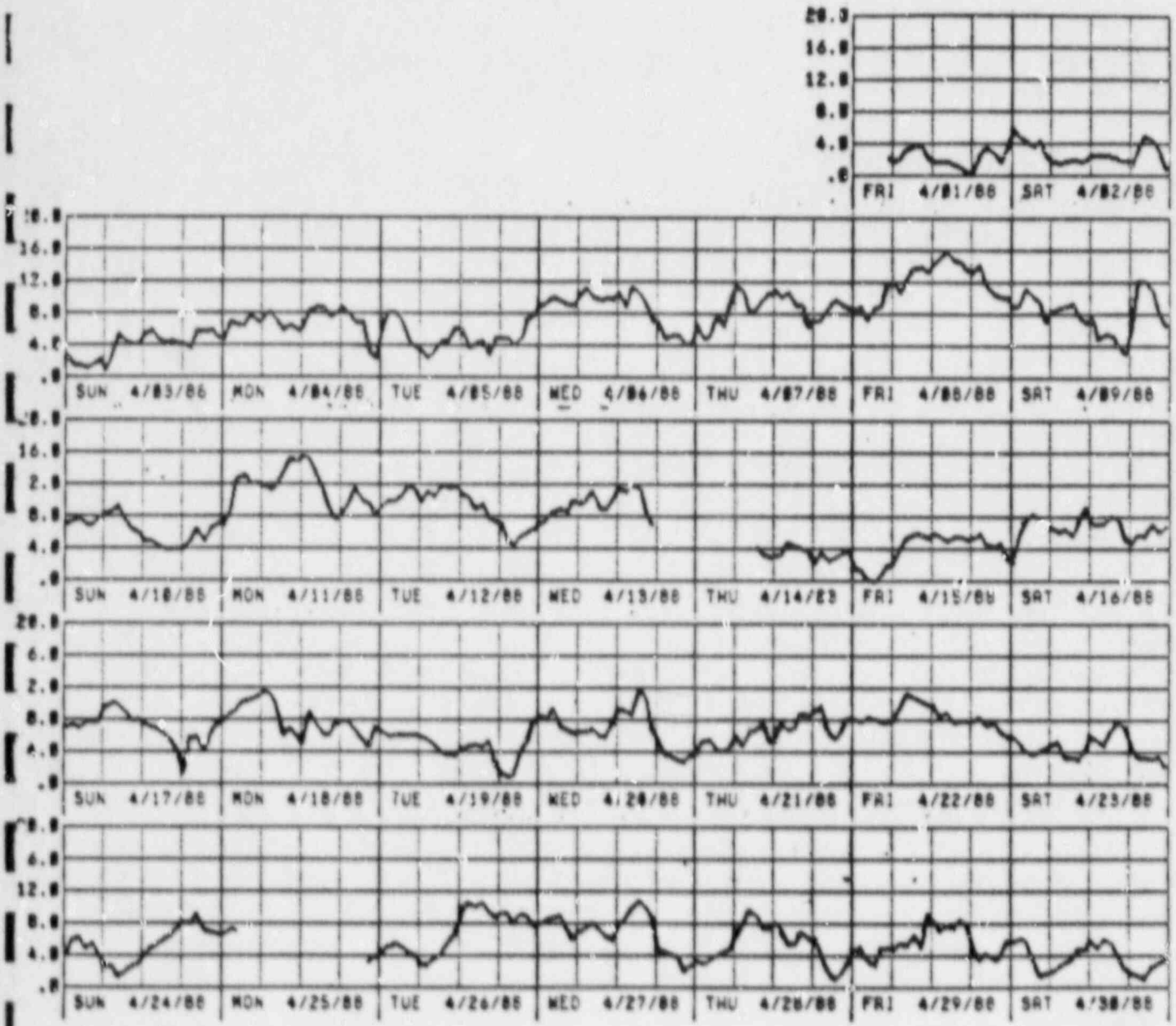


S4 33/220 FT WIND SPEED (MILES/HR)

APPENDIX A-4
(continued)

Wind Speed at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

April

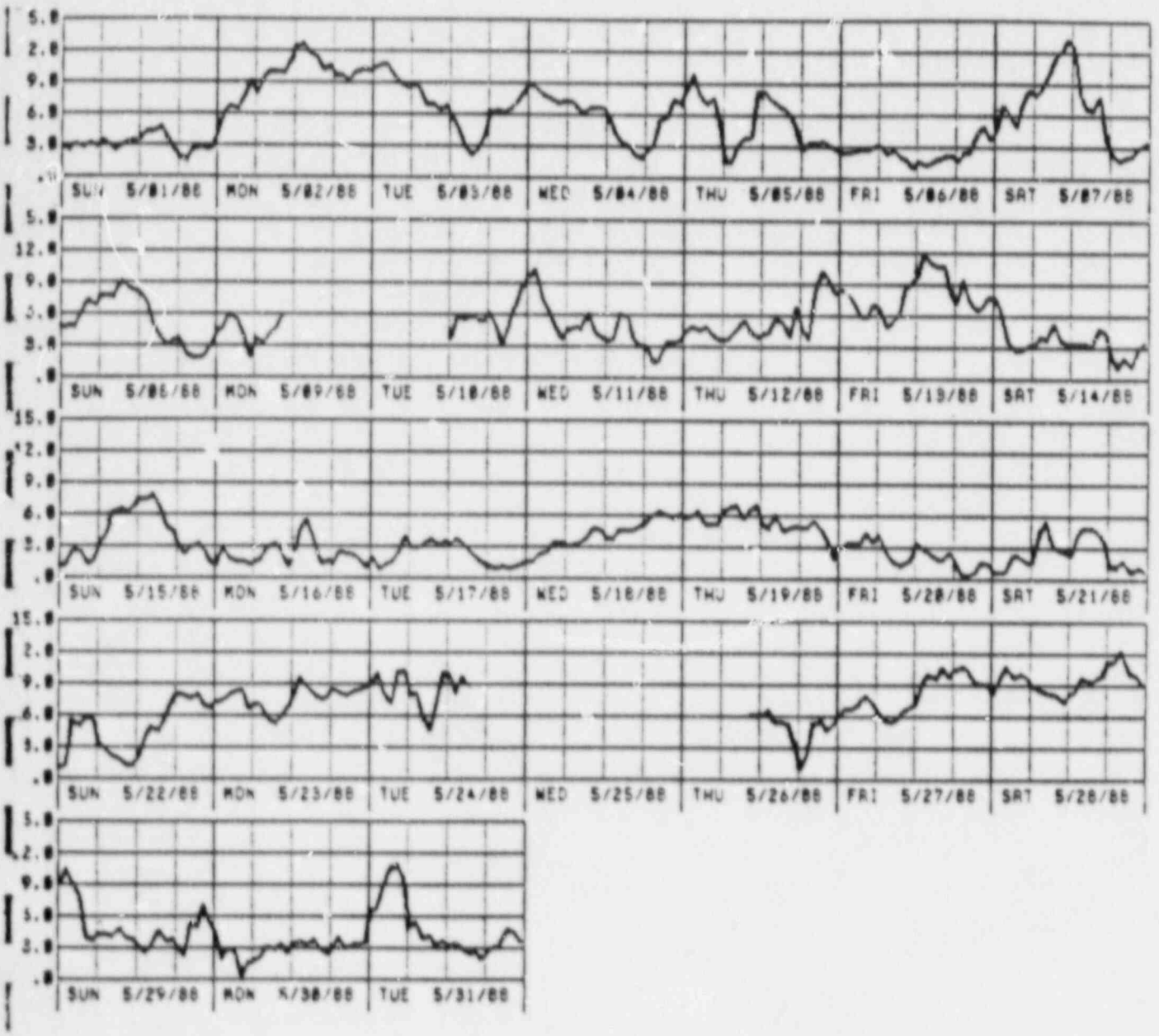


S4 33/220 FT WIND SPEED (MILES/HR)

APPENDIX A-4
(continued)

Wind Speed at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

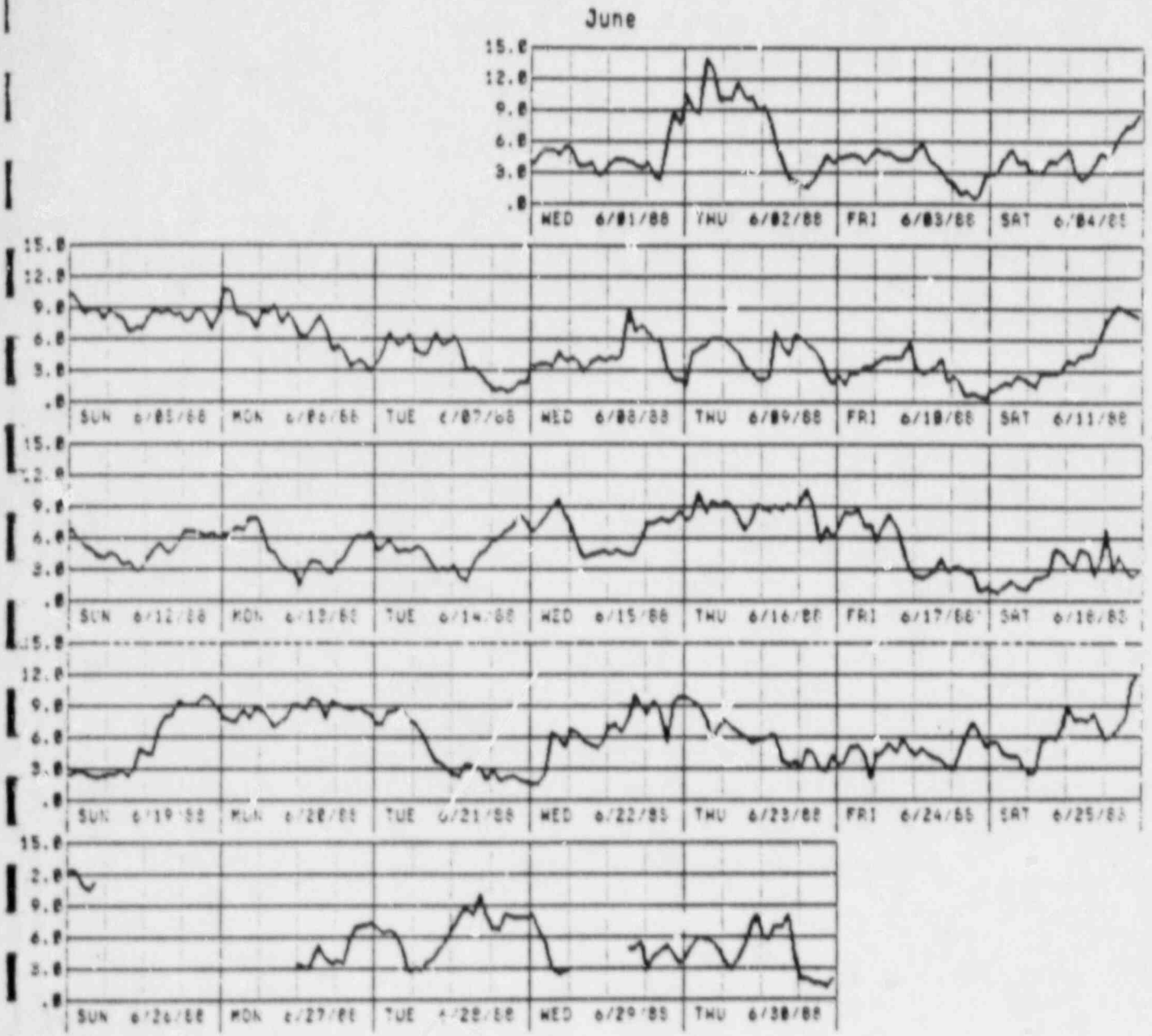
May



33/220 FT WIND SPEED (MILES/HR)

APPENDIX A-4
(continued)

Wind Speed at 33 Ft. Level from the 220 Ft. Tower for January - June 1988

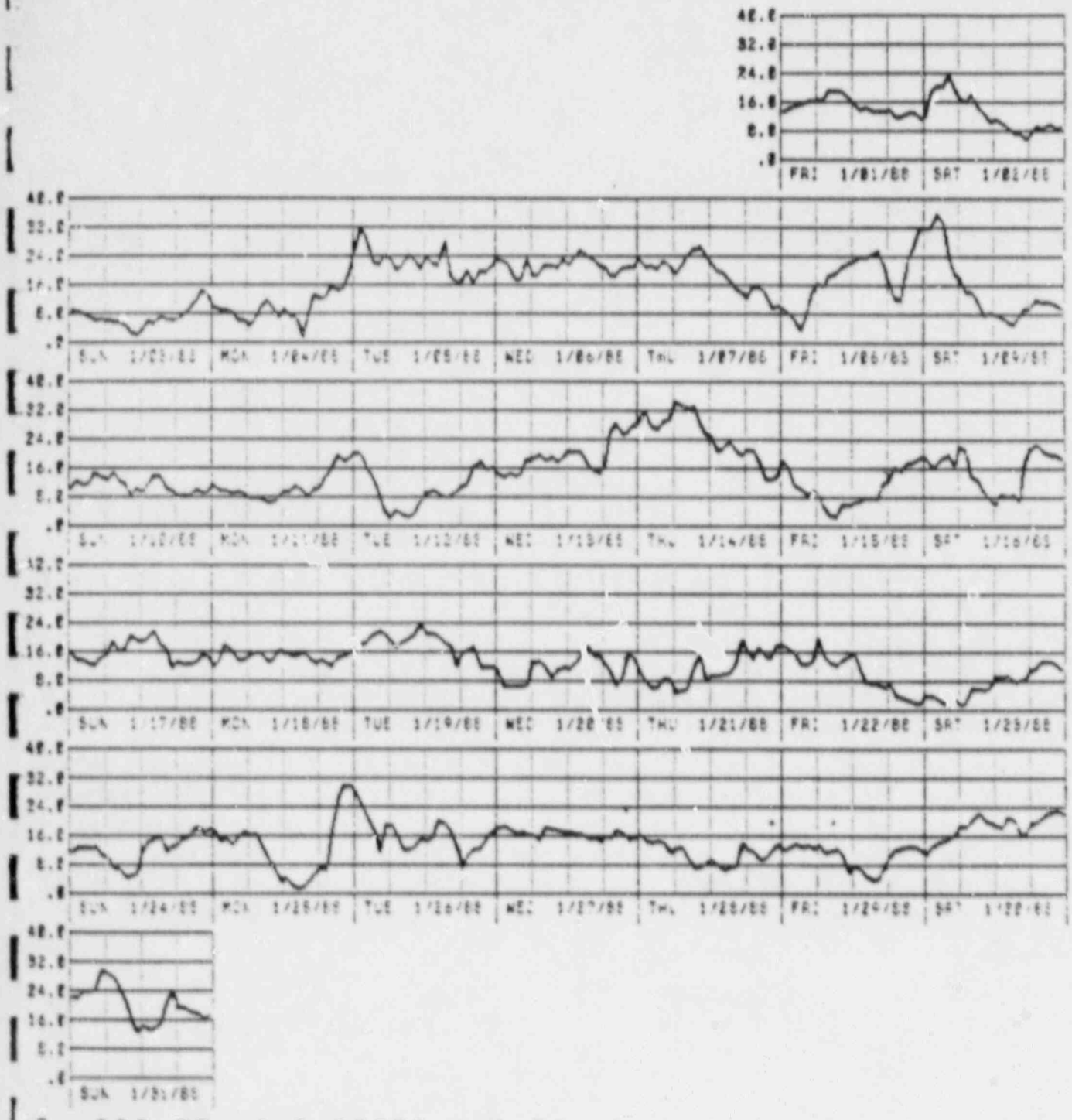


454 33/220 FT WIND SPEED (MILES/HR)

APPENDIX A-5

Wind Speed at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

January

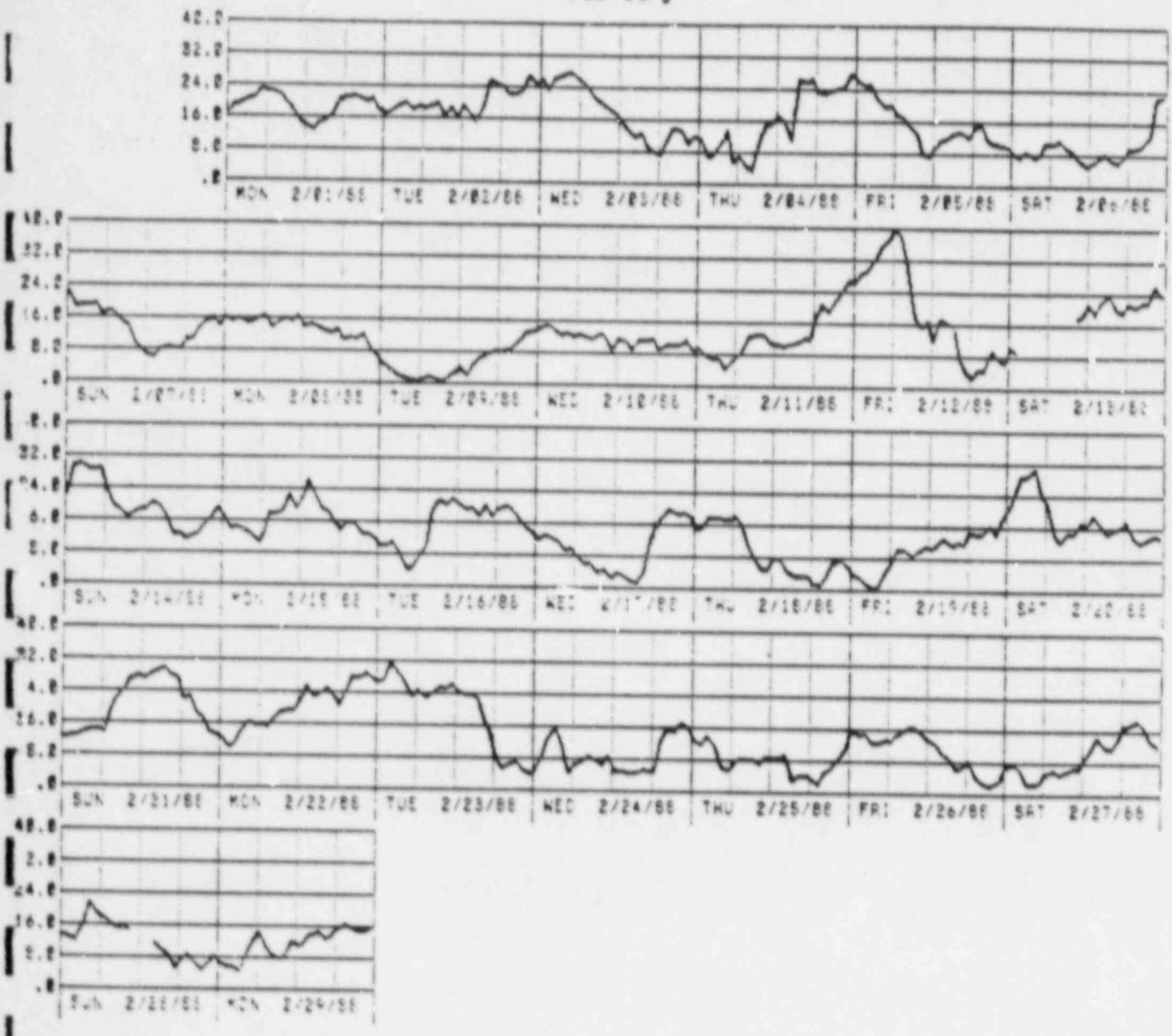


222 FT WIND SPEED (MILES/HR)

APPENDIX A-5
(continued)

Wind Speed at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

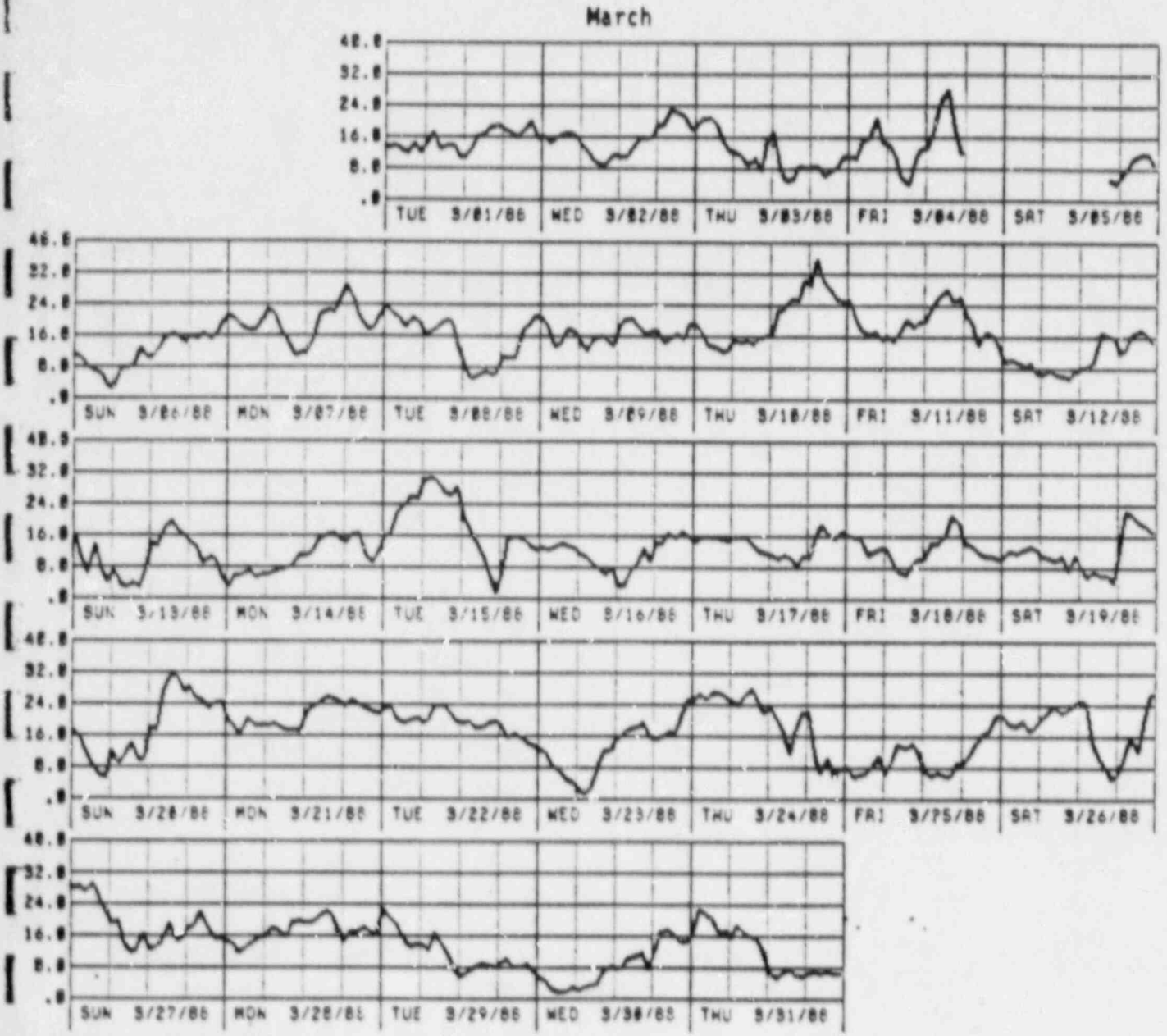
February



220 FT WIND SPEED (MILES/HR)

APPENDIX A-5
(continued)

Wind Speed at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

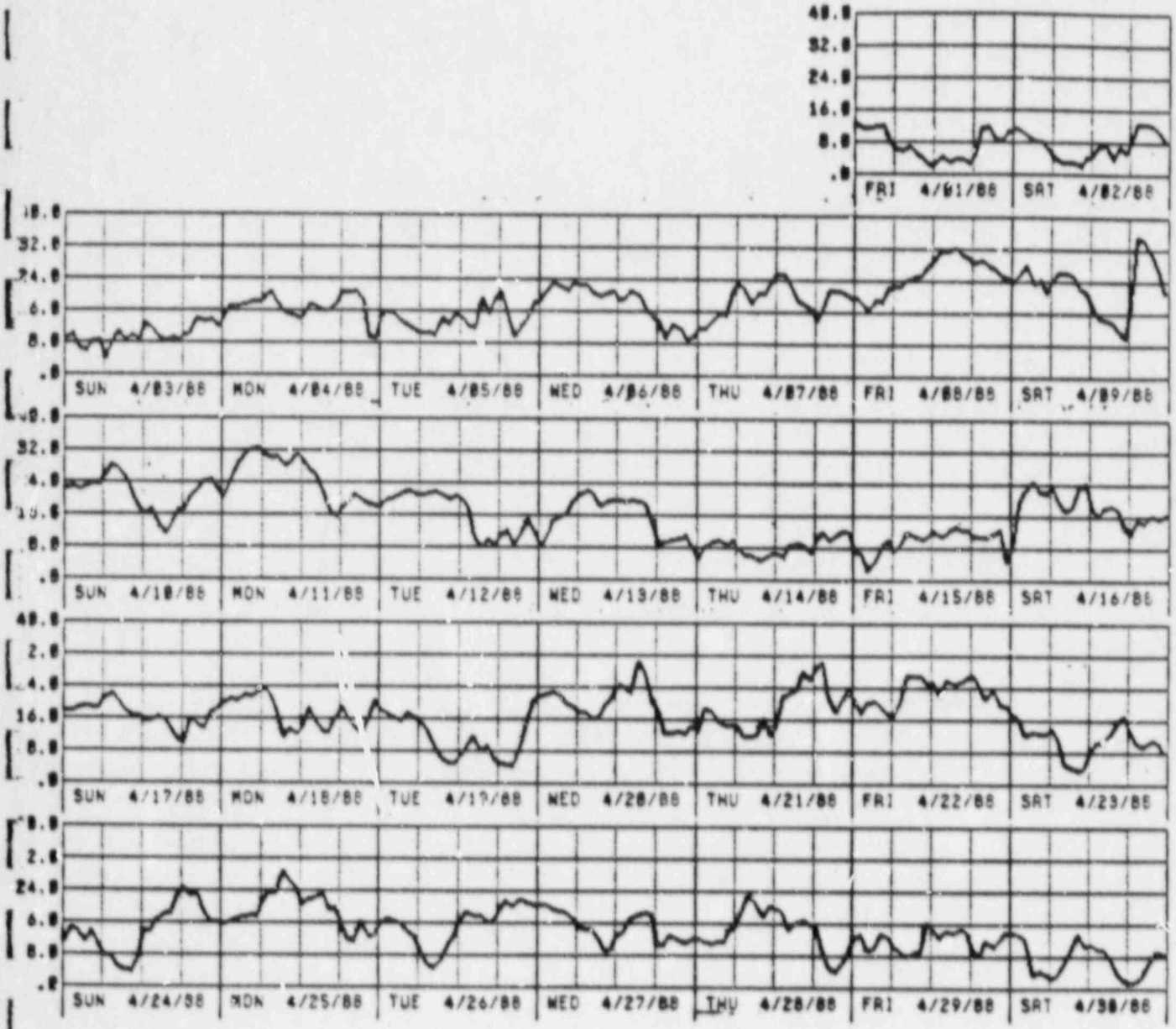


220 FT WIND SPEED (MILES/HR)

APPENDIX A-5
(continued)

Wind Speed at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

April

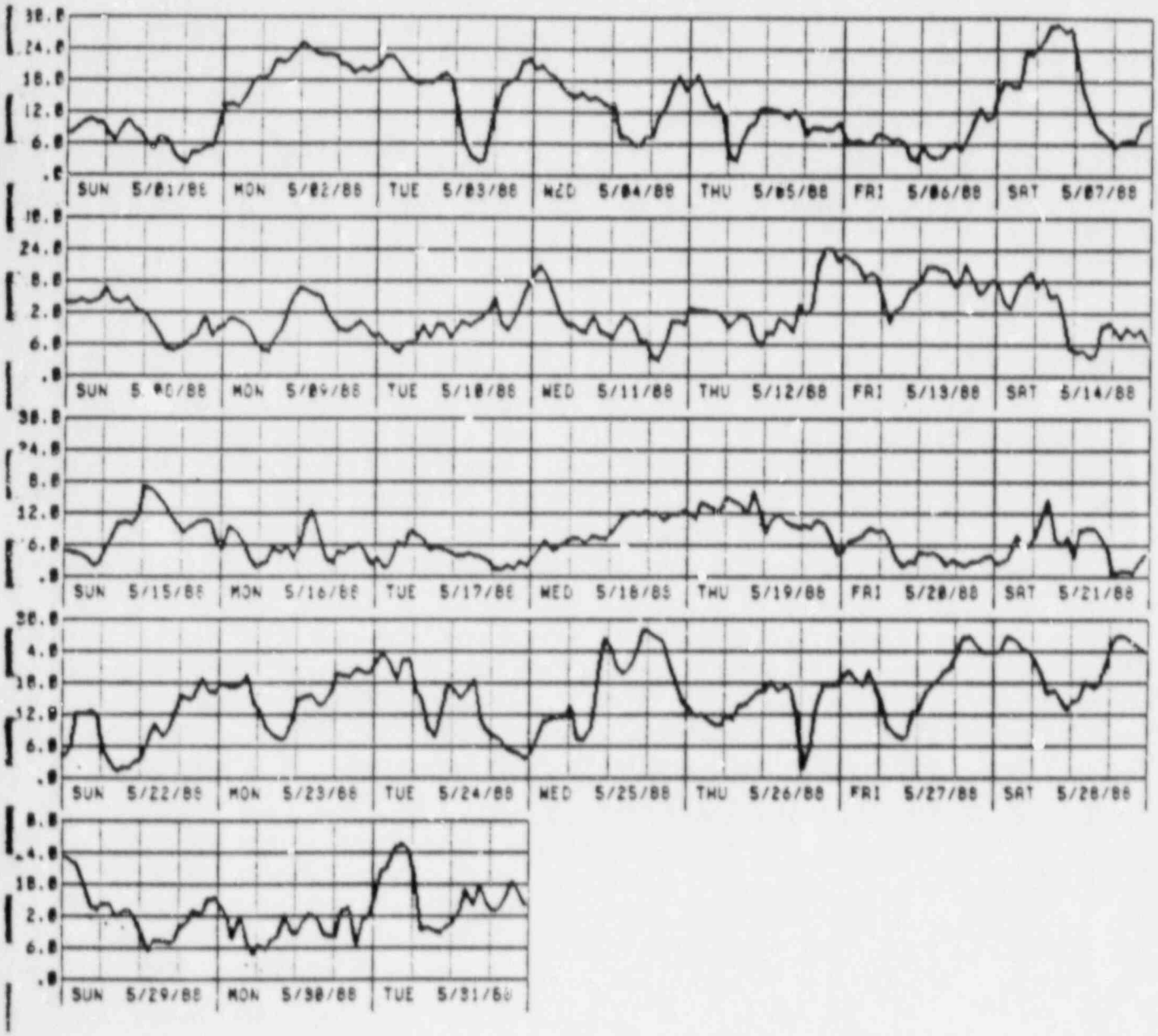


220/220 FT WIND SPEED (MILES/HR)

APPENDIX A-5
(continued)

Wind Speed at 220 Ft. Level from the 220 Ft. Tower for January - June 1988

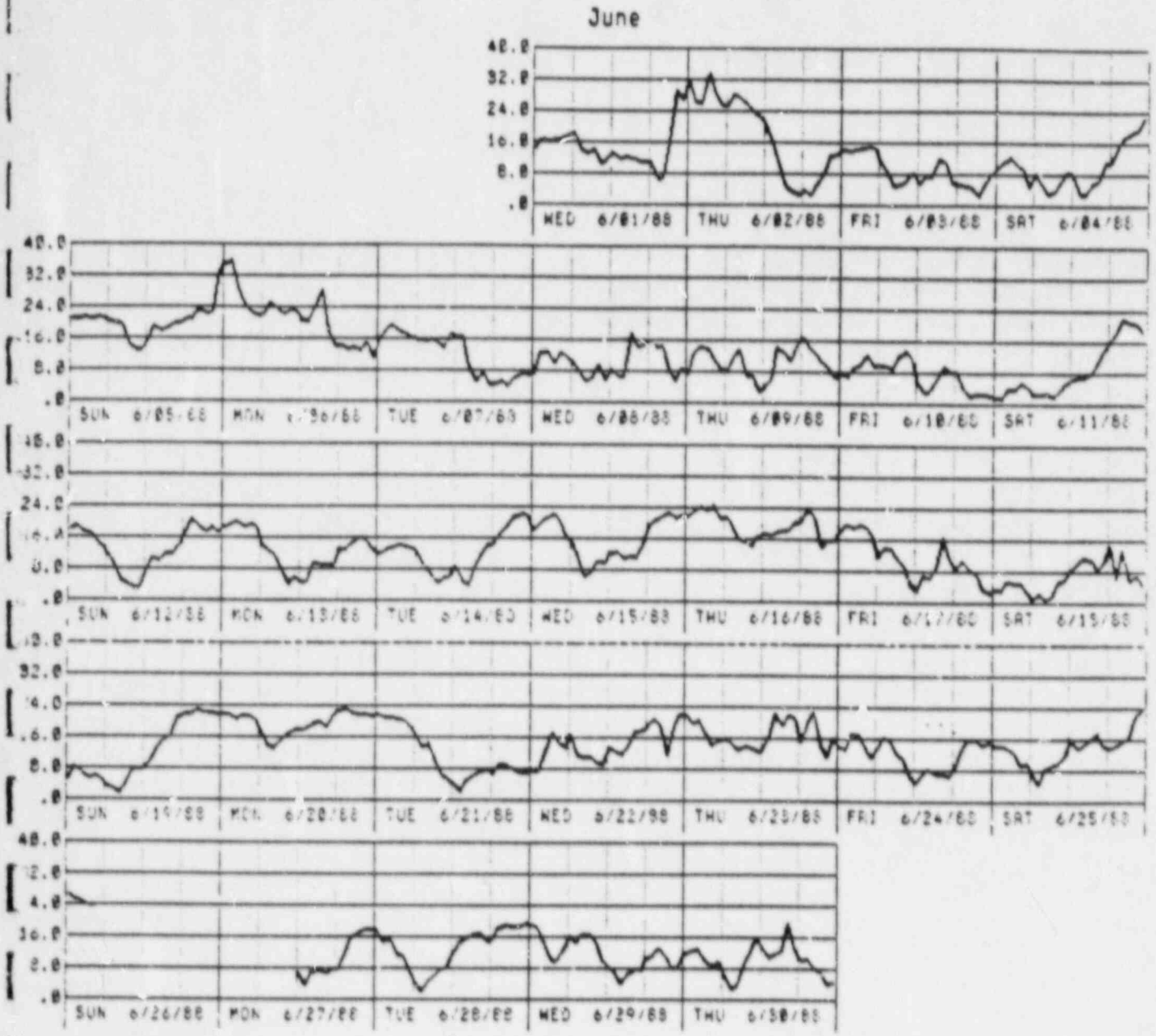
May



220/220 FT WIND SPEED (MILES/HR)

APPENDIX A-5
(continued)

Wind Speed at 220 Ft. Level from the 220 Ft. Tower for January - June 1988



220/220 FT WIND SPEED (MILES/HR)

