



Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
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May 10, 2005

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No. 50-293
License No. DPR-35

Radioactive Effluent Release Report
for January 1 through December 31, 2004

LETTER NUMBER: 2.05.035

Dear Sir or Madam:

In accordance with Pilgrim Technical Specifications 5.6.3, Entergy Nuclear Operations, Inc. submits the attached Annual Radiological Effluent and Waste Disposal Report for January 1 through December 31, 2004.

Should you have questions or require additional information, I can be contacted at (508) 830-8403.

This letter contains no commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "Bryan Ford", written over a horizontal line.

Bryan Ford

WGL/dm

Attachment: Pilgrim Nuclear Power Station Radiological Effluent and Waste Disposal Report,
January 1 through December 31, 2004

cc: U.S. Nuclear Regulatory Commission
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King of Prussia, PA 19406

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PILGRIM NUCLEAR POWER STATION

Facility Operating License DPR-35

Radiological Effluent and Waste Disposal Report

January 1 through December 31, 2004





**PILGRIM NUCLEAR POWER STATION
Facility Operating License DPR-35**

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT

JANUARY 01 THROUGH DECEMBER 31, 2004

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Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
January-December 2004

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Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
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EXECUTIVE SUMMARY

PILGRIM NUCLEAR POWER STATION RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT INCLUDING METEOROLOGICAL DATA JANUARY 01 THROUGH DECEMBER 31, 2004

INTRODUCTION

This report quantifies the radioactive gaseous, liquid, and radwaste releases, and summarizes the local meteorological data for the period from January 01 through December 31, 2004. This document has been prepared in accordance with the requirements set forth in the Pilgrim Nuclear Power Station (PNPS) Technical Specifications and Revision 1 of Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluents from Light Water Cooled Nuclear Power Plants".

The quantity of radioactive material released from PNPS was determined from sample analyses and continuous on-line monitoring of gaseous releases from the main stack, reactor building vent, turbine building, and various decontamination facilities, and liquid releases into the discharge canal.

The quantity and volume of radioactive waste shipped offsite from PNPS for processing and burial were determined from data contained on the radwaste shipping documentation. The meteorological data were obtained from monitoring instruments located on the 220-foot meteorological tower located at Pilgrim Station.

GASEOUS EFFLUENTS

Gaseous radioactive releases for the reporting period are quantified in Tables 2.2-A, 2.2-B, and 2.2-C. Radioactive noble gases released during the period totaled 55 Curies. Releases of radioactive iodines and particulates with half-life of greater than 8 days totaled 0.009 Curies, and tritium releases totaled 281 Curies. No gross alpha radioactivity was detected in gaseous effluents.

Noble gases released in gaseous effluents resulted in a maximum total body dose of 0.020 mrem, with a corresponding skin dose of 0.27 mrem. The release of radioactivity in gaseous effluents from PNPS during 2004 resulted in a total body dose to the maximum-exposed hypothetical individual of about 1.8 mrem from radioactive particulates, iodines, and tritium. The maximum hypothetical dose to any organ from radioactive particulates, iodines, and tritium was about 1.9 mrem. All of these maximum doses occurred to a hypothetical individual located on property under Entergy control. The maximum, hypothetical total body dose from the combined release of radioactivity in gaseous effluents was 1.8 mrem.

The maximum individual doses from gaseous radioactive effluents were compared to the applicable ODCM dose limits. Noble gas doses were less than 1.6% of the corresponding 10CFR50 dose objectives. Maximum doses resulting from releases of particulates, iodines, and tritium in gaseous effluents were less than 13% of corresponding 10CFR50 objectives.

LIQUID EFFLUENTS

Liquid radioactive releases for the reporting period are quantified in Tables 2.3-A and 2.3-B. No liquid effluents containing radioactivity were discharged during calendar year 2004.

METEOROLOGICAL DATA

Meteorological joint frequency distributions are listed in Appendix A. During the course of 2004, numerous problems were encountered with meteorological sensors and translator card electronics. Data recovery for the entire annual period was about 76% for the 33-ft level, and 81% for the 220-ft level of the tower. The predominant wind direction was from the south-southwest, which occurred approximately 14% of the time during the reporting period. The predominant stability class was Class D, which occurred about 42% of the time during the reporting period.

OFFSITE AMBIENT RADIATION MEASUREMENTS

Ambient radiation exposure was evaluated to complete the assessment of radiological impact on humans. A small number of thermoluminescent dosimeters (TLDs) indicated an elevation in ambient radiation exposure on Entergy property in close proximity to the station, when compared to background levels in the region. This elevation is due to nitrogen-16 contained within the plant steam system, as opposed to radioactive effluent released from the plant. The dose to the maximum-exposed member of the National Guard, who are considered members of the public even though they are within the owner-controlled area, was estimated as being about 21 mrem during 2004. There was no measurable increase during 2004 in ambient radiation measurements at the location of the nearest resident to PNPS.

COMBINED DOSE IMPACT

The collective total body dose to a maximum-exposed hypothetical member of the public from radioactive gases, liquids, and ambient radiation exposure resulting from PNPS operation during 2004 was calculated as being 4.1 mrem. This amount is less than 2% of the typical dose of 300 to 400 mrem received each year by an average person from other sources of natural and man-made radiation. Although this calculated collective dose occurs to a maximum-exposed hypothetical individual, it is also well below the NRC dose limit of 100 mrem/yr specified in 10CFR20.1301, as well as the EPA dose limit of 25 mrem/yr specified in 40CFR190. Both of these limits are to be applied to real members of the general public, so the fact that the dose to the hypothetical maximum-exposed individual is within the limits ensures that any dose received by a real member of the public would be smaller and well within any applicable limit.

RADIOACTIVE SOLID WASTE DISPOSAL

Solid radioactive wastes shipped offsite for processing and disposal during the reporting period are described in Table 7.0. Approximately 539 cubic meters of solid waste, containing 1785 Curies of radioactivity, were shipped during the reporting period.

CONCLUSION

The PNPS Offsite Dose Calculation Manual contains effluent controls to limit doses resulting from releases of radioactivity to the environment. None of the effluent controls associated with liquid or gaseous effluents were exceeded during the reporting period, as confirmed by conservative dose assessments performed at weekly and monthly intervals. Conformance to the PNPS ODCM effluent control limits ensures that releases of radioactivity in liquid and gaseous effluents are kept as low as reasonably achievable in accordance with 10 CFR Part 50, Appendix I. Compliance with the ODCM also demonstrates that requirements of the Environmental Protection Agency's nuclear fuel cycle standard, 40CFR190.10, Subpart B, have been met. Based on the dose assessment results for 2004, there was no significant radiological impact on the general public from PNPS operation.

2.0 RADIOACTIVE EFFLUENT DATA

Radioactive gaseous and liquid releases for the reporting period are given in the standard format presented in Tables 1A, 1B, 1C, 2A, 2B, and Supplemental Information table from NRC Regulatory Guide 1.21 (Reference 1) format.

2.1 Supplemental Effluent Release Data

Supplemental information related to radioactive gaseous and liquid releases for the reporting period are given in the standard NRC Regulatory Guide 1.21 format in Table 2.1.

2.2 Gaseous Effluent Data

Gaseous radioactivity is released from Pilgrim Station to the atmosphere from the main stack, reactor building vent, turbine building, and various decontamination facilities. Combined gaseous effluent releases from all release points are summarized in Table 2.2-A. No alpha activity was detected on any of the particulate filters collected during the reporting period. The total gaseous releases for various categories of radionuclides, as well as the corresponding average release rates, can be summarized as follows:

- Noble gases: 54.7 Ci, 1.73 μ Ci/sec
- Particulates and iodines with half-life greater than 8 days 0.009 Ci, 0.000285 μ Ci/sec
- Tritium: 281 Ci, 8.89 μ Ci/sec

Effluent releases from the main stack are detailed in Table 2.2-B. The main stack is 335 feet tall, and represents an elevated release point with a total height of approximately 400 feet above sea level. The main stack is located about 700 feet west-northwest of the reactor building.