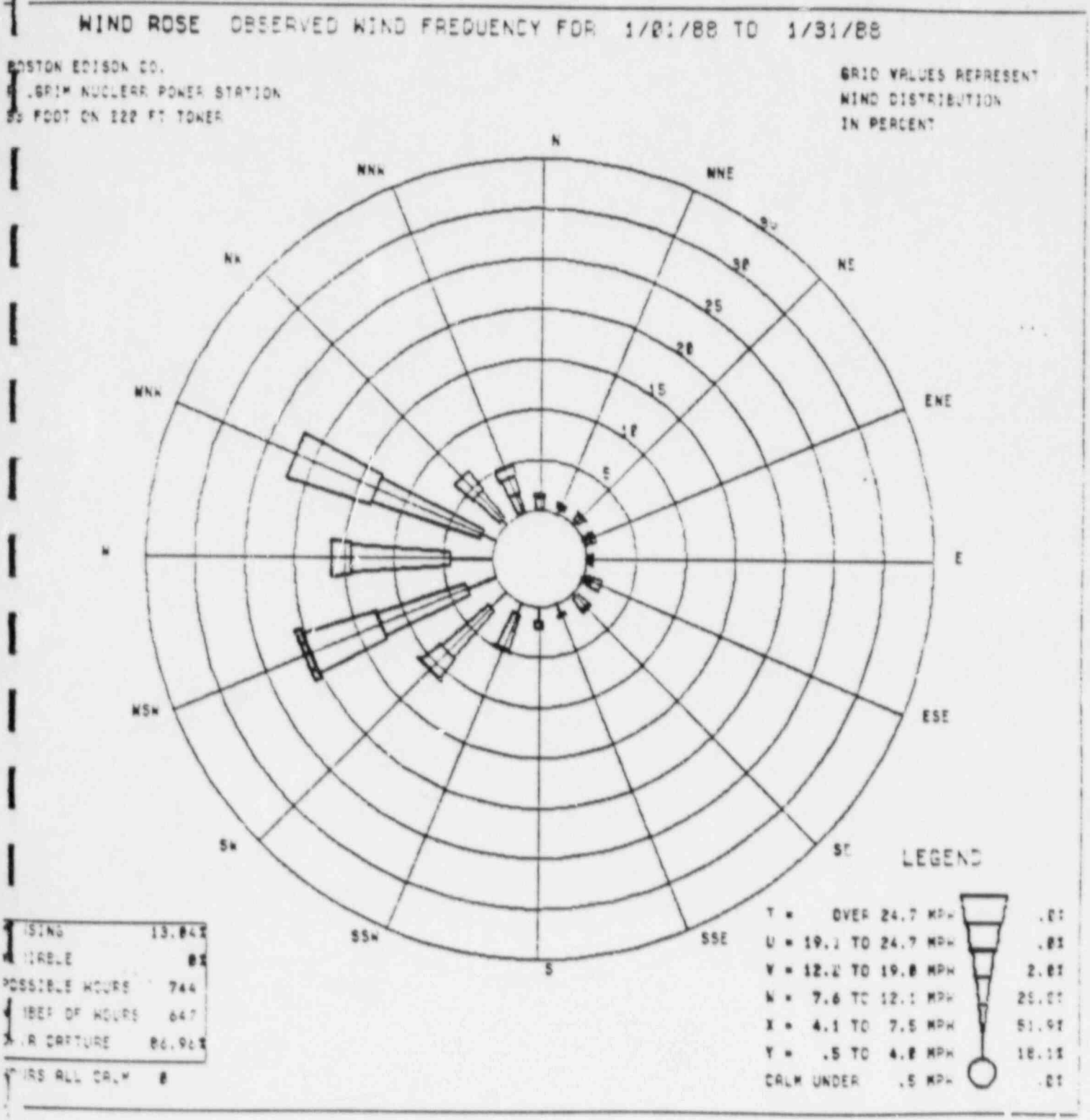
APPENDIX B

WIND ROSE DIAGRAMS

APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

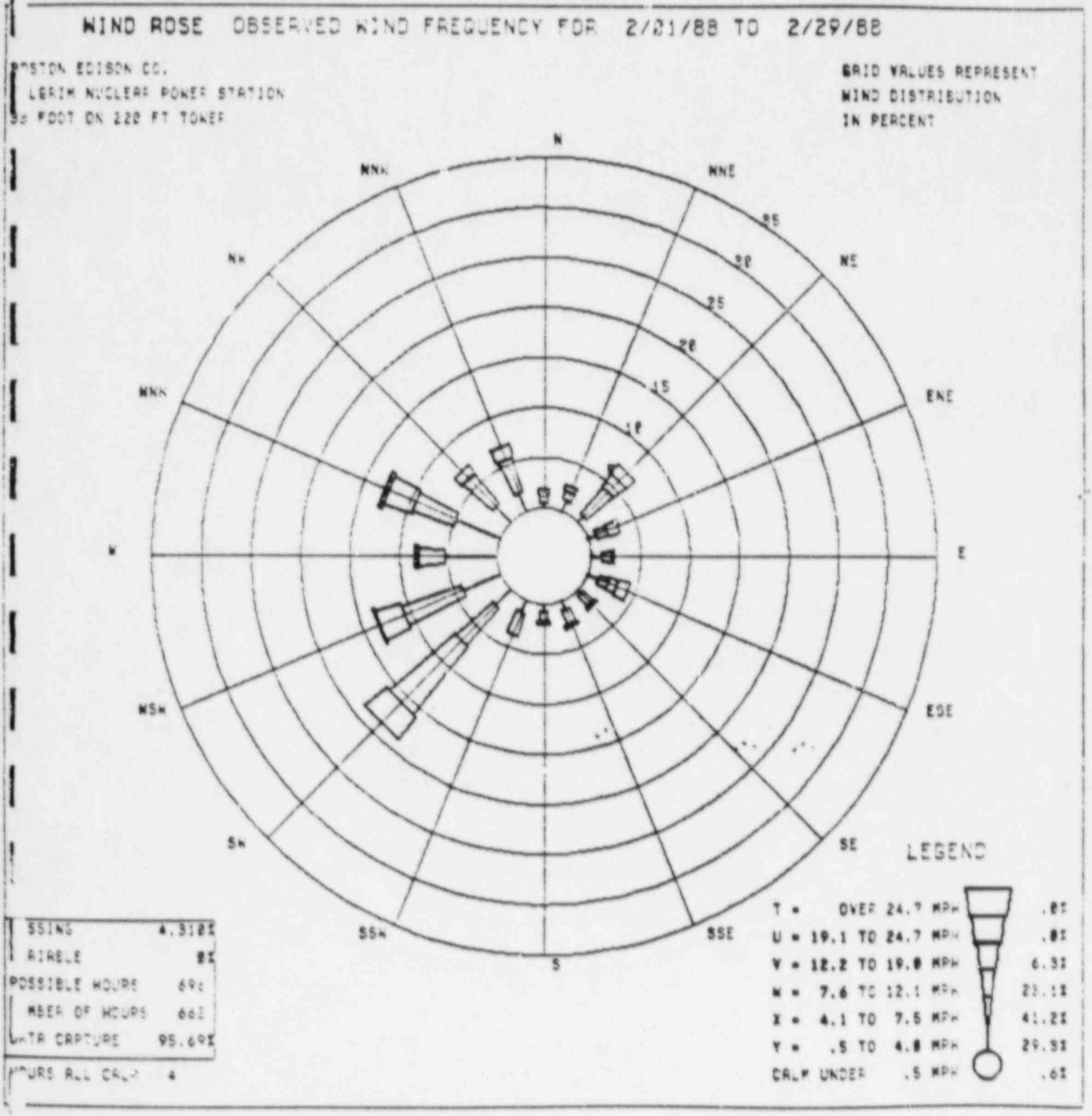
January



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

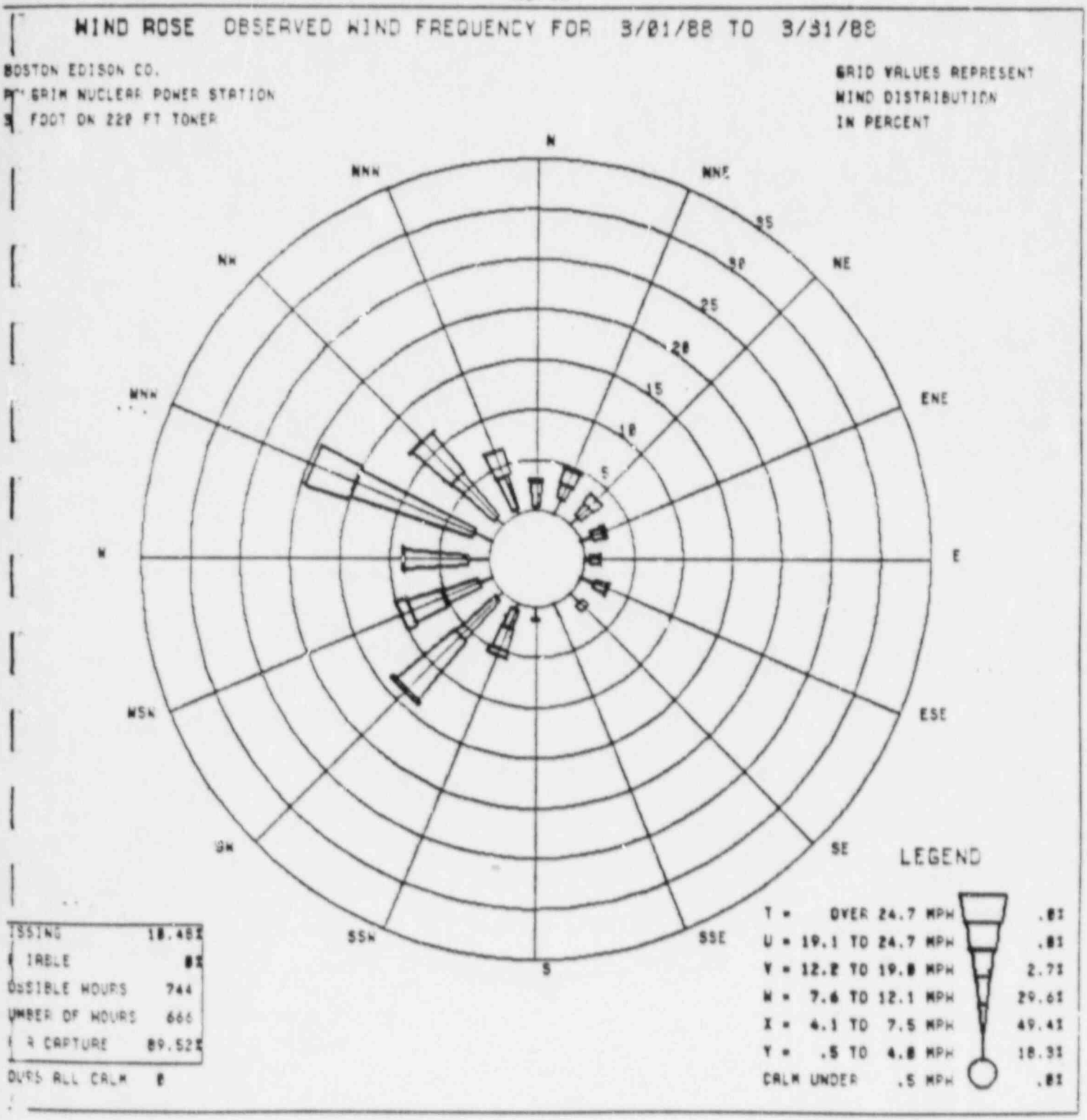
February



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

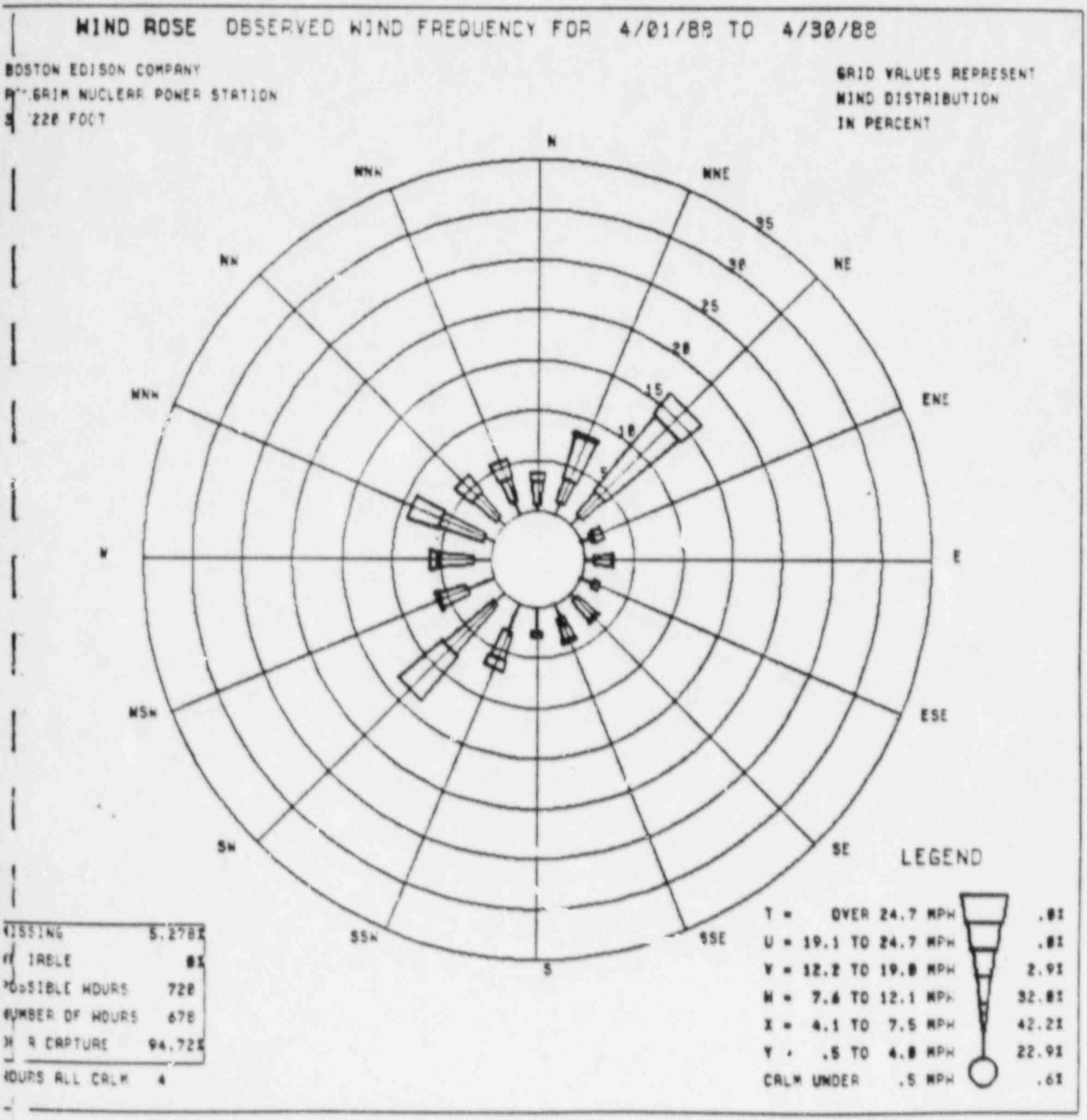
March



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

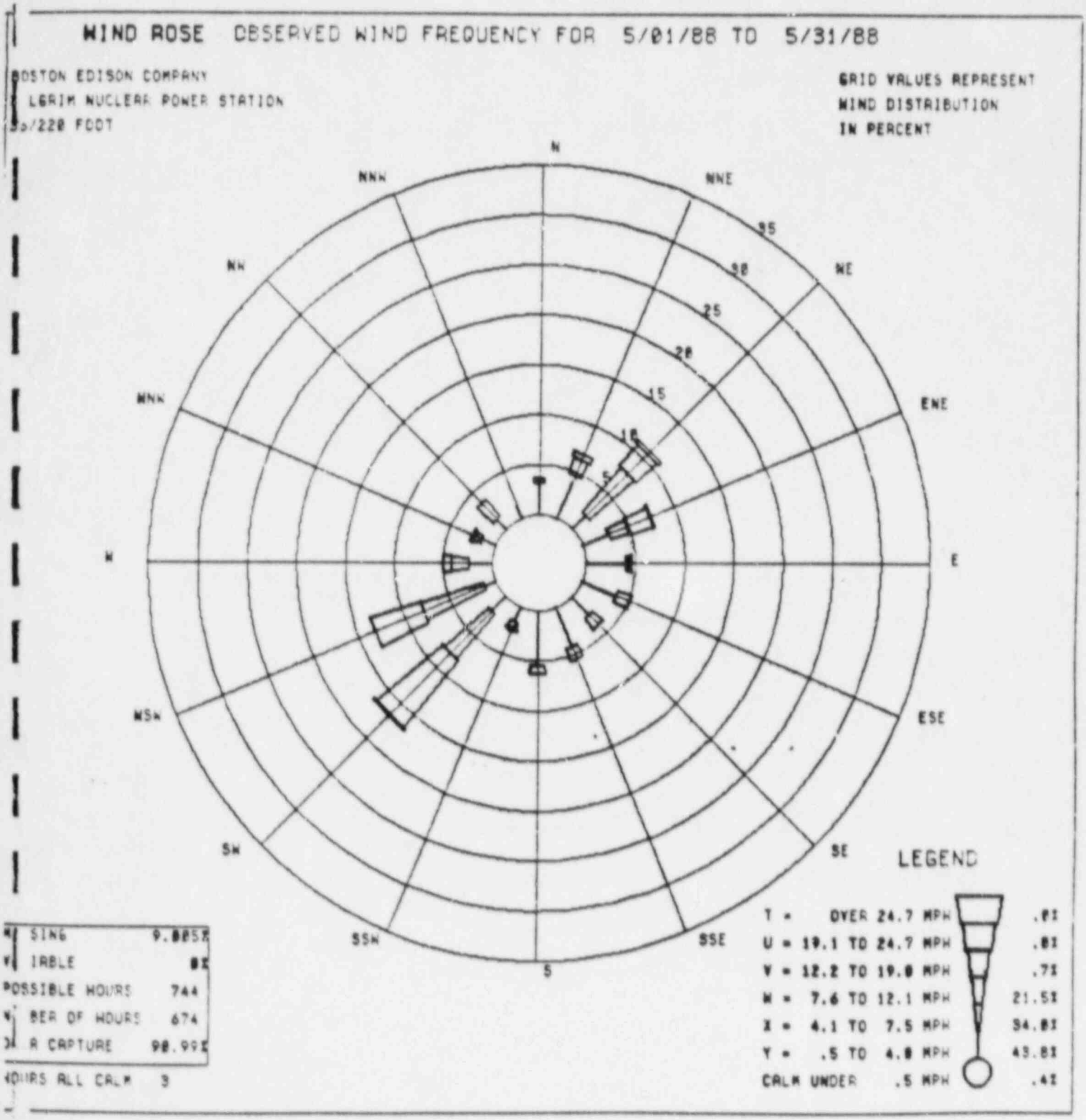
April



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

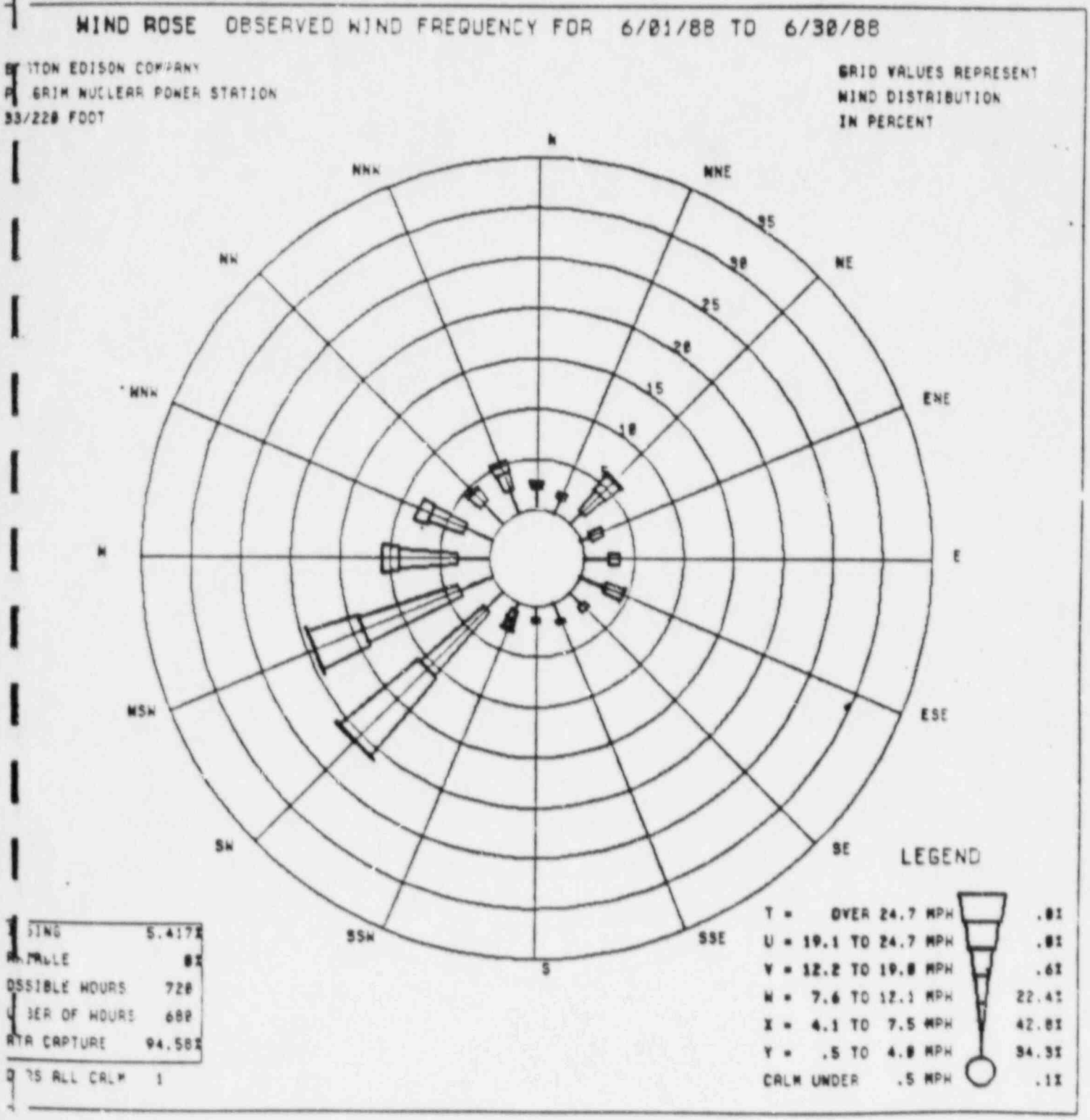
May



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

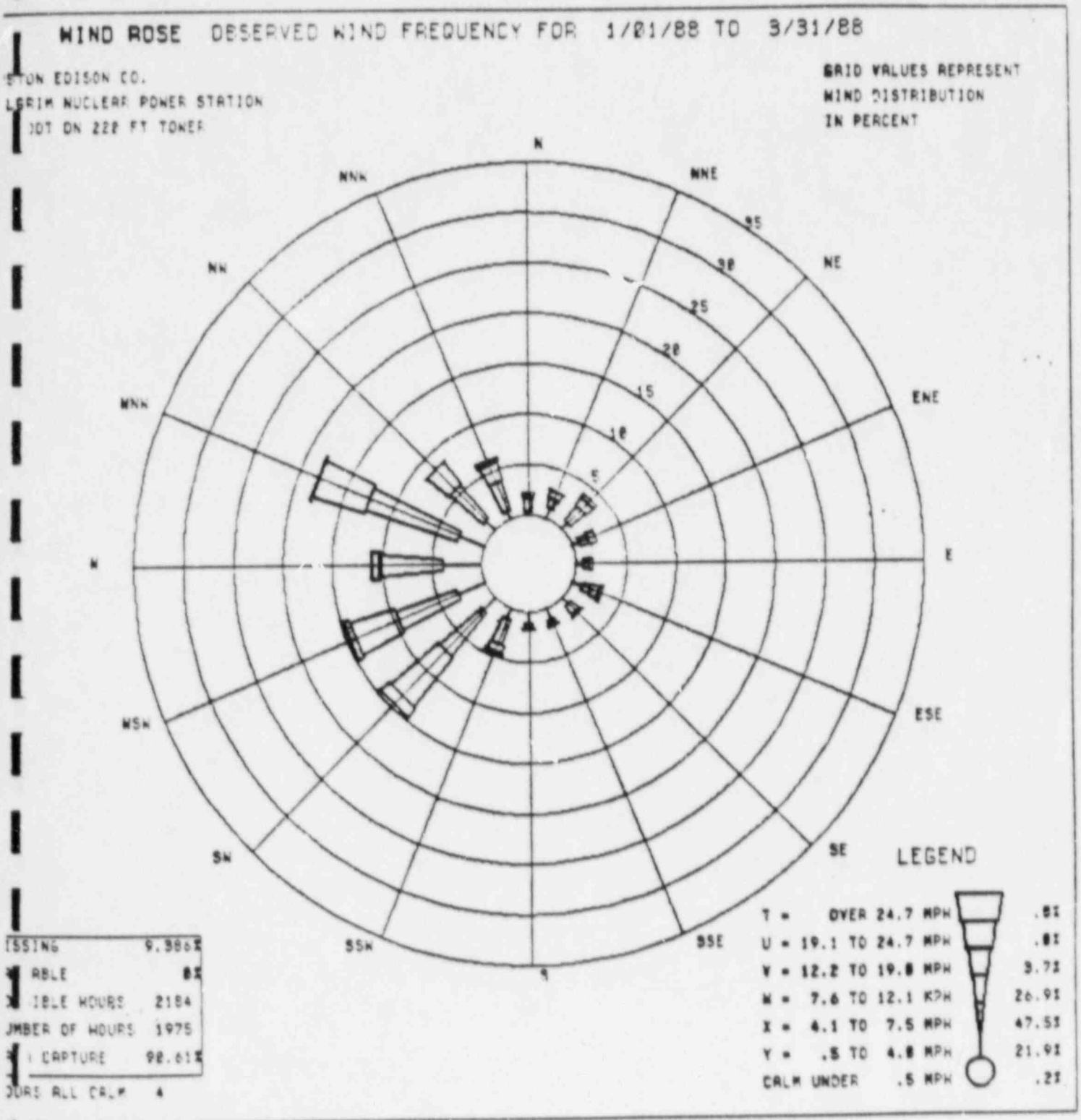
June



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

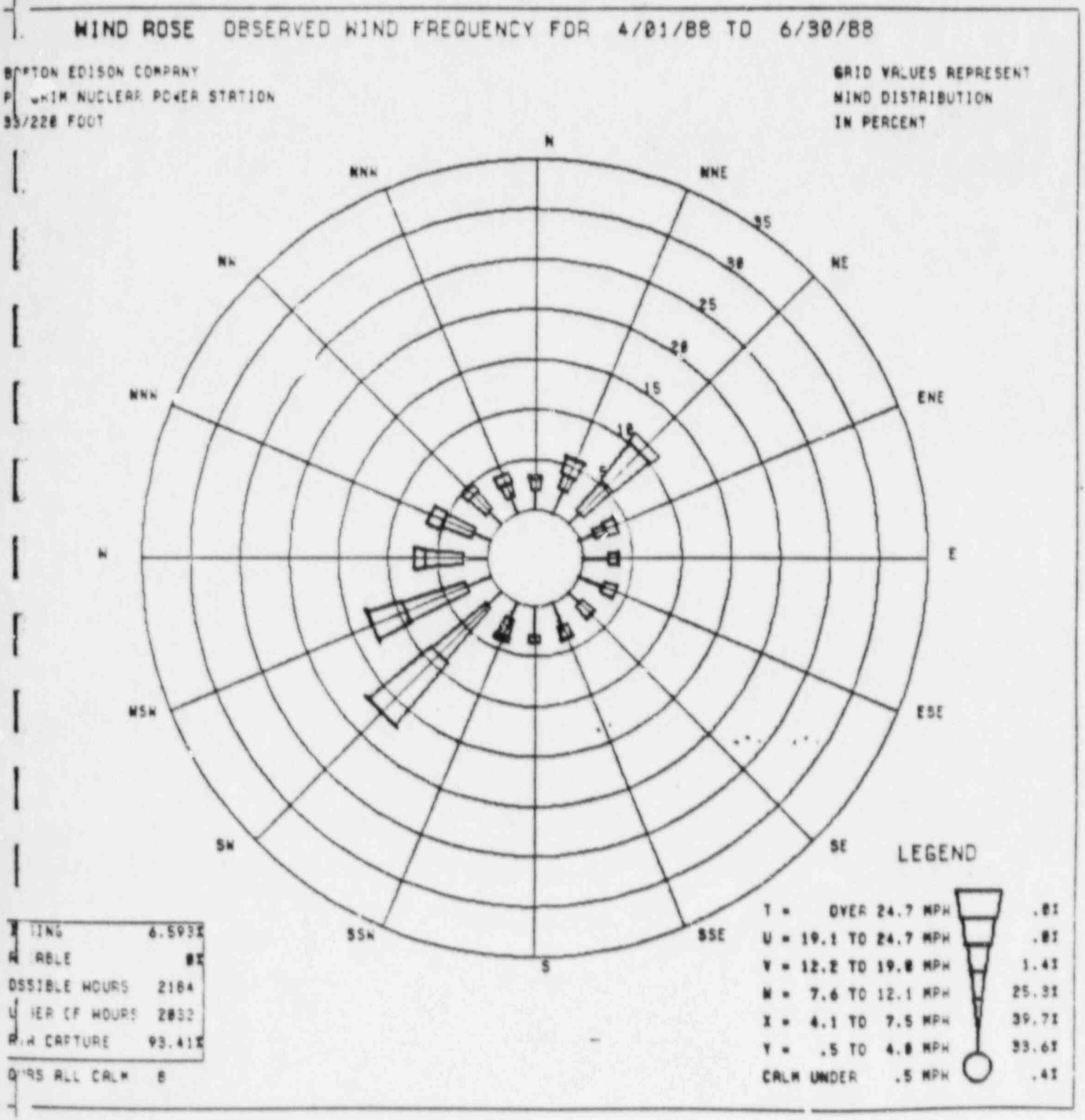
First Quarter 1988



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

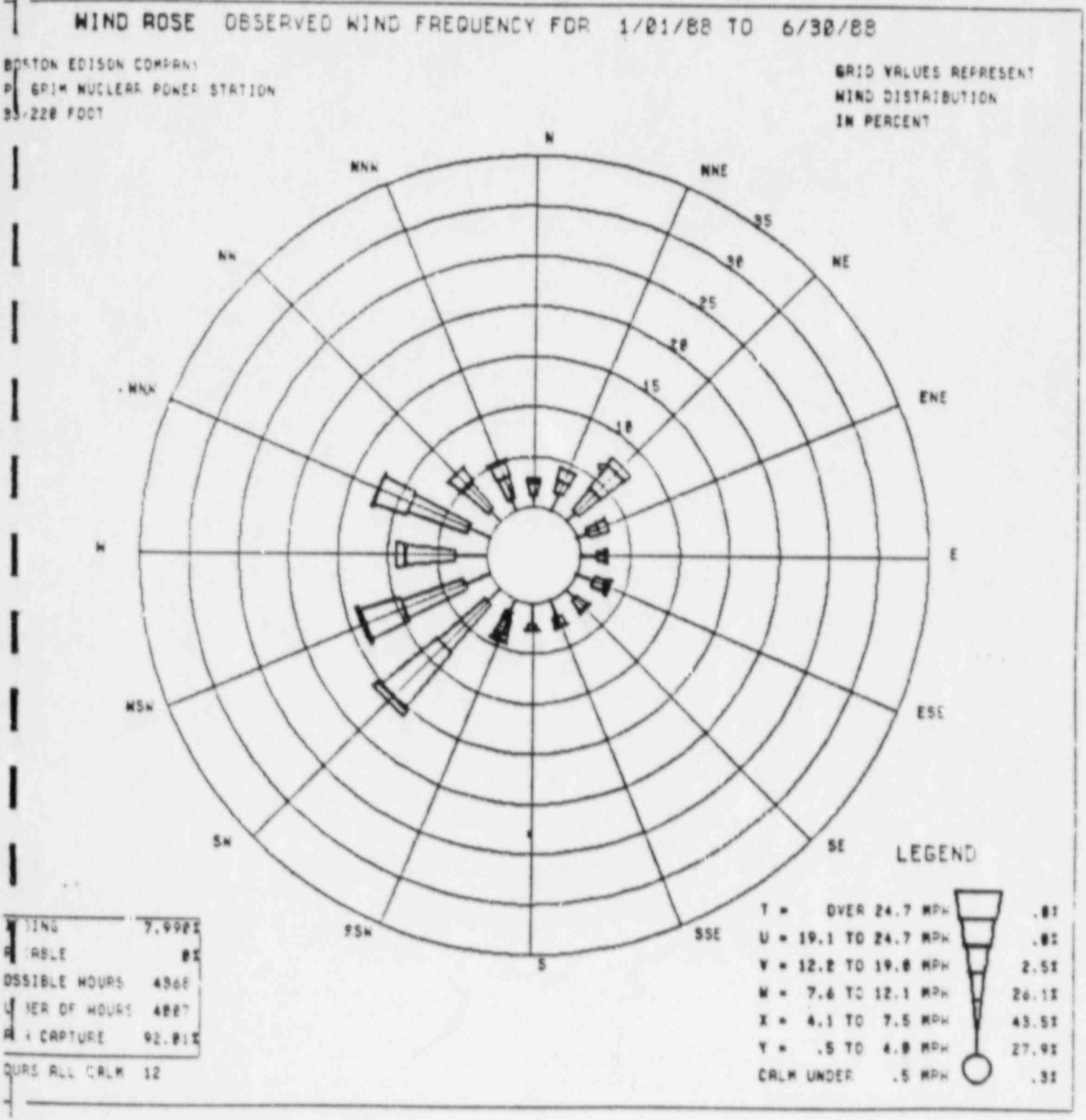
Second Quarter 1988



APPENDIX B-1
(continued)

Wind Rose Diagrams at the 33 Ft. Level of the 220 Ft. Tower
for January - June 1988