Ground-level effluent releases are detailed in Table 2.2-C. Data in this table include releases from the reactor building vent, turbine building, and assorted equipment decontamination facilities (e.g., hot machine shop, carbon dioxide pellet decon trailer, plastic media decon trailer, etc.) used during the period. Due to the close proximity of the reactor building, both of these release points are considered to be mixed-mode/ground level release points.

2.3 Liquid Effluent Data

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

Liquid effluent releases are summarized in Table 2.3-A. Detailed breakdowns for individual radionuclides are listed in Table 2.3-B. There were no discharges of liquid effluents containing radioactivity during the calendar year of 2004. Total releases for the various categories of radionuclides, as well as their corresponding mean concentrations, can be summarized as follows:

- Total Effluent Volume: 0 Liters
- Total Dilution Volume: 0 Liters
- Fission/Activation products: 0 Ci, 0 μ Ci/mL
- Tritium: 0 Ci, 0 μ Ci/mL
- Dissolved/entrained noble gases: 0 Ci, 0 μ Ci/mL

Table 2.1
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Supplemental Information
January-December 2004

FACILITY: PILGRIM NUCLEAR POWER STATION

LICENSE: DPR-35

1. <u>REGULATORY LIMITS</u>						
a. Fission and activation gases:		500 mrem/yr total body and 3000 mrem/yr for skin at site boundary				
b,c. Iodines, particulates with half-life: >8 days, tritium		1500 mrem/yr to any organ at site boundary				
d. Liquid effluents:		0.06 mrem/month for whole body and 0.2 mrem/month for any organ (without radwaste treatment)				
2. <u>EFFLUENT CONCENTRATION LIMITS</u>						
a. Fission and activation gases:		10CFR20 Appendix B Table II				
b. Iodines:		10CFR20 Appendix B Table II				
c. Particulates with half-life > 8 days:		10CFR20 Appendix B Table II				
d. Liquid effluents:		2E-04 µCi/mL for entrained noble gases; 10CFR20 Appendix B Table II values for all other radionuclides				
3. <u>AVERAGE ENERGY</u>		Not Applicable				
4. <u>MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY</u>						
a. Fission and activation gases:		High purity germanium gamma spectroscopy for all gamma emitters; radiochemistry analysis for H-3, Fe-55 (liquid effluents), Sr-89, and Sr-90				
b. Iodines:						
c. Particulates:						
d. Liquid effluents:						
5. <u>BATCH RELEASES</u>	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004	
a. Liquid Effluents						
1. Total number of releases:	0	0	0	0	0	
2. Total time period (minutes):	0	0	0	0	0	
3. Maximum time period (minutes):	0	0	0	0	0	
4. Average time period (minutes):	0	0	0	0	0	
5. Minimum time period (minutes):	0	0	0	0	0	
6. Average stream flow during periods of release of effluents into a flowing stream (Liters/min):	0	0	0	0	0	
b. Gaseous Effluents	None	None	None	None	None	
6. <u>ABNORMAL RELEASES</u>						
a. Liquid Effluents	None	None	None	None	None	
b. Gaseous Effluents	None	None	None	None	None	

Table 2.2-A
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Summation of All Releases
January-December 2004

RELEASE PERIOD	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004	Est. Total Error
A. FISSION AND ACTIVATION GASES						
Total Release: Ci	2.94E+01	8.01E+00	8.34E+00	8.91E+00	5.47E+01	±22%
Average Release Rate: μCi/sec	3.74E+00	1.02E+00	1.05E+00	1.12E+00	1.73E+00	
Percent of Effluent Control Limit*	*	*	*	*	*	
B. IODINE-131						
Total Iodine-131 Release: Ci	2.58E-04	3.09E-04	3.17E-04	2.82E-04	1.17E-03	±20%
Average Release Rate: μCi/sec	3.29E-05	3.93E-05	3.99E-05	3.55E-05	3.69E-05	
Percent of Effluent Control Limit*	*	*	*	*	*	
C. PARTICULATES WITH HALF-LIVES > 8 DAYS						
Total Release: Ci	1.91E-04	1.10E-04	1.20E-04	8.05E-05	5.02E-04	±21%
Average Release Rate: μCi/sec	2.42E-05	1.40E-05	1.51E-05	1.01E-05	1.59E-05	
Percent of Effluent Control Limit*	*	*	*	*	*	
Gross Alpha Radioactivity: Ci	NDA	NDA	NDA	NDA	NDA	
D. TRITIUM						
Total Release: Ci	8.41E+01	5.72E+01	6.30E+01	7.69E+01	2.81E+02	±20%
Average Release Rate: μCi/sec	1.07E+01	7.28E+00	7.93E+00	9.67E+00	8.89E+00	
Percent of Effluent Control Limit*	*	*	*	*	*	

Notes for Table 2.2-A:

* Percent of Effluent Control Limit values based on dose assessments are provided in Section 7 of this report.

1. NDA stands for No Detectable Activity.
2. LLD for airborne gross alpha activity listed as NDA is 1E-11 µCi/cc.

Table 2.2-B
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents – Elevated Release
January-December 2004

CONTINUOUS MODE RELEASES FROM ELEVATED RELEASE POINT					
Nuclide Released	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004
1. FISSION AND ACTIVATION GASES: CI					
Ar-41	1.07E-01	NDA	NDA	NDA	1.07E-01
Kr-85	NDA	NDA	NDA	NDA	NDA
Kr-85m	2.35E+00	2.09E+00	2.03E+00	2.08E+00	8.55E+00
Kr-87	1.62E+00	NDA	NDA	NDA	1.62E+00
Kr-88	1.58E+00	NDA	NDA	NDA	1.58E+00
Xe-131m	NDA	NDA	NDA	NDA	NDA
Xe-133	3.06E+00	2.73E+00	3.09E+00	3.30E+00	1.22E+01
Xe-133m	NDA	NDA	NDA	NDA	NDA
Xe-135	3.39E+00	3.07E-02	1.44E-01	2.40E-01	3.80E+00
Xe-135m	3.07E+00	NDA	NDA	NDA	3.07E+00
Xe-137	NDA	NDA	NDA	NDA	NDA
Xe-138	7.13E+00	NDA	NDA	NDA	7.13E+00
Total for Period	2.23E+01	4.84E+00	5.27E+00	5.62E+00	3.80E+01
2. IODINES: CI					
I-131	1.53E-04	1.39E-04	1.09E-04	8.31E-05	4.84E-04
I-133	9.81E-04	1.03E-03	7.20E-04	6.18E-04	3.35E-03
Total for Period	1.13E-03	1.17E-03	8.29E-04	7.01E-04	3.83E-03
3. PARTICULATES WITH HALF-LIVES > 8 DAYS: CI					
Mn-54	NDA	NDA	NDA	NDA	NDA
Co-60	NDA	NDA	NDA	NDA	NDA
Zn-65	NDA	NDA	NDA	NDA	NDA
Sr-89	1.12E-04	0.00E+00	0.00E+00	0.00E+00	1.12E-04
Sr-90	NDA	NDA	NDA	NDA	NDA
Cs-137	NDA	NDA	NDA	NDA	NDA
Ba/La-140	NDA	NDA	NDA	NDA	NDA
Total for Period	1.12E-04	0.00E+00	0.00E+00	0.00E+00	1.12E-04
4. TRITIUM: CI					
H-3	2.91E+00	1.90E+00	2.52E+00	2.38E+00	9.71E+00

Notes for Table 2.2-B:

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLDs for airborne radionuclides listed as NDA are as follows:
Fission Gases: 1E-04 µCi/cc
Iodines: 1E-12 µCi/cc
Particulates: 1E-11 µCi/cc

Table 2.2-B (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents – Elevated Release
January-December 2004