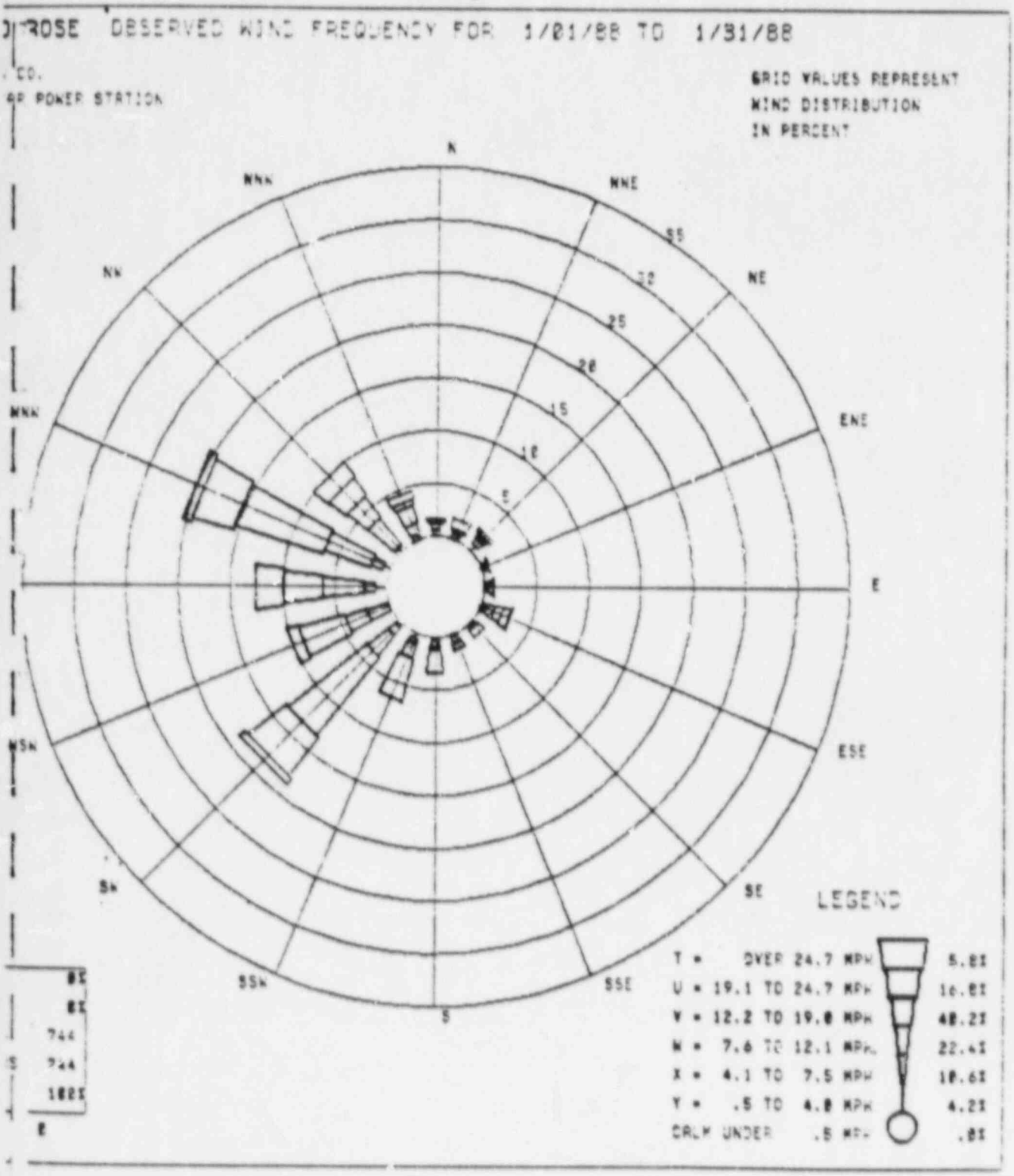
Semi-Annual



APPENDIX B-2

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

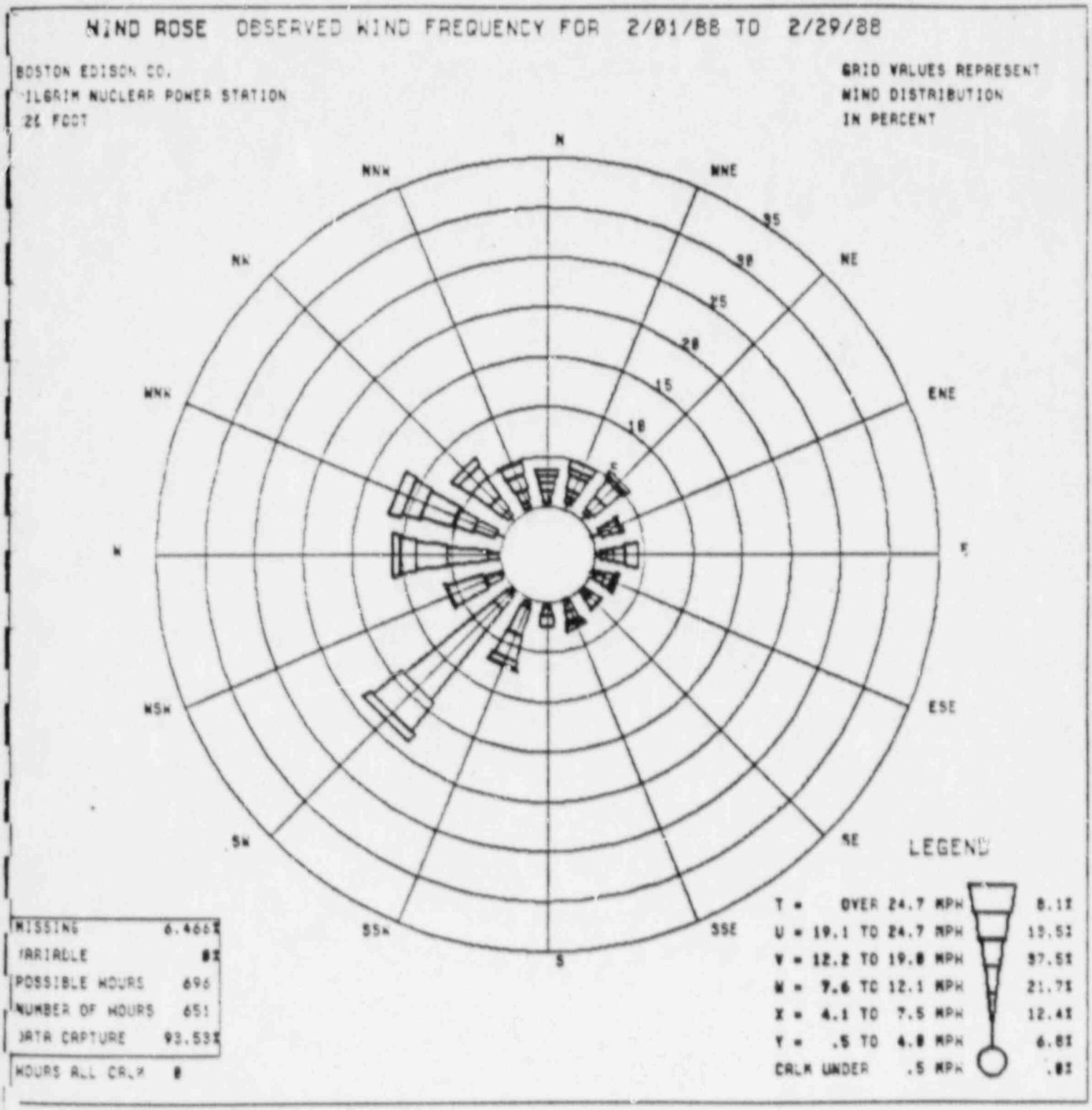
January



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

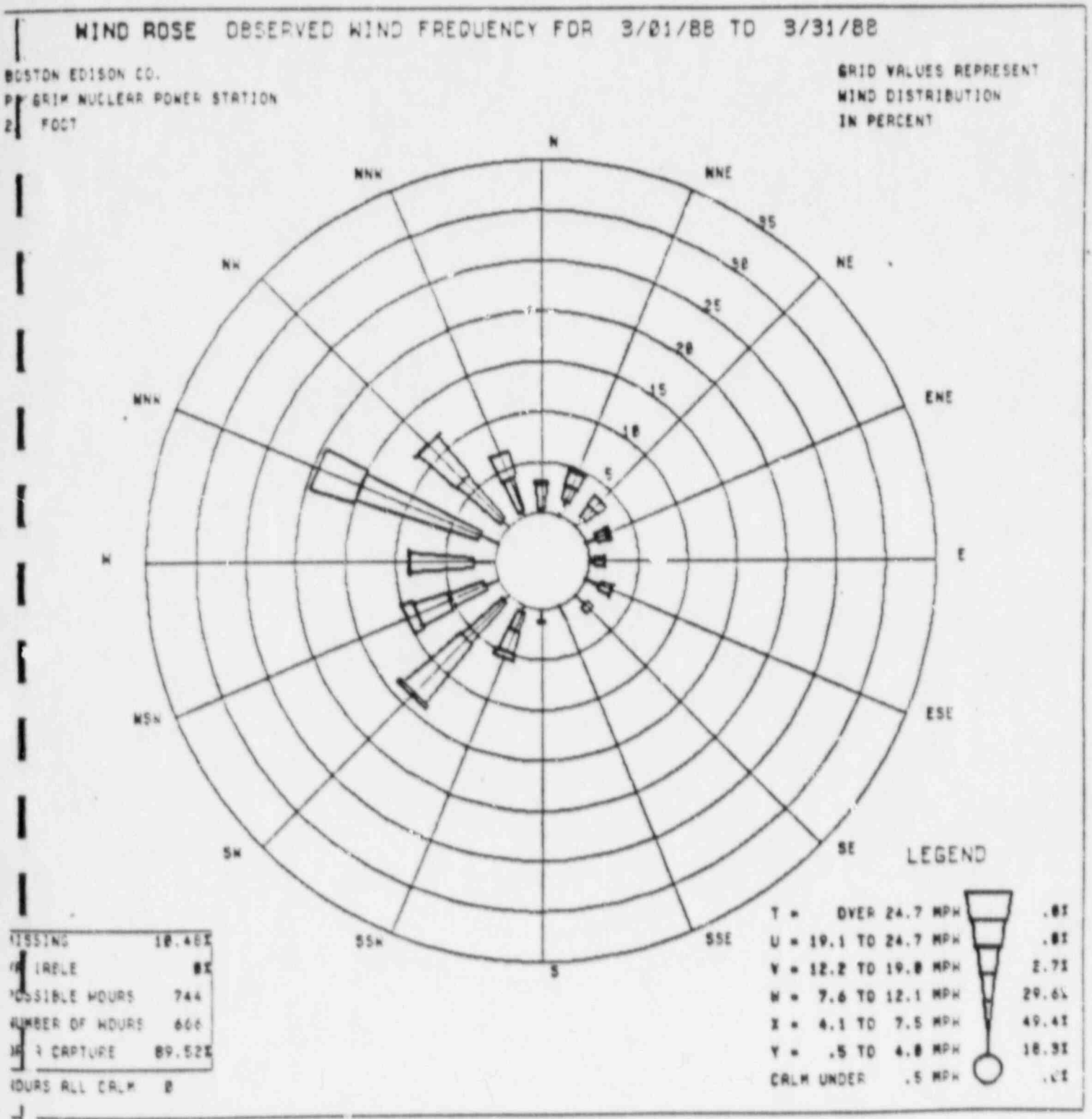
February



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

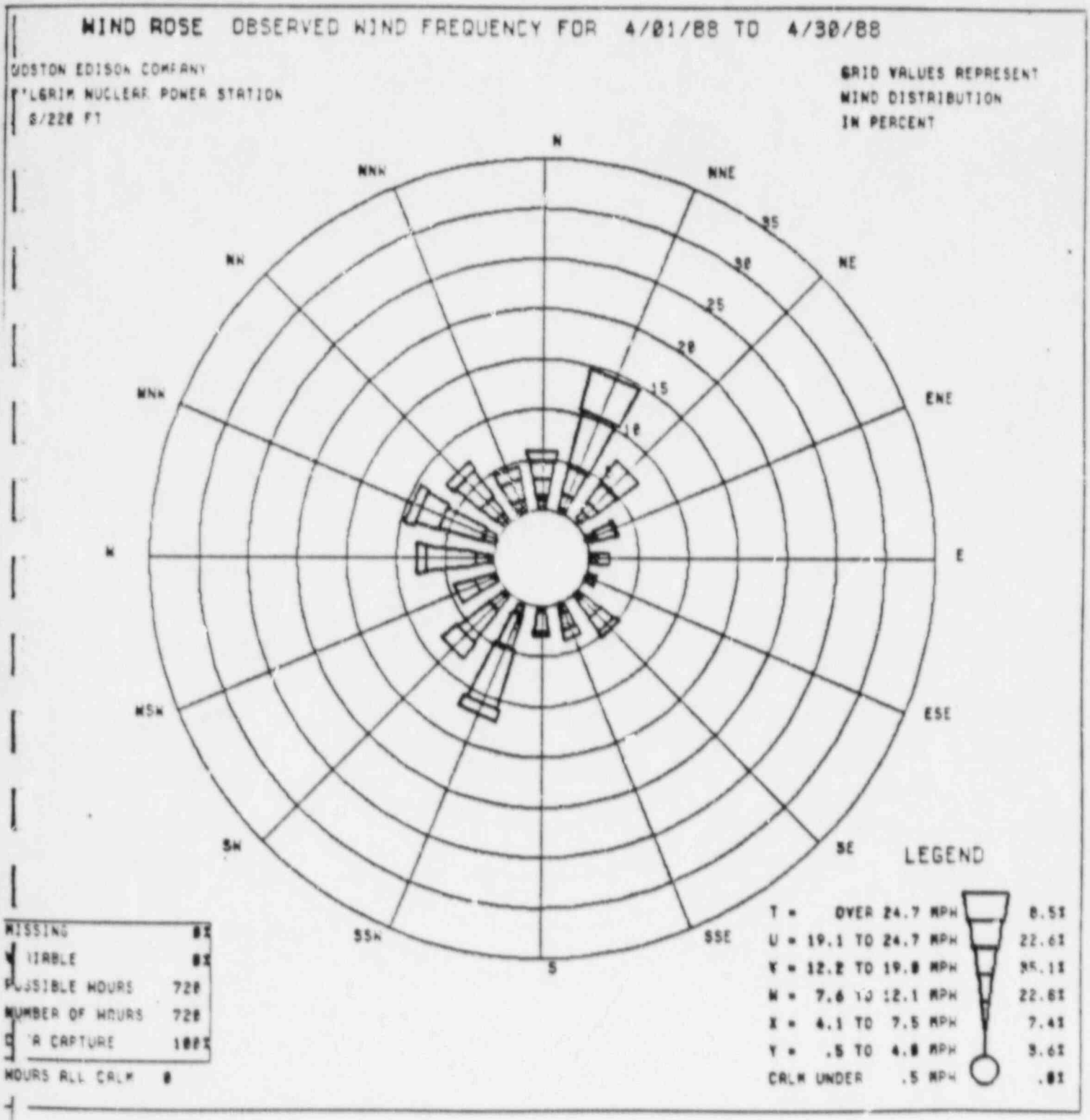
March



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

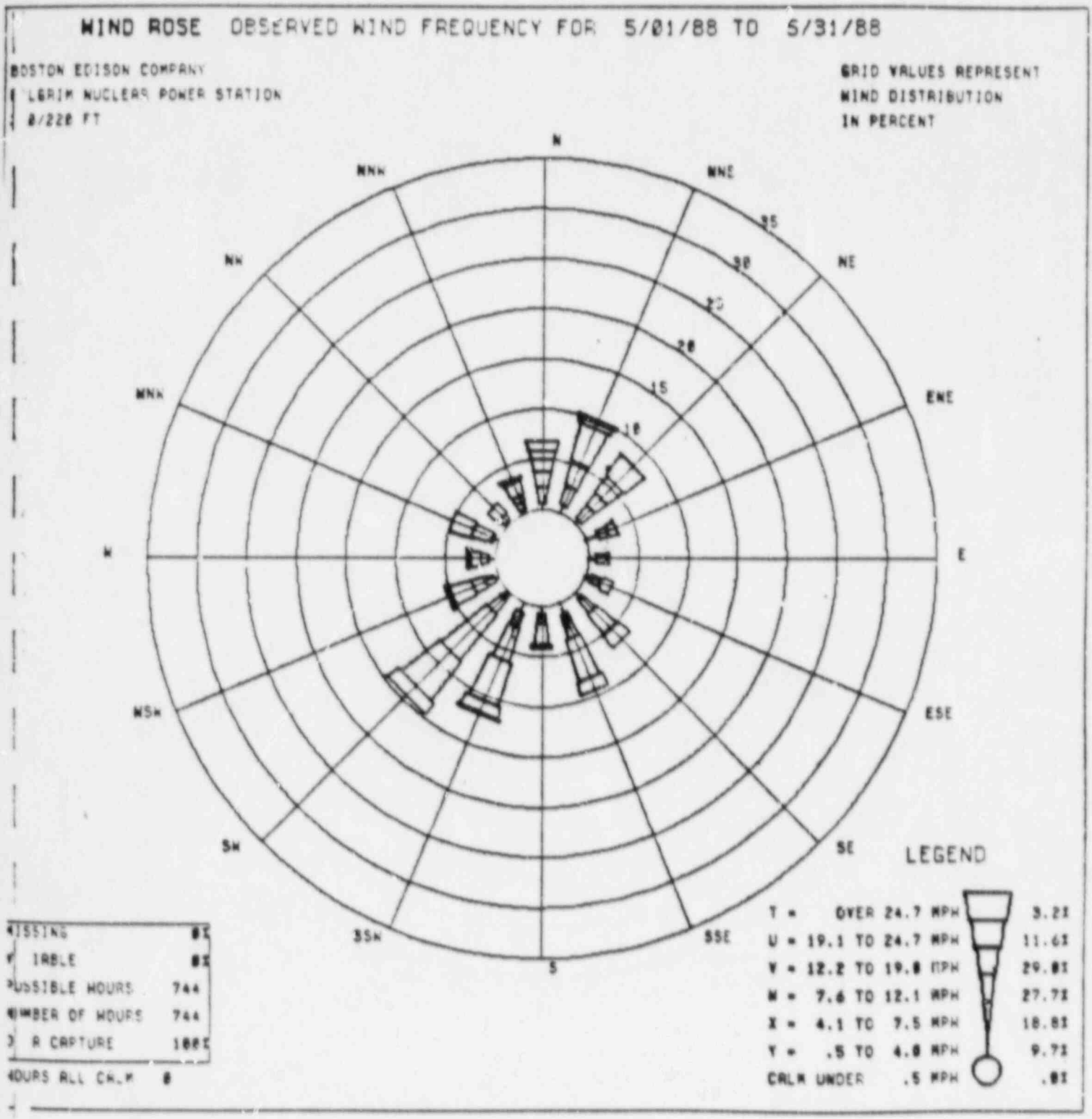
April



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

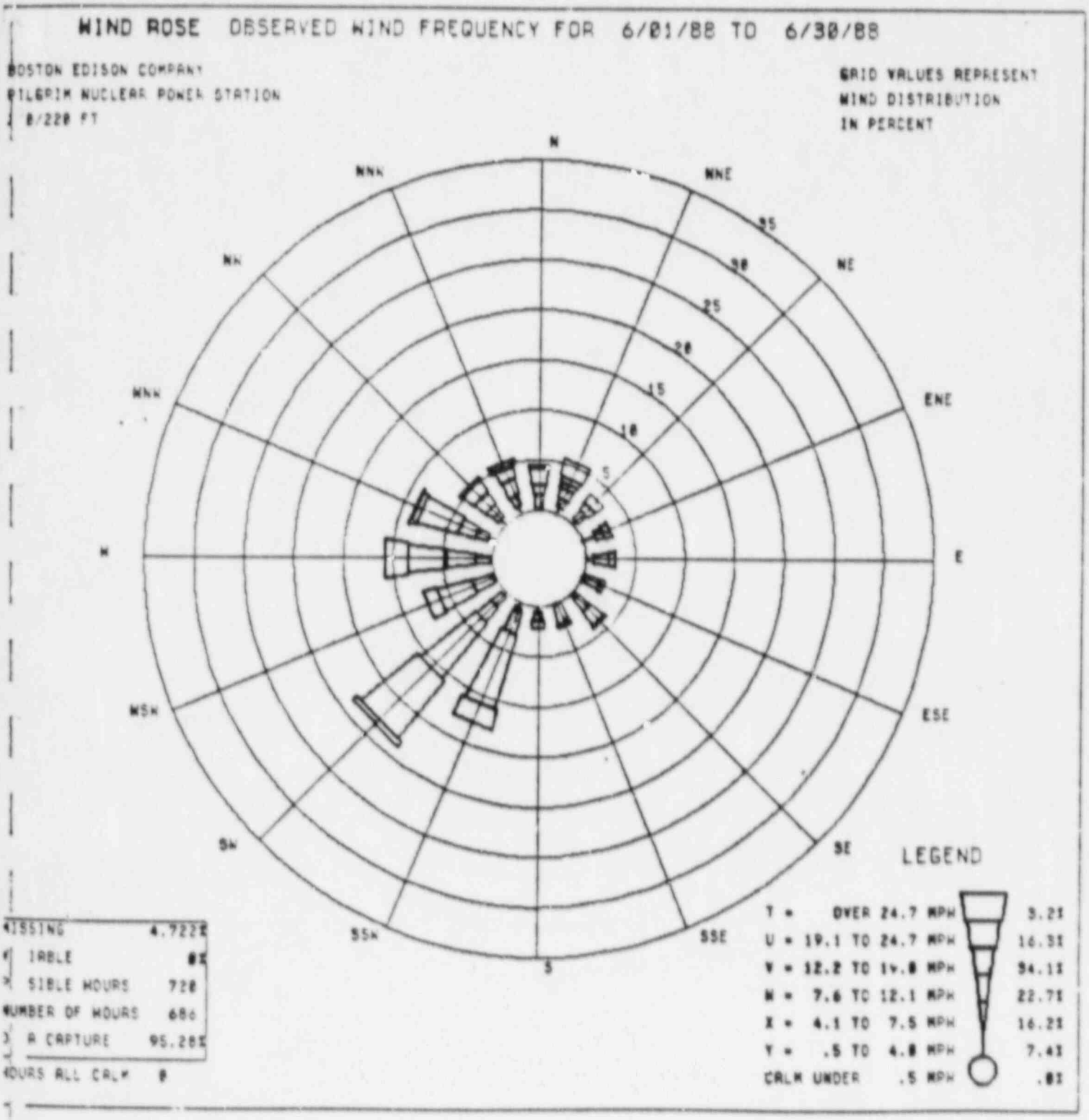
May



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

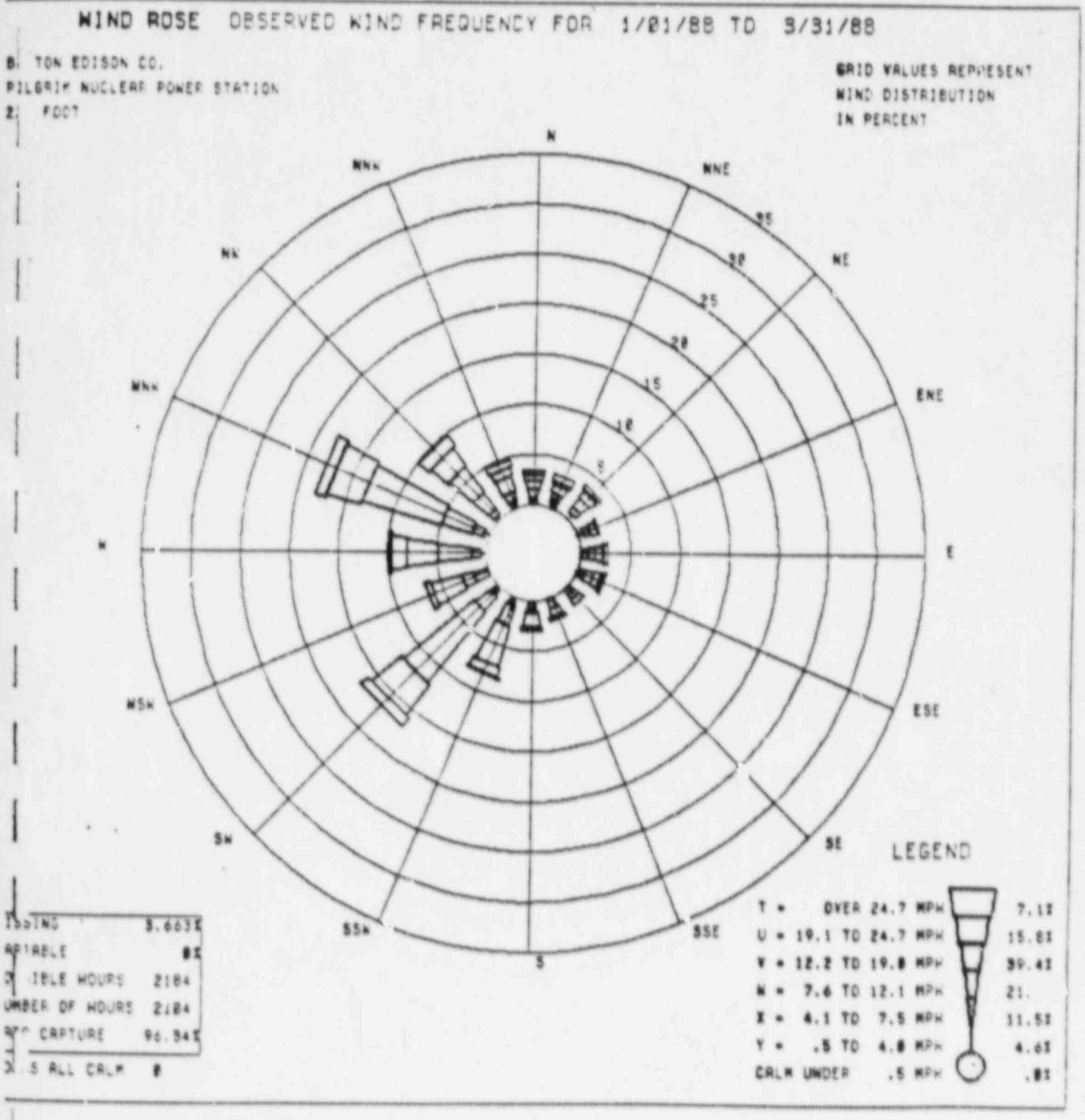
June



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

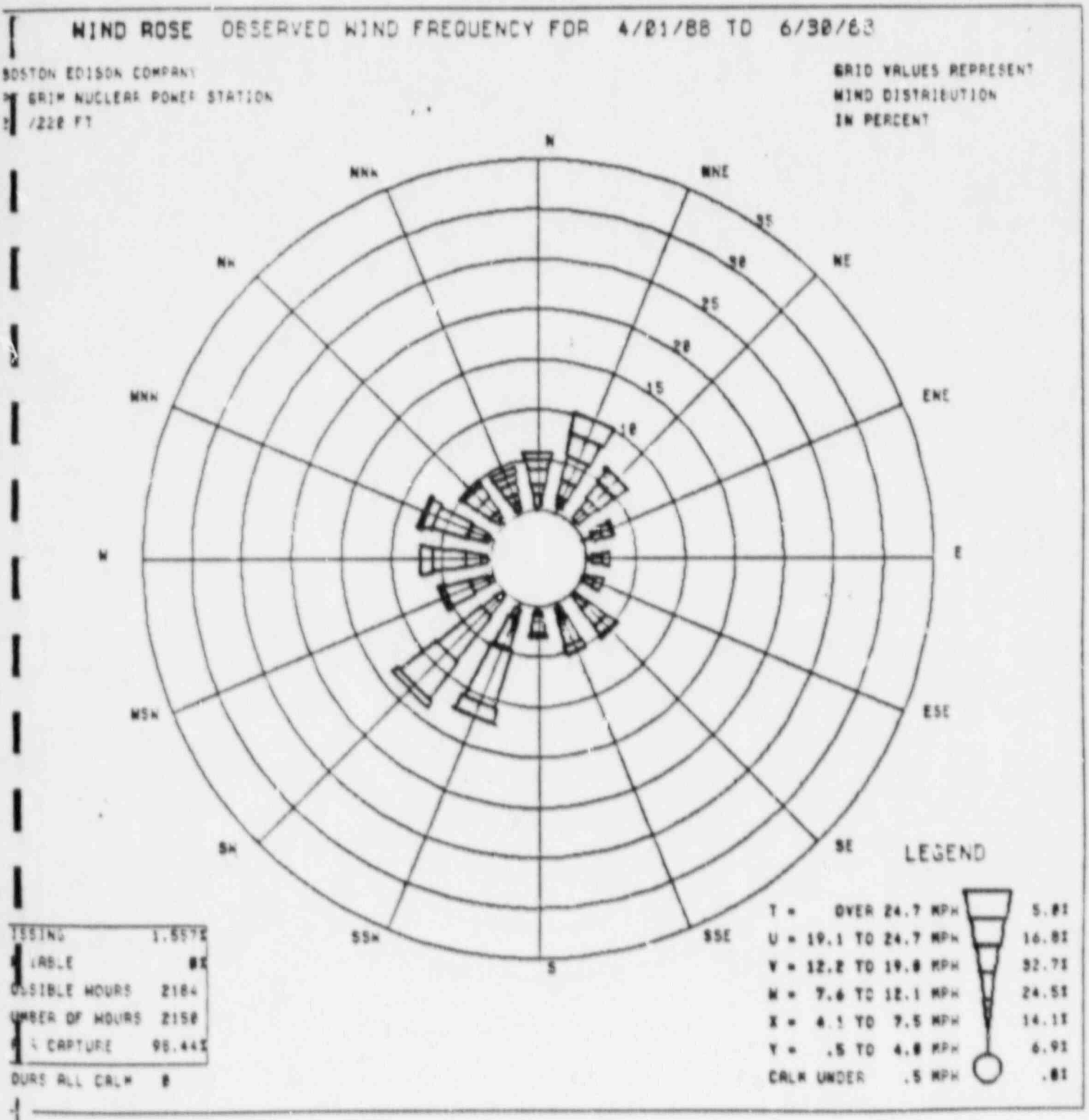
First Quarter 1988



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

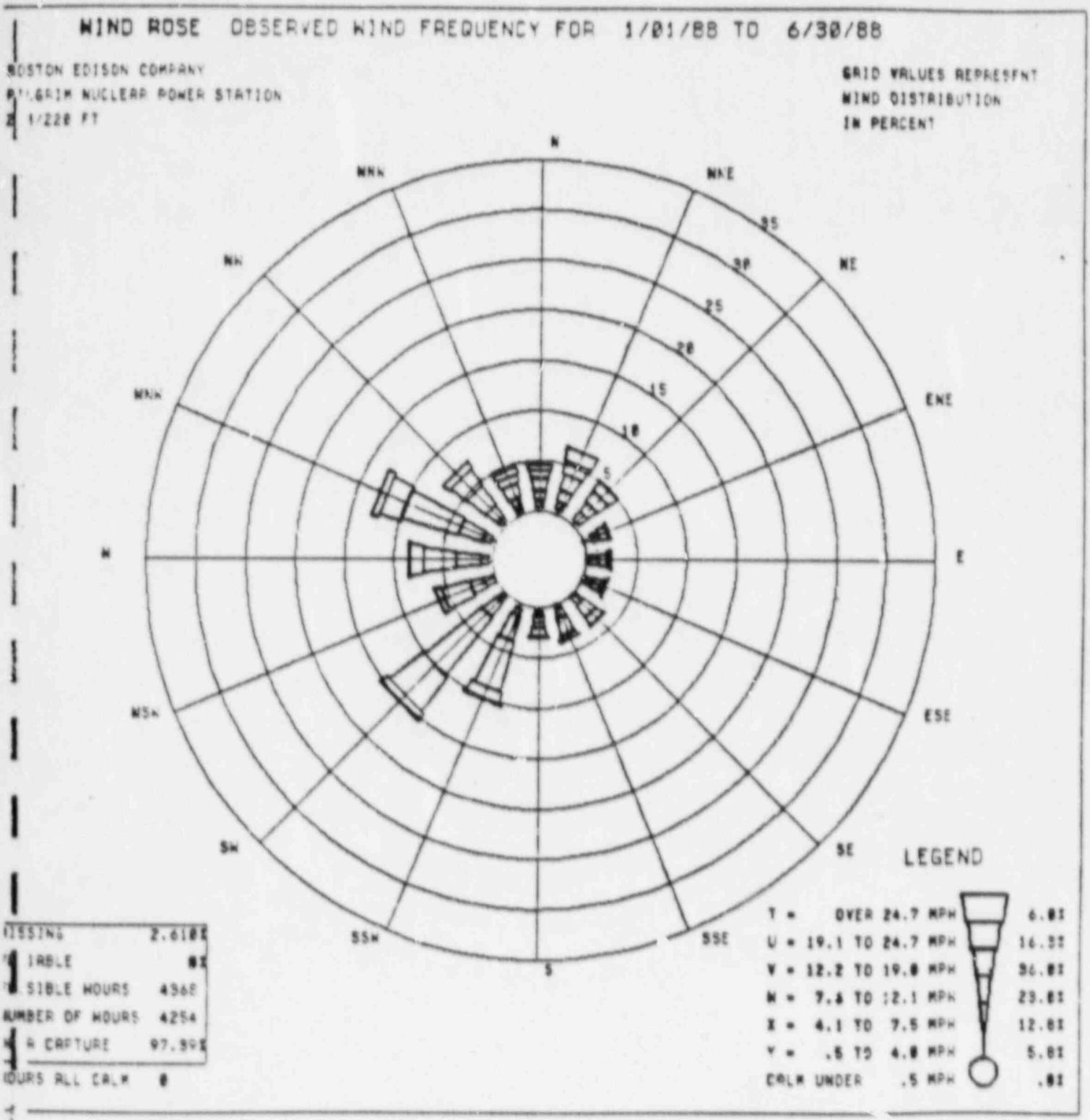
Second Quarter 1988



APPENDIX B-2
(continued)

Wind Rose Diagrams at the 220 Ft. Level of the 220 Ft. Tower
for January - June 1988

Semi-Annual



Appendix C

Pilgrim Nuclear Power Station

Offsite Dose Calculation Manual

Revision 2

PILGRIM NUCLEAR POWER STATION

OFFSITE DOSE CALCULATION MANUAL

BY: PLANT SUPPORT DEPARTMENT
RADIOLOGICAL ENGINEERING DIVISION
AND
PLANT OPERATIONS DEPARTMENT
CHEMISTRY DIVISION

Revision 2 - September 1988

BOSTON EDISON COMPANY

PILGRIM NUCLEAR POWER STATION

OFFSITE DOSE CALCULATION MANUAL

APPROVED BY: C E Bowman
C.E. Bowman
RADIOLOGICAL ENGINEERING
DIVISION MANAGER

APPROVED BY: Curtis S Crane for RA Canalas
R.A. Canalas
CHIEF CHEMICAL ENGINEER

REVIEWED BY: J A Seery - MEETING 88-57
ORC CHAIRMAN

Rev. 0 was originally reviewed by ORC on
on June 10, 1983

EFFECTIVE DATE: SEPTEMBER 1988

Changes to this document shall be reviewed by the Operations Review Committee and submitted to the Nuclear Regulatory Commission in the next Semi-Annual Effluent Release Report. All such changes shall be recorded below.

RECORD OF DOCUMENT CHANGES

REV. NO.	IDENTIFICATION OF CHANGE	REVISION DATE	DOCUMENT SECTION AND PAGE	INITIAL
0	Original Submittal	6/10/83	All Sections	
1	Update of TLD and Air Sampler Locations	6/1/87	7.0/7-7 & 7-8	
2	Changes in response to NRC questions on PNPS ODCM (TAC #63012). Changes in response to technical review performed by BECo Radiological Section.	7/15/88	All Sections	

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1.0 Introduction

The purpose of the Offsite Dose Calculation Manual (ODCM) is:

a. to identify the applicable effluent release limits defined by the Pilgrim Nuclear Power Station - Unit #1 (PNPS-1) Technical Specifications; and,

b. to identify the equipment, methods, equations, and data used to verify compliance with these offsite release limits.

This manual contains the current methodology, parameters, data, and information used in the calculation of offsite doses due to radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitor alarm/trip setpoints, and in the conduct of the radiological environmental monitoring program.

2.0 Limiting Conditions for Operation and Operational Objectives

Table 2.1 presents a summary of the Limiting Condition for Operation contained in PNPS Technical Specification Sections 3.8.A, 3.8.C, 3.8.D, and 3.8.F and also the Operational Objectives contained in PNPS Technical Specifications Sections 7.2, 7.3, 7.4, and 7.5.

This table is intended to serve as a summary of the contents of the PNPS Technical Specifications and does not, in itself, establish limits. The Technical Specifications should be consulted for exact wording and specifics.

TABLE 2-1

PNPS TECHNICAL SPECIFICATIONS/OFFSITE DOSE CALCULATION MANUAL CROSS-REFERENCE
FOR LIMITING CONDITIONS FOR OPERATION AND OPERATIONAL OBJECTIVES

Limiting Conditions for Operation	Technical Specifications Section	ODCM Section(s)	Applicable Limits and Objectives	Exposure Period	Required Action
Liquid Effluent Concentration	3.8.A	4.1	10CFR20, App. B Table II Column 2 and 2×10^{-4} uCi/ml for dissolved noble gases	Instantaneous	Restore concentration to within limits
Liquid Radwaste Treatment	3.8.C	4.2	0.06 mrem W.B. 0.2 mrem Organ	Projected for 31 days	Operate Liquid Waste Treatment System
Gaseous Effluents Dose Rate	3.8.D	4.3.1.3	500 mrem/yr W.B. from noble gases	Instantaneous	Restore release rates to within specifivations
		4.3.1.4	3000 mrem/yr skin from Noble Gases		
		4.3.2	1500 mrem/yr Organ from particulates w $T_{\frac{1}{2}}$ > 8d., I-131, 133 and tritium		
Operational Objectives					
Dose-Liquids	7.2	4.2	1.5 mrem W.B. 5 mrem Organ	Calendar Quarter	30 day report if exceeded
Dose-Liquids	7.2	4.2	3 mrem W.B. 10 mrem Organ	Calendar Year	30 day report if exceeded
Dose-Noble Gases	7.3	4.3.1.1 4.3.1.2	5 mrad gamma 10 mrad beta	Calendar Quarter	30 day report if exceeded
Dose-Noble Gases	7.3	4.3.1.1 4.3.1.2	10 mrad gamma 20 mrad beta	Calendar Year	30 day report if exceeded

TABLE 2-1 (continued)

PNPS TECHNICAL SPECIFICATIONS/OFFSITE DOSE CALCULATION MANUAL CROSS-REFERENCE
FOR LIMITING CONDITIONS FOR OPERATION AND OPERATIONAL OBJECTIVES

Operational Objectives	Technical Specifications Section	ODCM Section(s)	Applicable Limits and Objectives	Exposure Period	Required Action
Dose I-131, 133 Particulates, H-3	7.4	4.3.2	7.5 mrem Organ	Calendar Quarter	30 day report if exceeded
Dose I-131, 133 Particulates, H-3	7.4	4.3.2	15 mrem Organ	Calendar Year	30 day report if exceeded
Total Dose	7.5	4.2, 4.3.1, 4.3.2, 4.4	25 mrem W.B. 25 mrem Organ 75 mrem Thyroid	Calendar Year	Report if 2 times specifications in 7.2, 7.3, or 7.4 exceeded. Restore dose to public to within the applicalbe EPA limit(s) or obtain a variance.

NOTE: W.B. means whole body or total body.

3.0 Release Point and Monitor Description

3.1 Radioactive Effluent Release Point Description (Reference 10)

3.1.1 Main Stack Gas Release

The processed gases from the unit are routed to the main stack for dilution and elevated release to the atmosphere (see Figure 8-2). The main stack is continuously monitored by a radiation monitor (see Section 3.2.1).

Dilution air input to the stack is provided to reduce the hydrogen in the air ejector off-gases to a concentration of less than 4 percent by volume. Dilution air is supplied by one of two fans located in the filter building at the base of the main stack. The stack is designed such that prompt mixing of all gas inlet streams occurs in the base to provide prompt dilution of hydrogen and to allow location of sample points as near to the base as possible.

The main stack is a pipe with a top elevation of about 400 feet mean sea level (MSL). The main stack is supported by the filter building. The filter building is a reinforced concrete structure which houses the dilution fan (16,680 cfm each fan), off-gas filters, and heaters. The main stack is located about 700 feet west northwest of the reactor building.

3.1.2 Reactor Building Exhaust Vent Release

Air from areas containing potential sources of radioactive contamination such as the reactor building, radwaste building basement, and turbine building basement are discharged through the reactor building exhaust vent (see Figure 8-2). Normal airflow is routed from lesser to progressively greater areas of radioactive contamination potential prior to final exhaust. The reactor building exhaust vent is continuously monitored by a radiation monitor (see Section 3.2.2).

The operating floor ventilation is normally supplied with 40,000 cfm of filtered and tempered outside air which enters the reactor building through louvers in the east wall. Air is exhausted from the operating floor through ducts located in the roof truss area and the south wall, adjacent to the floor (54,000 cfm per fan). Additional exhaust ducts are located above the water level in the fuel pool, steam dryer/separator storage pool, and the reactor cavity.

Two contaminated area exhaust fans (25,000 cfm per fan), each rated at design capacity, are located in the reactor building. The fans discharge to the main exhaust plenum at the base of the reactor building. An additional smaller exhaust fan (5,000 cfm), located in the reactor building, exhausts only from the control rod drive maintenance shop and discharges to the main exhaust plenum. Constant volume control is maintained by inlet vanes which are automatically positioned.

The reactor building exhaust vent is a square plenum extending from the top of the west corner of the reactor building. The exhaust plenum releases to the atmosphere at an elevation of 182 feet MSL.

3.1.3 Liquid Radiation Waste Effluent Release

The liquid radwaste discharge header receives discharge from the chemical radwaste monitor tank pumps, the clean radwaste treated water transfer pumps, and the miscellaneous waste drain tank pump (see Figure B-1). The header provides controlled discharge through either a low flow discharge path or a high flow discharge path. The high flow path is normally used with a variable liquid radwaste effluent flow from 1-200 gpm. The common discharge header extends from both the low and high flow-paths and is monitored for radiation prior to discharge (see Section 3.2.3).