BATCH MODE RELEASES FROM ELEVATED RELEASE POINT					
Nuclide Released	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004
1. FISSION AND ACTIVATION GASES: CI					
Ar-41	N/A	N/A	N/A	N/A	N/A
Kr-85	N/A	N/A	N/A	N/A	N/A
Kr-85m	N/A	N/A	N/A	N/A	N/A
Kr-87	N/A	N/A	N/A	N/A	N/A
Kr-88	N/A	N/A	N/A	N/A	N/A
Xe-131m	N/A	N/A	N/A	N/A	N/A
Xe-133	N/A	N/A	N/A	N/A	N/A
Xe-133m	N/A	N/A	N/A	N/A	N/A
Xe-135	N/A	N/A	N/A	N/A	N/A
Xe-135m	N/A	N/A	N/A	N/A	N/A
Xe-137	N/A	N/A	N/A	N/A	N/A
Xe-138	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
2. IODINES: CI					
I-131	N/A	N/A	N/A	N/A	N/A
I-133	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
3. PARTICULATES WITH HALF-LIVES > 8 DAYS: CI					
Mn-54	N/A	N/A	N/A	N/A	N/A
Co-60	N/A	N/A	N/A	N/A	N/A
Sr-89	N/A	N/A	N/A	N/A	N/A
Sr-90	N/A	N/A	N/A	N/A	N/A
Cs-137	N/A	N/A	N/A	N/A	N/A
Ba/La-140	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
4. TRITIUM: CI					
H-3	N/A	N/A	N/A	N/A	N/A

Notes for Table 2.2-B:

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLDs for airborne radionuclides listed as NDA are as follows:
Fission Gases: 1E-04 $\mu\text{Ci/cc}$
Iodines: 1E-12 $\mu\text{Ci/cc}$
Particulates: 1E-11 $\mu\text{Ci/cc}$

Table 2.2-C
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents – Ground-Level Release
January-December 2004

CONTINUOUS MODE RELEASES FROM GROUND-LEVEL RELEASE POINT					
Nuclide Released	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004
1. FISSION AND ACTIVATION GASES: CI					
Ar-41	NDA	NDA	NDA	NDA	NDA
Kr-85	NDA	NDA	NDA	NDA	NDA
Kr-85m	NDA	5.71E-01	NDA	NDA	5.71E-01
Kr-87	NDA	NDA	NDA	NDA	NDA
Kr-88	NDA	NDA	NDA	NDA	NDA
Xe-131m	NDA	NDA	NDA	NDA	NDA
Xe-133	NDA	NDA	NDA	NDA	NDA
Xe-133m	NDA	NDA	NDA	NDA	NDA
Xe-135	4.30E+00	2.60E+00	3.08E+00	3.29E+00	1.33E+01
Xe-135m	2.81E+00	NDA	NDA	NDA	2.81E+00
Xe-137	NDA	NDA	NDA	NDA	NDA
Xe-138	NDA	NDA	NDA	NDA	NDA
Total for period	7.11E+00	3.17E+00	3.08E+00	3.29E+00	1.67E+01
2. IODINES: CI					
I-131	1.05E-04	1.70E-04	2.09E-04	1.99E-04	6.83E-04
I-133	8.44E-04	8.77E-04	1.11E-03	1.16E-03	3.99E-03
Total for period	9.49E-04	1.05E-03	1.32E-03	1.36E-03	4.67E-03
3. PARTICULATES WITH HALF-LIVES > 8 DAYS: CI					
Mn-54	NDA	NDA	NDA	NDA	NDA
Co-60	NDA	NDA	NDA	NDA	NDA
Zn-65	NDA	NDA	NDA	NDA	NDA
Sr-89	7.86E-05	1.10E-04	1.20E-04	8.05E-05	3.90E-04
Sr-90	NDA	NDA	NDA	NDA	NDA
Cs-137	NDA	NDA	NDA	NDA	NDA
Ba/La-140	NDA	NDA	NDA	NDA	NDA
Total for period	7.86E-05	1.10E-04	1.20E-04	8.05E-05	3.90E-04
4. TRITIUM: CI					
H-3	8.12E+01	5.53E+01	6.05E+01	7.45E+01	2.72E+02

Notes for Table 2.2-C:

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLDs for airborne radionuclides listed as NDA are as follows:
Fission Gases: 1E-04 $\mu\text{Ci/cc}$
Iodines: 1E-12 $\mu\text{Ci/cc}$
Particulates: 1E-11 $\mu\text{Ci/cc}$

Table 2.2-C (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents – Ground-Level Release
January-December 2004

BATCH MODE RELEASES FROM GROUND-LEVEL RELEASE POINT					
Nuclide Released	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004
1. FISSION AND ACTIVATION GASES: CI					
Ar-41	N/A	N/A	N/A	N/A	N/A
Kr-85	N/A	N/A	N/A	N/A	N/A
Kr-85m	N/A	N/A	N/A	N/A	N/A
Kr-87	N/A	N/A	N/A	N/A	N/A
Kr-88	N/A	N/A	N/A	N/A	N/A
Xe-131m	N/A	N/A	N/A	N/A	N/A
Xe-133	N/A	N/A	N/A	N/A	N/A
Xe-133m	N/A	N/A	N/A	N/A	N/A
Xe-135	N/A	N/A	N/A	N/A	N/A
Xe-135m	N/A	N/A	N/A	N/A	N/A
Xe-137	N/A	N/A	N/A	N/A	N/A
Xe-138	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
2. IODINES: CI					
I-131	N/A	N/A	N/A	N/A	N/A
I-133	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
3. PARTICULATES WITH HALF-LIVES > 8 DAYS: CI					
Mn-54	N/A	N/A	N/A	N/A	N/A
Co-60	N/A	N/A	N/A	N/A	N/A
Sr-89	N/A	N/A	N/A	N/A	N/A
Sr-90	N/A	N/A	N/A	N/A	N/A
Cs-137	N/A	N/A	N/A	N/A	N/A
Ba/La-140	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
4. TRITIUM: CI					
H-3	N/A	N/A	N/A	N/A	N/A

Notes for Table 2.2-C:

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLDs for airborne radionuclides listed as NDA are as follows:
Fission Gases: 1E-04 $\mu\text{Ci/cc}$
Iodines: 1E-12 $\mu\text{Ci/cc}$
Particulates: 1E-11 $\mu\text{Ci/cc}$

Table 2.3-A
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Liquid Effluents - Summation of All Releases
January-December 2004

RELEASE PERIOD	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004	Est. Total Error
A. FISSION AND ACTIVATION PRODUCTS						
Total Release (not including tritium, gases, alpha): Ci	N/A	N/A	N/A	N/A	N/A	N/A
Average Diluted Concentration During Period: $\mu\text{Ci/mL}$	N/A	N/A	N/A	N/A	N/A	
Percent of Effluent Concentration Limit*	N/A	N/A	N/A	N/A	N/A	
B. TRITIUM						
Total Release: Ci	N/A	N/A	N/A	N/A	N/A	N/A
Average Diluted Concentration During Period: $\mu\text{Ci/mL}$	N/A	N/A	N/A	N/A	N/A	
Percent of Effluent Concentration Limit*	N/A	N/A	N/A	N/A	N/A	
C. DISSOLVED AND ENTRAINED GASES						
Total Release: Ci	N/A	N/A	N/A	N/A	N/A	N/A
Average Diluted Concentration During Period: $\mu\text{Ci/mL}$	N/A	N/A	N/A	N/A	N/A	
Percent of Effluent Concentration Limit*	N/A	N/A	N/A	N/A	N/A	
D. GROSS ALPHA RADIOACTIVITY						
Total Release: Ci	N/A	N/A	N/A	N/A	N/A	N/A
E. VOLUME OF WASTE RELEASED PRIOR TO DILUTION						
Waste Volume: Liters	N/A	N/A	N/A	N/A	N/A	N/A
F. VOLUME OF DILUTION WATER USED DURING PERIOD						
Dilution Volume: Liters	N/A	N/A	N/A	N/A	N/A	N/A

Notes for Table 2.3-A:

* Additional percent of Effluent Control Limit values based on dose assessments are provided in Section 7 of this report.

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLD for dissolved and entrained gases listed as NDA is $1\text{E-}05 \mu\text{Ci/mL}$.
4. LLD for liquid gross alpha activity listed as NDA is $1\text{E-}07 \mu\text{Ci/mL}$.