The monitor trips the discharge pumps, closes the flow control valves, and provides an alarm on high radiation. The liquid radwaste effluent is finally discharged through an outlet diffuser to the circulating water discharge canal. Liquid effluent releases enter the Cape Cod Bay at the outfall of the discharge canal which is located about 1100 feet north from the center of the reactor building.

In addition, batch releases from sources other than the radwaste tanks are permitted provided at least two independent samples are analyzed in accordance with PNPS Technical Specifications section 4.8.A.1, an independent verification of the release rate calculations is performed, and an independent verification of the discharge valving is performed. Concentrations released to unrestricted areas must be limited to the values specified in 10CFR20.

All batch releases which are not processed through the liquid radwaste treatment system are also discharged through an outlet to the circulating water discharge canal. These untreated liquid effluent releases also enter the Cape Cod Bay at the outfall of the discharge canal.

3.2 Radioactive Effluent Monitoring System Description (References 8, 9, and 10)

3.2.1 Main Stack Gas Monitoring System

The main stack gas monitoring system consists of two individual channels (see Section 7.12 of Reference 10) to monitor the release of noble gases. Each channel consists of a gamma-sensitive scintillation detector and a seven decade logarithmic count rate monitor that includes a power supply and a meter. Both channels are recorded on a two-pen recorder located in the main control room. Both channels are connected to the 24 volt DC power bus and to the AC Radiation Protection System via a transfer switch to the emergency diesel generators.

Each monitor has two upscale alarms and one downscale alarm. Exceeding a setpoint initiates an alarm in the main control room, but no control action is provided. The upscale alarms indicate high radiation (see Section 6-2 for gaseous effluent monitor setpoint), and the downscale alarm indicates instrument trouble.

To monitor noble gases in the gaseous effluent from the main stack, a sample is drawn through an isokinetic probe which is located in the stream to assure representative sampling. The sample passes through a particulate filter and charcoal cartridge. The filtered gas then flows to two shielded chambers where the radiation level of the noble gases is measured by two scintillation detectors, one located in each shielded chamber.

The system also provides for sampling of particulates and iodines by the use of a filter and charcoal cartridge located upstream of the gas being monitored in the shielded chambers. The filter and cartridge are routinely analyzed in a chemistry laboratory in accordance with PNPS Technical Specification.

Each individual channel includes a built-in check source and a purge line to purge the stack gas from the sampling chamber. Both the purge valve and the check source are operated from the main control room. Each channel is calibrated by laboratory analysis of a grab sample in the offgas line. Alarm trip circuits can be tested using a test source.

The channel has an upscale trip to indicate high radiation level and a downscale trip to indicate instrument trouble. The upscale trip alarms in the main control room (see Section 6.1 for liquid effluent monitor setpoints), trips the monitor tank pumps, and terminates the discharge. The downscale trip alarms in the main control room. The waste discharge valve is the isolation control device for the liquid radwaste effluent stream and it is automatically closed when the alarm is tripped. There are two waste discharge valves, one is situated on a two inch line and the other is situated on a one inch line. Both valves are located prior to the radiation waste effluent monitor and prior to the discharge canal. The valves are air operated valves. The waste discharge valves are: AO7216A and SV7216A, which are on the 2 inch line; and AO7216B and SV7216B, on the 1 inch line. The power source is the 24 volt DC power bus.

Alarm trip circuits can be tested using test signals. The channel is calibrated by laboratory analysis of a grab sample from the liquid radwaste system.

TABLE 3-1
RADIATION EFFLUENT MONITOR DATA

Item	Effluent Monitors				
	Stack Gas		Reactor Bldg. Vent		
	Channel 1	Channel 2	Channel A	Channel B	Liquid Effluent
Manufacturer	GE	GE	GE	GE	GE
Model Number	194X900G9	194X900G11	194X900G11	194X900G11	194X900G9
Serial Number	6,343,901 PPA 6,342,790 PRM	6,550,PA6,343 907	6,550,733	6,550,789	6,342,995 PPA 6,342,788 PRM
Scale	cps	cps	cps	cps	cps
Range	10^{-1} - 10^{5}	10^{-1} - 10^{6}	10^{-1} - 10^{6}	10^{-1} - 10^{6}	10^{-1} - 10^{6}
Power	24V, DC	24V, DC	24V, DC	24V, DC	24V, DC
Location	Panel 910	Panel C910	Panel C910	Panel C910	Panel C910
Installation Date	8/20/71	8/20/71	8/20/71	8/20/71	9/13/71
Surveillance Test a. Daily b. Monthly c. Quarterly	Channel Check Source Check Channel Functional Test		Channel Check Source Check Channel Functional Test		Channel Check --- Channel Functional Test
Calibration a. Quarterly b. 18 months	Check Source Known radiation source		Check Source Known radiation source		Check Source Known radiation source

TABLE 3-1
RADIATION EFFLUENT MONITOR DATA (continued)

Item	Effluent Monitors				
	Stack Gas		Reactor Bldg. Vent		Liquid Effluent
	Channel 1	Channel 2	Channel A	Channel B	
Alarm Set Points a. Hi Alarm b. Hi Hi Alarm	see Section 6.0		see Section 6.0		see Section 6.0
Isolation Control Device	None		None		Waste Discharge Valve

3.3 Measurement Method During Release (References 5, 7, and 10)

3.3.1 Gaseous Effluent

The gaseous effluent radiation level is continuously monitored as it is being vented to the atmosphere. Periodic samples are collected from the reactor building vent and the main stack. The particulate filters, charcoal cartridges, gas samples, and condensed water samples are analyzed for isotopic identification and quantification, in accordance with the PNPS Technical Specifications.

3.3.2 Liquid Effluent

Prior to the release of any liquid waste, a sample of the release is collected and analyzed for gross beta and gross gamma activity, and the specific activity of each release is determined by isotopic analysis. The waste discharge tank is recirculated at least 60 minutes prior to the collection of a sample. The release of any liquid waste is controlled on a mixed maximum permissble concentration (MPC) basis, where the sum of the ratios between the isotopic concentration and the MPC is less than one. The specified waste discharge flow rate must be at least 10% less than the maximum waste discharge flow rate which shall not exceed 200 gpm. The discharge of the liquid effluent is made from the liquid radwaste discharge header.

3.3.3 Limitations

a. Gaseous Effluent

1) PNPS Technical Specifications for gaseous release values.

b. Liquid Effluent

1) PNPS Technical Specifications for liquid release values.

2) If one pump is used to discharge the liquid waste and fails, the release is immediately discontinued.

3) If the discharge flow rate recorder fails, the release is immediately discontinued.

4.0 Calculations Methods

This section presents the calculational specifics required to demonstrate compliance with each of the Technical Specifications for limiting conditions for operation and operational objectives identified in Section 2 of this document.

The equations in this section are based on the equations and calculational methods described in Reference 1, unless otherwise specified. These equations have, in some cases, been presented in a slightly different form in an effort to simplify their use. The subscripts used are "a" for age group, "j" for organ, "i" for radionuclide, "p" for pathway and "l" for location. Capital letters have been used on the dose/dose rate, use factor, concentration, and dose conversion factor abbreviations to designate pathways. "A" is for aquatic foods, "S" for shoreline deposits, "W" for swimming, "Y" for yachting/boating, "N" for noble gas, "G" for ground plane deposition, "B" for breathing/inhalation, "L" for leafy vegetation, "R" for root crops/non-leafy vegetation, "M" for milk, and "C" for meat.

The descriptions of constants, variables, and parameters in this section are also based on those described in Reference 1, unless otherwise specified. The descriptions have, in some cases, been modified to describe the constant, variable, and parameter specific application in the corresponding equation. In addition, some of the constants and variables values have been revised to include more site specific values, to include more technically correct information, or to provide uniformity (e.g., λ_i values always presented in hr^{-1}). Values for parameters which only have a single value will appear along with the definition. For those parameters which can take on different values for different conditions, the appropriate value will appear in the referenced tables. All numerical contants have been derived from the indicated base conversion factors and are represented in scientific notation to the third significant digit.

4.1 Concentrations of Liquid Effluents

The following equation shall be used to determine the discharge flow rate such that concentrations of radioactive effluents released to unrestricted areas do not exceed the concentration limits specified in 10CFR20 Appendix B, Table II, Column 2:

$$DFR = CW / \sum_i (C_{wi} / MPC_i)$$

where:

DFR = Maximum discharge release rate of liquid effluent, (gal/min).

F_W = Flow rate of dilution water, (gal/min).
C_{wi} = Concentration of nuclide i in the liquid waste discharge volume prior to any dilution as determined by current isotopic analysis for gamma emitting nuclides and most recent results from pure beta and alpha emitters, (uCi/cc).

MPC_i = Maximum Permissible Concentration of each nuclide i from 10CFR20 Appendix B, Table II, Column 2, (uCi/cc).

4.2 Liquid Effluents Dose Assessment Methodology

The following equations shall be used to estimate the annual dose rates due to release of radioactive liquid effluents. All input parameters (i.e. activity and volume) must be normalized to a 1 year release period. Modification of final results is necessary for comparison to dose rate limits for periods different than one year. For comparison to monthly limits and quarterly limits, results would be scaled by 1/12 and 1/4, respectively. To determine the dose or dose commitment for a desired period, multiply the annual dose rate by the fraction of the year for the dose period desired.

Pathways assuming internal deposition of radionuclides (i.e., ingestion) involve the use of a 50-year committed dose conversion factor. This entire prospective dose will be assigned to the individual for the year of intake (Reference 1). For pathways involving external radiation to the total body (i.e., shoreline activity, swimming, boating), the dose to all other organs is assumed equal to that for the total body (Reference 1, Appendix E).

Summation of the dose rates from the equations below should be performed for all significant pathways.

4.2.1 Liquid Pathways Annual Dose Rates

4.2.1.1 Aquatic Food Ingestion (Fish, Shellfish)

$$DA_{ajp} = UA_{ap} \sum_i CA_{ip} DFI_{aij} \quad . \quad .$$

where:

$$CA_{ip} = CW_{i1} B_{ip} e^{-\lambda_i \tau_h}$$

$$CW_{i1} = 1.00E12 \, Q_1 \left(\frac{M_1}{V}\right) e^{-\lambda_i t_1}$$

Above equations derived from Reference 1 equations 2 and A-3.

4.2.1.2 Shoreline Deposits (Discharge Canal and Recreational Areas)

$$DS_{ajl} = US_{al}\, W_j \sum_i CS_{il}\, DFG_{ij}$$

where:

$$CS_{il} = 2.89\, CW_{il}\, \frac{(1-e^{-\lambda_i t_b})}{\lambda_i}$$

CW_{il} = same as indicated in equation 4.2.1.1

Above equation derived from Ref. 1 equations A-4 through A-7.

4.2.1.3 Swimming (White Horse Beach)

$$DW_{ajl} = UW_{al} \sum_i CW_{il}\, DFW_{ij}$$

where:

CW_{il} = same as indicated in equation 4.2.1.1

Above equations derived from Reference 14 equation 41 on page 151 .

4.2.1.4 Yachting/Boating (Cape Cod Bay)

$$DY_{ajl} = 0.50\, UY_{al} \sum_i CW_{il}\, DFW_{ij}$$

where:

CW_{il} = same as indicated in equation 4.2.1.1

Above equations derived from Reference 14 equation 41 on page 151 .

4.2.2 Definitions:

B_{ip} is the equilibrium bioaccumulation factor for radionuclide i, in aquatic foods pathway p, expressed as the concentration in biota (pCi/kg), divided by the concentration in water (pCi/liter) from Table A-1, (liters/kg);

CA_{ip} is the concentration of radionulcide i in pathway p of aquatic foods, (pCi/kg);

CS_{il} is the effective surface concentration of radionuclide i in sediments at location l, (pCi/m^2);

CW_{il} is the concentration of radionuclide i in seawater at location l, (pCi/liter);

DA_{ajp} is the total annual dose rate from ingestion of aquatic foods to organ j, of individuals of age group a, from pathway p, (mrem/yr);

DFG_{ij} is the open field ground plane dose conversion factor for organ j, from radionuclide i, from Table E-6, (mrem-m^2/pCi-hr);

DFI_{aij} is the ingestion 50-year committed dose conversion factor for organ j, of individuals in age group a, from radionuclide i, from Table E-11 through E-14 (mrem/pCi ingested);

DFW_{ij} is the submersion dose conversion factor in water, for organ j, of individuals in age group a, from radionuclide i, from Table A-2, (mrem-liter/pCi-hr);

DS_{ajl} is the total annual dose from exposure received during shoreline activities rate to organ j, of individuals of age group a, at location l, (mrem/yr);

DW_{ajl} is the total annual dose rate from exposure received during swimming, to organ j, of individuals of age group a, at location l, (mrem/yr);

DY_{ajl} is the total annual dose rate from exposure received during yachting/boating, to organ j, of individuals in age group a, at location l, (mrem/yr);

M_l is the mixing ratio (reciprocal of dilution factor) at location l of exposure or harvest of aquatic food, from Table A-3, (dimensionless);

Q_i is the annual release rate of radionuclide i in liquid effluents, (Ci/yr);

t_b is the period of time for which sediment is exposed to radionuclides in seawater, including buildup, (hr, assumed to be 1.31E5 hr = 15y);

t_h is the time between exposure of aquatic foods to radionuclides in sea water and their consumption by an individual, from Table A-3, (hr);

t_l is the transit time required for radionuclides to reach location l, (hr, assumed to be 0.0 hr from the liquid waste tank to the discharge canal);

UA_{ap} is the use factor of aquatic foods from pathway p, by individuals in age group a, from Table E-5 for maximum individual, Table E-4 for average individual, (kg/yr);

US_{al} is the use factor (amount of time) an individual in age group a, engages in shoreline activities at location l, from Table E-5 for maximum individual, Table E-4 for average individual, (hr/yr);

UW_{al} is the use factor (amount of time) an individual in age group a, engages in swimming at location l, from Table E-5 for maximum individual, Table E-4 for average individual, (hr/yr);

UY_{al} is the use factor (amount of time) an individual in age group a, engages in yachting/boating at location l, from Table E-5 for maximum individual, Table E-4 for average individual, (hr/yr);

V is the total annual discharge rate of liquid effluent + condensor cooling/dilution water, (liters/yr);

W_l is the shoreline width factor for location l, from Table A-3, (dimensionless);

λ_i is the radioactive decay constant of radionuclide i, (hr^{-1});

0.50 is a scaling factor for yachting/boating assuming that doses received while on the surface of the water are 1/2 of doses received while immersed in water from Reference 14, (dimensionless);

2.89 is the factor to convert for transfer of nuclides from water to sediment, equal to 100 liters/m^2-day from Reference 16 multiplied by 1 day/24 hr and by ln 2 (to convert reciprocal λ_i to halflife), as calcuated in Reference 1 equation A-5, (liter/m^2-hr);

1.00E12 is the factor to convert from Ci to pCi, (pCi/Ci);

4.3 Gaseous Effluents Dose Assessment Methodology

The following equations shall be used to estimate the annual dose rates due to release of radioactive gaseous effluents. All input parameters (ie, activity and volume) must be normalized to a 1 year release period. Modification of final results is necessary for comparison to dose rate limits for periods different than one year. For comparison to monthly limits and quarterly limits, results would be scaled by 1/12 and 1/4, respectively. To determine the dose or dose commitment for a desired period multiply the annual dose rate by the fraction of the year for the dose period desired.

Pathways assuming internal deposition of radionuclides (i.e., inhalation, ingestion) involve the use of a 50-year committed dose conversion factor. This entire prospective dose will be assigned to the individual for the year of intake (Reference 1). For pathways involving external radiation to the total body (i.e., noble gas total body dose, ground plane deposition), the dose to all other organs is assumed equal to that for the total body (Reference 1, Appendix E).

Summation of the doses rates from the equations below should be performed for all significant pathways and all release points from which significant radioactive effluent releases have occurred (i.e., Main Stack and Reactor Building Exhaust Vent).

4.3.1 Gaseous Pathways Annual Dose Rates from Noble Gases

4.3.1.1 Gamma Air Dose

$$DN_\gamma = \sum_i C_{i\gamma}\ DFN_{i\gamma}$$

where:

$$C_{i\gamma} = 3.17E4 \left(\frac{\chi}{Q}\right)_\gamma Q_i$$

Above equations derived from Ref. 1 equations 6, 7, B-1, B-2, B-4, and B-5, as well as References 3 and 4.

4.3.1.2 Beta Air Dose

$$DN_\beta = \sum_i C_{i\beta}\ DFN_{i\beta}$$

where:

$$C_{i\beta} = 3.17E4 \left(\frac{\chi}{Q}\right)_c Q_i$$

Above equations derived from Ref. 1 equations 7, B-4, and B-5.

4.3.1.3 Total Body Dose

$$DN_{TB} = S \sum_i C_{i\gamma}\ DFN_{iTB}$$

where:

$C_{i\gamma}$ = Same as indicated in equation 4.3.1.1.

Above equations derived from Ref. 1 equations 8, 10, B-1, B-2, B-4, B-5, B-6, and B-8, as well as References 3 and 4.

4.3.1.4 Skin Dose

$$DN_S = \sum_i C_{ig} \, DFN_{iS} + 1.11 \, S \, DN_g$$

where:

C_{ig}, DN_g = same as indicated above in equations 4.3.1.2 and 4.3.1.1, respectively.

Above equations derived from Ref. 1 equations 6, 7, 9, 11, B-1, B-2, B-4, B-7, and B-9, as well as References 3 and 4.

4.3.2 Gaseous Pathways Annual Dose Rates from Iodine 131 and 133, Particulates with a Half-life Greater than 8 Days, and Tritium.

PNPS Technical Specifications do not consider doses from C-14 and I-135 for compliance. However, equations for these radionuclides are included in this section for completeness.

4.3.2.1 Ground Plane Deposition

$$DG_j = S \sum_i CG_i \, DFG_{ij}$$

where:

$$CG_i = 1.00E12 \left(\frac{D}{Q}\right) Q_i \, \frac{(1-e^{-\lambda_i t_s})}{\lambda_i}$$

Above equations derived from Ref. 1 equations 12, C-1, and C-2.

4.3.2.2 Breathing/Inhalation

$$DB_{aj} = UB_a \sum_i CB_i \, DFB_{aij}$$

where:

$$CB_i = 3.17E4 \left(\frac{\chi}{Q}\right)_c Q_i \qquad \text{for H-3, C-14}$$

$$CB_i = 3.17E4 \left(\frac{\chi}{Q}\right)_d Q_i \qquad \text{for particulates with } T_{\frac{1}{2}} > 8d \text{ and I-131, I-133, and I-135.}$$

Above equations derived from Ref. 1 equations 13, C-3, and C-4.

4.3.2.3 Leafy Vegetation Ingestion

$$DL_{aj} = UL_a f_1 \sum_i CL_i DFI_{aij}$$

where:

CL_i = leafy vegetation concentration as calculated below.

Above equation derived from Ref. 1 equations 14 and C-13.

where:

$$CH_i, CL_i, CP_i, CR_i = 1.19E7\ Q_i \left(\frac{\chi}{Q}\right)_c / H \qquad \text{for H - 3}$$

$$CH_i, CL_i, CP_i, CR_i = 2.18E7\ p\ Q_i \left(\frac{\chi}{Q}\right)_c \qquad \text{for C - 14}$$

$$CH_i, CL_i, CP_i, CR_i = 5.71E7 \left(\frac{D}{Q}\right) Q_i \cdot \left[\frac{r_I \left(1 - e^{-\lambda_i t_e}\right)}{Y_v \lambda_{Ei}} + \frac{B_{iv} \left(1 - e^{-\lambda_i t_h}\right)}{P \lambda_i}\right] e^{-\lambda_i t_h} \qquad \text{for I-131, I-133, and I-135}$$

$$CH_i, CL_i, CP_i, CR_i = 1.14E8 \left(\frac{D}{Q}\right) Q_i \cdot \left[\frac{r_p \left(1 - e^{-\lambda_i t_e}\right)}{Y_v \lambda_{Ei}} + \frac{B_{iv} \left(1 - e^{-\lambda_i t_h}\right)}{P \lambda_i}\right] e^{-\lambda_i t_h} \qquad \text{for particulates with } T_{\frac{1}{2}} > 8 \text{ days}$$

Above equations derived from Ref. 1 equations C-5 through C-9.

4.3.2.4 Root Crop Non-Leafy Vegetation Ingestion

$$DR_{aj} = UR_a \, f_r \sum_i CR_i \, DFl_{aij}$$

where:

CR_i = root crop concentration as calculated in 4.3.2.3.

Above equations derived from Ref. 1 equations 14 and C-13.

4.3.2.5 Milk Ingestion

$$DM_{aj} = UM_a \sum_i CM_i \, DFI_{aij}$$

where:

$$CM_i = F_{im} \, CF_i \, Q_f \, e^{-\lambda_i t_f}$$

$$CF_i = f_p f_s CP_i + (CH_i(1-f_p)) + CH_i f_p(1-f_s)$$

CP_i, CH_i = concentration in pasture grass and harvested/stored feed as calculated in equation 4.3.2.3.

Above equations derived from Ref. 1 equations 14, C-10, C-11, and C-13

4.3.2.6 Meat Ingestion

$$DC_{aj} = UC_a \sum_i CC_i \, DFI_{aij}$$

where:

$$CC_i = F_{if} \, CF_i \, Q_f \, e^{-\lambda_i t_s}$$

CF_i = concentration in forage as calculated in equation 4.3.2.3

Above equations derived from Ref. 1 equations 14, C-12, and C-13

4.3.3 Definitions

B_{iv} - is the concentration factor for uptake of radionuclide i, from soil in the edible portions of crops, in pCi/kg (wet weight) per pCi/kg dry soil, from Table E-1, (kg/kg);

$C_{i\beta}$ - is the effective semi-infinite cloud concentration of noble gas i, for the purpose of calculating beta air dose, (pCi/m^3);

$C_{i\gamma}$ - is the effective finite cloud concentration of noble gas i for the purpose of calculating gamma air dose, (pCi/m^3);

CB_i - is the ground-level airborne concentration of radionuclide i, (pCi/m^3);

CC_i - is the concentration of radionuclide i in meat, (pCi/kg);

CF_i - is the concentration of radionuclide i on forage, (pCi/kg);

CG_i - is the ground plane concentration of radionuclide i, ($pCi-hr/m^2-yr$);

CH_i - is the concentration of radionuclide i on harvested/stored feed, (pCi/kg);

CM_i - is the concentration of radionuclide i in milk, (pCi/liter);

CL_i - is the concentration of radionuclide i in leafy vegetables, (pCi/kg);

CP_i - is the concentration of radionuclide i on pasture grass, (pCi/kg);

CR_i - is the concentration of radionuclide i in root crops/non-leafy vegetables, (pCi/kg);

DB_{aj} - is the total annual dose rate from breathing/inhalation to organ j, of an individual in age group a, (mrem/yr);

DC_{aj} - is the total annual dose rate from ingestion of meat to organ j; of an individual in age group a, (mrem/yr);

DFB_{aij} - is the inhalation 50-year committed dose conversion factor for organ j, of individuals in age group a, from radionuclide i, from Tables E-7 through E-10, (mrem/pCi);

DFG_{ij} - is the open field ground plane dose conversion factor for organ j, from radionuclide i, from Table E-6, ($mrem-m^2/pCi-hr$);

DFI_{aij} - is the ingestion 50-year committed dose conversion factor for organ j, for individuals in age group a, from radionuclide i, organ j, from Table E-11 through E-14, (mrem/pCi);

DFN_{iS} - is the beta skin dose conversion factor for a semi-infinite cloud of noble gas i, which includes the attenuation by the outer "dead" layer of skin, from Table B-1, (mrem-m^3/pCi-yr);

DFN_{iTB} - is the total body dose conversion factor for a semi-infinite cloud of noble gas i, which includes the attenuation of 5 g/cm^2 of tissue, from Table B-1, (mrem-m^3/pCi-yr);

$DFN_{i\beta}$ - is the beta air dose conversion factor from a semi-infinite cloud of noble gas i, from Table B-1, (mrad-m^3/pCi-yr);

$DFN_{i\gamma}$ - is the gamma air dose conversion factor from a semi-infinite cloud of noble gas i, from Table B-1, (mrad-m^3/pCi-yr);

DG_j - is the total annual dose rate to organ j from direct exposure to the contaminated ground plane from all radionuclides, (mrem/yr);

DL_{aj} - is the total annual dose rate from ingestion of leafy vegetables to the organ j, of an individual in age group a, (mrem/yr);

DM_{aj} - is the total annual dose rate from ingestion of milk to the organ j, of an individual in age group a, (mrem/yr);

DN_S - is the total annual skin dose rate due to immersion in a finite cloud of noble gases, (mrem/yr);

DN_{TB} - is the annual total body dose rate due to immersion in a finite cloud of noble gases, (mrem/yr);

DN_β - is the annual beta air dose rate to a semi-infinite cloud of noble gases (mrad/yr);

DN_γ - is the annual gamma air dose rate due to a finite cloud of noble gases, (mrad/yr);

DR_{aj} - is the total annual dose rate from ingestion of root crop or non-leafy vegetables to the organ j, of an individual in age group a, (mrem/yr);

$\left(\frac{D}{Q}\right)$ - is the deposition rate considering depletion at the receptor location in question, from Table 5-1, (m^{-2});

f_l - is the fraction of the ingestion rate of a leafy vegetable that is produced in the garden of interest, (dimensionless; assumed to be 1.0);

f_p - is the fraction of the year the animals graze on pasture, (dimensionless; assumed to be 1.0);

f_r - is the fraction of root crops/non-leafy vegetable that are produced in the garden of interest, (dimensionless; assumed to be 0.76);

f_s - is the fraction of daily feed that is pasture grass when the animal grazes on pasture, (dimensionless; assumed to be 1.0);

F_{if} - is the average fraction of the animal's daily intake of radionuclide i which appears in each kilogram of meat, from Table E-1, (days/kg);

F_{im} - is the average fraction of the animal's daily intake of radionuclide i which appears in each liter of milk, from Table E-1 for cows, Table E-2 for goats, (days/liter);

H - is the absolute humidity of the atmosphere from Reference 15, (g/m^3; assumed to be 5.6 g/m^3);

p - is the fractional equilibrium ratio, (dimensionless; assumed to be 1.0 for continuous release);

P - is the effective surface density for dry soil, (kg/m^2; assumed to be 240 kg/m^2);

Q_f - is the amount of feed consumed by the animal per day from Table E-3, (kg/day);

Q_i - is the annual release rate of radionuclide i in gaseous effluents (Ci/yr);

r_I - is the fraction of deposited radioiodine retained on crops, (dimensionless; assumed to be 1.0 from References 17-20);

r_p - is the fraction of deposited particulates retained on crops, (dimensionless; assumed to be 0.2 from References 21 and 22);

S - is the attenuation factor that accounts for the dose reduction due to shielding provided by residential structures from Table E-15, (dimensionless);

t_b - is the time period over which the radionuclide buildup is evaluated, (hr; assumed to be 1.31E5 hr = 15 yr);

t_e - is the time period that crops are exposed to radionuclide deposition during the growing season, from Table E-15, (hr);

t_f - is the average transport time of the activity from the feed into the milk and to the receptor from Table E-15, (hr);

t_h - is the holdup time that represents the time interval between harvest and consumption of the food, from Table E-15, (hr);

t_s - is the average time for radioruclides to pass from feed through meat to the consuming individua., (hr; assumed to be 480 hr = 20 days);

UB_a - is the annual breathing rate, for individuals in the age group a, from Table E-5 for maximum individual, Table E-4 for average individual, (m^3/yr);

UC_a - is the annual intake of meat, for individuals in age group a, from Table E-5 for maximum individual, Table E-4 for average individual, (kg/yr);

UL_a - is the annual intake of leafy vegetables, for individuals in the age group a, from Table E-5 for maximum individual, Table E-4 for average individual, (kg/yr);

UM_a - is the annual intake of milk, for individuals in the age group a, from Table E-5 for maximum individual, Table E-4 for average individual, (liter/yr);

UR_a - is the annual intake of root crops/non-leafy vegetables, for individuals in the age group a, from Table E-5 for maximum individual, Table E-4 for average individual, (kg/yr);

Y_v - is the agricultural productivity, also, from Table E-15, (kg/m^2, wet weight);

$\left(\frac{\chi}{Q}\right)_c$ - is the appropriate value of undepleted atmospheric dispersion factor used to estimate ground level airborne concentration of gaseous, (i.e., non-particulate) radionuclides, from Table 5-1, (sec/m^3);

$\left(\frac{\chi}{Q}\right)_d$ - is the appropriate value of the average gaseous dispersion factor corrected for depletion of particulates and radioiodines, from Table 5-1, (sec/m^3);

$\left(\frac{\chi}{Q}\right)_i$ - is the appropriate value of gamma atmospheric dispersion factor used to estimate ground level gamma dose rate from an elevated or ground level plume as calculated in References 3 and 4, from Table 5-1, (sec/m^3);

λ_i - is the radioactive decay constant of radionuclide i, (hr^{-1});

λ_{Ei} - is the effective removal rate constant for radionuclide i from crops, in hr^{-1}, where $\lambda_{Ei} = \lambda_i + \lambda_w$. λ_i is the radioactive decay constant, and λ_w is the removal rate constant for physical loss by weathering $\lambda_w = 0.0021\ hr^{-1}$, ($hr^{-1}$);

1.11 - is the average ratio of the tissue to air energy absorption coefficients, (mrem/mrad);

3.17E4 is equal to 1.00E12pCi/Ci divided by 3.15E7 sec/yr, (pCi-yr/Ci-Sec)

1.19E7 - is equal to 1.00E12 pCi/Ci divided by 3.15E7 sec/yr and multiplied by 1.00E3 g/kg and by 0.5 g H-3 in plant water per g H-3 in atmospheric water from Reference 23 (dimensionless) and by 0.75 g water per g plant (dimensionless), as calculated in Reference 1 equation C-9, (pCi-yr-g/Ci-sec-kg);

2.18E7 - is equal to 1.00E12 pCi/Ci divided by 3.15E7 sec/yr and multipled by 1.00E3 g/kg and by 0.11 g Carbon/g plant mass from References 24 and 25 divided by 0.16 g Carbon/m^3 of air, as calculated in Reference 1 equation C-8, (pCi-yr-m^3/Ci-sec-kg):

5.71E7 - is the conversion factor to correct for activity, time units, and elemental forms of radioiodines, equal to the particulate radionuclide conversion factor 1.14E8 multiplied by an elemental iodine fraction of 0.5 from Reference 26, (pCi-yr/Ci-hr);

1.14E8 - is the conversion factor to correct activity units and time units for particulate radionuclides, equal to 1.00E12 pCi/Ci multiplied by 1 yr/8760 hr, (pCi-yr/Ci-hr);

1.00E12 - is the conversion factor to correct for activity units, (pCi/Ci);

4.4 Total Dose to a Member of the Public

The purpose of this section is to describe the method used to calculate the cumulative dose contributions from liquid and gaseous effluents in accordance with PNPS Technical Specifications for total dose. This method can also be used to demonstrate compliance with the Environmental Protection Agency (EPA) 40CFR190, "Environmental Standards for the Uranium Fuel Cycle".

Compliance with the PNPS Technical Specifications dose objectives for the maximum individual demonstrates compliance with the EPA limits to any member of the public, since the design dose objectives from 10CFR50 Appendix I are much lower than the 40CFR190 dose limits to the general public. With the operational objectives in PNPS Technical Specifications sections 7.2.A, 7.3.A and 7.4.A being exceeded by a factor of two, a special analysis must be performed. The purpose of this special analasis is to demonstrate if the total dose to any member of the public (real individual) from all uranium fuel cycle sources (including all real pathways and direct radiation) is limited to less than on equal to 25 mrem per year to the total body or any organ except for the thyroid which is limited to 75 mrem per year.

If required, the total dose to a member of the public will be calculated for all significant effluent release points for all real pathways including direct radiation. Only effluent releases from PNPS (Pilgrim Station) need to be considered since no other nuclear fuel cycle facilities exist within a 50 mile radius. The calculations will be based on the equations contained in this section, with the exception that the usage factors and other site specific parameters will be modified using more realistic assumptions, where appropriate.

The direct radiation component from the facility can be determined by using environmental TLD results. These results will be corrected for natural background and for actual occupancy time of the recreational areas accessible to the general public at the location of maximum direct radiation. It is recognized that by including the results from the environmental TLDs into the sum of total dose component, the direct radiation dose may be overestimated. The TLD measurements may include the exposure from noble gases, ground plane deposition, and shoreline deposition, which have already been included in the summation of the significant dose pathways to the general public. However, this conservative method can be used, if required, as well as any other method for estimating the direct radiation dose from contained radioactive sources within the facility.

Therefore, the total dose will be determined based on the most realistic site specific data and parameters to assess the real dose to any member of the general public.

5.0 Receptor Locations, Hydrology, and Meteorology

The purpose of this section is to identify those receptor locations which represent critical pathway locations and the methods used to estimate dilution and dispersion factors for these locations.

For the dose calculations from liquid effluents, the maximum individual is assumed to: 1) ingest fish and shellfish from the discharge canal, 2) receive direct radiation from shoreline deposits at both the discharge canal and PNPS shoreline recreational area, and 3) receive external radiation while swimming at White Horse Beach as well as while boating on the Cape Cod Bay. The doses are calculated for the various age groups (i.e., infant, child, teenager and adult), as well as for the various organs, (i.e., bone, liver, thyroid, kidney, lung, gastrointestinal tract/lower large intestine, skin, and total body). The maximum total body and organ doses are selected from the totals of the various age group and organ doses calculated as described above.

For liquid effluent pathways, Table A-3 lists the conservative values for the mixing ratio and shore width factor for the various aquatic receptor locations.

For the dose calculations for gaseous effluents, the maximum individual is assumed to reside at the receptor location that provides the highest dose from the dose contributions from all gaseous release points where significant releases have occurred. The locations selected in Table 5-1 are the site boundary, a garden at the site boundary, and the nearest milk animal at the Plimoth Plantation. The dose calculations are performed for each release point and totalled for the following dose pathways; 1) noble gas immersion, 2) ground plane deposition, 3) inhalation, and 4) ingestions of leafy vegetable, root crops/non-leafy vegetables, milk, and meat. The doses are also calculated for the various age groups and for the various organs as described for liquid effluents. The maximum total body, skin, and organ doses are selected from the totals of the various age group and organ doses calculated as described above.

In order to estimate atmospheric dispersion and deposition factors for each of these locations, a computer code supplied by the Yankee Atomic Electric Company was used. The code, AEOLUS (Reference 3), was used to calculate quarterly average values of dispersion and deposition factors.

Meteorological data for a three year period, January 1, 1977 to December 31, 1979, were used for these analyses. The most conservative quarterly average values of ground level average atmospheric dispersion factor before depletion $(X/Q)_c$, ground level average atmospheric dispersion factor after depletion $(X/Q)_d$, average gamma dilution factor $(X/Q)_\gamma$ and average deposition rate (D/Q) for the three year period were chosen for each of the critical receptor locations.

The technique used to estimate ground level gamma doses from an elevated or ground level plume is based on the sector average finite cloud model of Regulatory Guide 1.109 (Reference 1). The equation has been rearranged into a form similar to the standard semi-infinite cloud equation thereby allowing the use of a "gamma Chi/Q" which includes the effects of plume dimensions, gamma energy mix, atmospheric and geometric attenuation, etc. (See Reference 3 and 4 for a detailed discussion.)

For gaseous effluent pathways, Table 5-1 lists the critical locations for receptors and conservative atmospheric dispersion factors for each atmospheric receptor location.

Table 5-1

Critical Receptor Locations and Atmospheric Dispersion Factors

Atmospheric Dispersion Factor
1) Reactor Building Vent
2) Main Stack

Technical Specification Section		$\left(\frac{X}{Q}\right)_c$ (sec/m^3)	$\left(\frac{X}{Q}\right)_d$ (sec/m^3)	$\left(\frac{X}{Q}\right)_I$ (sec/m^3)	$\left(\frac{D}{Q}\right)$ (1/m^2)
3.8.D	Gaseous Effluent Dose Rate				
	Site Boundary[1]	1) 7.40E-06	7.04E-06	4.69E-06	5.22E-08
		2) 4.69E-07	4.69E-07	1.68E-06	2.92E-09
	Nearest Garden[2]	1) 7.40E-06	7.04E-06	4.69E-06	5.22E-08
		2) 4.69E-07	4.69E-07	1.68E-06	2.92E-09
	Nearest Milk Animal[3]	1) 4.29E-07	4.21E-07	1.70E-07	7.93E-10
		2) 3.73E-08	3.70E-08	3.22E-08	2.46E-10
3.8.F	Gaseous Effluent Treatment				
	Site Boundary[1]	1) 7.40E-06	N/A	4.69E-06	N/A
		2) 4.69E-07	N/A	1.68E-06	N/A
7.3	Dose - Noble Gases				
	Site Boundary[1]	1) 7.40E-06	N/A	4.69E-06	N/A
		2) 4.69E-07	N/A	1.68E-06	N/A
7.4	Dose - Iodine-131, Iodine-133, Radioactive Materials in Particulate Form, and Tritium				
	Site Boundary[1]	1) 7.40E-06	7.04E-06	N/A	5.22E-08
		2) 4.69E-07	4.69E-07	N/A	2.92E-09
	Nearest Garden[2]	1) 7.40E-06	7.04E-06	N/A	5.22E-08
		2) 4.69E-07	4.69E-07	N/A	2.92E-09
	Nearest Milk Animal[3]	1) 4.29E-07	4.21E-07	N/A	7.93E-10
		2) 3.73E-08	3.70E-08	N/A	2.46E-10

Table 5-1 (Continued)

Critical Receptor Locations and Atmospheric Dispersion Factors

Technical Specification Section		Atmospheric Dispersion Factor 1) Reactor Building Vent 2) Main Stack $\left(\frac{X}{Q}\right)_c$ (sec/m^3)	$\left(\frac{X}{Q}\right)_d$ (sec/m^3)	$\left(\frac{X}{Q}\right)_x$ (sec/m^3)	$\frac{D}{Q}$ (1/m^2)
7.5	Total Dose				
	Site Boundary(1)	1) 7.40E-06	7.04E-06	4.69E-06	5.22E-08
		2) 4.69E-07	4.69E-07	1.68E-06	2.92E-09
	Nearest Garden(2)	1) 7.40E-06	7.04E-06	4.69E-06	5.22E-08
		2) 4.69E-07	4.69E-07	1.68E-06	2.92E-09
	Nearest Milk Animal(3)	1) 4.29E-07	4.21E-07	1.70E-07	7.93E-10
		2) 3.73E-08	3.70E-08	3.22E-08	2.46E-10

NOTES:

(1) "Site Boundary" means the location at or beyond the boundary of the restricted area with the highest calculated dispersion and/or deposition factor.