Table 2.3-B
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Liquid Effluents
January-December 2004

CONTINUOUS MODE RELEASES					
Nuclide Released	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004
1. FISSION AND ACTIVATION PRODUCTS: CI					
Cr-51	N/A	N/A	N/A	N/A	N/A
Mn-54	N/A	N/A	N/A	N/A	N/A
Fe-55	N/A	N/A	N/A	N/A	N/A
Fe-59	N/A	N/A	N/A	N/A	N/A
Co-58	N/A	N/A	N/A	N/A	N/A
Co-60	N/A	N/A	N/A	N/A	N/A
Zn-65	N/A	N/A	N/A	N/A	N/A
Zn-69m	N/A	N/A	N/A	N/A	N/A
Sr-89	N/A	N/A	N/A	N/A	N/A
Sr-90	N/A	N/A	N/A	N/A	N/A
Zr/Nb-95	N/A	N/A	N/A	N/A	N/A
Mo/Tc-99	N/A	N/A	N/A	N/A	N/A
Ag-110m	N/A	N/A	N/A	N/A	N/A
Sb-124	N/A	N/A	N/A	N/A	N/A
I-131	N/A	N/A	N/A	N/A	N/A
I-133	N/A	N/A	N/A	N/A	N/A
Cs-134	N/A	N/A	N/A	N/A	N/A
Cs-137	N/A	N/A	N/A	N/A	N/A
Ba/La-140	N/A	N/A	N/A	N/A	N/A
Ce-141	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
2. DISSOLVED AND ENTRAINED GASES: CI					
Xe-133	N/A	N/A	N/A	N/A	N/A
Xe-135	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A

Notes for Table 2.3-B:

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLDs for liquid radionuclides listed as NDA are as follows:

Strontium:	5E-08 $\mu\text{Ci/mL}$
Iodines:	1E-06 $\mu\text{Ci/mL}$
Noble Gases:	1E-05 $\mu\text{Ci/mL}$
All Others:	5E-07 $\mu\text{Ci/mL}$

Table 2.3-B (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Liquid Effluents
January-December 2004

BATCH MODE RELEASES					
Nuclide Released	Jan-Mar 2004	Apr-Jun 2004	Jul-Sep 2004	Oct-Dec 2004	Jan-Dec 2004
1. FISSION AND ACTIVATION PRODUCTS: CI					
Cr-51	N/A	N/A	N/A	N/A	N/A
Mn-54	N/A	N/A	N/A	N/A	N/A
Fe-55	N/A	N/A	N/A	N/A	N/A
Fe-59	N/A	N/A	N/A	N/A	N/A
Co-58	N/A	N/A	N/A	N/A	N/A
Co-60	N/A	N/A	N/A	N/A	N/A
Zn-65	N/A	N/A	N/A	N/A	N/A
Zn-69m	N/A	N/A	N/A	N/A	N/A
Sr-89	N/A	N/A	N/A	N/A	N/A
Sr-90	N/A	N/A	N/A	N/A	N/A
Zr/Nb-95	N/A	N/A	N/A	N/A	N/A
Mo/Tc-99	N/A	N/A	N/A	N/A	N/A
Ag-110m	N/A	N/A	N/A	N/A	N/A
Sb-124	N/A	N/A	N/A	N/A	N/A
I-131	N/A	N/A	N/A	N/A	N/A
I-133	N/A	N/A	N/A	N/A	N/A
Cs-134	N/A	N/A	N/A	N/A	N/A
Cs-137	N/A	N/A	N/A	N/A	N/A
Ba/La-140	N/A	N/A	N/A	N/A	N/A
Ce-141	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A
2. DISSOLVED AND ENTRAINED GASES: CI					
Xe-133	N/A	N/A	N/A	N/A	N/A
Xe-135	N/A	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A	N/A

Notes for Table 2.3-B:

1. N/A stands for not applicable.
2. NDA stands for No Detectable Activity.
3. LLDs for liquid radionuclides listed as NDA are as follows:
Strontium: 5E-08 $\mu\text{Ci/mL}$
Iodines: 1E-06 $\mu\text{Ci/mL}$
Noble Gases: 1E-05 $\mu\text{Ci/mL}$
All Others: 5E-07 $\mu\text{Ci/mL}$

3.0 METEOROLOGICAL DATA

Meteorological data are summarized for the reporting period in Appendix A, in the standard joint frequency distribution format as given in NRC Regulatory Guide 1.21.

The predominant meteorological conditions observed during the annual reporting period can be summarized with their corresponding frequencies as follows:

- Stability Class: Class D, 42%
- Wind Direction (from): South-southwest, 14%
- 33-ft Wind Speed: 4-7 mph, 53%
- 220-ft Wind Speed: 13-18 mph, 36%

There were a number of instances when data collection from the 220-ft meteorological tower was not continuous. During the course of 2004, numerous problems were encountered with meteorological sensors and translator card electronics. Data recovery for the entire annual period was about 76% for the 33-ft level, and 81% for the 220-ft level of the tower. These data recovery values are well below the NRC's recommended annual recovery goal of 90%. Steps have been taken to perform backups of the database computer, as well as performing qualitative data screening on a weekly basis to identify malfunctioning sensors and facilitate more timely repairs. A detailed engineering design plan is being implemented to upgrade meteorological instrumentation to increase reliability and data recovery.

4.0 MAXIMUM INDIVIDUAL DOSES

Doses to the maximum exposed individual resulting from radionuclides in effluents released offsite were calculated using methods presented in the PNPS Offsite Dose Calculation Manual (ODCM, Reference 2), NRC Regulatory Guide 1.109 (Reference 3), NRC Regulatory Guide 1.111 (Reference 4), and the Pilgrim Station Unit 1 Appendix I Evaluation (Reference 5). Maximum individual doses are calculated separately for: (1) noble gases in gaseous effluents, (2) particulates, iodines, and tritium in gaseous effluents; and, (3) liquid effluents. Maximum consumption and use factors for various pathways from Table E-5 of the PNPS ODCM are used for calculating the doses to the maximum exposed individual.

Information related to liquid and gaseous effluent releases are summarized Section 2 of this report. These effluent release data were used as input to computer programs to calculate the resulting doses. PNPS ODCM methodologies were used to calculate the dose contributions to the various organs in each age class from major exposure pathways.

4.1 Doses From Noble Gas Releases

Gaseous effluent release data presented in Tables 2.2-A, 2.2-B, and 2.2-C from this effluent release report were used as input to a dose assessment computer program to calculate radiation doses. These data include gaseous releases from the PNPS main stack, reactor building vent, and turbine building roof exhausters. Meteorological data obtained from the PNPS 220-foot meteorological tower during the 10-year period from 1994 through 2003 were used as input to the "AEOLUS-3" computer program (Reference 6). This program was used to calculate the annual average atmospheric dispersion and deposition factors used in the dose assessment computer program to calculate maximum individual doses.

The maximum individual doses resulting from radioactive noble gases released in gaseous effluents are presented in Table 4.1 according to specific receptor locations. This table includes all noble gas doses for the individual calendar quarters and total calendar year.

Noble gases released in gaseous effluents from PNPS during 2004 resulted in a maximum total body dose of 0.020 mrem. The maximum skin dose was 0.27 mrem. Both of these doses occurred to a hypothetical individual, located at the shoreline approximately 0.10 kilometers NNE of the PNPS Reactor Building. These areas are under control of Entergy Nuclear. For the more "realistic" individuals at offsite locations, the maximum total body dose was 0.0013 mrem (nearest residence, 0.80 kilometers ESE from the Reactor Building), while the maximum skin dose was 0.0044 mrem (nearest residence, 0.80 kilometers ESE from the Reactor Building).