(2) "Nearest Garden" is considered to be the same as the site boundary due to the abundance of small gardens near Pilgrim Station.

(3) "Nearest Milk Animal" is presently considered to be at the Plimoth Plantation, 2.2 miles west of Pilgrim Station.

6.0 Monitor Set Points

6.1 Liquid Effluent Monitor

The set point for the liquid effluent & monitor (see Section 3.2.3) is established as follows:

1) Prior to a liquid batch release, the waste discharge tank is recirculated for at least 60 minutes and a sample is taken.

2) The liquid effluent sample is analyzed (see Section 3.3) to determine the concentrations of each detectable isotope in uCi/cc. (See Appendix B for the definitions of lower limit of detection.)

3) The efficiency (in counts/sec per uCi/cc) of the liquid discharge monitor is calculated based on prior release experience. PNPS Chemistry Procedure 7.3.38 entitled "Determination of Conversion Factors for Liquid PRM's" describes the method to determine the efficiency.

4) The setpoint for the liquid effluent & monitor is calculated as follows:

$$S_l = (E \cdot G) + B_g$$

where:

S_l = Liquid monitor setpoint for steady-state, equilibrium discharge (counts/sec).

E = Efficiency of liquid discharge monitor in counts/sec per uCi/cc for the mixture of isotopes observed in the grab sample.

G = Total specific gamma activity of the grab sample.

B_g = Measured background count rate of the monitor with no sample present (counts/sec).

The setpoint will ensure that the concentration of liquid effluents discharged does not increase above the value for which the maximum permissible discharge flow rate was established (see Section 4.1 of this manual).

6.2 Gaseous Effluent Monitors

The only components of the station's gaseous effluent and discharge which is continuously monitored are the noble gases. The method of determining the Main Stack Gas Monitor (see Section 3.2.1) and Reactor Building Exhaust Vent monitor (see Section 3.2.2) Hi and Hi-Hi alarms is as follows:

1) At the time a gas grab sample is taken at the discharge point, the gross monitor reading is recorded (in counts/sec).

2) The results of the isotopic analyses on this sample in terms of uCi/cc of each isotope detected are used along with estimates of gaseous discharge flow rate (SCFM) to determine the current release rate of each detected isotope in uCi/sec.

3) These calculated release rates (uCi/sec) are used along with the equations given in Section 4.3.1.3 and 4.3.1.4 of this manual to calculate the maximum offsite dose rate due to noble gases.

4) The ratio of this calculated dose rate to the PNPS Technical Specifications instantaneous dose rate limit (500 mrem/yr for the total body and 3000 mrem/yr for the skin, or some fraction thereof) is used to scale the observed monitor reading at the time at which the grab sample was obtained as follows:

$$S_G = (C_s - B_g)\ \frac{DR_{Limit}}{DR_{Calc}} + B_g$$

where:

S_G = gaseous monitor setpoint corresponding to 500 mrem/yr to the total body or 3000 mrem/yr to the skin, whichever is more limiting (in counts/sec)

B_g = measured background count rate at the sampler with no sample present (in counts/sec)

C_s = observed monitor reading at the time of the grab sample (in counts/sec)

DR_{Limit} = the applicable dose rate limit 500 mrem/yr for the total body or 3000 mrem/yr for the skin or some fraction thereof

DR_{Calc} = the calculated dose rate for the maximum individual from the methods of Section 4.3.1.3 and 4.3.1.4 of this manual using the release rates determined from the grab sample, mrem/yr

The resulting setpoint will be valid until the next grab sample is taken from the release point.

This method will be used to establish the Hi-Hi alarm at 500 mrem/yr to the total body or 3000 mrem/yr to the skin, whichever is more restrictive.

Since two release points exist for noble gas effluents, the set points may be varied to allow greater release rates from one point than the other, provided the total limit is below 500 mrem/yr for the total body or 3000 mrem/yr for the skin, whichever is more restrictive.

The Hi-Hi alarm setpoint for the gaseous monitors will be based on the equation in this section. The Hi alarm setpoint may be set at or below, but in no case above, the Hi-Hi alarm setpoint.

7.0 Radiological Environmental Sampling and Measurement Locations

Sampling and measurement locations have been established for Pilgrim Station considering meteorology, population distribution, hydrology, and land use characteristics of the Plymouth area. The sampling locations are divided into two classes: indicator and control. Indicator locations are those which are expected to show effects from PNPS operations, if any exist. These locations were selected primarily on the basis of where the highest predicted environmental concentrations were calculated to occur. While the indicator locations are typically within a few miles of the plant, the control stations are generally located so as to be outside the influence of Pilgrim Station. They provide a basis on which to evaluate fluctuations at indicator locations relative to natural background radiation, natural radioactivity, and fallout from prior nuclear weapons tests.

The environmental sampling media collected in the vicinity of Pilgrim Station include air particulate filters, charcoal cartridges, seawater, shellfish, Irish moss, American lobster, fishes, sediment, milk, cranberries, vegetation, and beef forage. The media, sample designation location, description, distance, and direction for indicator and control samples are listed in Tables 7-2 and 7-5. These sampling locations are also displayed on the maps shown in Figures 7-1, 7-2, 7-3, and 7-5. The frequency of collection and types of radioactivity analysis are described in the PNPS Technical Specifications and in Table 7-1. The maximum lower limits of detection (LLD) for the analytical measurements are specified in the PNPS Technical Specifications and Table 7-6 (see Appendix B for the definitions of the lower limit of detection).

The environmental TLD location designations, distance, and direction from the reactor are listed in Table 7-3. The radiation measurement locations for the environmental TLDs are shown in Figures 7-2, 7-3, and 7-5. The frequency and type of radiation measurement is described in PNPS Technical Specifications and in Table 7-1.

The pressurized ion chamber measurement locations, distance, and direction from the reactor are listed in Table 7-4. These radiation measurement locations for the surveys performed on local beaches are shown on Figure 7-3. The frequency and type of radiation measurement is described in PNPS Technical Specifications and in Table 7-1.

The atmospheric and land-based samples are collected by Boston Edison personnel from the Electrical Engineering and Station Operation Department's Environmental Laboratory. The aquatic samples are collected by the Division of Marine Fisheries - Pilgrim Station Project personnel. The direct radiation measurements and soil radioactivity measurements are conducted by Yankee Atomic Electric Co. - Radiological Engineering Group and Environmental Laboratory personnel. The radioactivity analysis of samples and the processing of the environmental TLDs is performed by Yankee's Environmental Laboratory personnel.

The Boston Edison staff reviews the radioactivity analysis results from Yankee Atomic Electric Company. Reporting levels for radioactivity concentrations in environmental samples are listed in PNPS Technical Specifications. If the radioactivity concentrations are above the reporting levels, the NRC is notified in writing within 30 days. A determination of the cummulative dose contribution for the current year will be performed for radioactivity which is detected that is attributable to PNPS operation. Depending upon the circumstances, a special study may also be completed.

If radioactivity levels in the environment become elevated as a result of the station's operation, an investigation is performed, and corrective actions are recommended to reduce the amount of radioactivity to as far below the legal limits as is reasonably achievable.

The radiological environmental sampling and measurement locations are reviewed annually, and modified if necessary. A garden and milk animal census is performed every year to identify changes in the use of the environment in the vicinity of the station to permit modification of the sampling and measurement locations.

TABLE 7-1

PILGRIM NUCLEAR POWER STATION

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample/Measurement Type	Locations	Sampling, Measurement and/or Collection Frequency	Type and Frequency of Analysis or Measurement
AIRBORNE			
Particulates	See Table 7-2	Continuous sampling with particulate filter collection weekly	Gross beta radioactivity 24 hours after weekly filter change[1]
			Quarterly composite (by location) for gamma isotopic[2]
Radiolodines	See Table 7-2	Continuous sampling with charcoal cartridge collection weekly	Analyze weekly for I-131
DIRECT RADIATION			
Environmental TLD	See Table 7-3	Quarterly	Gamma exposure quarterly[9]
Pressurized Ion Chamber	Plymouth Beach, Priscilla/White Horse Beach and Duxbury Beach[4]	Annually	Gamma exposure survey[9]
Soil	See Table 7-2	3 Years	Gamma isotopic and exposure rate

Table E 7-1

PILGRIM NUCLEAR POWER STATION
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample/Measurement Type	Locations	Sampling, Measurement and/or Collection Frequency	Type and Frequency of Analysis or Measurement
AQUATIC			
Seawater	Discharge Canal Bartlett Pond Powder Point Control[4]	Continuous Composite Weekly grab sample Weekly grab sample	Gamma isotopic[2] monthly, and composite for H-3 analysis quarterly[3]
Shellfish (clams, mussels or quahogs as available)	Discharge Canal Outfall Manomet Point Plymouth Harbor Duxbury Bay Control[4] Green Harbor Control[4] Powder Point Control[4]	Quarterly (at approximately 3 month intervals)	Gamma isotopic[2,6]
Lobster	Vicinity of Discharge Point or Plymouth Harbor	Four times per season	Gamma isotopic[2] on edible portions
	Offshore Control[4]	Once per season	
Fishes	Vicinity of Discharge Point	Quarterly (when particular species available) for Groups I and II, in season for Groups III and IV	Gamma isotopic[2] on edible portions[5]
	Offshore Control[4]	Annually for each group[5]	
Irish Moss (Algae)	Discharge Canal Outfall Manomet Point Ellisville Brant Rock Control[4]	Quarterly (at approx. 3-month intervals)	Gamma isotopic[2]

TABLE 7-1

PILGRIM NUCLEAR POWER STATION
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway or Sample/Measurement Type	Locations	Sampling, Measurement and/or Collection Frequency	Type and Frequency of Analysis or Measurement
Sediment	Rocky Point Plymouth Harbor Plymouth Beach Manomet Point Duxbury Bay Control[4] Green Harbor Control[4] Powder Point Control[4]	Semiannually	Gamma isotopic[2, 3, 7]
TERRESTRIAL			
Milk	Plymouth County Farm,[8] when available Whitman Farm Control[4]	Semimonthly during periods when animals are on pasture, otherwise monthly	Gamma isotopic[2], radioiodine analysis all samples
Cranberries	Manomet Point Bog[8] Bartlett Rd. Bog Pine St Bog Control[4]	At time of harvest	Gamma isotopic[2], on edible portions
Tuberous and Green Leafy Vegetables	Plymouth County Farm[8] Bridgewater Farm Control[4]	At time of harvest	Gamma isotopic[2] on edible portions
Forage	Plymouth County Farm[8] Whitman Farm Control[4]	Annually	Gamma isotopic[2]

TABLE 7-1 (Continued)

NOTES

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

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

3 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.

4 Indicates control location.

5 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. Near Bottom 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		

6 Mussel samples from four locations (immediate vicinity of discharge outfall, Manomet Point, Plymouth 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. Sensitivity values are to be determined in accordance with a 95% confidence level on k_a, and a 50% confidence level on k_b (See HASL-300 for definitions).

The mussel shell sample from one location will be analyzed each quarter. One additional mussel shell sample will be analyzed semiannually. Unscrubbed shells to be analyzed will be dried, processed, and analyzed similarly to the mussel bodies.

TABLE 7-1 (Continued)

NOTES

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.

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

7 Sediment samples from four locations (Manomet Point, Rocky Point, 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, other 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 spectroscopy with target sensitivity of 25 pCi/kg dry sediment. Two additoinal core slices per year (mid-depth slice from two core samples) will be similarly analyzed.

8 These locations may be altered in accordance with results of surveys discussed in paragraphs 8.1.A-3 and 8.1.A-4 of the Technical Specifications.

9 Minimum sensitivities for gamma exposure/exposure rate measurements are as follows:

Gamma exposure quarterly - 2 uR/hr average quarterly exposure rate.
Gamma exposure rate survey - 1 uR/hr exposure rate.

TABLE 7-2

PILGRIM NUCLEAR POWER STATION
AIR PARTICULATE, RADIOIODINE AND SOIL SAMPLING LOCATIONS

Sampling Location (Desingation)	Distance and Direction from Reactor
1. Offsite Stations	
East Weymouth Control (EW)	24 Miles NW
Plymouth Center (PC)	4.1 Miles W
Manomet Substation (MS)	2.3 Miles SSE
Cleft Rock (CR)	0.86 Miles SSW
2. Onsite Stations	
E. Rocky Hill Road (ER)	0.65 Miles SE
W. Rocky Hill Road (WR)	0.48 Miles WNW
Overlook Area (OA)	0.09 Miles W
Property Line (PL)	0.32 Miles NW
Pedestrian Bridge (PB)	0.13 Miles N
East Breakwater (EB)	0.33 Miles ESE
Warehouse (WS)	0.11 Miles SSE

TABLE 7-3
PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER (TLD) LOCATIONS

Dosimeter Location (Designation)	Distance and Direction from Reactor
1. Exclusion Area	
Warehouse* (WS)	600 Feet SSE
Station I* (I)	1600 Feet WNW
Property Line* (PL)	1700 Feet NW
Station F* (F)	1400 Feet NW
Station D* (D)	1700 Feet NNW
Parking Area* (PA)	1200 Feet NNW
Pedestrain Bridge* (PB)	700 Feet N
Plymouth Metrological Tower (PMT)	1400 Feet WNW
Overlook Area* (OA)	500 Feet W
Station A* (A)	1300 Feet WSW
Station G* (G)	1700 Feet W
W. Rocky Hill Road* (WR)	2400 Feet WNW
Station B* (B)	1300 Feet S
East Breakwater* (EB)	1800 Feet ESE
Station L* (L)	1400 Feet ESE
Station C* (C)	1700 Feet ESE
Hall's Bog* (HB)	2000 Feet SE
Training Center (TC)	520 Feet WSW
Contractor Parking Lot (CT)	1100 Feet SE
Security House Shore (P01)	720 Feet NNW
Fence Shore (P02)	440 Feet NW
Fence, Left Screenhouse (P03)	330 Feet NW
Fence, Right Screenhouse (P04)	220 Feet N
Fence, Water Tank (P05)	260 Feet NNE

* Indicates TLD locations required by PNPS Technical Specifications

TABLE 7-3 (Continued)
PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER (TLD) LOCATIONS

Dosimeter Location (Designation)	Distance and Direction from Reactor
1. Exclusion Area (continued)	
Fence, Culvert (P06)	280 Feet NE
Fence, Intake (P07)	400 Feet ENE
Fence, New Administration Bldg. (P08)	300 Feet E
Fence, TCF Side of Triangle Area (P09)	450 Feet E
Fence, Intake Side TCF (P10)	740 Feet ESE
Gate, Warehouse to TCF (P11)	620 Feet ESE
Fence, Warehouse Contractor Gate (P12)	660 Feet SE
Fence, Contractor Gate & Parking Lot (P13)	740 Feet SSE
Fence, Butler Bldg. (P14)	750 Feet S
Fence, Unit #9 (P15)	720 Feet S
Fence, Switchyard and Main Gate (P16)	560 Feet SW
Fence, Shorefront and Main Gate (P17)	350 Feet W
I & C, Administration Bldg. (P18)	2[illegible] eet S
Compliance Area, Admin. Bldg. (P19)	280 Feet S
Dosimetry Window, Admin. Bldg. (P20)	220 Feet SE
Walkway, Admin. Bldg. & Turb. Bldg. (P21)	160 Feet SE
QA/QC Area, Admin. Bldg. (P22)	450 Feet SE
CMG Area, Admin. Bldg. (P23)	400 Feet SSE
Old Admin. Bldg., 2nd Fl. (P24)	190 Feet W
First Aid Trailer (P25)	250 Feet WNW

TABLE 7-3 (Continued)

PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER (TLD) LOCATIONS

Dosimeter Location (Designation)	Distance and Direction from Reactor
2. Exclusion Area to About 2 Miles	
On BECo Property	
Greenwood House (GH)	0.57 Miles SE
East Rocky Hill Rd.* (ER)	0.65 Miles SE
Emerson Road* (EM)	1.1 Miles SSE
White Horse Road* (WH)	1.3 Miles SSE
Right of Way (RW)	1.7 Miles S
Station K* (K)	1.4 Miles SSE
Station J* (J)	1.3 Miles S
Edison Access Road* (AR)	0.92 Miles S
Station E* (E)	1.2 Miles S
Manomet Road (MR)	0.98 Miles S
Cleft Rock* (CR)	0.86 Miles S
Microwave Tower* (MT)	0.58 Miles SSW
Station H* (H)	0.57 Miles SW
Dirt Road (DR)	0.94 Miles SW
Goodwin Property (GN)	1.4 Miles SW
Off BECo Property	
Emerson Rd. & Priscilla Rd. (EP)	1.1 Miles SE
Taylor Ave. & Thomas (TT)	1.5 Miles SE
Taylor Ave. & Pearle (TP)	1.9 Miles SE
Rt. 3A & Bartlett Road (BB)	2.1 Miles SSE
Valley Road (VR)	1.8 Miles SSW

* Indicates TLD locations required by PNPS Technical Specifications

TABLE 7-3 (Continued)

PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER (TLD) LOCATIONS

Dosimeter Location (Designation)	Distance and Direction from Reactor
2. Exclusion Area to About 2 Miles (continued)	
Off BECo Property (continued)	
Yankee Village (YV)	1.4 Miles WSW
Recreational Pool (RC)	1.3 Miles WSW
John Gauley Residence (JG)	1.1 Miles W
Bayshore (BS)	1.3 Miles W
Bayshore Drive* (BD)	0.81 Miles WNW
Warren Ave. & Clifford (WC)	2.1 Miles W
3. 2 Miles to About 5 Miles	
Manomet Point* (MP)	2.3 Miles SE
Beachwood Road (BW)	2.5 Miles SE
Manomet Elementary* (ME)	2.1 Miles SE
Manomet Substation* (MS)	2.3 Miles SSE
Manomet Beach* (MB)	3.4 Miles SSE
Earl Road (EA)	3.0 Miles SSE
Rt. 3A & Hyannis Road (HR)	4.8 Miles SSE
Beaverdam Road (BR)	3.5 Miles S
Pines Estates (PT)	2.7 Miles SSW
Long Pond Rd. & Clark Road (LP)	5.7 Miles SSW
College Pond* (CP)	4.8 Miles SW
Rt. 3 Overpass (RP)	3.0 Miles SW
Russell Mill Road (RM)	3.0 Miles WSW
Long Pond & Drew Road (LD)	4.5 Miles WSW
S. Plymouth Substation* (SP)	2.8 Miles W

* Indicates TLD locations required by PNPS Technical Specifications

TABLE 7-3 (Continued)
PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER (TLD) LOCATIONS

Dosimeter Location (Designation)	Distance and Direction from Reactor
3. 2 Miles to About 5 Miles (continued)	
Hilldale Road (HD)	3.1 Miles W
Deep Water (DW)	5.3 Miles W
Plymouth Center* (PC)	4.1 Miles W
Memorial Hall (MH)	4.7 Miles WNW
4. Greater Than 5 Miles	
Rt. 3A & Ellisville Road (EL)	7.2 Miles SSE
Division of Marine Fisheries (DMF)	4 Miles SSE
Cedarville Substation* (CS)	10 Miles S
Bourne Road (BE)	8.4 Miles SSW
Upper College Pond Road (UC)	7.4 Miles SW
Main Street & Meadow, Carver (MM)	11 Miles WSW
Sherman Airport* (SA)	8.4 Miles WSW
Sacred Heart School (SH)	8.1 Miles W
North Plymouth* (NP)	5.8 Miles WNW
Kingston Substation* (KS)	10 Miles WNW
Standish Shores* (SS)	6.5 Miles NW
Church & West Street (CW)	10 Miles NW
East Weymouth* (EW)	24 Miles NW
King Caesar Road (KC)	8.1 Miles NNW
Landing Road (LR)	10 Miles NNW

* Indicates TLD locations required by PNPS Technical Specifications

TABLE 7-4
PILGRIM NUCLEAR POWER STATION
PRESSURIZED ION CHAMBER (PIC) SURVEY LOCATIONS

Survey Location	Distance and Direction from Reactor
White Horse Beach (Near Hilltop Ave)	2.1 Miles SE
White Horse Beach (In Back of Full Sail Bar)	1.5 Miles SE
Plymouth Beach (Outer Beach)	4.4 Miles WNW
Plymouth Beach (Inner Beach)	3.5 Miles WNW
Plymouth Beach (Behind Bert's Restaurant)	2.2 Miles W
Duxbury Beach Control	7 Miles NNW

TABLE 7-5
PILGRIM NUCLEAR POWER STATION
TERRESTRIAL AND AQUATIC SAMPLING
LOCATIONS

Sampling Location (Designation)	Distance and Direction from Reactor
TERRESTRIAL	
Cranberries	
Manomet Pt. Bog* (MR)	2.4 Miles SE
Bartlett Rd. Bog* (BT)	2.7 Miles SSE
Pine St. Bog Control* (PS)	16 Miles WNW
Forage	
Plymouth County Farm* (CF)	3.5 Miles W
Davis Farm (DF)	3.1 Miles S
Whitman Farm Control* (WF)	20 Miles WNW
Milk	
Plymouth County Farm* (CF)	3.5 Miles W
Whitman Farm Control* (WF)	20 Miles WNW
Seawater	
Discharge Canal* (DIS)	0.13 Miles N
Bartlett Pond* (BP)	1.7 Miles SE
Powder Point Control* (PP)	7.9 Miles NNW
Vegetation	
Plymouth County Farm* (CF)	3.5 Miles W
Bridgewater Farm Cont.* (BF)	20 Miles W
Whipple House (WH)	1.8 Miles SW
Alden Road (AF)	0.77 Miles SE
Malmgren Residence (ML)	1.0 Miles SE
Jenkins Residence (JG)	1.2 Miles WSW
Moon Residence (MG)	2.1 Miles WSW

* Indicates sampling locations required by PNPS Technical Specifications

TABLE 7-5 (Continued)
PILGRIM NUCLEAR POWER STATION
TERRESTRIAL AND AQUATIC SAMPLING
LOCATIONS

Sampling Location (Designation)	Distance and Direction from Reactor
AQUATIC	
Fishes	
Discharge Canal* (DIS)	0.21 Miles N
Cataumet Control (CA)	20 Miles SSW
Priest Cove Control (PC)	30 Miles SW
Jones River Control (JR)	7.8 Miles WNW
Buzzards Bay Control (BB)	28 Miles SSW
Vineyard Sound Control (MV)	40 Miles SSW
Atlantic Ocean Control (AO)	30 Miles E
N. River-Hanover Control (NR)	15 Miles NNW
Nantucket Sound Control (NS)	30 Miles SSE
Cape Cod Bay Control (CC-Bay)	15 Miles ESE
Provincetown Control (PT)	20 Miles NE
Irish Moss	
Discharge Canal (DIS)	0.21 Miles N
Manomet Point (MP)	2.2 Miles ESE
Ellisville (EL)	7.9 Miles SSE
Brant Rock Control (RK)	10 Miles NNW
Lobster	
Discharge Canal* (DIS)	0.21 Miles N
Plymouth Harbor* (Ply-H)	4.0 Miles WNW
Duxbury Bay Control (Dux-Bay)	7.1 Miles NNW
Duxbury Beach Control (Dux-R)	5.8 Miles NNW
Sediment	
Rocky Point* (RP)	0.21 Miles N
Plymouth Harbor* (Ply-H)	3.0 Miles W
Plymouth Beach* (PLB)	2.5 Miles W
Manomet Point* (MP)	2.5 Miles ESE
Duxbury Bay Control* (Dux-Bay)	8.7 Miles NNW
Green Harbor Control* (GH)	10 Miles NNW
Shellfish	
Discharge Canal* (DIS)	0.21 Miles N
Plymouth Harbor* (Ply-H)	2.8 Miles W
Manomet Point* (MP)	3.0 Miles ESE
Duxbury Bay Control* (Dux-Bay)	7.8 Miles NNW
Green Harbor Control* (GH)	9.9 Miles NNW

* Indicates sampling locations required by PNPS Technical Specifications

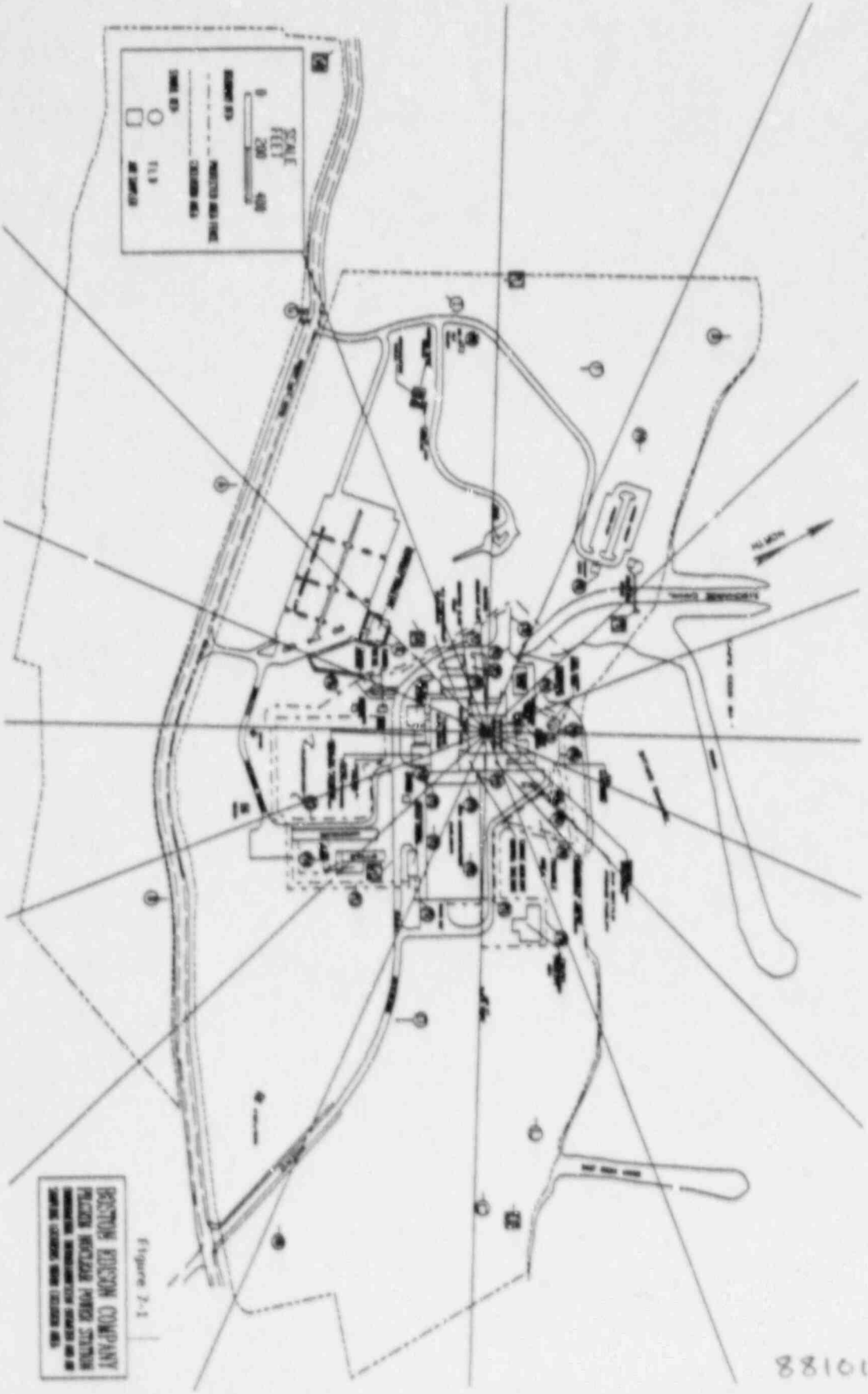
TABLE 7-6

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)a

Analysis	Water (pCi/kg)	Airborne Particulate or Gas (pCi/m^3)	Wet Solids (pCi/kg, wet)	Milk (pCi/kg)	Food Products (pCi/kg, wet)	Dry Solids (pCi/kg, dry)
gross beta	4[b]	1×10^{-2}				
^{3}H	2000[c]					
^{54}Mn	15		130			
^{59}Fe	30		260			
$^{58,60}Co$	15		130			50
^{65}Zn	30		260			50
^{95}Zr	15					50
^{131}I	1	7×10^{-2}		1	60[d]	
$^{134,137}Cs$	15, 18	1×10^{-2}	130	15	60	50
^{140}Ba	15			15[d]		
^{144}Ce						150

TABLE NOTATION

a. Refer to Appendix B for LLD definition.
b. LLD for surface water.
c. If no drinking water pathway exists, a value of 3000 pCi/l may be used.
d. LLD for leafy vegetables.



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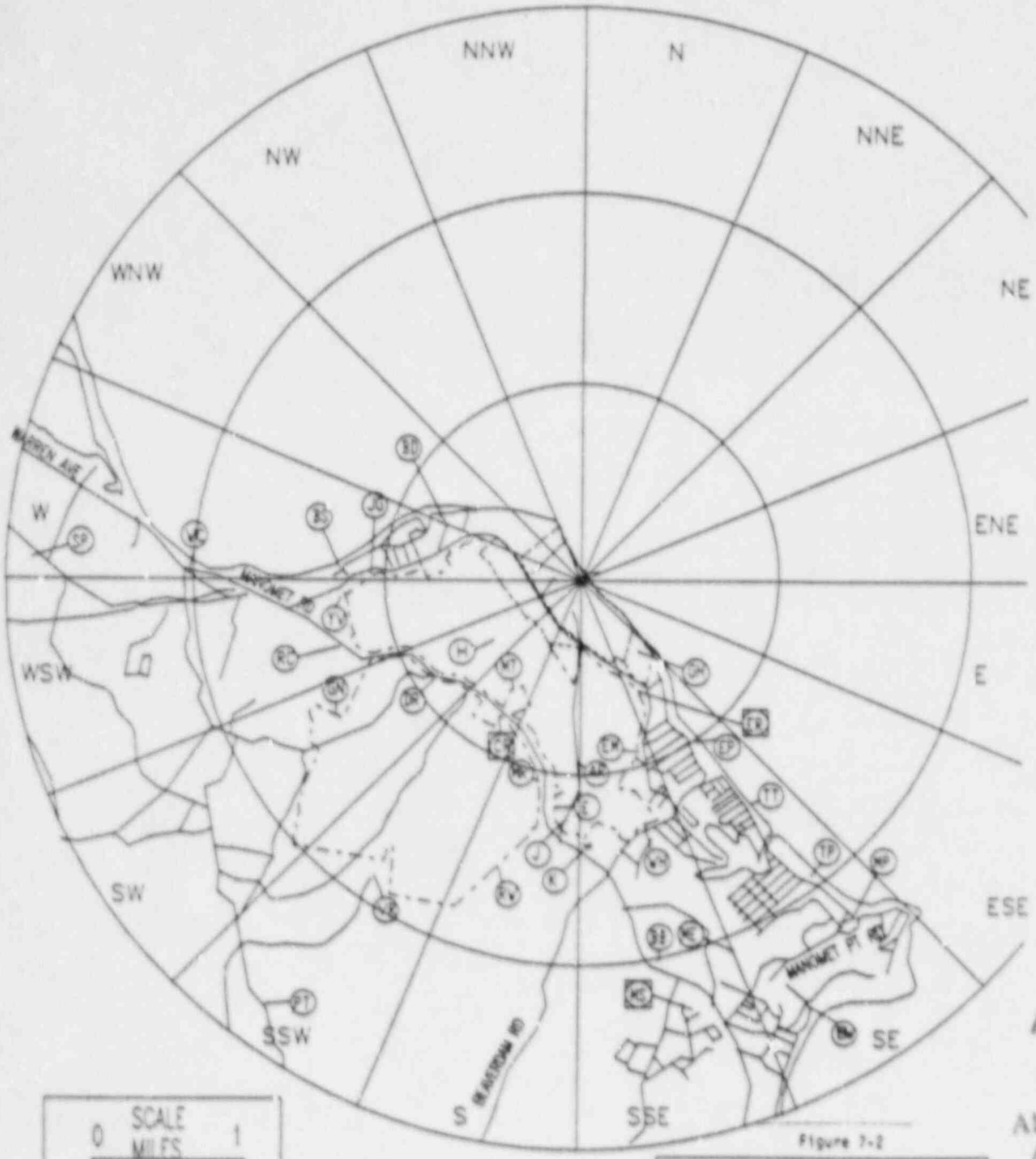
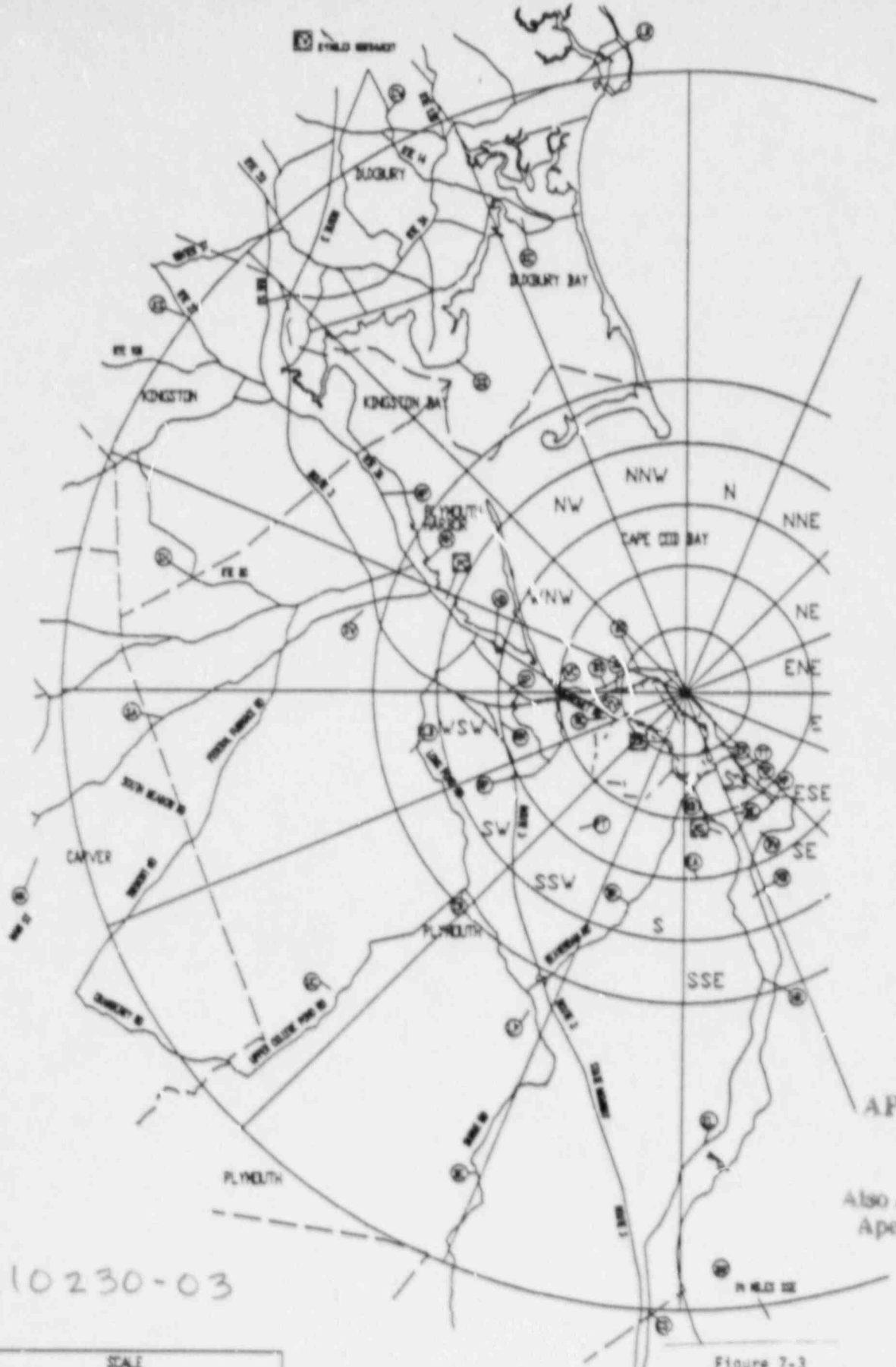