Table 4.1

Maximum Doses From Noble Gas Releases During 2004^(a)

Release Period	Gamma Air Dose (location)	Beta Air Dose (location)	Total Body Dose (location)	Skin Dose (location)
Jan-Mar	1.54E-02 (0.10 km NNE)	1.12E-01 (0.10 km NNE)	1.01E-02 (0.10 km NNE)	1.01E-01 (0.10 km NNE)
Apr-Jun	4.71E-03 (0.10 km NNE)	6.69E-02 (0.10 km NNE)	3.11E-03 (0.10 km NNE)	5.41E-02 (0.10 km NNE)
Jul-Sep	4.90E-03 (0.10 km NNE)	6.73E-02 (0.10 km NNE)	3.23E-03 (0.10 km NNE)	5.47E-02 (0.10 km NNE)
Oct-Dec	5.23E-03 (0.10 km NNE)	7.19E-02 (0.10 km NNE)	3.45E-03 (0.10 km NNE)	5.85E-02 (0.10 km NNE)
Jan-Dec	3.02E-02 (0.10 km NNE)	3.19E-01 (0.10 km NNE)	1.99E-02 (0.10 km NNE)	2.68E-01 (0.10 km NNE)

^(a) All directions and distances are with respect to the reactor building vent.

4.2 Doses From Gaseous Effluent Releases

Gaseous effluent release data presented in Tables 2.2-A, 2.2-B, and 2.2-C from this effluent release report were used as input to a dose assessment computer program to calculate radiation doses. These data include gaseous releases from the PNPS main stack, reactor building vent, and turbine building roof exhausters. Meteorological data obtained from the PNPS 220-foot meteorological tower during the 10-year period from 1994 through 2003 were used as input to the "AEOLUS-3" computer program (Reference 6). This program was used to calculate the annual average atmospheric dispersion and deposition factors used in the dose assessment computer program to calculate maximum individual doses.

The maximum individual doses resulting from radioactive particulates, iodines, and tritium released in gaseous effluents are presented in Tables 4.2-A through 4.2-E. These tables cover the individual calendar quarters and the total calendar year, respectively. Doses resulting from releases of noble gases are addressed independently in the PNPS ODCM. Therefore, none of these tables for maximum individual doses include any dose contribution from noble gases. The presentation and analysis of doses resulting from noble gases are addressed in Section 4.1 of this report.

Tables 4.2-A through 4.2-E summarize the maximum total body and organ doses for the adult, teen, child, and infant age classes resulting from the major gaseous exposure pathways. These tables present the dose data according to specific receptor location and the exposure pathways assumed to occur at that location. For example, the second column of the tables presents the information for the hypothetical maximum-exposed at the most restrictive site boundary location, where only inhalation and ground deposition exposure pathways are assumed to occur. Since this is a shoreline location controlled by Entergy, the other pathways of garden vegetable production, milk production, and meat production are assumed not to occur. Doses for other offsite locations not under Entergy control, where other exposure pathways can and do occur, are presented in subsequent columns of the tables, and represent the potential maximum doses to individuals at these locations.

Radioactivity released in gaseous effluents from PNPS during 2004 resulted in a maximum total body dose (teen age class) of 1.8 mrem. The maximum organ dose (teen age class, thyroid) was 1.9 mrem. Both of these doses occurred to hypothetical individuals at the shoreline 0.10 kilometers NNE of the PNPS Reactor Building, an area under Entergy control. For the more "realistic" individuals at offsite locations, the maximum total body dose was 0.098 mrem (child age class at nearest garden location, 0.87 kilometers SE from the Reactor Building), while the maximum organ dose was 0.11 mrem (child thyroid at nearest garden location, 0.87 kilometers SE from the Reactor Building, yielding vegetables).

Table 4.2-A

Maximum Individual Organ Dose at Receptor Location -- mrem
From Gaseous Release Period: Jan-Mar 2004

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NNE 0.10 km DI	Resident ESE 0.80 km DI	Garden SE 0.87 km DIV ³	Cow/Goat WSW 3.97 km DIVCG ³	Cow/Meat W 5.77 km DIVCM ³	Meat S 3.80 km DIVM ³
Age Class: Adult						
Bone	1.87E-03	2.47E-05	1.27E-03	1.25E-04	4.39E-05	9.36E-05
GI-LLI	5.20E-01	6.15E-03	1.87E-02	2.17E-03	8.07E-04	1.17E-03
Kidney	5.20E-01	6.14E-03	1.85E-02	2.16E-03	8.02E-04	1.16E-03
Liver	5.20E-01	6.14E-03	1.85E-02	2.16E-03	8.01E-04	1.16E-03
Lung	5.24E-01	6.18E-03	1.85E-02	2.15E-03	8.01E-04	1.16E-03
Thyroid	6.65E-01	7.74E-03	2.34E-02	5.66E-03	1.14E-03	1.65E-03
T.Body	5.19E-01	6.13E-03	1.85E-02	2.15E-03	8.02E-04	1.16E-03
Age Class: Teen						
Bone	2.50E-03	3.16E-05	1.96E-03	2.09E-04	6.72E-05	1.43E-04
GI-LLI	5.25E-01	6.20E-03	2.10E-02	2.60E-03	8.78E-04	1.27E-03
Kidney	5.25E-01	6.20E-03	2.08E-02	2.60E-03	8.72E-04	1.26E-03
Liver	5.25E-01	6.20E-03	2.08E-02	2.59E-03	8.71E-04	1.26E-03
Lung	5.32E-01	6.28E-03	2.08E-02	2.57E-03	8.71E-04	1.26E-03
Thyroid	7.12E-01	8.27E-03	2.54E-02	7.93E-03	1.25E-03	1.69E-03
T.Body	5.24E-01	6.19E-03	2.08E-02	2.58E-03	8.72E-04	1.26E-03
Age Class: Child						
Bone	3.29E-03	4.03E-05	4.67E-03	5.06E-04	1.59E-04	3.38E-04
GI-LLI	4.63E-01	5.47E-03	2.96E-02	3.86E-03	1.23E-03	1.78E-03
Kidney	4.64E-01	5.48E-03	2.94E-02	3.89E-03	1.23E-03	1.77E-03
Liver	4.63E-01	5.47E-03	2.94E-02	3.87E-03	1.23E-03	1.77E-03
Lung	4.70E-01	5.54E-03	2.94E-02	3.84E-03	1.23E-03	1.77E-03
Thyroid	6.93E-01	8.01E-03	3.61E-02	1.43E-02	1.87E-03	2.40E-03
T.Body	4.63E-01	5.47E-03	2.95E-02	3.87E-03	1.23E-03	1.78E-03
Age Class: Infant						
Bone	2.43E-03	3.08E-05	2.18E-05	4.52E-04	1.02E-05	1.49E-06
GI-LLI	2.66E-01	3.15E-03	2.24E-03	2.96E-03	1.43E-04	1.30E-04
Kidney	2.67E-01	3.16E-03	2.24E-03	3.04E-03	1.46E-04	1.30E-04
Liver	2.67E-01	3.16E-03	2.24E-03	3.02E-03	1.45E-04	1.30E-04
Lung	2.73E-01	3.22E-03	2.29E-03	2.95E-03	1.44E-04	1.32E-04
Thyroid	4.78E-01	5.49E-03	3.90E-03	2.74E-02	1.02E-03	2.38E-04
T.Body	2.66E-01	3.15E-03	2.24E-03	2.99E-03	1.44E-04	1.30E-04

¹ Distances are measured with respect to the reactor building vent.

² Pathway designations are as follows:

D = Deposition (Ground Plane)

I = Inhalation

V = Vegetable Garden

C = Cow Milk

G = Goat Milk

M = Meat

³ Doses are conservative since it is unlikely for vegetables to be grown outside or for animals to be fed on pasture during winter months.