Figure 7-2

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER AND AIR SAMPLING LOCATIONS WITHIN EXCLUSION AREA TO ABOUT 2 MILES



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SCALE
MILES 0 3

BOUNDARY KEY:
EXCLUSION AREA
PROPERTY
TOWN

SYMBOL KEY:
TLD
AIR SAMPLER

Figure 7-3

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER AND
AIR SAMPLING LOCATIONS OUTSIDE PROPERTY BOUNDARY

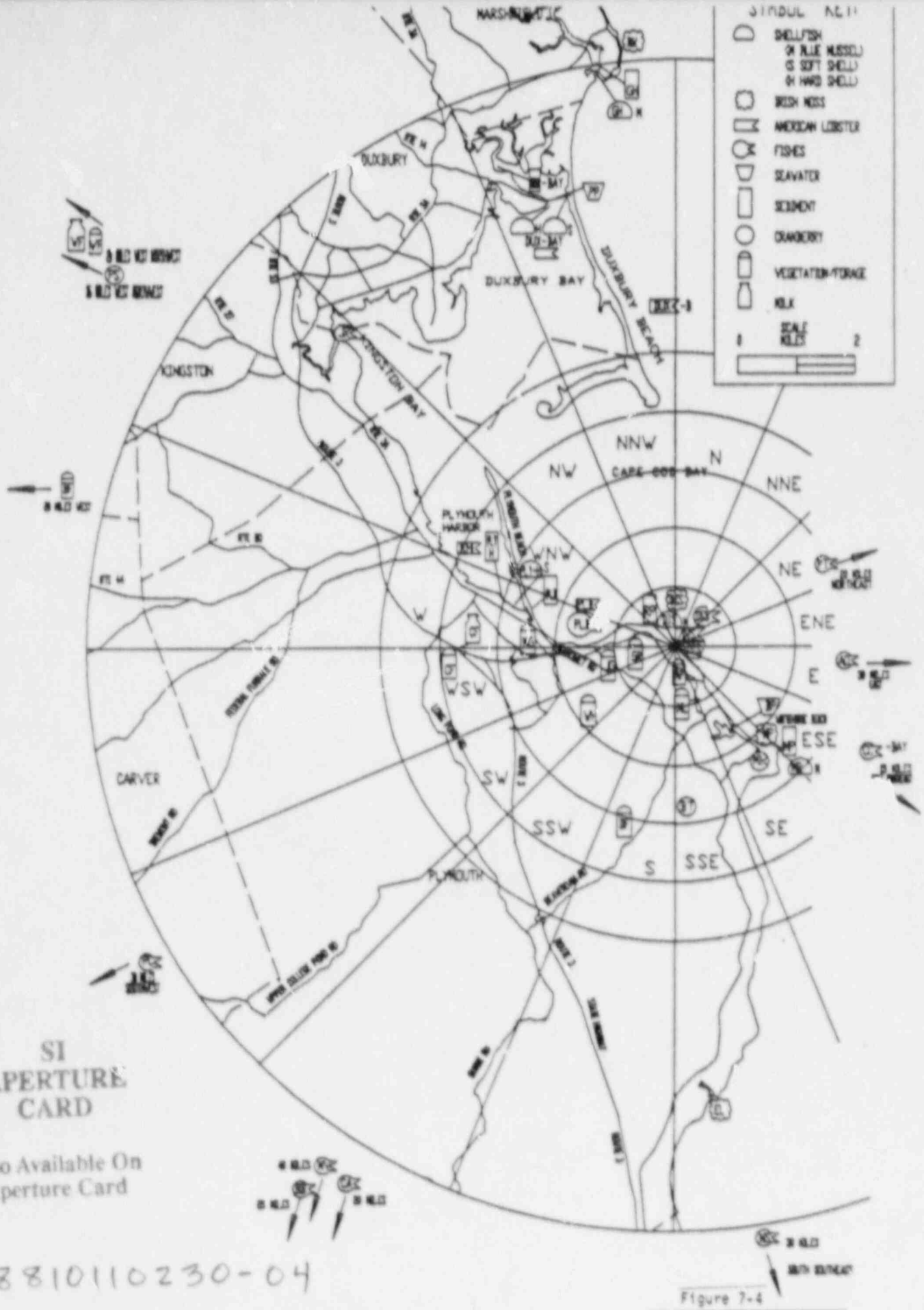

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Figure 7-4

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
TERRESTRIAL AND AQUATIC
SAMPLING LOCATIONS

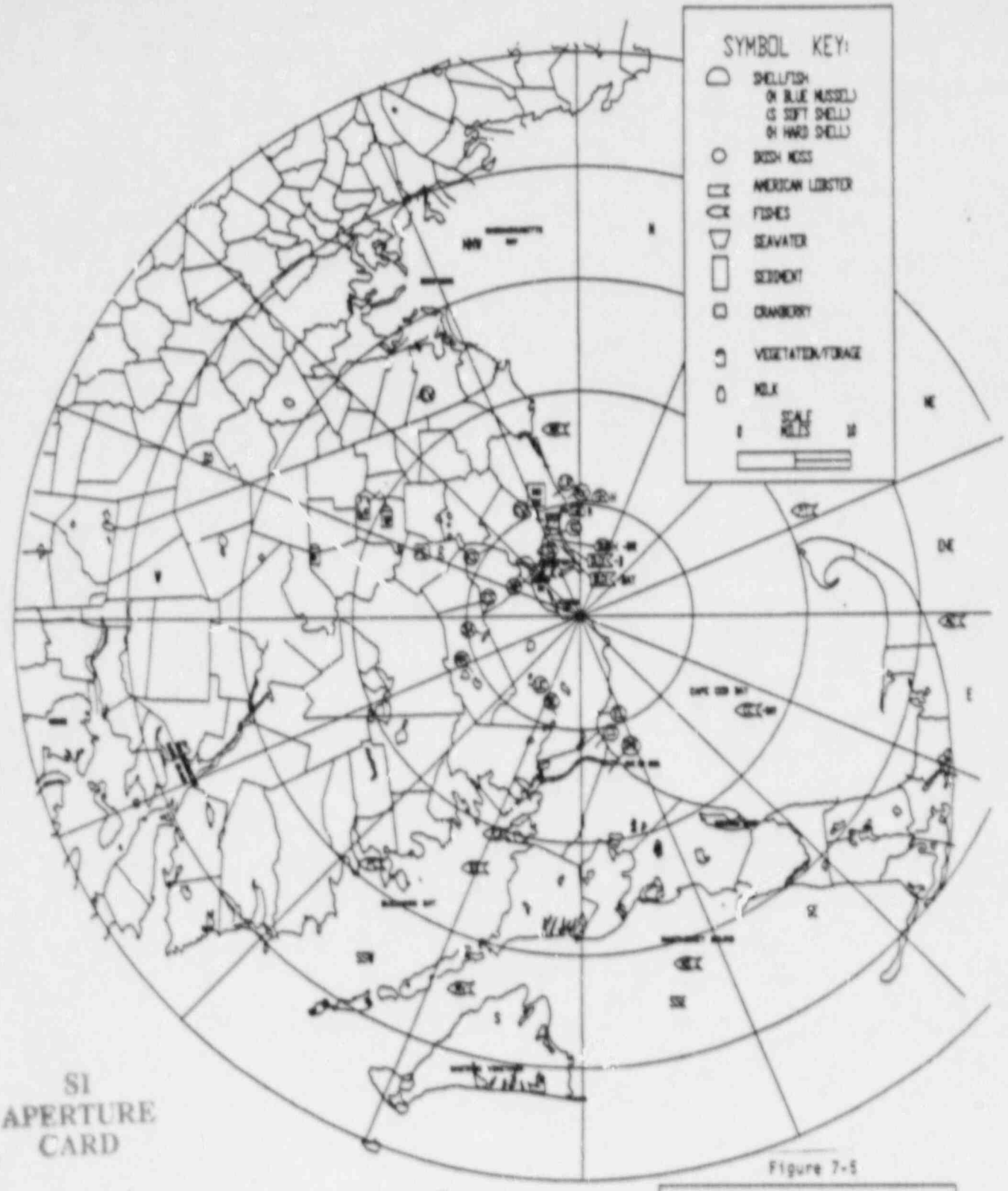


Figure 7-5

BOSTON EDISON COMPANY
PILGRIM NUCLEAR POWER STATION
ENVIRONMENTAL SAMPLING AND
MEASUREMENT CONTROL LOCATIONS

8.0 Description of the Radwaste Systems

8.1 Liquid Radwaste System

Liquid wastes from Pilgrim Station originates from a variety of sources which have a considerable disparity in chemical and radio-chemical composition and concentration (see section 9.2 of Reference 10). Normally these wastes are collected and treated separately. The liquid wastes fall into the following categories:

1) High Purity

2) Low Purity

3) Detergent

High purity clean wastes may have high or low solids content and generally have low conductivity, and variable radioactivity. They come from equipment drain sumps, from trasonic resin cleaner (URC) operation, and from the backwash and resin transfer water used to change out the condensate demineralizers. Liquid wastes collected in the turbine building equipment drains may sometimes be included with the high-purity waste stream; more frequently, they are returned directly to the main condenser hotwell. Reuse of processed high-purity waste is highly desirable.

Low purity chemical wastes have moderate conductivity and solids content. They come from building floor sumps and are generally high-purity wastes which have been contaminated by dirt, oil, etc. When processed, this stream may or may not be reused depending on the water balance in the plant and the quality of the product.

Detergent wastes, are low radioactivity concentration wastes that have the potential to contain detergents. This waste is generated from washing and decontamination of the equipment, the plant, and personnel. This detergent waste which is collected in the Miscellaneous Waste Tank is not treatable. The waste is passed through strainers, prior to discharge through the radwaste discharge header and into the circulating water discharge canal.

A schematic of the cost beneficial system as determined in Ref. 2 is shown in Figure 8-1. In the system, the High Purity waste is collected in one of two 15,000-gal clean waste tanks, and processed through mixed bed ion exchangers. The processed liquid is collected in one of four 18,000 gal treated water holdup tanks. It is reused to the greatest extent possible.

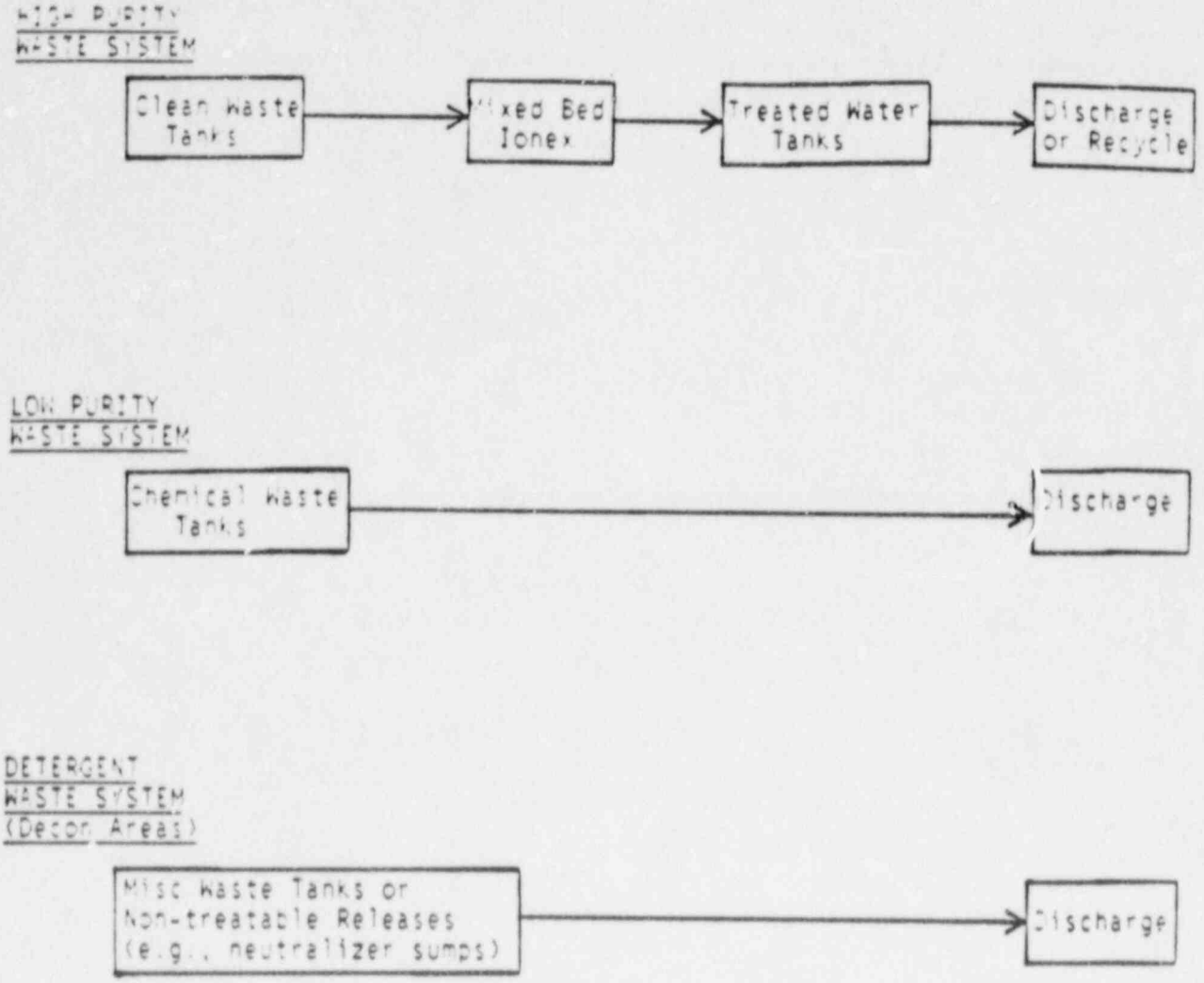


Figure 8-1 Liquid Radwaste Treatment System Schematic

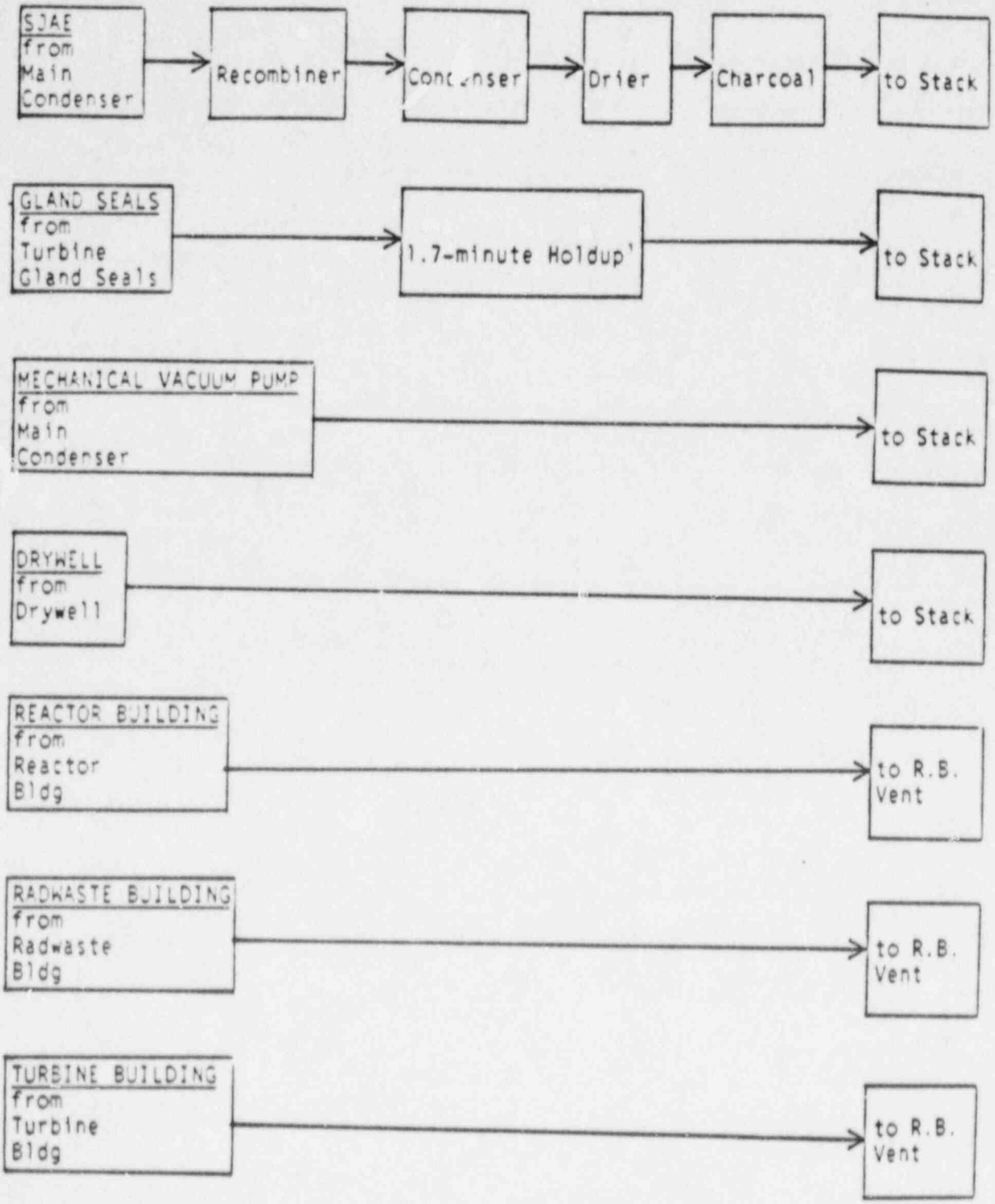
8.2 Treated Gaseous Radwaste System

The Air Ejector and Augmented Offgas System (see Section 9.4 of Reference 10) includes the subsystems that process and/or dispose of the gases from the main condenser air ejectors, the startup mechanical vacuum pump, and the gland seal condensers. All such gases from the unit are routed to the main stack for dilution and elevated release to the atmosphere. Discharges from the air ejector, the charcoal vault, and the stack are continuously monitored by radiation monitors.

Gases routed to the main stack include air ejector and gland seal offgases, and gases from the Standby Gas Treatment System (SGTS). Dilution air input to the stack is supplied by one of two fans located in the filter building at the base of the main stack. The stack is designed such that prompt mixing of all gas inlet streams occurs in the base to allow location of sample points as near the base as possible.

The Augmented Offgas System uses a high temperature catalytic recombiner to recombine radiolytically dissociated hydrogen and oxygen from the Air Ejector System. Noncondensible radioactive offgas is continuously removed from the main condenser by the air ejector during plant operation. The air ejector offgas normally contains activation gases, principally N-16, O-19, and N-13. The N-16 and O-19 have short half-lives and quickly decay. The 10 min half-life N-13 is present in small amounts which is further reduced by decay. The air ejector offgas also contains Sr-90, Ba-140, and Cs-137. After hydrogen/oxygen recombination and chilling to strip the condensibles to reduce the volume, the remaining noncondensibles, principally the kryptons, xenons, and air, are delayed in a 30 minute holdup system before reaching the adsorption bed. Radioactive particulate daugthers of the noble gases are retained on the HEPA filters and on the charcoal. The charcoal adsorption bed, operating in a constant temperature vault, selectively adsorbs and delays the xenons and kryptons from the bulk carrier gas, principally air. This delay on the charcoal permits the xenons and kryptons to decay in place. The offgas is discharged to the environs via the main stack. The activity of the gas leaving the Offgas Treatment System is continuously monitored as described in 3.2.1. This system results in a reduction of the offgas activity (Curies) released by factor of approximately 185 relative to a 30 minute holdup system.

The cost-beneficial system as determined in Reference 2 for handling gaseous waste in Pilgrim I is shown in Figure 8-2.



' No significant effect in reducing offsite doses when compared to transit time required for releases to reach site boundary.

Figure 8-2 Gaseous Effluent Treatment Schematic

9.0 References

1) U. S. Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I", Revision 1, October, 1977.

2) Boston Edison Company, Pilgrim Station Unit 1 Appendix I Evaluation, April, 1977.

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4) J. N. Hamawi, "SKIRON", Yankee Atomic Electric Company YAEC-1138, 1977.

5) Boston Edison Company, PNPS Technical Specifications.

6) Boston Edison Company, PNPS Operations Manual, Volume 8, Book 8: Surveillance Procedures.

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12) U.S. Nuclear Regulatory Commission, NUREG-0016 "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWR-GALE Code)," April, 1976.

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19) F. O. Hoffman, IRS-W-6, "Environmental Variables Involved with the Estimation of the Amount of ^{131}I in Milk and the Subsequent Dose to the Thyroid," Institute fur Reaktorsicherheit, June 1973.

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23) L. R. Anspaugh et al., USAEC Report UCRL-73195, Rev. 1, "The Dose to Man via the Food-Chain Transfer Resulting from Exposure to Tritiated Water Vapor,", 1972.

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APPENDIX A

DATA REQUIRED FOR EFFLUENT CALCULATIONS

TABLE A-1

BIOACCUMULATION FACTORS TO BE USED IN THE ABSENCE OF SITE-SPECIFIC DATA
(pCi/kg per pCi/liter)*

ELEMENT	FRESHWATER		SALTWATER	
	FISH	INVERTEBRATE	FISH	INVERTEBRATE
H	9.0E-01	9.0E-01	9.0E-01	9.3E-01
C	4.6E 03	9.1E 03	1.8E 03	1.4E 03
NA	1.0E 02	2.0E 02	6.7E-02	1.9E-01
P	1.0E 05	2.0E 04	2.9E 04	3.0E 04
CR	2.0E 02	2.0E 03	4.0E 02	2.0E 03
MN	4.0E 02	9.0E 04	5.5E 02	4.0E 02
FE	1.0E 02	3.2E 03	3.0E 03	2.0E 04
CO	5.0E 01	2.0E 02	1.0E 02	1.0E 03
NI	1.0E 02	1.0E 02	1.0E 02	2.5E 02
CU	5.0E 01	4.0E 02	6.7E 02	1.7E 03
ZN	2.0E 03	1.0E 04	2.0E 03	5.0E 04
BR	4.2E 02	3.3E 02	1.5E-02	3.1E 00
RB	2.0E 03	1.0E 03	8.3E 00	1.7E 01
SR	3.0E 01	1.0E 02	2.0E 00	2.0E 01
Y	2.5E 01	1.0E 03	2.5E 01	1.0E 03
ZR	3.3E 00	6.7E 00	2.0E 02	8.0E 01
NB	3.0E 04	1.0E 02	3.0E 04	1.0E 02
MO	1.0E 01	1.0E 01	1.0E 01	1.0E 01
TC	1.5E 01	5.0E 00	1.0E 01	5.0E 01
RU	1.0E 01	3.0E 02	3.0E 00	1.0E 03
RH	1.0E 01	3.0E 02	1.0E 01	2.0E 03
TE	4.0E 02	6.1E 03	1.0E 01	1.0E 02
I	1.5E 01	5.0E 00	1.0E 01	5.0E 01
CS	2.0E 03	1.0E 03	4.0E 01	2.5E 01
BA	4.0E 00	2.0E 02	1.0E 01	1.0E 02
LA	2.5E 01	1.0E 03	2.5E 01	1.0E 03
CE	1.0E 00	1.0E 03	1.0E 01	6.0E 02
PR	2.5E 01	1.0E 03	2.5E 01	1.0E 03
ND	2.5E 01	1.0E 03	2.5E 01	1.0E 03
W	1.2E 03	1.0E 01	3.0E 01	3.0E 01
NP	1.0E 01	4.0E 02	1.0E 01	1.0E 01

*Values in Table A-1 are taken from Reference 1 unless otherwise indicated.

TABLE A-2

DOSE FACTORS FOR IMMERSION IN WATER*
(mRem/hr per pCi/liter) (a)

Nuclide	Skin	Total Body (b)	Nuclide	Skin	Total Body (b)
H-3(c)	0	0	Zr-95	1.8E-6	1.5E-6
N-13	2.6E-6	1.9E-6	Nb-95	1.6E-6	1.4E-6
C-14(c)	3.8E-6	0	Mo-99	9.1E-7	4.7E-7
Na-22	4.8E-6	4.0E-6	Ru-103	1.1E-6	8.9E-7
Na-24	9.3E-6	7.8E-6	Ru-106	1.9E-6	3.8E-7
Cr-51	6.4E-8	5.2E-8	Te-132	4.8E-7	4.0E-7
Mn-54	1.8E-6	1.5E-6	I-129	6.1E-9	2.1E-9
Fe-55(d)	3.6E-10	6.4E-11	I-131	9.5E-7	6.8E-7
Fe-59	2.6E-6	2.2E-6	I-132	5.5E-6	4.4E-6
Co-58	2.3E-6	1.8E-6	I-133	1.5E-6	9.6E-7
Co-60	5.4E-6	4.6E-6	I-135	4.0E-6	3.3E-6
Ni-63	0	0	Cs-134	3.5E-6	2.9E-6
Cu-64	5.2E-7	3.7E-7	Cs-137	1.4E-6	1.0E-6
Zn-65	1.2E-6	1.1E-6	Ba-140	7.6E-7	4.6E-7
Sr-89(d)	5.4E-7	4.6E-9	La-140	5.3E-6	4.1E-6
Sr-90(d)	1.5E-7	5.4E-10	Ce-141	2.4E-7	1.3E-7
Y-90(d)	9.6E-7	1.3E-8	Ce-144	6.2E-8	3.0E-8
(Sr+Y-90)(d)(e)	1.1E-6	1.3E-8	Pr-144	1.3E-6	5.6E-8
			(Ce+Pr-144)(f)	1.4E-6	8.6E-8

(a) The same factors apply to adult, teenager, and child.

(b) Total body factors also apply to other internal organs.

(c) Not including penetration of oxide into skin.

(d) Includes bremsstrahlung.

(e) Use these factors for Sr-90 unless Y-90 concentration is given separately.

(f) Use these factors for Ce-144 unless Pr-144 concentration is given separately.

* Data presented in this table are from Reference 14.

TABLE A-3

RECOMMENDED VALUES FOR LIQUID EFFLUENTS*

Parameter Symbol		Values
M_l	is the mixing ratio at location l of exposure or harvest of aquatic foods**	0.2 (Aquatic foods, Discharge Canal) 0.5 (Shoreline, Pilgrim Station Recreational Area)[a] 1.0 (Shoreline, Discharge Canal) 0.03 (Swimming, White Horse Beach) 0.03 (Boating, Cape Cod Bay)
t_h	is the period of time between exposure of aquatic foods to radionuclides water and their consumption	24 hr for maximum individual 168 hr for average individual, sport fish doses 240 hr for average individual, commercial fish doses
W_l	is the shoreline width factor for location l **	0.5 (Recreational Area) 0.1 (Discharge Canal)

* Data presented in this table are from Reference 1 unless otherwise noted.
** From Reference 2.

[a] Swimming is prohibited at Pilgrim Station Recreational Area.

TABLE B-1
DOSE FACTORS FOR EXPOSURE TO A SEMI-INFINITE CLOUD OF NOBLE GASES*

Nuclide	β-air (DFN_i) mrad-m3/pCi-yr	β-skin (DFN_i) mrem-m3/pCi-yr	γ-air (DFN_i) mrad-m3/pCi-yr	γ-body (DFN_{iTB}) mrem-m3/pCi-yr
Kr-83m	2.88E-04	---	1.93E-05	7.56E-08
Kr-85m	1.97E-03	1.46E-03	1.23E-03	1.17E-03
Kr-85	1.95E-03	1.34E-03	1.72E-05	1.61E-05
Kr-87	1.03E-02	9.73E-03	6.17E-03	5.92E-03
Kr-88	2.93E-03	2.37E-03	1.52E-02	1.47E-02
Kr-89	1.06E-02	1.01E-02	1.73E-02	1.66E-02
Kr-90	7.83E-03	7.29E-03	1.63E-02	1.56E-02
Xe-131m	1.11E-03	4.76E-04	1.56E-04	9.15E-05
Xe-133m	1.48E-03	9.94E-04	3.27E-04	2.51E-04
Xe-133	1.05E-03	3.06E-04	3.53E-04	2.94E-04
Xe-135m	7.39E-04	7.11E-04	3.36E-03	3.12E-03
Xe-135	2.46E-03	1.86E-03	1.92E-03	1.81E-03
Xe-137	1.27E-02	1.22E-02	1.51E-03	1.42E-03
Xe-138	4.75E-03	4.13E-03	9.21E-03	8.83E-03
Ar-41	3.28E-03	2.69E-03	9.30E-03	8.84E-03

* Data presented in this table are from Reference 1.

TABLE E-1

STABLE ELEMENT TRANSFER DATA*

Element	B_{iv} Veg/Soil	F_m (Cow) Milk (d/l)	F_f Meat (d/kg)
H	4.8E 00	1.0E-02	1.2E-02
C	5.5E 00	1.2E-02	3.1E-02
Na	5.2E-02	4.0E-02	3.0E-02
P	1.1E 00	2.5E-02	4.6E-02
Cr	2.5E-04	2.2E-03	2.4E-03
Mn	2.9E-02	2.5E-04	8.0E-04
Fe	6.6E-04	1.2E-03	4.0E-02
Co	9.4E-03	1.0E-03	1.3E-02
Ni	1.9E-02	6.7E-03	5.3E-02
Cu	1.2E-01	1.4E-02	8.0E-03
Zn	4.0E-01	3.9E-02	3.0E-02
Rb	1.3E-01	3.0E-02	3.1E-02
Sr	1.7E-02	8.0E-04	6.0E-04
Y	2.6E-03	1.0E-05	4.6E-03
Zr	1.7E-04	5.0E-06	3.4E-02
Nb	9.4E-03	2.5E-03	2.8E-01
Mo	1.2E-01	7.5E-03	8.0E-03
Tc	2.5E-01	2.5E-02	4.0E-01
Ru	5.0E-02	1.0E-06	4.0E-01
Rh	1.3E 01	1.0E-02	1.5E-03
Ag	1.5E-01	5.0E-02	1.7E-02
Te	1.3E 00	1.0E-03	7.7E-02
I	2.0E-02	6.0E-03	2.9E-03
Cs	1.0E-02	1.2E-02	4.0E-03
Ba	5.0E-03	4.0E-04	3.2E-03
La	2.5E-03	5.0E-06	2.0E-04
Ce	2.5E-03	1.0E-04	1.2E-03
Pr	2.5E-03	5.0E-06	4.7E-03
Nd	2.4E-03	5.0E-06	3.3E-03
W	1.8E-02	5.0E-04	1.3E-03
Np	2.5E-03	5.0E-06	2.0E-04

*Data presented in this table is from Reference 1

TABLE E-2
NUCLIDE TRANSFER PARAMETERS FOR GOAT'S MILK*

Element	F_m (days/liter)
H	1.70E-01
C	1.00E-01
P	2.50E-01
Fe	1.30E-04
Cu	1.30E-02
Sr	1.40E-02
I	6.00E-02
Cs	3.00E-01

TABLE E-3
ANIMAL CONSUMPTION RATES*

Animal	Q_F Feed or Forage (kg/day [wet weight])	Q_{AW} Water (l/day)
Milk Cow	50	60
Beef Cattle	50	50
Goats	6	8

* Data presented in these tables are from Reference 1.

TABLE E-4

RECOMMENDED USE FACTORS TO BE APPLIED FOR THE AVERAGE INDIVIDUAL *

Pathway	Infant	Child	Teen	Adult
Fruits, vegetables, & grain (kg/yr)	-	200	240	190
Milk (ℓ/yr)	330	170	200	110
Meat & poultry (kg/yr)	-	37	59	95
Fish (kg/yr)	-	2.2	5.2	6.9
Seafood (kg/yr)	-	0.33	0.75	1.0
Drinking water (ℓ/yr)	330	260	260	370
Shoreline recreation ** (hr/yr)				
Discharge Canal	-	9.5	47	8.3
Pilgrim Station Recreational Area	-	9.5	47	8.3
Swimming - White Horse Beach ** (hr/yr)	-	29	52	52
Boating - Cape Cod Bay ** (hr/yr)	-	29	52	52
Inhalation (m^3/yr)	1400	3700	8000	8000

A Usage factors for the average individual are used to determine the annual dose to the total body and thyroid of an average individual and the annual integrated dose to the population within a 50 mile radius.

* Data presented in this table are from Reference 1, unless otherwise indicated.

** From Reference 2.

TABLE E-5
RECOMMENDED USE FACTORS TO BE APPLIED FOR THE MAXIMUM EXPOSED INDIVIDUAL *

Pathway	Infant	Child	Teen	Adult
Fruits, vegetables & grain (kg/yr)	-	520	630	520
Leafy vegetables (kg/yr)	-	26	42	64
Milk (ℓ/yr)	330	330	400	310
Meat & poultry (kg/yr)	-	41	65	110
Fish (fresh or salt) (kg/yr)	-	6.9	16	21
Shellfish ** (kg/yr)	-	3	6	9
Drinking water (ℓ/yr)	330	510	510	730
Shoreline recreation ** (hr/yr)				
Discharge Canal Pilgrim Station	-	14	67	12
Recreational Area	-	14	67	12
Swimming - White Horse Beach ** (hr/yr)	-	29	52	52
Boating - Cape Cod Bay ** (hr/yr)	-	29	52	52
Inhalation (m^3/yr)	1400	3700	8000	8000

* Data presented in this table are from Reference 1, unless otherwise indicated.