Table 4.2-B

Maximum Individual Organ Dose at Receptor Location -- mrem
From Gaseous Release Period: Apr-Jun 2004

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NNE 0.10 km DI	Resident ESE 0.80 km DI	Garden SE 0.87 km DIV	Cow/Goat WSW 3.97 km DIVCG	Cow/Meat W 5.77 km DIVCM	Meat S 3.80 km DIVM
Age Class: Adult						
Bone	4.87E-04	6.32E-06	3.54E-04	3.07E-05	1.03E-05	2.16E-05
GI-LLI	3.54E-01	4.18E-03	1.26E-02	1.47E-03	5.46E-04	7.92E-04
Kidney	3.54E-01	4.17E-03	1.26E-02	1.46E-03	5.45E-04	7.89E-04
Liver	3.53E-01	4.17E-03	1.26E-02	1.46E-03	5.45E-04	7.89E-04
Lung	3.55E-01	4.19E-03	1.26E-02	1.46E-03	5.45E-04	7.89E-04
Thyroid	3.87E-01	4.55E-03	1.38E-02	2.37E-03	6.32E-04	9.15E-04
T.Body	3.53E-01	4.17E-03	1.26E-02	1.46E-03	5.45E-04	7.89E-04
Age Class: Teen						
Bone	6.54E-04	8.16E-06	5.49E-04	5.13E-05	1.57E-05	3.29E-05
GI-LLI	3.57E-01	4.21E-03	1.42E-02	1.76E-03	5.94E-04	8.57E-04
Kidney	3.57E-01	4.21E-03	1.41E-02	1.76E-03	5.92E-04	8.54E-04
Liver	3.57E-01	4.21E-03	1.41E-02	1.75E-03	5.92E-04	8.54E-04
Lung	3.59E-01	4.23E-03	1.41E-02	1.75E-03	5.92E-04	8.54E-04
Thyroid	4.00E-01	4.70E-03	1.53E-02	3.14E-03	6.90E-04	9.66E-04
T.Body	3.56E-01	4.21E-03	1.41E-02	1.75E-03	5.92E-04	8.54E-04
Age Class: Child						
Bone	8.65E-04	1.05E-05	1.31E-03	1.24E-04	3.73E-05	7.79E-05
GI-LLI	3.15E-01	3.72E-03	2.01E-02	2.62E-03	8.37E-04	1.20E-03
Kidney	3.15E-01	3.72E-03	2.00E-02	2.62E-03	8.37E-04	1.20E-03
Liver	3.15E-01	3.72E-03	2.00E-02	2.62E-03	8.36E-04	1.20E-03
Lung	3.17E-01	3.74E-03	2.00E-02	2.61E-03	8.36E-04	1.20E-03
Thyroid	3.68E-01	4.31E-03	2.17E-02	5.33E-03	1.00E-03	1.37E-03
T.Body	3.15E-01	3.72E-03	2.00E-02	2.62E-03	8.37E-04	1.20E-03
Age Class: Infant						
Bone	6.31E-04	7.91E-06	5.61E-06	1.11E-04	2.46E-06	3.78E-07
GI-LLI	1.81E-01	2.14E-03	1.52E-03	2.01E-03	9.70E-05	8.79E-05
Kidney	1.81E-01	2.14E-03	1.52E-03	2.03E-03	9.78E-05	8.80E-05
Liver	1.81E-01	2.14E-03	1.52E-03	2.03E-03	9.76E-05	8.80E-05
Lung	1.83E-01	2.16E-03	1.54E-03	2.01E-03	9.74E-05	8.86E-05
Thyroid	2.30E-01	2.68E-03	1.91E-03	8.35E-03	3.26E-04	1.15E-04
T.Body	1.81E-01	2.14E-03	1.52E-03	2.02E-03	9.73E-05	8.79E-05

¹ Distances are measured with respect to the reactor building vent.

² Pathway designations are as follows:

D = Deposition (Ground Plane)
C = Cow Milk

I = Inhalation
G = Goat Milk

V = Vegetable Garden
M = Meat

Table 4.2-C

Maximum Individual Organ Dose at Receptor Location -- mrem
From Gaseous Release Period: Jul-Sep 2004

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NNE 0.10 km DI	Resident ESE 0.80 km DI	Garden SE 0.87 km DIV	Cow/Goat WSW 3.97 km DIVCG	Cow/Meat W 5.77 km DIVCM	Meat S 3.80 km DIVM
Age Class: Adult						
Bone	5.62E-04	7.37E-06	3.86E-04	3.35E-05	1.12E-05	2.35E-05
GI-LLI	3.87E-01	4.57E-03	1.38E-02	1.61E-03	5.98E-04	8.68E-04
Kidney	3.87E-01	4.57E-03	1.38E-02	1.60E-03	5.97E-04	8.65E-04
Liver	3.87E-01	4.57E-03	1.37E-02	1.60E-03	5.97E-04	8.65E-04
Lung	3.88E-01	4.58E-03	1.38E-02	1.60E-03	5.97E-04	8.65E-04
Thyroid	4.29E-01	5.03E-03	1.52E-02	2.59E-03	6.90E-04	9.99E-04
T.Body	3.87E-01	4.56E-03	1.38E-02	1.60E-03	5.97E-04	8.65E-04
Age Class: Teen						
Bone	7.51E-04	9.45E-06	5.99E-04	5.59E-05	1.72E-05	3.59E-05
GI-LLI	3.90E-01	4.61E-03	1.55E-02	1.92E-03	6.50E-04	9.40E-04
Kidney	3.90E-01	4.61E-03	1.55E-02	1.92E-03	6.49E-04	9.36E-04
Liver	3.90E-01	4.61E-03	1.55E-02	1.92E-03	6.49E-04	9.36E-04
Lung	3.92E-01	4.63E-03	1.55E-02	1.92E-03	6.49E-04	9.36E-04
Thyroid	4.45E-01	5.21E-03	1.68E-02	3.43E-03	7.53E-04	1.05E-03
T.Body	3.90E-01	4.61E-03	1.55E-02	1.92E-03	6.49E-04	9.37E-04
Age Class: Child						
Bone	9.90E-04	1.21E-05	1.43E-03	1.35E-04	4.07E-05	8.50E-05
GI-LLI	3.45E-01	4.07E-03	2.19E-02	2.86E-03	9.17E-04	1.32E-03
Kidney	3.45E-01	4.07E-03	2.19E-02	2.87E-03	9.17E-04	1.32E-03
Liver	3.45E-01	4.07E-03	2.19E-02	2.87E-03	9.16E-04	1.32E-03
Lung	3.47E-01	4.09E-03	2.19E-02	2.86E-03	9.16E-04	1.32E-03
Thyroid	4.11E-01	4.80E-03	2.39E-02	5.82E-03	1.09E-03	1.49E-03
T.Body	3.44E-01	4.07E-03	2.19E-02	2.87E-03	9.17E-04	1.32E-03
Age Class: Infant						
Bone	7.28E-04	9.19E-06	6.50E-06	1.21E-04	2.66E-06	4.05E-07
GI-LLI	1.98E-01	2.34E-03	1.66E-03	2.20E-03	1.06E-04	9.64E-05
Kidney	1.98E-01	2.34E-03	1.67E-03	2.22E-03	1.07E-04	9.65E-05
Liver	1.98E-01	2.34E-03	1.67E-03	2.22E-03	1.07E-04	9.65E-05
Lung	2.00E-01	2.36E-03	1.68E-03	2.20E-03	1.07E-04	9.72E-05
Thyroid	2.60E-01	3.02E-03	2.15E-03	9.10E-03	3.50E-04	1.26E-04
T.Body	1.98E-01	2.34E-03	1.66E-03	2.21E-03	1.07E-04	9.64E-05

¹ Distances are measured with respect to the reactor building vent.