** From Reference 2.

TABLE E-6

EXTERNAL DOSE FACTORS FOR STANDING ON CONTAMINATED GROUND *

(mrem/hr per pCi/m^2)

Element	Total Body	Skin
H-3	0.0	0.0
C-14	0.0	0.0
NA-24	2.50E-08	2.90E-08
P-32	0.0	0.0
Cr-51	2.20E-10	2.60E-10
Mn-54	5.80E-09	6.80E-09
Mn-56	1.10E-08	1.30E-08
Fe-55	0.0	0.0
Fe-59	8.00E-09	9.40E-09
Co-58	7.00E-09	8.20E-09
Co-60	1.70E-08	2.00E-08
Ni-63	0.0	0.0
Nr-65	3.70E-09	4.30E-09
Cu-64	1.50E-09	1.70E-09
Zn-65	4.00E-09	4.60E-09
Zn-69	0.0	0.0
Br-83	6.40E-11	9.30E-11
Br-84	1.20E-08	1.40E-08
Br-85	0.0	0.0
Rb-86	6.30E-10	7.20E-10
Rb-88	3.50E-09	4.00E-09
Rb-89	1.50E-08	1.80E-08
Sr-89	5.60E-13	6.50E-13
Sr-91	7.10E-09	8.30E-09
Sr-92	9.00E-09	1.00E-08
Y-90	2.20E-12	2.60E-12
Y-91M	3.80E-09	4.40E-09
Y-91	2.40E-11	2.70E-11
Y-92	1.60E-09	1.90E-09
Y-93	5.70E-10	7.80E-10
Zr-95	5.00E-09	5.80E-09
Zr-97	5.50E-09	6.40E-09
Nb-95	5.10E-09	6.00E-09
Mo-99	1.90E-09	2.20E-09
Tc-99M	9.60E-10	1.10E-09
Tc-101	2.70E-09	3.00E-09
Ru-103	3.60E-09	4.20E-09
Ru-105	4.50E-09	5.10E-09
Ru-106	1.50E-09	1.80E-09
Ag-110M	1.80E-08	2.10E-08
Te-125M	3.50E-11	4.80E-11
Te-127M	1.10E-12	1.30E-12
Te-127	1.00E-11	1.10E-11
Te-129M	7.70E-10	9.00E-10
Te-129	7.10E-10	8.40E-10
Te-131M	8.40E-09	9.90E-09
Te-131	2.20E-09	2.60E-09
Te-132	1.70E-09	2.00E-09
I-130	1.40E-08	1.70E-08
I-131	2.80E-09	3.40E-09
I-132	1.70E-08	2.00E-08
I-133	3.70E-09	4.50E-09
I-134	1.60E-08	1.90E-08
I-135	1.20E-08	1.40E-08

* Data presented in this table is from Reference 1

TABLE E-6 (Continued) *

Isotope	Total Body	Skin
Cs-134	1.20E-08	1.40E-08
Cs-136	1.50E-08	1.70E-08
Cs-137	4.20E-09	4.90E-09
Cs-138	2.10E-08	2.40E-08
Ba-139	2.40E-09	2.70E-09
Ba-140	2.10E-09	2.40E-09
Ba-141	4.30E-09	4.90E-09
Ba-142	7.90E-09	9.00E-09
La-140	1.50E-08	1.70E-08
La-142	1.50E-08	1.80E-08
Ce-141	5.50E-10	6.20E-10
Ce-143	2.20E-09	2.50E-09
Ce-144	3.20E-10	3.70E-10
Pr-143	0.0	0.0
Pr-144	2.00E-10	2.30E-10
Nd-147	1.00E-09	1.20E-09
W-187	3.10E-09	3.60E-09
Np-239	9.50E-10	1.10E-09

* Data presented in this table is from Reference 1

TABLE E-7

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INHALATION DOSE FACTORS FOR ADULTS *
(MREM PER UCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	1.58E-07	1.58E-07	1.58E-07	1.58E-07	1.58E-07	1.58E-07
C 14	2.27E-06	4.26E-07	4.26E-07	4.26E-07	4.26E-07	4.26E-07	4.26E-07
NA 24	1.28E-06	1.28E-06	1.28E-06	1.28E-06	1.28E-06	1.28E-06	1.28E-06
P 32	1.65E-04	9.64E-06	6.26E-06	NO DATA	NO DATA	NO DATA	1.08E-05
CR 51	NO DATA	NO DATA	1.25E-08	7.44E-09	2.85E-09	1.80E-06	4.15E-07
MN 54	NO DATA	4.95E-06	7.87E-07	NO DATA	1.23E-06	1.75E-04	9.67E-06
MN 56	NO DATA	1.55E-10	2.29E-11	NO DATA	1.63E-10	1.18E-06	2.53E-06
FE 55	3.07E-06	2.12E-06	4.93E-07	NO DATA	NO DATA	9.01E-06	7.54E-07
FE 59	1.47E-06	9.47E-06	1.32E-06	NO DATA	NO DATA	1.27E-04	2.35E-05
CO 58	NO DATA	1.98E-07	2.59E-07	NO DATA	NO DATA	1.16E-04	1.33E-05
CO 60	NO DATA	1.44E-06	1.85E-06	NO DATA	NO DATA	7.46E-04	3.56E-05
NI 63	5.40E-05	3.93E-06	1.81E-06	NO DATA	NO DATA	2.23E-05	1.67E-06
NI 65	1.92E-10	2.62E-11	1.14E-11	NO DATA	NO DATA	7.00E-07	1.54E-06
CU 64	NO DATA	1.83E-10	7.69E-11	NO DATA	5.78E-10	8.48E-07	6.12E-06
ZN 65	4.05E-06	1.29E-05	9.82E-06	NO DATA	8.62E-06	1.08E-04	6.68E-06
ZN 69	4.23E-12	8.14E-12	5.65E-13	NO DATA	5.27E-12	1.15E-07	2.04E-09
BR 83	NO DATA	NO DATA	3.01E-08	NO DATA	NO DATA	NO DATA	2.90E-08
BR 84	NO DATA	NO DATA	3.91E-08	NO DATA	NO DATA	NO DATA	2.05E-13
BR 85	NO DATA	NO DATA	1.60E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	1.69E-05	7.37E-06	NO DATA	NO DATA	NO DATA	2.08E-06
RB 88	NO DATA	4.84E-08	2.41E-08	NO DATA	NO DATA	NO DATA	4.18E-19
RB 89	NO DATA	3.20E-08	2.12E-08	NO DATA	NO DATA	NO DATA	1.16E-21
SR 89	3.80E-05	NO DATA	1.09E-06	NO DATA	NO DATA	1.75E-04	4.37E-05
SR 90	1.24E-02	NO DATA	7.62E-04	NO DATA	NO DATA	1.20E-03	9.02E-05
SR 91	7.74E-09	NO DATA	3.13E-10	NO DATA	NO DATA	4.56E-06	2.39E-05
SR 92	8.43E-10	NO DATA	3.64E-11	NO DATA	NO DATA	2.06E-06	5.38E-06
Y 90	2.61E-07	NO DATA	7.01E-09	NO DATA	NO DATA	2.12E-05	6.32E-05
Y 91M	3.26E-11	NO DATA	1.27E-12	NO DATA	NO DATA	2.40E-07	1.66E-10
Y 91	5.78E-05	NO DATA	1.55E-06	NO DATA	NO DATA	2.13E-04	4.81E-05
Y 92	1.29E-09	NO DATA	3.77E-11	NO DATA	NO DATA	1.96E-06	9.19E-06

* Data presented in this table is from Reference 1

TABLE E-7, CONT'D

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INHALATION DOSE FACTORS FOR ADULTS *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	1.18E-08	NO DATA	3.26E-10	NO DATA	NO DATA	6.06E-06	5.27E-05
ZR 95	1.34E-05	4.30E-06	2.91E-06	NO DATA	6.77E-06	2.21E-04	1.88E-05
ZR 97	1.21E-08	2.45E-09	1.13E-09	NO DATA	3.71E-09	9.84E-06	6.54E-05
NB 95	1.76E-06	9.77E-07	5.26E-07	NO DATA	9.67E-07	6.31E-05	1.30E-05
MO 99	NO DATA	1.51E-08	2.87E-09	NO DATA	3.64E-08	1.14E-05	3.10E-05
TC 99M	1.29E-13	3.64E-13	4.63E-12	NO DATA	5.52E-12	9.55E-08	5.20E-07
TC101	5.22E-15	7.52E-15	7.38E-14	NO DATA	1.35E-13	4.99E-08	1.36E-21
RU103	1.91E-07	NO DATA	8.23E-08	NO DATA	7.29E-07	6.31E-05	1.38E-05
RU105	9.88E-11	NO DATA	3.89E-11	NO DATA	1.27E-10	1.37E-06	6.02E-06
RU106	8.64E-06	NO DATA	1.09E-06	NO DATA	1.67E-05	1.17E-03	1.14E-04
AG110M	1.35E-06	1.25E-06	7.43E-07	NO DATA	2.46E-06	5.79E-04	3.78E-05
TE125M	4.27E-07	1.98E-07	5.84E-08	1.31E-07	1.55E-06	3.92E-05	8.83E-06
TE127M	1.58E-06	7.21E-07	1.96E-07	4.11E-07	5.72E-06	1.20E-04	1.87E-05
TE127	1.75E-10	8.03E-11	3.87E-11	1.32E-10	6.37E-10	8.14E-07	7.17E-06
TE129M	1.22E-06	5.64E-07	1.98E-07	4.30E-07	4.57E-06	1.45E-04	4.79E-05
TE129	6.22E-12	2.99E-12	1.55E-12	4.87E-12	2.34E-11	2.42E-07	1.96E-08
TE131M	8.74E-09	5.45E-09	3.63E-09	6.88E-09	3.86E-08	1.82E-05	6.95E-05
TE131	1.39E-12	7.44E-13	4.49E-13	1.17E-12	5.46E-12	1.74E-07	2.30E-09
TE132	3.25E-08	2.69E-08	2.02E-08	2.37E-08	1.82E-07	3.60E-05	6.37E-05
I 130	5.72E-07	1.68E-06	6.60E-07	1.42E-04	2.61E-06	NO DATA	9.61E-07
I 131	3.15E-06	4.47E-06	2.56E-06	1.49E-03	7.66E-06	NO DATA	7.85E-07
I 132	1.48E-07	4.07E-07	1.45E-07	1.43E-05	6.48E-07	NO DATA	5.08E-08
I 133	1.08E-06	1.85E-06	5.65E-07	2.69E-04	3.23E-06	NO DATA	1.11E-06
I 134	8.05E-08	2.16E-07	7.59E-08	3.73E-06	3.44E-07	NO DATA	1.26E-10
I 135	3.35E-07	8.73E-07	3.21E-07	5.60E-05	1.39E-06	NO DATA	6.56E-07
CS134	4.66E-05	1.06E-04	9.10E-05	NO DATA	3.59E-05	1.22E-05	1.30E-06
CS136	4.88E-06	1.83E-05	1.38E-05	NO DATA	1.07E-05	1.50E-06	1.46E-06
CS137	5.98E-06	7.76E-05	5.35E-05	NO DATA	2.78E-05	9.40E-06	1.05E-06
CS138	4.14E-08	7.76E-08	4.05E-08	NO DATA	6.00E-08	6.07E-09	2.33E-13
BA139	1.17E-10	8.32E-14	3.42E-12	NO DATA	7.78E-14	4.70E-07	1.12E-07

* Data presented in this table is from Reference 1

TABLE E-7, CONT'D

INHALATION DOSE FACTORS FOR ADULTS *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	4.88E-06	6.13E-09	3.21E-07	NO DATA	2.09E-09	1.59E-04	2.73E-05
BA141	1.25E-11	9.41E-15	4.20E-13	NO DATA	8.75E-15	2.42E-07	1.45E-17
BA142	3.29E-12	3.38E-15	2.07E-13	NO DATA	2.96E-15	1.49E-07	1.96E-26
LA140	4.30E-08	2.17E-08	5.73E-09	NO DATA	NO DATA	1.70E-05	5.73E-05
LA142	8.54E-11	3.88E-11	9.65E-12	NO DATA	NO DATA	7.91E-07	2.64E-07
CE141	2.49E-06	1.69E-06	1.91E-07	NO DATA	7.83E-07	4.52E-05	1.50E-05
CE143	2.33E-08	1.72E-08	1.91E-09	NO DATA	7.60E-09	9.97E-06	2.83E-05
CE144	4.29E-04	1.79E-04	2.30E-05	NO DATA	1.06E-04	9.72E-04	1.02E-04
PR143	1.17E-06	4.69E-07	5.80E-08	NO DATA	2.70E-07	3.51E-05	2.50E-05
PR144	3.76E-12	1.56E-12	1.91E-13	NO DATA	8.81E-13	1.27E-07	2.69E-18
ND147	6.59E-07	7.62E-07	4.56E-08	NO DATA	4.45E-07	2.76E-05	2.16E-05
W 187	1.06E-09	8.85E-10	3.10E-10	NO DATA	NO DATA	3.63E-06	1.94E-05
NP239	2.87E-08	2.82E-09	1.55E-09	NO DATA	8.75E-09	4.70E-06	1.49E-05

* Data presented in this table is from Reference 1

TABLE E-8

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INHALATION DOSE FACTORS FOR TEENAGER*
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	1.59E-07	1.59E-07	1.59E-07	1.59E-07	1.59E-07	1.59E-07
C 14	3.25E-06	6.09E-07	6.09E-07	6.09E-07	6.09E-07	6.09E-07	6.09E-07
NA 24	1.72E-06	1.72E-06	1.72E-06	1.72E-06	1.72E-06	1.72E-06	1.72E-06
P 32	2.36E-04	1.37E-05	8.95E-06	NO DATA	NO DATA	NO DATA	1.16E-05
CR 51	NO DATA	NO DATA	1.69E-08	9.37E-09	3.84E-09	2.62E-06	3.75E-07
MN 54	NO DATA	8.39E-06	1.05E-06	NO DATA	1.59E-06	2.48E-04	8.35E-06
MN 56	NO DATA	2.12E-10	3.15E-11	NO DATA	2.24E-10	1.90E-06	7.18E-06
FE 55	4.18E-06	2.98E-06	6.93E-07	NO DATA	NO DATA	1.55E-05	7.99E-07
FE 59	1.79E-06	4.62E-06	1.79E-06	NO DATA	NO DATA	1.91E-04	2.23E-05
CO 58	NO DATA	2.59E-07	3.47E-07	NO DATA	NO DATA	1.68E-04	1.19E-05
CO 60	NO DATA	1.87E-06	2.48E-06	NO DATA	NO DATA	1.09E-03	3.24E-05
NI 63	7.25E-05	5.43E-06	2.47E-06	NO DATA	NO DATA	3.84E-05	1.77E-06
NI 65	2.73E-10	3.66E-11	1.59E-11	NO DATA	NO DATA	1.17E-06	4.59E-06
CU 64	NO DATA	2.54E-10	1.06E-10	NO DATA	8.01E-10	1.39E-06	7.68E-06
ZN 65	4.82E-06	1.67E-05	7.80E-06	NO DATA	1.08E-05	1.55E-04	5.83E-06
ZN 69	6.04E-12	1.15E-11	8.07E-13	NO DATA	7.53E-12	1.98E-07	3.56E-08
BR 83	NO DATA	NO DATA	4.30E-08	NO DATA	NO DATA	NO DATA	LT E-24
BR 84	NO DATA	NO DATA	5.41E-08	NO DATA	NO DATA	NO DATA	LT E-24
BR 85	NO DATA	NO DATA	2.29E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	2.38E-05	1.05E-05	NO DATA	NO DATA	NO DATA	2.21E-06
RB 88	NO DATA	6.82E-08	3.40E-08	NO DATA	NO DATA	NO DATA	3.65E-15
RB 89	NO DATA	4.40E-08	2.91E-08	NO DATA	NO DATA	NO DATA	4.22E-17
SR 89	5.43E-05	NO DATA	1.56E-06	NO DATA	NO DATA	3.02E-04	4.64E-05
SR 90	7.35E-02	NO DATA	8.35E-04	NO DATA	NO DATA	2.06E-03	9.56E-05
SR 91	1.10E-08	NO DATA	4.39E-10	NO DATA	NO DATA	7.59E-06	5.24E-05
SR 92	1.19E-09	NO DATA	5.08E-11	NO DATA	NO DATA	3.43E-06	1.49E-05
Y 90	3.73E-07	NO DATA	1.00E-08	NO DATA	NO DATA	3.66E-05	6.99E-03
Y 91M	4.63E-11	NO DATA	1.77E-12	NO DATA	NO DATA	4.00E-07	3.77E-09
Y 91	8.76E-05	NO DATA	2.21E-06	NO DATA	NO DATA	3.67E-04	5.11E-05
Y 92	1.84E-09	NO DATA	5.36E-11	NO DATA	NO DATA	3.35E-06	2.06E-05

* Data presented in this table is from Reference 1

TABLE E-8, CONT'D

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INHALATION DOSE FACTORS FOR TEFNAGER *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	1.69E-08	ND DATA	4.65E-10	ND DATA	ND DATA	1.04E-05	7.24E-05
ZR 95	1.82E-05	5.73E-06	3.94E-06	ND DATA	8.42E-06	3.36E-04	1.86E-05
ZR 97	1.72E-08	3.40E-09	1.57E-09	ND DATA	5.15E-09	1.62E-05	7.88E-05
NB 95	2.32E-06	1.29E-06	7.08E-07	ND DATA	1.25E-06	9.39E-05	1.21E-05
MO 99	ND DATA	2.11E-08	4.03E-09	ND DATA	5.14E-08	1.92E-05	3.36E-05
TC 99M	1.73E-13	4.83E-13	6.24E-12	ND DATA	7.20E-12	1.44E-07	7.66E-07
TC101	7.40E-15	1.05E-14	1.03E-13	ND DATA	1.90E-13	8.34E-08	1.09E-16
RU103	2.63E-07	ND DATA	1.12E-07	ND DATA	9.29E-07	5.79E-05	1.36E-05
RU105	1.40E-10	ND DATA	5.42E-11	ND DATA	1.76E-10	2.27E-06	1.13E-05
RU106	1.23E-05	ND DATA	1.55E-06	ND DATA	2.38E-05	2.01E-03	1.20E-04
AG110M	1.73E-06	1.64E-06	9.99E-07	ND DATA	3.13E-06	8.44E-04	3.41E-05
TE125M	6.70E-07	2.80E-07	8.34E-08	1.75E-07	ND DATA	6.70E-05	9.38E-06
TE127M	2.25E-06	1.02E-06	2.73E-07	5.48E-07	8.17E-06	2.07E-04	1.99E-05
TE127	2.51E-10	1.14E-10	5.52E-11	1.77E-10	9.10E-10	1.40E-06	1.01E-05
TE129M	1.74E-06	8.23E-07	2.81E-07	5.72E-07	6.49E-06	2.47E-04	5.06E-05
TE129	8.87E-12	4.22E-12	2.20E-12	6.48E-12	3.32E-11	4.12E-07	2.02E-07
TE131M	1.23E-08	7.51E-09	5.03E-09	9.06E-09	5.49E-08	2.97E-05	7.76E-05
TE131	1.97E-12	1.04E-12	6.30E-13	1.55E-12	7.72E-12	2.92E-07	1.89E-09
TE132	4.50E-08	3.63E-08	2.74E-08	3.07E-08	2.44E-07	5.61E-05	5.79E-05
I 130	7.80E-07	2.84E-06	8.96E-07	1.86E-06	3.44E-06	ND DATA	1.14E-06
I 131	4.43E-06	6.14E-06	3.30E-06	1.83E-03	1.05E-05	ND DATA	8.11E-07
I 132	1.99E-07	5.47E-07	1.97E-07	1.19E-05	8.65E-07	ND DATA	1.59E-07
I 133	1.52E-06	2.96E-06	7.72E-07	3.45E-04	4.49E-06	ND DATA	1.29E-06
I 134	1.11E-07	2.[illegible]	1.[illegible]E-07	4.94E-06	4.58E-07	ND DATA	2.55E-09
I 135	4.62E-07	1.18E-06	4.36E-07	7.76E-05	1.86E-06	ND DATA	8.69E-07
CS134	6.28E-05	1.41E-04	6.86E-05	ND DATA	4.64E-05	1.83E-03	1.22E-06
CS136	6.44E-06	2.42E-05	1.71E-05	ND DATA	1.38E-05	2.22E-06	1.36E-06
CS137	8.38E-05	1.06E-04	3.89E-05	ND DATA	3.80E-05	1.51E-05	1.06E-06
CS138	5.82E-08	1.07E-07	5.55E-08	ND DATA	8.28E-08	9.84E-09	3.38E-11
BA139	1.67E-10	1.18E-13	4.87E-12	ND DATA	1.11E-13	8.08E-07	8.06E-07

* Data presented in this table is from Reference 1

TABLE E-8, CONT'D

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INHALATION DOSE FACTORS FOR TEENAGER*
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	6.84E-06	8.38E-09	4.40E-07	NO DATA	2.85E-09	2.54E-04	2.8[illegible]E-05
BA141	1.78E-11	1.32E-14	5.95E-13	NO DATA	1.23E-14	4.11E-07	9.3[illegible]E-14
BA142	4.62E-12	4.63E-15	2.84E-13	NO DATA	3.92E-15	2.39E-07	5.99E-20
LA140	5.99E-08	2.95E-08	7.82E-09	NO DATA	NO DATA	2.68E-05	6.09E-05
LA142	1.20E-10	5.31E-11	1.32E-11	NO DATA	NO DATA	1.27E-06	1.50E-06
CE141	3.55E-06	2.37E-06	2.71E-07	NO DATA	1.11E-06	7.67E-05	1.58E-05
CE143	3.32E-08	2.42E-08	2.70E-09	NO DATA	1.08E-08	1.63E-05	3.19E-05
CE144	6.11E-04	2.53E-04	3.28E-05	NO DATA	1.51E-04	1.67E-03	1.08E-04
PR143	1.67E-06	6.64E-07	8.28E-08	NO DATA	3.86E-07	6.04E-05	2.67E-05
PR144	5.37E-12	2.20E-12	2.72E-13	NO DATA	1.26E-12	2.19E-07	2.94E-14
ND147	9.83E-07	1.07E-06	6.41E-08	NO DATA	6.28E-07	4.65E-05	2.28E-05
W 187	1.50E-09	1.22E-09	4.29E-10	NO DATA	NO DATA	5.92E-06	2.21E-05
NP239	4.23E-08	3.99E-09	2.21E-09	NO DATA	1.25E-08	8.11E-06	1.65E-05

* Data presented in this table is from Reference 1

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INHALATION DOSE FACTORS FOR CHILD *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	3.04E-07	3.04E-07	3.04E-07	3.04E-07	3.04E-07	3.04E-07
C 14	9.70E-06	1.82E-06	1.82E-06	1.82E-06	1.82E-06	1.82E-06	1.82E-06
NA 24	4.35E-06	4.35E-06	4.35E-06	4.35E-06	4.35E-06	4.35E-06	4.35E-06
P 32	7.04E-04	3.09E-05	2.67E-05	NO DATA	NO DATA	NO DATA	1.14E-05
CR 51	NO DATA	NO DATA	4.17E-08	2.31E-08	6.57E-09	4.59E-06	2.93E-07
MN 54	NO DATA	1.16E-05	2.57E-06	NO DATA	2.71E-06	4.26E-04	6.19E-06
MN 56	NO DATA	4.48E-10	8.43E-11	NO DATA	4.52E-10	3.55E-06	3.33E-05
FE 55	1.28E-05	8.09E-06	2.10E-06	NO DATA	NO DATA	3.00E-05	7.75E-07
FE 59	5.59E-06	9.64E-06	4.51E-06	NO DATA	NO DATA	3.43E-04	1.91E-05
CO 58	NO DATA	4.79E-07	8.55E-07	NO DATA	NO DATA	2.99E-04	9.29E-06
CO 60	NO DATA	3.55E-06	6.12E-06	NO DATA	NO DATA	1.91E-03	2.60E-05
NI 63	2.22E-04	1.25E-05	7.56E-06	NO DATA	NO DATA	7.43E-05	1.71E-06
NI 65	8.08E-10	7.99E-11	4.44E-11	NO DATA	NO DATA	2.21E-06	2.27E-05
CU 64	NO DATA	5.89E-10	2.90E-10	NO DATA	1.63E-09	2.59E-06	9.92E-06
ZN 65	1.15E-05	3.06E-05	1.90E-05	NO DATA	1.93E-05	2.69E-04	4.41E-06
ZN 69	1.81E-11	2.61E-11	2.41E-12	NO DATA	1.58E-11	3.84E-07	2.75E-06
BR 83	NO DATA	NO DATA	1.28E-07	NO DATA	NO DATA	NO DATA	LT E-24
BR 84	NO DATA	NO DATA	1.48E-07	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	NO DATA	6.84E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 88	NO DATA	3.36E-05	3.09E-05	NO DATA	NO DATA	NO DATA	2.16E-06
RB 89	NO DATA	1.57E-07	9.90E-08	NO DATA	NO DATA	NO DATA	4.66E-09
SR 89	9.33E-08	7.82E-09	NO DATA	NO DATA	NO DATA	NO DATA	5.11E-10
SR 89	1.62E-04	NO DATA	4.66E-06	NO DATA	NO DATA	5.83E-04	4.52E-05
SR 90	2.73E-02	NO DATA	1.74E-03	NO DATA	NO DATA	3.99E-03	9.28E-05
SR 91	3.28E-09	NO DATA	1.24E-09	NO DATA	NO DATA	1.44E-05	4.70E-05
SR 92	3.54E-09	NO DATA	1.42E-10	NO DATA	NO DATA	6.49E-06	6.55E-05
Y 90	1.11E-06	NO DATA	2.94E-08	NO DATA	NO DATA	7.07E-05	7.24E-05
Y 91M	1.37E-10	NO DATA	4.98E-12	NO DATA	NO DATA	7.60E-07	4.64E-07
Y 91	2.47E-04	NO DATA	6.59E-06	NO DATA	NO DATA	7.10E-04	4.97E-05
Y 92	5.50E-09	NO DATA	1.57E-10	NO DATA	NO DATA	6.46E-06	6.46E-05

* Data presented in this table is from Reference 1

TABLE E-9, CONT'D

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INHALATION DOSE FACTORS FOR CHILD *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	5.04E-08	NO DATA	1.38E-09	NO DATA	NO DATA	2.01E-05	1.05E-04
ZR 95	5.13E-05	1.13E-05	1.00E-05	NO DATA	1.61E-05	6.03E-04	1.65E-05
ZR 97	5.07E-08	7.34E-09	4.32E-09	NO DATA	1.05E-08	3.06E-05	9.49E-05
NB 95	6.35E-06	2.48E-06	1.77E-06	NO DATA	2.33E-06	1.66E-04	1.00E-05
MO 99	NO DATA	4.66E-08	1.15E-08	NO DATA	1.06E-07	3.66E-05	3.42E-05
TC 99M	4.81E-13	9.41E-13	1.56E-11	NO DATA	1.37E-11	2.37E-07	1.30E-06
TC101	2.19E-14	2.30E-14	2.91E-13	NO DATA	3.92E-13	1.58E-07	4.41E-09
RU103	7.55E-07	NO DATA	2.90E-07	NO DATA	1.90E-06	1.79E-04	1.21E-05
RU105	4.13E-10	NO DATA	1.50E-10	NO DATA	3.63E-10	4.30E-06	2.69E-05
RU106	3.68E-05	NO DATA	4.57E-06	NO DATA	4.97E-05	3.87E-03	1.16E-04
AG110M	4.56E-06	3.08E-06	2.47E-06	NO DATA	5.74E-06	1.48E-03	2.71E-05
TE125M	1.82E-06	6.29E-07	2.47E-07	5.20E-07	NO DATA	1.29E-04	9.13E-06
TE127M	6.72E-06	2.31E-06	8.16E-07	1.64E-06	1.72E-05	4.00E-04	1.93E-05
TE127	7.49E-10	2.57E-10	1.65E-10	5.30E-10	1.91E-09	2.71E-06	1.52E-05
TE129M	5.19E-06	1.85E-06	8.22E-07	1.71E-06	1.36E-05	4.76E-04	4.91E-05
TE129	2.64E-11	9.45E-12	6.44E-12	1.93E-11	6.94E-11	7.43E-07	6.89E-06
TE131M	3.63E-08	1.60E-08	1.37E-08	2.64E-08	1.08E-07	5.56E-05	8.32E-05
TE131	5.87E-12	2.28E-12	1.78E-12	4.59E-12	1.59E-11	5.55E-07	3.60E-07
TE132	1.30E-07	7.36E-08	7.12E-08	8.58E-08	4.79E-07	1.02E-04	3.72E-05
I 130	2.21E-06	4.43E-06	2.28E-06	4.99E-04	6.61E-06	NO DATA	1.38E-06
I 131	1.30E-05	1.30E-05	7.37E-06	4.39E-03	2.13E-05	NO DATA	7.68E-07
I 132	5.72E-07	1.40E-06	5.07E-07	9.23E-05	1.69E-06	NO DATA	8.65E-07
I 133	4.48E-06	8.69E-06	2.08E-06	1.04E-03	9.13E-06	NO DATA	1.48E-06
I 134	5.17E-07	5.84E-07	2.69E-07	1.37E-05	6.92E-07	NO DATA	2.55E-07
I 135	1.33E-06	2.36E-06	1.12E-06	2.14E-04	3.42E-06	NO DATA	1.20E-06
CS134	1.76E-04	2.74E-04	6.07E-05	NO DATA	6.57E-05	3.27E-05	1.04E-06
CS136	1.76E-05	4.62E-05	3.14E-05	NO DATA	2.58E-05	3.93E-06	1.13E-06
CS137	2.45E-04	2.23E-04	3.47E-05	NO DATA	7.63E-05	2.81E-05	9.78E-07
CS138	1.71E-07	2.27E-07	1.50E-07	NO DATA	1.68E-07	1.84E-08	7.29E-08
BA139	4.98E-10	2.66E-12	1.45E-11	NO DATA	2.53E-13	1.36E-06	1.76E-05

* Data presented in this table is from Reference 1

TABLE E-9, CONT'D

INHALATION DOSE FACTORS FOR CHILD*
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	2.00E-05	1.75E-08	1.17E-06	NO DATA	5.71E-09	4.71E-04	2.75E-05
BA141	5.29E-11	2.95E-14	1.72E-12	NO DATA	2.56E-14	7.89E-07	7.44E-08
BA142	1.35E-11	9.73E-15	7.54E-13	NO DATA	7.87E-15	4.44E-07	7.41E-10
LA140	1.74E-07	6.08E-08	2.04E-08	NO DATA	NO DATA	4.94E-05	6.10E-05
LA142	3.50E-10	1.11E-10	3.44E-11	NO DATA	NO DATA	2.35E-06	2.05E-05
CE141	1.06E-05	5.28E-06	7.83E-07	NO DATA	2.31E-06	1.47E-04	1.53E-05
CE143	9.89E-08	5.37E-08	7.77E-09	NO DATA	2.26E-08	3.12E-05	3.44E-05
CE144	1.83E-03	5.72E-04	9.77E-05	NO DATA	3.17E-04	3.23E-03	1.05E-04
PR143	4.99E-06	1.50E-06	2.47E-07	NO DATA	8.11E-07	1.17E-04	2.63E-05
PR144	1.61E-11	4.99E-12	8.10E-13	NO DATA	2.64E-12	4.23E-07	5.32E-08
ND147	2.92E-06	2.36E-06	1.84E-07	NO DATA	1.30E-06	8.87E-05	2.22E-05
W 187	4.41E-09	2.61E-09	1.17E-09	NO DATA	NO DATA	1.11E-05	2.46E-05
NP239	1.26E-07	9.04E-09	6.35E-09	NO DATA	2.63E-08	1.57E-05	1.73E-05

* Data presented in this table is from Reference 1

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INHALATION DOSE FACTORS FOR INFANT*
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	4.62E-07	4.62E-07	4.62E-07	4.62E-07	4.62E-07	4.62E-07
C 14	1.89E-05	3.79E-06	3.79E-06	3.79E-06	3.79E-06	3.79E-06	3.79E-06
NA 24	7.54E-06	7.54E-06	7.54E-06	7.54E-06	7.54E-06	7.54E-06	7.54E-06
P 32	1.45E-03	8.03E-05	5.53E-05	NO DATA	NO DATA	NO DATA	1.15E-05
CR 51	NO DATA	NO DATA	6.39E-08	4.11E-08	9.45E-09	9.17E-06	2.55E-07
MN 54	NO DATA	1.81E-05	3.56E-06	NO DATA	3.56E-06	7.14E-04	5.04E-06
MN 56	NO DATA	1.10E-09	1.58E-10	NO DATA	7.86E-10	8.95E-06	5.12E-05
FE 55	1.41E-05	8.39E-06	2.38E-06	NO DATA	NO DATA	4.21E-05	7.82E-06
FE 59	9.67E-06	2.68E-05	6.77E-06	NO DATA	NO DATA	7.25E-04	1.77E-05
CO 58	NO DATA	8.71E-07	1.30E-06	NO DATA	NO DATA	5.55E-04	7.95E-06
CO 60	NO DATA	5.73E-06	8.41E-06	NO DATA	NO DATA	3.22E-03	2.28E-05
NI 63	2.42E-04	1.46E-05	8.29E-06	NO DATA	NO DATA	1.49E-04	1.73E-06
NI 65	1.71E-09	2.03E-10	8.79E-11	NO DATA	NO DATA	5.80E-06	3.58E-05
CU 64	NO DATA	1.34E-09	5.53E-10	NO DATA	2.84E-09	6.64E-06	1.07E-05
ZN 65	1.38E-05	4.47E-05	2.22E-05	NO DATA	2.32E-05	4.62E-04	3.67E-05
ZN 69	3.85E-11	6.91E-11	5.13E-12	NO DATA	2.87E-11	1.05E-06	9.44E-06
BR 83	NO DATA	NO DATA	2.72E-07	NO DATA	NO DATA	NO DATA	LT E-24
KR 85	NO DATA	NO DATA	2.86E-07	NO DATA	NO DATA	NO DATA	LT E-24
BR 83	NO DATA	NO DATA	1.46E-08	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	1.36E-04	9.30E-05	NO DATA	NO DATA	NO DATA	2.17E-06
SR 89	NO DATA	9.98E-07	2.09E-07	NO DATA	NO DATA	NO DATA	2.42E-07
RB 88	NO DATA	2.29E-07	1.47E-07	NO DATA	NO DATA	NO DATA	4.87E-08
SR 89	2.84E-04	NO DATA	8.15E-06	NO DATA	NO DATA	1.45E-03	4.57E-05
SR 90	2.92E-02	NO DATA	1.85E-03	NO DATA	NO DATA	8.03E-03	9.36E-05
SR 91	6.83E-08	NO DATA	2.47E-09	NO DATA	NO DATA	2.08E-05	
SR 92	7.50E-09	NO DATA	2.79E-10	NO DATA	NO DATA	2.70E-05	1.00E-04
Y 90	2.35E-06	NO DATA	6.30E-08	NO DATA	NO DATA	1.92E-04	7.43E-05
Y 91M	2.91E-10	NO DATA	3.90E-12	NO DATA	NO DATA	1.99E-06	1.68E-06
Y 91	4.20E-04	NO DATA	1.12E-05	NO DATA	NO DATA	1.75E-03	5.02E-05
Y 92	1.17E-08	NO DATA	3.29E-10	NO DATA	NO DATA	1.75E-05	8.04E-05

* Data presented in this table is from Reference 1

TABLE E-10, CONT'D

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INHALATION DOSE FACTORS FOR INFANT *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	1.07E-07	NO DATA	2.91E-09	NO DATA	NO DATA	5.46E-05	1.19E-04
ZR 95	8.24E-05	1.99E-05	1.45E-05	NO DATA	2.22E-05	1.25E-03	1.55E-05
ZR 97	1.07E-07	1.83E-08	8.36E-09	NO DATA	1.85E-08	7.88E-05	1.00E-04
NB 95	1.12E-05	4.59E-06	2.70E-06	NO DATA	3.37E-06	3.42E-04	9.05E-06
MO 99	NO DATA	1.18E-07	2.31E-08	NO DATA	1.89E-07	9.63E-05	3.48E-05
TC 99M	9.98E-13	2.06E-12	2.66E-11	NO DATA	2.22E-11	5.79E-07	1.45E-06
TC101	4.65E-14	5.98E-14	5.80E-13	NO DATA	6.99E-13	4.17E-07	6.03E-07
RU103	1.44E-06	NO DATA	4.85E-07	NO DATA	3.03E-06	3.94E-04	1.15E-05
RU105	8.74E-10	NO DATA	2.93E-10	NO DATA	6.42E-10	1.12E-05	3.46E-05
RU106	6.20E-05	NO DATA	7.77E-06	NO DATA	7.61E-05	8.26E-03	1.17E-04
AG110M	7.13E-06	5.16E-06	3.57E-06	NO DATA	7.80E-06	2.62E-03	2.36E-05
TE125M	3.40E-06	1.42E-06	4.70E-07	1.16E-06	NO DATA	3.19E-04	9.22E-06
TE127M	1.19E-05	4.93E-06	1.48E-06	3.48E-06	2.69E-05	9.37E-04	1.95E-05
TE127	1.59E-09	6.81E-10	3.49E-10	1.32E-09	3.47E-09	7.39E-06	1.74E-05
TE129M	1.01E-05	4.35E-06	1.59E-06	3.91E-06	2.27E-05	1.20E-03	4.91E-05
TE129	5.63E-11	2.48E-11	1.34E-11	4.82E-11	1.25E-10	2.14E-06	1.88E-05
TE131M	7.62E-08	3.93E-08	2.59E-08	6.38E-08	1.89E-07	1.42E-04	8.51E-05
TE131	1.24E-11	5.87E-12	3.57E-12	1.13E-11	2.85E-11	1.47E-06	5.87E-06
TE132	2.66E-07	1.69E-07	1.26E-07	1.99E-07	7.39E-07	2.43E-04	3.15E-05
I 130	4.54E-06	9.91E-06	3.68E-06	1.14E-03	1.09E-05	NO DATA	6.42E-06
I 131	2.71E-05	3.17E-05	1.40E-05	1.06E-02	3.70E-05	NO DATA	7.36E-07
I 132	1.21E-06	2.53E-06	8.99E-07	1.21E-04	2.82E-06	NO DATA	1.30E-06
I 133	9.46E-06	1.37E-05	4.00E-06	2.64E-03	1.00E-05	NO DATA	1.54E-05
I 134	6.58E-07	1.34E-06	4.75E-07	3.18E-05	1.49E-06	NO DATA	9.21E-07
I 135	2.76E-06	5.43E-06	1.95E-06	4.97E-04	6.05E-06	NO DATA	1.31E-06
CS134	2.83E-04	5.02E-04	5.32E-05	NO DATA	1.36E-04	5.69E-05	9.53E-07
CS136	3.45E-05	9.61E-05	3.78E-05	NO DATA	4.03E-05	8.40E-06	1.02E-06
CS137	3.90E-04	4.37E-04	3.29E-05	NO DATA	1.23E-04	5.09E-05	9.53E-07
CS138	3.61E-07	5.58E-07	2.84E-07	NO DATA	2.93E-07	4.47E-08	8.36E-07
BA139	1.06E-09	7.03E-13	3.07E-11	NO DATA	4.73E-13	4.25E-06	8.64E-05

* Data presented in this table is from Reference 1

TABLE E-10, CONT'D

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INHALATION DOSE FACTORS FOR INFANT *
(MREM PER PCI INHALED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	4.00E-05	4.00E-08	2.07E-06	NO DATA	9.99E-09	1.14E-03	2.74E-05
BA141	1.12E-10	7.70E-14	3.55E-12	NO DATA	4.64E-14	2.12E-06	3.39E-06
BA142	2.84E-11	2.36E-14	1.40E-12	NO DATA	1.36E-14	1.11E-06	4.95E-07
LA140	3.61E-07	1.43E-07	3.68E-08	NO DATA	NO DATA	1.20E-04	6.06E-05
LA142	7.36E-10	2.69E-10	6.46E-11	NO DATA	NO DATA	5.87E-06	4.25E-05
CE141	1.98E-05	1.19E-05	1.42E-06	NO DATA	3.75E-06	3.69E-04	1.54E-05
CE143	2.09E-07	1.38E-07	1.59E-08	NO DATA	4.03E-08	8.30E-05	3.55E-05
CE144	2.28E-03	8.65E-04	1.26E-04	NO DATA	3.84E-04	7.03E-03	1.06E-04
PR143	2.00E-05	3.74E-06	4.99E-07	NO DATA	1.41E-06	3.00E-04	2.66E-05
PR144	3.42E-11	1.32E-11	1.72E-12	NO DATA	4.80E-12	1.15E-06	3.06E-06
ND147	5.67E-06	5.81E-06	3.57E-07	NO DATA	2.25E-06	2.30E-04	2.23E-05
W 187	9.26E-09	6.44E-09	2.23E-09	NO DATA	NO DATA	2.83E-05	2.54E-05
NP239	2.65E-07	2.37E-08	1.34E-08	NO DATA	4.73E-08	4.25E-05	1.78E-05

* Data presented in this table is from Reference 1

TABLE E-11

INGESTION DOSE FACTORS FOR ADULTS *
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07
C 14	2.84E-06	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07
NA 24	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06
P 32	1.93E-04	1.20E-05	7.46E-06	NO DATA	NO DATA	NO DATA	2.17E-05
CR 51	NO DATA	NO DATA	2.66E-09	1.59E-09	5.86E-10	3.53E-09	4.69E-07
MN 54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05
MN 56	NO DATA	1.15E-07	2.04E-08	NO DATA	1.46E-07	NO DATA	3.67E-06
FE 55	2.75E-06	1.90E-06	4.43E-07	NO DATA	NO DATA	1.06E-06	1.09E-06
FE 59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05
CO 58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05
CO 60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05
NI 63	1.30E-04	9.01E-06	4.36E-06	NO DATA	NO DATA	NO DATA	1.88E-06
NI 65	5.28E-07	6.86E-08	3.13E-08	NO DATA	NO DATA	NO DATA	1.74E-06
CU 64	NO DATA	8.33E-08	3.91E-08	NO DATA	2.10E-07	NO DATA	7.10E-06
ZN 65	4.84E-06	1.54E-05	6.90E-06	NO DATA	1.03E-05	NO DATA	9.70E-06
ZN 69	1.03E-08	1.97E-08	1.37E-09	NO DATA	1.28E-08	NO DATA	2.96E-09
BR 83	NO DATA	NO DATA	4.02E-08	NO DATA	NO DATA	NO DATA	5.79E-08
BR 84	NO DATA	NO DATA	5.21E-08	NO DATA	NO DATA	NO DATA	4.09E-13
BR 85	NO DATA	NO DATA	2.14E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	2.11E-05	9.83E-06	NO DATA	NO DATA	NO DATA	4.16E-06
RB 88	NO DATA	6.05E-08	3.21E-08	NO DATA	NO DATA	NO DATA	8.36E-19
RB 89	NO DATA	4.01E-08	2.82E-08	NO DATA	NO DATA	NO DATA	2.33E-21
SR 89	3.08E-04	NO DATA	8.84E-06	NO DATA	NO DATA	NO DATA	4.94E-05
SR 90	7.58E-03	NO DATA	1.86E-03	NO DATA	NO DATA	NO DATA	2.19E-04
SR 91	5.67E-06	NO DATA	2.29E-07	NO DATA	NO DATA	NO DATA	2.70E-05
SR 92	2.15E-06	NO DATA	9.30E-08	NO DATA	NO DATA	NO DATA	4.26E-05
Y 90	9.62E-09	NO DATA	2.58E-10	NO DATA	NO DATA	NO DATA	1.02E-04
Y 91M	9.09E-11	NO DATA	3.52E-12	NO DATA	NO DATA	NO DATA	2.67E-10
Y 91	1.41E-07	NO DATA	3.77E-09	NO DATA	NO DATA	NO DATA	7.76E-05
Y 92	8.45E-10	NO DATA	2.47E-11	NO DATA	NO DATA	NO DATA	1.48E-05

* Data presented in this table is from Reference 1

TABLE E-11, CONT'D

INGESTION DOSE FACTORS FOR ADULTS*
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	2.68E-09	NO DATA	7.40E-11	NO DATA	NO DATA	NO DATA	8.50E-05
ZR 95	3.04E-08	9.75E-09	6.60E-09	NO DATA	1.53E-08	NO DATA	3.09E-05
ZR 97	1.68E-09	3.39E-10	1.55E-10	NO DATA	5.12E-10	NO DATA	1.05E-04
NB 95	6.22E-09	3.46E-09	1.86E-09	NO DATA	3.42E-09	NO DATA	2.10E-05
MO 99	NO DATA	4.31E-06	8.20E-07	NO DATA	9.76E-06	NO DATA	9.99E-06
TC 99M	2.47E-10	6.98E-10	8.89E-09	NO DATA	1.06E-08	3.42E-10	4.13E-07
TC101	2.54E-10	3.66E-10	3.59E-09	NO DATA	6.59E-09	1.87E-10	1.10E-21
RU103	1.85E-07	NO DATA	7.97E-08	NO DATA	7.06E-07	NO DATA	2.13E-05
RU105	1.54E-08	NO DATA	6.08E-09	NO DATA	1.99E-07	NO DATA	9.42E-06
RU106	2.75E-06	NO DATA	3.48E-07	NO DATA	5.31E-06	NO DATA	1.78E-04
AG110M	1.60E-07	1.48E-07	8.79E-08	NO DATA	2.91E-07	NO DATA	6.04E-05
TE125M	2.69E-06	9.71E-07	3.59E-07	8.06E-07	1.09E-05	NO DATA	1.07E-05
TE127M	6.77E-06	2.42E-06	8.25E-07	1.73E-06	2.75E-05	NO DATA	2.27E-05
TE127	1.10E-07	3.95E-08	2.38E-08	8.15E-08	4.48E-07	NO DATA	8.68E-06
TE129M	1.15E-05	4.79E-06	1.82E-06	3.95E-06	4.80E-05	NO DATA	5.79E-05
TE129	3.14E-08	1.18E-08	7.65E-09	2.41E-08	1.32E-07	NO DATA	2.37E-08
TE131M	1.73E-06	8.46E-07	7.05E-07	1.34E-06	8.57E-06	NO DATA	8.40E-05
TE131	1.97E-08	8.23E-09	6.22E-09	1.62E-08	8.63E-08	NO DATA	2.79E-09
TE132	2.52E-06	1.63E-06	1.53E-06	1.80E-06	1.57E-05	NO DATA	7.71E-05
I 130	7.56E-07	2.23E-06	8.80E-07	1.89E-04	3.48E-06	NO DATA	1.92E-06
I 131	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06
I 132	2.03E-07	5.43E-07	1.90E-07	1.90E-05	8.65E-07	NO DATA	1.02E-07
I 133	1.42E-06	2.47E-06	7.53E-07	3.63E-04	4.31E-06	NO DATA	2.22E-06
I 134	1.06E-07	2.88E-07	1.03E-07	4.99E-06	4.58E-07	NO DATA	2.51E-10
I 135	4.43E-07	1.16E-06	4.28E-07	7.65E-05	1.86E-06	NO DATA	1.31E-06
CS134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06
CS136	6.51E-06	2.57E-05	1.85E-05	NO DATA	1.43E-05	1.96E-06	2.92E-06
CS137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06
CS138	5.52E-08	1.09E-07	5.40E-08	NO DATA	8.01E-08	7.91E-09	4.65E-13
BA139	9.70E-08	6.91E-11	2.84E-09	NO DATA	6.46E-11	3.92E-11	1.72E-07

* Data presented in this table is from Reference 1

TABLE E-11, CONT'D

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INGESTION DOSE FACTORS FOR ADULTS*
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	2.03E-05	2.55E-08	1.33E-06	NO DATA	8.67E-09	1.46E-08	4.18E-05
BA141	4.71E-08	3.56E-11	1.59E-09	NO DATA	3.31E-11	2.02E-11	2.22E-17
BA142	2.13E-08	2.19E-11	1.34E-09	NO DATA	1.85E-11	1.24E-11	3.00E-26
LA140	2.50E-09	1.26E-09	8.33E-10	NO DATA	NO DATA	NO DATA	9.25E-05
LA142	1.28E-10	5.82E-11	1.45E-11	NO DATA	NO DATA	NO DATA	4.25E-07
CE141	9.36E-09	6.33E-09	7.18E-10	NO DATA	2.94E-09	NO DATA	2.42E-05
CE143	1.65E-09	1.22E-06	1.35E-10	NO DATA	5.37E-10	NO DATA	4.56E-05
CE144	4.88E-07	2.04E-07	2.62E-08	NO DATA	1.21E-07	NO DATA	1.65E-04
PR143	9.20E-09	3.69E-09	4.56E-10	NO DATA	2.13E-09	NO DATA	4.03E-05
PR144	3.01E-11	1.25E-11	1.53E-12	NO DATA	7.05E-12	NO DATA	4.33E-18
ND147	8.29E-09	7.27E-09	4.35E-10	NO DATA	4.25E-09	NO DATA	3.49E-05
W 187	1.03E-07	8.61E-08	3.01E-08	NO DATA	NO DATA	NO DATA	2.82E-05
NP239	1.19E-09	1.17E-10	6.45E-11	NO DATA	3.65E-10	NO DATA	2.40E-05

* Data presented in this table is from Reference 1

TABLE E-12

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INGESTION DOSE FACTORS FOR TEENAGER*
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07
C 14	4.06E-06	8.12E-07	8.12E-07	8.12E-07	8.12E-07	8.12E-07	8.12E-07
NA 24	2.30E-06	2.30E-06	2.30E-06	2.30E-06	2.30E-06	2.30E-06	2.30E-06
P 32	2.76E-04	1.71E-05	1.07E-05	NO DATA	NO DATA	NO DATA	2.32E-05
CR 51	NO DATA	NO DATA	3.60E-09	2.00E-09	7.89E-10	5.14E-09	6.05E-07
MN 54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05
MN 56	NO DATA	1.58E-07	2.81E-08	NO DATA	2.00E-07	NO DATA	1.04E-05
FE 55	3.78E-06	2.68E-06	6.25E-07	NO DATA	NO DATA	1.70E-06	1.16E-06
FE 59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05
CO 58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05
CO 60	NO DATA	2.61E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05
NI 63	1.77E-04	1.25E-05	6.00E-06	NO DATA	NO DATA	NO DATA	1.99E-06
NI 65	7.49E-07	9.57E-08	4.36E-08	NO DATA	NO DATA	NO DATA	5.19E-06
CU 64	NO DATA	1.15E-07	5.41E-08	NO DATA	2.91E-07	NO DATA	8.92E-06
ZN 65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06
ZN 69	1.47E-08	2.60E-08	1.96E-09	NO DATA	1.93E-08	NO DATA	5.16E-08
BR 83	NO DATA	NO DATA	5.74E-08	NO DATA	NO DATA	NO DATA	LT E-24
BR 84	NO DATA	NO DATA	7.22E-08	NO DATA	NO DATA	NO DATA	LT E-24
BR 85	NO DATA	NO DATA	3.05E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	2.[illegible]E-05	1.40E-05	NO DATA	NO DATA	NO DATA	4.41E-06
RB 88	NO DATA	8.52E-08	4.54E-08	NO DATA	NO DATA	NO DATA	7.30E-15
RB 89	NO DATA	5.50E-08	3.89E-08	NO DATA	NO DATA	NO DATA	8.43E-17
SR 89	4.40E-04	NO DATA	1.26E-05	NO DATA	NO DATA	NO DATA	5.24E-05
SR 90	8.30E-03	NO DATA	2.05E-03	NO DATA	NO DATA	NO DATA	2.33E-04
SR 91	8.07E-06	NO DATA	3.21E-07	NO DATA	NO DATA	NO DATA	3.66E-05
SR 92	3.05E-06	NO DATA	1.30E-07	NO DATA	NO DATA	NO DATA	7.77E-05
Y 90	3.37E-08	NO DATA	3.69E-10	NO DATA	NO DATA	NO DATA	1.13E-04
Y 91M	1.29E-10	NO DATA	4.93E-12	NO DATA	NO DATA	NO DATA	6.09E-09
Y 91	2.01E-07	NO DATA	5.39E-09	NO DATA	NO DATA	NO DATA	8.24E-05
Y 92	1.21E-09	NO DATA	3.50E-11	NO DATA	NO DATA	NO DATA	3.32E-05

* Data presented in this table is from Reference 1

TABLE E-12, CONT'D

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INGESTION DOSE FACTORS FOR TEENAGER*
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	3.83E-09	NO DATA	1.05E-10	NO DATA	NO DATA	NO DATA	1.17E-04
ZR 95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.91E-08	NO DATA	3.00E-05
ZR 97	2.37E-09	4.69E-10	2.16E-10	NO DATA	7.11E-10	NO DATA	1.27E-04
NB 95	8.22E-09	4.56E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05
MO 99	NO DATA	6.03E-06	1.19E-06	NO DATA	1.38E-05	NO DATA	1.08E-05
TC 99M	3.42E-10	9.26E-10	1.20E-08	NO DATA	1.38E-08	5.14E-10	6.08E-07
TC101	3.60E-10	5.12E-10	5.03E-09	NO DATA	9.26E-09	3.12E-10	8.75E-17
RU103	2.55E-07	NO DATA	1.09E-07	NO DATA	8.99E-07	NO DATA	2.13E-05
RU105	2.18E-08	NO DATA	8.46E-09	NO DATA	2.75E-07	NO DATA	1.76E-05
RU106	3.92E-06	NO DATA	4.94E-07	NO DATA	7.56E-06	NO DATA	1.88E-04
AG110M	2.05E-07	1.94E-07	1.18E-07	NO DATA	3.70E-07	NO DATA	5.45E-05
TE125M	3.83E-06	1.38E-06	5.12E-07	1.07E-06	NO DATA	NO DATA	1.13E-05
TE127M	9.67E-06	3.43E-06	1.15E-06	2.30E-06	3.92E-05	NO DATA	2.41E-05
TE127	1.58E-07	5.60E-08	3.40E-08	1.09E-07	6.40E-07	NO DATA	1.22E-05
TE129M	1.63E-05	6.05E-06	2.58E-06	5.26E-06	6.82E-05	NO DATA	6.12E-05
TE129	4.48E-08	1.67E-08	1.03E-08	3.20E-08	1.98E-07	NO DATA	2.45E-07
TE131M	2.44E-06	1.17E-06	9.76E-07	1.76E-06	1.22E-05	NO DATA	9.39E-05
TE131	2.79E-08	1.15E-08	8.72E-09	2.15E-08	1.22E-07	NO DATA	2.29E-09
TE132	3.49E-06	2.21E-06	2.08E-06	2.33E-06	2.12E-05	NO DATA	7.00E-05
I 130	1.03E-06	2.98E-06	1.19E-06	2.41E-04	4.59E-06	NO DATA	2.29E-06
I 131	5.85E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.62E-06
I 132	2.79E-07	7.30E-07	2.62E-07	2.46E-05	1.15E-06	NO DATA	3.18E-07
I 133	2.01E-06	3.41E-06	1.04E-06	4.76E-04	5.98E-06	NO DATA	2.58E-06
I 134	1.46E-07	3.77E-07	1.39E-07	6.45E-06	6.10E-07	NO DATA	5.10E-09
I 135	6.10E-07	1.57E-06	5.82E-07	1.01E-04	2.48E-06	NO DATA	1.74E-06
CS134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06
CS136	8.59E-06	3.38E-05	2.27E-05	NO DATA	1.84E-05	2.90E-06	2.72E-06
CS137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06
CS138	7.76E-08	1.49E-07	7.45E-08	NO DATA	1.10E-07	1.28E-08	6.76E-11
BA139	1.39E-07	9.78E-11	4.05E-09	NO DATA	9.22E-11	6.74E-11	1.24E-06

* Data presented in this table is from Reference 1

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INGESTION DOSE FACTORS FOR TEENAGER *
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	2.84E-08	3.48E-09	1.83E-06	ND DATA	1.18E-08	2.34E-08	4.38E-05
BA141	6.71E-08	5.01E-11	2.24E-09	ND DATA	4.65E-11	3.43E-11	1.43E-13
BA142	2.99E-08	2.99E-11	1.84E-09	ND DATA	2.53E-11	1.99E-11	9.18E-20
LA140	3.48E-09	1.71E-09	4.55E-10	ND DATA	ND DATA	ND DATA	9.82E-05
LA142	1.79E-10	7.95E-11	1.98E-11	ND DATA	ND DATA	ND DATA	2.42E-06
CE141	1.33E-08	8.88E-09	1.02E-09	ND DATA	4.18E-09	ND DATA	2.54E-05
CE143	2.35E-09	1.71E-06	1.91E-10	ND DATA	7.67E-10	ND DATA	5.14E-05
CE144	6.96E-07	2.88E-07	3.74E-08	ND DATA	1.72E-07	ND DATA	1.75E-04
PR143	1.31E-08	5.23E-09	6.52E-10	ND DATA	3.04E-09	ND DATA	4.31E-05
PR144	4.30E-11	1.76E-11	2.18E-12	ND DATA	1.01E-11	ND DATA	4.74E-14
ND147	9.38E-09	1.02E-08	6.11E-10	ND DATA	5.99E-09	ND DATA	3.68E-05
W 187	1.46E-07	1.19E-07	4.17E-08	ND DATA	ND DATA	ND DATA	3.22E-05
NP239	1.76E-09	1.66E-10	9.22E-11	ND DATA	5.21E-10	ND DATA	2.67E-05

* Data presented in this table is from Reference 1

TABLE E-13

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INGESTION DOSE FACTORS FOR CHILD *
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07
C 14	1.21E-05	2.42E-06	2.42E-06	2.42E-06	2.42E-06	2.42E-06	2.42E-06
NA 24	5.80E-06	5.80E-06	5.80E-06	5.80E-06	5.80E-06	5.80E-06	5.80E-06
P 32	8.75E-04	3.86E-05	3.18E-05	NO DATA	NO DATA	NO DATA	2.28E-05
CR 51	NO DATA	NO DATA	8.90E-09	4.94E-09	1.35E-09	9.02E-09	4.72E-07
MN 54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06
MN 56	NO DATA	3.34E-07	7.54E-08	NO DATA	4.04E-07	NO DATA	4.84E-05
FE 55	1.15E-05	6.10E-06	1.89E-06	NO DATA	NO DATA	3.45E-06	1.13E-06
FE 59	1.65E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05
CO 58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05
CO 60	NO DATA	5.29E-06	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05
NI 63	5.38E-04	2.88E-05	1.83E-05	NO DATA	NO DATA	NO DATA	1.94E-06
NI 65	2.22E-06	2.09E-07	1.22E-07	NO DATA	NO DATA	NO DATA	2.56E-05
CU 64	NO DATA	2.45E-07	1.46E-07	NO DATA	5.92E-07	NO DATA	1.15E-05
ZN 65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06
ZN 69	4.38E-08	6.23E-08	5.85E-09	NO DATA	3.84E-08	NO DATA	3.99E-06
BR 83	NO DATA	NO DATA	1.71E-07	NO DATA	NO DATA	NO DATA	LT E-24
BR 84	NO DATA	NO DATA	1.93E-07	NO DATA	NO DATA	NO DATA	LT E-24
RB 85	NO DATA	NO DATA	9.12E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	6.70E-05	4.12E-05	NO DATA	NO DATA	NO DATA	4.31E-06
RB 88	NO DATA	1.90E-07	1.32E-07	NO DATA	NO DATA	NO DATA	9.32E-09
RB 89	NO DATA	1.17E-07	1.04E-07	NO DATA	NO DATA	NO DATA	1.02E-09
SR 89	1.32E-03	NO DATA	3.77E-05	NO DATA	NO DATA	NO DATA	5.11E-05
SR 90	1.70E-02	NO DATA	4.31E-03	NO DATA	NO DATA	NO DATA	2.29E-04
SR 91	2.40E-05	NO DATA	9.06E-07	NO DATA	NO DATA	NO DATA	5.30E-05
SR 92	9.03E-06	NO DATA	3.62E-07	NO DATA	NO DATA	NO DATA	1.71E-04
Y 90	4.11E-08	NO DATA	1.10E-09	NO DATA	NO DATA	NO DATA	1.17E-04
Y 91M	3.82E-10	NO DATA	1.37E-11	NO DATA	NO DATA	NO DATA	7.48E-07
Y 91	6.02E-07	NO DATA	1.61E-08	NO DATA	NO DATA	NO DATA	8.02E-05
Y 92	3.60E-09	NO DATA	1.03E-10	NO DATA	NO DATA	NO DATA	1.04E-04

* Data presented in this table is from Reference 1

TABLE E-13, CONT'D

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INGESTION DOSE FACTORS FOR CHILD*
(MREM PER UCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	1.14E-08	NO DATA	3.13E-10	NO DATA	NO DATA	NO DATA	1.70E-04
ZR 95	1.16E-07	2.95E-08	2.27E-08	NO DATA	3.65E-06	NO DATA	2.66E-05
ZR 97	6.99E-09	1.01E-09	5.96E-10	NO DATA	1.45E-09	NO DATA	1.53E-04
NB 95	2.25E-08	8.76E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.62E-05
MO 99	NO DATA	1.33E-05	3.29E-06	NO DATA	2.84E-05	NO DATA	1.10E-05
TC 99M	9.23E-10	1.81E-09	3.00E-08	NO DATA	2.63E-08	9.19E-10	1.03E-06
TC101	1.07E-09	1.12E-09	1.42E-06	NO DATA	1.91E-08	5.92E-10	3.56E-09
RU103	7.31E-07	NO DATA	2.81E-07	NO DATA	1.84E-06	NO DATA	1.89E-05
RU105	6.45E-08	NO DATA	2.34E-08	NO DATA	5.67E-07	NO DATA	4.21E-05
RU106	1.17E-05	NO DATA	1.46E-06	NO DATA	1.58E-05	NO DATA	1.82E-04
AG110M	5.39E-07	3.64E-07	2.91E-07	NO DATA	6.78E-07	NO DATA	4.33E-05
TE125M	1.14E-05	3.09E-06	1.52E-06	3.20E-06	NO DATA	NO DATA	1.10E-05
TE127M	2.89E-05	7.78E-06	3.43E-06	6.91E-06	9.24E-05	NO DATA	2.34E-05
TE127	4.71E-07	1.27E-07	1.01E-07	3.24E-07	1.34E-06	NO DATA	1.64E-05
TE129M	4.87E-05	1.36E-05	7.56E-06	1.57E-05	1.43E-04	NO DATA	5.94E-05
TE129	1.34E-07	3.74E-08	3.18E-08	9.56E-08	3.92E-07	NO DATA	8.34E-06
TE131M	7.20E-06	2.49E-06	2.65E-06	5.12E-06	2.41E-05	NO DATA	1.01E-04
TE131	8.30E-08	2.53E-08	2.47E-08	6.35E-08	2.51E-07	NO DATA	4.36E-07
TE132	1.01E-05	4.47E-06	5.40E-06	6.51E-06	4.15E-05	NO DATA	4.50E-05
I 130	2.92E-06	5.90E-06	3.04E-06	6.50E-04	9.82E-06	NO DATA	2.76E-06
I 131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06
I 132	8.00E-07	1.47E-06	6.76E-07	6.82E-05	2.25E-06	NO DATA	1.73E-06
I 133	5.92E-06	7.32E-06	2.77E-06	1.36E-03	1.22E-05	NO DATA	2.95E-06
I 134	4.19E-07	7.78E-07	3.58E-07	1.79E-05	1.19E-06	NO DATA	5.16E-07
I 135	1.75E-06	3.15E-06	1.49E-06	2.79E-04	4.83E-06	NO DATA	2.40E-06
CS134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06
CS136	2.35E-05	6.46E-05	4.18E-05	NO DATA	3.44E-05	5.13E-06	2.27E-06
CS137	3.27E-04	3.13E-04	4.62E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06
CS138	2.28E-07	3.17E-07	2.01E-07	NO DATA	2.23E-07	2.40E-08	1.46E-07
BA139	4.14E-07	2.21E-10	1.20E-08	NO DATA	1.93E-10	1.30E-10	9.39E-05

* Data presented in this table is from Reference 1

TABLE E-13, CONT'D

INGESTION DOSE FACTORS FOR CHILD *
(MREM PER PCI INGESTED)

NUCL. E	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	8.1E-05	7.28E-08	4.85E-06	NO DATA	2.37E-08	4.34E-08	4.21E-05
BA141	2.00E-07	1.12E-10	6.51E-09	NO DATA	9.69E-11	6.58E-10	1.14E-07
BA142	8.74E-08	6.29E-11	4.88E-09	NO DATA	5.09E-11	3.70E-11	1.14E-09
LA140	1.01E-08	3.53E-09	1.17E-09	NO DATA	NO DATA	NO DATA	9.84E-05
LA142	5.74E-10	1.67E-10	5.23E-11	NO DATA	NO DATA	NO DATA	3.31E-05
CE141	3.97E-08	1.98E-08	2.94E-09	NO DATA	8.68E-09	NO DATA	2.47E-05
CE143	6.99E-09	3.79E-06	5.49E-10	NO DATA	1.59E-09	NO DATA	5.55E-05
CE144	2.08E-06	8.52E-07	1.11E-07	NO DATA	3.61E-07	NO DATA	1.70E-04
PR143	3.93E-08	1.18E-08	1.95E-09	NO DATA	6.39E-09	NO DATA	4.24E-05
PR144	1.29E-10	3.37E-11	6.49E-12	NO DATA	2.11E-11	NO DATA	8.59E-08
ND147	2.79E-08	2.26E-08	1.75E-09	NO DATA	1.24E-08	NO DATA	3.58E-05
W 187	4.29E-07	2.54E-07	1.14E-07	NO DATA	NO DATA	NO DATA	3.57E-05
NP239	5.25E-09	3.77E-10	2.65E-10	NO DATA	1.09E-09	NO DATA	2.79E-05

* Data presented in this table is from Reference 1

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INGESTION DOSE FACTORS FOR INFANT *
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	ND DATA	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07
C 14	2.37E-05	5.06E-06	5.06E-06	5.06E-06	5.06E-06	5.06E-06	5.06E-06
NA 24	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05
P 32	1.70E-03	1.00E-04	6.59E-05	ND DATA	ND DATA	ND DATA	2.90E-05
CR 51	ND DATA	ND DATA	1.41E-08	9.20E-09	2.01E-09	1.79E-08	4.11E-07
MN 54	ND DATA	1.99E-05	4.51E-06	ND DATA	4.41E-06	ND DATA	7.31E-06
MN 56	ND DATA	8.18E-07	1.41E-07	ND DATA	7.03E-07	ND DATA	7.43E-05
FE 55	1.39E-05	8.98E-06	2.40E-06	ND DATA	ND DATA	4.39E-06	1.14E-06
FE 59	3.08E-05	5.58E-05	2.12E-05	ND DATA	ND DATA	1.59E-05	2.57E-05
CO 58	ND DATA	3.60E-06	8.93E-06	ND DATA	ND DATA	ND DATA	8.97E-06
CO 60	ND DATA	1.08E-05	2.55E-05	ND DATA	ND DATA	ND DATA	2.57E-05
NI 63	6.34E-04	3.92E-05	2.70E-05	ND DATA	ND DATA	ND DATA	1.95E-06
NI 65	4.70E-06	5.32E-07	2.42E-07	ND DATA	ND DATA	ND DATA	4.05E-05
CU 64	ND DATA	6.09E-07	2.82E-07	ND DATA	1.03E-06	ND DATA	1.25E-05
ZN 65	1.94E-05	6.31E-05	2.91E-05	ND DATA	3.06E-05	ND DATA	5.33E-05
ZN 69	9.33E-08	1.68E-07	1.25E-08	ND DATA	6.98E-08	ND DATA	1.37E-05
BR 83	ND DATA	ND DATA	3.63E-07	ND DATA	ND DATA	ND DATA	LT E-24
BR 84	ND DATA	ND DATA	3.82E-07	ND DATA	ND DATA	ND DATA	LT E-24
BR 85	ND DATA	ND DATA	1.94E-08	ND DATA	ND DATA	ND DATA	LT E-24
RB 86	ND DATA	1.70E-04	8.40E-05	ND DATA	ND DATA	ND DATA	4.35E-06
RB 88	ND DATA	4.98E-07	2.73E-07	ND DATA	ND DATA	ND DATA	4.85E-07
RB 89	ND DATA	2.86E-07	1.97E-07	ND DATA	ND DATA	ND DATA	9.74E-08
SR 89	2.51E-03	ND DATA	7.20E-05	ND DATA	ND DATA	ND DATA	5.16E-05
SR 90	1.85E-02	ND DATA	4.71E-03	ND DATA	ND DATA	ND DATA	2.31E-04
SR 91	5.00E-05	ND DATA	1.81E-06	ND DATA	ND DATA	ND DATA	5.92E-05
SR 92	1.92E-05	ND DATA	7.13E-07	ND DATA	ND DATA	ND DATA	2.07E-04
Y 90	8.69E-08	ND DATA	2.33E-09	ND DATA	ND DATA	ND DATA	1.20E-04
Y 91M	8.10E-10	ND DATA	2.76E-11	ND DATA	ND DATA	ND DATA	2.70E-06
Y 91	1.13E-06	ND DATA	3.01E-08	ND DATA	ND DATA	ND DATA	8.10E-05
Y 92	7.65E-09	ND DATA	2.15E-10	ND DATA	ND DATA	ND DATA	1.46E-04

* Data presented in this table is from Reference 1

TABLE E-14, CONT'D

INGESTION DOSE FACTORS FOR INFANT *
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	2.43E-08	NO DATA	6.62E-10	NO DATA	NO DATA	NO DATA	1.92E-04
ZR 95	2.06E-07	5.02E-08	3.56E-08	NO DATA	5.41E-08	NO DATA	2.50E-05
ZR 97	1.48E-08	2.54E-09	1.16E-09	NO DATA	2.56E-09	NO DATA	1.62E-04
NB 95	4.20E-08	1.73E-08	1.03E-08	NO DATA	1.74E-08	NO DATA	1.46E-05
MO 99	NO DATA	3.40E-05	6.63E-06	NO DATA	5.08E-05	NO DATA	1.12E-05
TC 99M	1.92E-09	3.96E-09	5.10E-08	NO DATA	4.26E-08	2.07E-09	1.15E-06
TC101	2.27E-09	2.86E-09	2.83E-08	NO DATA	3.40E-08	1.56E-09	4.86E-07
RU103	1.48E-06	NO DATA	4.95E-07	NO DATA	3.08E-06	NO DATA	1.80E-05
RU105	1.36E-07	NO DATA	4.58E-08	NO DATA	1.00E-06	NO DATA	5.41E-05
RU106	2.41E-05	NO DATA	3.01E-06	NO DATA	2.85E-05	NO DATA	1.83E-04
AG110M	9.96E-07	7.27E-07	4.81E-07	NO DATA	1.04E-06	NO DATA	3.77E-05
TE125M	2.33E-05	7.79E-06	3.15E-06	7.84E-06	NO DATA	NO DATA	1.11E-05
TE127M	5.85E-05	1.94E-05	7.08E-06	1.69E-05	1.44E-04	NO DATA	2.36E-05
TE127	1.00E-06	3.35E-07	2.15E-07	8.14E-07	2.44E-06	NO DATA	2.10E-05
TE129M	1.00E-04	3.43E-05	1.54E-05	3.84E-05	2.50E-04	NO DATA	5.97E-05
TE129	2.84E-07	9.79E-08	6.63E-08	2.38E-07	7.07E-07	NO DATA	2.27E-05
TE131M	1.52E-05	6.12E-06	5.05E-06	1.24E-05	4.21E-05	NO DATA	1.03E-04
TE131	1.76E-07	6.50E-08	4.94E-08	1.57E-07	4.50E-07	NO DATA	7.11E-06
TE132	2.08E-05	1.03E-05	9.61E-06	1.52E-05	6.44E-05	NO DATA	3.81E-05
I 130	6.00E-06	1.32E-05	5.30E-06	1.48E-03	1.45E-05	NO DATA	2.83E-06
I 131	3.59E-05	4.23E-05	1.86E-05	1.39E-02	4.94E-05	NO DATA	1.51E-06
I 132	1.66E-06	3.37E-06	1.20E-06	1.58E-04	3.76E-06	NO DATA	2.73E-06
I 133	1.25E-05	1.82E-05	5.33E-06	3.31E-03	2.14E-05	NO DATA	3.08E-06
I 134	8.69E-07	1.78E-06	6.33E-07	4.15E-05	1.99E-06	NO DATA	1.[illegible]E-06
I 135	3.64E-06	7.24E-06	2.64E-06	6.49E-04	8.07E-06	NO DATA	2.62E-06
CS134	3.77E-04	7.03E-04	7.10E-05	NO DATA	1.81E-04	7.42E-05	1.91E-06
CS136	4.59E-05	1.35E-04	5.04E-05	NO DATA	5.38E-05	1.10E-05	2.05E-06
CS137	5.22E-04	6.11E-04	4.33E-05	NO DATA	1.64E-04	6.64E-05	1.91E-06
CS138	4.81E-07	7.82E-07	3.79E-07	NO DATA	3.90E-07	6.09E-08	1.25E-06
BA139	8.81E-07	5.84E-10	2.55E-08	NO DATA	3.51E-10	3.54E-10	5.58E-05

* Data presented in this table is from Reference 1

TABLE E-14, CONT'D

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INGESTION DOSE FACTORS FOR INFANT*
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	1.71E-04	1.71E-07	8.81E-06	NO DATA	4.06E-08	1.05E-07	4.20E-05
BA141	4.25E-07	2.91E-10	1.34E-08	NO DATA	1.75E-10	1.77E-10	5.19E-06
BA142	1.84E-07	1.53E-10	9.06E-09	NO DATA	8.81E-11	9.26E-11	7.59E-07
LA140	2.11E-08	8.32E-09	2.14E-09	NO DATA	NO DATA	NO DATA	9.77E-05
LA142	1.10E-09	4.04E-10	9.67E-11	NO DATA	NO DATA	NO DATA	6.86E-05
CE141	7.87E-08	4.80E-08	5.65E-09	NO DATA	1.48E-09	NO DATA	2.48E-05
CE143	1.48E-08	9.82E-06	1.12E-09	NO DATA	2.96E-09	NO DATA	5.73E-05
CE144	2.98E-06	1.22E-06	1.67E-07	NO DATA	4.93E-07	NO DATA	1.71E-04
PR143	8.13E-08	3.64E-08	4.03E-09	NO DATA	1.13E-08	NO DATA	4.29E-05
PR144	2.74E-10	1.06E-10	1.38E-11	NO DATA	3.84E-11	NO DATA	4.93E-06
ND147	5.53E-08	5.68E-08	3.48E-09	NO DATA	2.19E-08	NO DATA	3.60E-05
W 187	9.03E-07	6.26E-07	2.17E-07	NO DATA	NO DATA	NO DATA	3.69E-05
NP239	1.11E-08	9.93E-10	5.61E-10	NO DATA	1.98E-09	NO DATA	2.87E-05

* Data presented in this table is from Reference 1.

TABLE E-15

RECOMMENDED VALUES FOR GASEOUS EFFLUENTS*

Parameter		Values
S	is the attenuation factor that accounts for the shielding provided by residential structures	0.7 (maximum individual) 0.5 (average indiv.) 1.0 (noble gas-gamma instantaneous dose)
t_e	is the time period that crops are exposured to contamination during growing season	
	i) for forage ingested by animals	720 hrs (30 days, for for pasture grass) 1440 hr (60 days for stored feed)**
	ii) for crops ingested by man	1440 hrs (60 days)
t_f	is the average transport time of activity from the feed into the milk and to the receptor	48 hr (2 days, maximum individual 96 hr (4 days, average individual)
t_h	Time delay between harvest of vegetation or crops and ingestion	
	i) for forage ingested by animals	Zero (for pasture grass) 2160 hr (90 days for stored feed)
	ii) for crops ingested by man	24 hr (1 day, for leafy vegetables & max. individual) 1440 hr (60 days, for produce & max. individual) 336 hr (14 days, for average individual)

* All data presented from this table are from Reference 1, unless otherwise indicated.

** From Reference 2.

TABLE E-15

RECOMMENDED VALUES FOR GASEOUS EFFLUENTS*

Parameter		Values
Y_v	Agricultural productivity by unit area (measured in wet weight)	
	i) for forage ingested by animals	0.42 kg/m^2 (for pasture grass)** 2.5 kg/m^2 (for stored feed)**
	ii) for crops ingested by man	2.0 kg/m^2

* All data presented from this table are from Reference 1, unless otherwise indicated.

** From Reference 2.

APPENDIX B

DEFINITION OF LOWER LIMIT OF DETECTION

APPENDIX B

Definition of Lower Limit of Detection

a. The LLD is defined for purposes of these specifications as the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a gross activity measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 \cdot s_b}{E \times V \times 2.22 \times 10^6 \times Y \ e^{-\lambda t}}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume),

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute) defined as $\sqrt{\frac{B}{T}}$,

B is the average background count rate (as counts per minute),

T is the total time of the background (in minutes),

E is the counting efficiency (as counts per disintegration),

V is the sample size (in units of mass or volume),

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

t for plant effluents is the elapsed time between the midpoint of sample collection and time of counting.

Typical values of E, V, Y, and t should be used in the calculation.

10CFR50.36a(a)(2),
PNPS TS Section 6.9.C.1,
Reg. Guide 1.21

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Document Control Desk
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SEMI-ANNUAL RADIOACTIVE EFFLUENT AND
WASTE DISPOSAL REPORT FOR THE PERIOD
JANUARY 1 THROUGH JUNE 30, 1988

In accordance with the requirements of 10CFR50.36a(a)(2), Pilgrim Nuclear Power Station Technical Specification Section 6.9.C.1, and Regulatory Guide 1.21, the Boston Edison Company submits the Semi-Annual Radioactive Effluent and Waste Disposal Report for the period of January 1 through June 30, 1988.

R. G. Bird

RPH/jcp/2415

Attachments

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