² Pathway designations are as follows:

D = Deposition (Ground Plane)
C = Cow Milk

I = Inhalation
G = Goat Milk

V = Vegetable Garden
M = Meat

Table 4.2-D

Maximum Individual Organ Dose at Receptor Location -- mrem
From Gaseous Release Period: Oct-Dec 2004

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NNE 0.10 km DI	Resident ESE 0.80 km DI	Garden SE 0.87 km DIV ³	Cow/Goat WSW 3.97 km DIVCG ³	Cow/Meat W 5.77 km DIVCM ³	Meat S 3.80 km DIVM ³
Age Class: Adult						
Bone	4.58E-04	6.21E-06	2.61E-04	2.31E-05	7.59E-06	1.59E-05
GI-LLI	4.76E-01	5.62E-03	1.70E-02	1.97E-03	7.34E-04	1.06E-03
Kidney	4.76E-01	5.62E-03	1.69E-02	1.97E-03	7.34E-04	1.06E-03
Liver	4.76E-01	5.62E-03	1.69E-02	1.97E-03	7.33E-04	1.06E-03
Lung	4.77E-01	5.63E-03	1.69E-02	1.97E-03	7.33E-04	1.06E-03
Thyroid	5.18E-01	6.09E-03	1.84E-02	2.87E-03	8.18E-04	1.18E-03
T.Body	4.76E-01	5.62E-03	1.69E-02	1.97E-03	7.33E-04	1.06E-03
Age Class: Teen						
Bone	6.03E-04	7.80E-06	4.04E-04	3.85E-05	1.16E-05	2.42E-05
GI-LLI	4.80E-01	5.67E-03	1.91E-02	2.36E-03	7.98E-04	1.15E-03
Kidney	4.81E-01	5.67E-03	1.90E-02	2.36E-03	7.97E-04	1.15E-03
Liver	4.80E-01	5.67E-03	1.90E-02	2.36E-03	7.97E-04	1.15E-03
Lung	4.82E-01	5.69E-03	1.90E-02	2.36E-03	7.97E-04	1.15E-03
Thyroid	5.35E-01	6.27E-03	2.04E-02	3.74E-03	8.93E-04	1.26E-03
T.Body	4.80E-01	5.67E-03	1.90E-02	2.36E-03	7.97E-04	1.15E-03
Age Class: Child						
Bone	7.85E-04	9.81E-06	9.59E-04	9.30E-05	2.74E-05	5.72E-05
GI-LLI	4.24E-01	5.01E-03	2.70E-02	3.52E-03	1.13E-03	1.62E-03
Kidney	4.24E-01	5.01E-03	2.70E-02	3.53E-03	1.13E-03	1.62E-03
Liver	4.24E-01	5.01E-03	2.70E-02	3.52E-03	1.13E-03	1.62E-03
Lung	4.26E-01	5.02E-03	2.70E-02	3.52E-03	1.13E-03	1.62E-03
Thyroid	4.91E-01	5.75E-03	2.89E-02	6.22E-03	1.29E-03	1.78E-03
T.Body	4.24E-01	5.01E-03	2.70E-02	3.52E-03	1.13E-03	1.62E-03
Age Class: Infant						
Bone	5.93E-04	7.69E-06	5.43E-06	8.59E-05	1.96E-06	3.39E-07
GI-LLI	2.44E-01	2.88E-03	2.05E-03	2.70E-03	1.31E-04	1.18E-04
Kidney	2.44E-01	2.88E-03	2.05E-03	2.72E-03	1.31E-04	1.18E-04
Liver	2.44E-01	2.88E-03	2.05E-03	2.72E-03	1.31E-04	1.18E-04
Lung	2.45E-01	2.90E-03	2.06E-03	2.70E-03	1.31E-04	1.19E-04
Thyroid	3.06E-01	3.56E-03	2.53E-03	9.02E-03	3.52E-04	1.47E-04
T.Body	2.44E-01	2.88E-03	2.05E-03	2.71E-03	1.31E-04	1.18E-04

¹ Distances are measured with respect to the reactor building vent.

² Pathway designations are as follows:

D = Deposition (Ground Plane)

I = Inhalation

V = Vegetable Garden

C = Cow Milk

G = Goat Milk

M = Meat

³ Doses are conservative since it is unlikely for vegetables to be grown outside or for animals to be fed on pasture during winter months.

Table 4.2-E

Maximum Individual Organ Dose at Receptor Location -- mrem
From Gaseous Release Period: Jan-Dec 2004

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NNE 0.10 km DI	Resident ESE 0.80 km DI	Garden SE 0.87 km DIV ³	Cow/Goat WSW 3.97 km DIVCG ³	Cow/Meat W 5.77 km DIVCM ³	Meat S 3.80 km DIVM ³
Age Class: Adult						
Bone	1.87E-03	2.47E-05	1.27E-03	1.25E-04	4.39E-05	9.36E-05
GI-LLI	1.74E+00	2.05E-02	6.19E-02	7.19E-03	2.68E-03	3.89E-03
Kidney	1.74E+00	2.05E-02	6.17E-02	7.19E-03	2.68E-03	3.88E-03
Liver	1.73E+00	2.05E-02	6.17E-02	7.18E-03	2.67E-03	3.87E-03
Lung	1.74E+00	2.05E-02	6.17E-02	7.17E-03	2.67E-03	3.87E-03
Thyroid	1.88E+00	2.21E-02	6.66E-02	1.07E-02	3.01E-03	4.36E-03
T.Body	1.73E+00	2.05E-02	6.17E-02	7.18E-03	2.68E-03	3.88E-03
Age Class: Teen						
Bone	2.50E-03	3.16E-05	1.96E-03	2.09E-04	6.72E-05	1.43E-04
GI-LLI	1.75E+00	2.07E-02	6.96E-02	8.62E-03	2.91E-03	4.21E-03
Kidney	1.75E+00	2.07E-02	6.94E-02	8.62E-03	2.91E-03	4.19E-03
Liver	1.75E+00	2.07E-02	6.93E-02	8.61E-03	2.91E-03	4.19E-03
Lung	1.76E+00	2.08E-02	6.94E-02	8.59E-03	2.91E-03	4.19E-03
Thyroid	1.94E+00	2.27E-02	7.40E-02	1.39E-02	3.28E-03	4.62E-03
T.Body	1.75E+00	2.07E-02	6.94E-02	8.60E-03	2.91E-03	4.19E-03
Age Class: Child						
Bone	3.29E-03	4.03E-05	4.67E-03	5.06E-04	1.59E-04	3.38E-04
GI-LLI	1.55E+00	1.83E-02	9.84E-02	1.28E-02	4.11E-03	5.91E-03
Kidney	1.55E+00	1.83E-02	9.82E-02	1.29E-02	4.11E-03	5.90E-03
Liver	1.55E+00	1.83E-02	9.82E-02	1.29E-02	4.11E-03	5.90E-03
Lung	1.55E+00	1.83E-02	9.83E-02	1.28E-02	4.11E-03	5.90E-03
Thyroid	1.78E+00	2.08E-02	1.05E-01	2.33E-02	4.74E-03	6.54E-03
T.Body	1.55E+00	1.83E-02	9.84E-02	1.28E-02	4.11E-03	5.91E-03
Age Class: Infant						
Bone	2.43E-03	3.08E-05	2.18E-05	4.52E-04	1.02E-05	1.49E-06
GI-LLI	8.89E-01	1.05E-02	7.47E-03	9.86E-03	4.76E-04	4.32E-04
Kidney	8.90E-01	1.05E-02	7.47E-03	9.94E-03	4.79E-04	4.32E-04
Liver	8.90E-01	1.05E-02	7.47E-03	9.93E-03	4.79E-04	4.32E-04
Lung	8.96E-01	1.06E-02	7.52E-03	9.85E-03	4.78E-04	4.34E-04
Thyroid	1.10E+00	1.28E-02	9.13E-03	3.43E-02	1.36E-03	5.40E-04
T.Body	8.89E-01	1.05E-02	7.47E-03	9.89E-03	4.77E-04	4.32E-04

¹ Distances are measured with respect to the reactor building vent.

² Pathway designations are as follows:

D = Deposition (Ground Plane)

I = Inhalation

V = Vegetable Garden

C = Cow Milk

G = Goat Milk

M = Meat

³ Doses are conservative since it is unlikely for vegetables to be grown outside or for animals to be fed on pasture during winter months.

4.3 Doses From Liquid Effluent Releases

Liquid effluent release data presented in Tables 2.3-A and 2.3-B were used as input to the dose assessment computer program to calculate radiation doses. The maximum individual doses resulting from radionuclides released in liquid effluents are presented in Tables 4.3-A through 4.3-E. These tables cover the individual calendar quarters and the total calendar year, respectively.

Tables 4.3-A through 4.3-E summarize the maximum total body and organ doses for the adult, teen, and child age classes resulting from the major liquid exposure pathways. NRC Regulatory Guide 1.109 does not recognize the infant age class as being exposed to the liquid effluent pathways. Therefore, doses for this age class are not included in any of the tables.

It should be noted that doses calculated for the entire year might not equal the sum of the doses for the individual quarters. Doses from liquid effluents are based on the concentration (activity divided by volume) of radionuclides released in the effluent, as prescribed by the NRC in Regulatory Guide 1.109. If a larger proportion of activity is released with a relatively smaller volume of dilution water during a given quarter, the resulting concentration for that quarter will be higher than concentrations from other quarters. This will result in a proportionally higher dose for that quarter. However, when that quarter's activity values are included in the annual sum, and divided by the total annual dilution flow, the resulting dose contribution will be smaller. In such a situation, the annual dose will actually be less than the sum of the individual quarterly doses.

Since there were no discharges of liquid effluents containing radioactivity, there were no dose consequences resulting from such release, and all resulting doses were zero.

Table 4.3-A

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: Jan-Mar 2004

No Liquid Effluent Discharges Occurred During This Period

Organ	Age Class Organ Dose – mrem *		
	Adult	Teen	Child
Bone	0.00E+00	0.00E+00	0.00E+00
GI-LLI	0.00E+00	0.00E+00	0.00E+00
Kidney	0.00E+00	0.00E+00	0.00E+00
Liver	0.00E+00	0.00E+00	0.00E+00
Lung	0.00E+00	0.00E+00	0.00E+00
Thyroid	0.00E+00	0.00E+00	0.00E+00
T.Body	0.00E+00	0.00E+00	0.00E+00

* These doses are conservative since the same usage factor was applied for each quarter. In reality, it is unlikely that anyone would be swimming or boating during the entire year. However, the resulting dose is considerably lower than those from other pathways and does not contribute much to the total dose.

Table 4.3-B

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: Apr-Jun 2004

No Liquid Effluent Discharges Occurred During This Period

Organ	Age Class Organ Dose – mrem		
	Adult	Teen	Child
Bone	0.00E+00	0.00E+00	0.00E+00
GI-LLI	0.00E+00	0.00E+00	0.00E+00
Kidney	0.00E+00	0.00E+00	0.00E+00
Liver	0.00E+00	0.00E+00	0.00E+00
Lung	0.00E+00	0.00E+00	0.00E+00
Thyroid	0.00E+00	0.00E+00	0.00E+00
T.Body	0.00E+00	0.00E+00	0.00E+00

Table 4.3-C

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: Jul-Sep 2004

No Liquid Effluent Discharges Occurred During This Period

Organ	Age Class Organ Dose – mrem		
	Adult	Teen	Child
Bone	0.00E+00	0.00E+00	0.00E+00
GI-LLI	0.00E+00	0.00E+00	0.00E+00
Kidney	0.00E+00	0.00E+00	0.00E+00
Liver	0.00E+00	0.00E+00	0.00E+00
Lung	0.00E+00	0.00E+00	0.00E+00
Thyroid	0.00E+00	0.00E+00	0.00E+00
T.Body	0.00E+00	0.00E+00	0.00E+00

Table 4.3-D

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: Oct-Dec 2004

No Liquid Effluent Discharges Occurred During This Period

Organ	Age Class Organ Dose – mrem *		
	Adult	Teen	Child
Bone	0.00E+00	0.00E+00	0.00E+00
GI-LLI	0.00E+00	0.00E+00	0.00E+00
Kidney	0.00E+00	0.00E+00	0.00E+00
Liver	0.00E+00	0.00E+00	0.00E+00
Lung	0.00E+00	0.00E+00	0.00E+00
Thyroid	0.00E+00	0.00E+00	0.00E+00
T.Body	0.00E+00	0.00E+00	0.00E+00

* These doses are conservative since the same usage factor was applied for each quarter. In reality, it is unlikely that anyone would be swimming or boating during these months. However, the resulting dose is considerably lower than those from other pathways and does not contribute much to the total dose.

Table 4.3-E

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: Jan-Dec 2004

No Liquid Effluent Discharges Occurred During This Period

Organ	Age Class Organ Dose -- mrem *		
	Adult	Teen	Child
Bone	0.00E+00	0.00E+00	0.00E+00
GI-LLI	0.00E+00	0.00E+00	0.00E+00
Kidney	0.00E+00	0.00E+00	0.00E+00
Liver	0.00E+00	0.00E+00	0.00E+00
Lung	0.00E+00	0.00E+00	0.00E+00
Thyroid	0.00E+00	0.00E+00	0.00E+00
T.Body	0.00E+00	0.00E+00	0.00E+00

* These doses are conservative since the same usage factor was applied for each quarter. In reality, it is unlikely that anyone would be swimming or boating during the entire year. However, the resulting dose is considerably lower than those from other pathways and does not contribute much to the total dose.

5.0 OFFSITE AMBIENT RADIATION MEASUREMENTS

The PNPS ODCM does not contain control limits related specifically to offsite ambient radiation exposure. However, Regulatory Guide 1.21 (Reference 1) recommends calculation of ambient radiation exposure as part of the overall assessment of radiological impact on man.

Thermoluminescent dosimeters (TLDs) are located at 83 sites beyond the boundary of the PNPS restricted/protected area. A number of these TLDs are located within the site boundary, on Entergy property in close proximity to the station proper. The TLDs are collected on a quarterly basis and used to calculate the ambient radiation exposure in milliRoentgen (mR) over the exposure period. These TLDs are grouped into four zones of increasing distance from the station. Average exposure values for each of these zones were calculated for each calendar quarter and the total year. The average exposure values (mR) for the four zones are presented in Table 5.0.

In addition to responding to ambient radiation exposure, TLDs will also record radiation resulting from noble gases (plume and immersion exposure), particulate materials deposited on the ground, cosmic rays from outer space, and from naturally-occurring radioactivity in the soil and air. Typically, the exposure from cosmic rays and other natural radioactivity components is about 40 to 70 mR/year. As calculated in Sections 4.1 and 4.2 of this report, the ambient radiation component of doses from PNPS effluent emissions are below 1 mrem/yr and would not be discernible above the natural radiation exposure levels.

The major source of ambient radiation exposure from PNPS results from high-energy gamma rays emitted from nitrogen-16 (N-16) contained in steam flowing through the turbine. Although the N-16 is enclosed in the process lines and turbine and is not released into the environment, the ambient radiation exposure and sky shine from this contained source accounts for the majority of the radiation dose, especially in close proximity to the station. Other sources of ambient radiation exposure include radiation emitted from contained radioactive materials and/or radwaste at the facility. Despite these sources of ambient radiation exposure at PNPS, increases in exposure from ambient radiation are typically not observable above background radiation levels at locations beyond Entergy controlled property.

The average exposure values presented in Table 5.0 appear to indicate an elevation in ambient exposures in Zone 1, those TLDs within 2 miles of PNPS. Most of this apparent elevation is due to increases in exposure levels measured at TLD locations on Entergy property in close proximity to the station proper. For example, the annual exposure at TLD location OA, located at the Overlook Area near the PNPS Health Club (I&S Building), was 568 mR for the entire year. This location is immediately adjacent to the station proper and overlooks the turbine building, therefore receiving the highest direct ambient and sky shine exposure. When the near-site TLDs (those located within 0.6 km of the Reactor Building) are removed from the calculation of averages, the mean annual exposure in Zone 1 falls from 110.5 ± 89.2 mR/yr to 76.1 ± 12.8 mR/yr. Such a corrected dose is not statistically different from the Zone 4 average of 73.1 ± 13.7 mR/yr, and is indicative of natural background radiation.

Although the annual exposure at TLD location OA was 495 mR above the average Zone 4 exposure, members of the general public do not continuously occupy this area. When adjusted for such occupancy, a hypothetical member of the public who was at this location for 40 hours per year would only receive an incremental dose of 2.3 mrem over natural background radiation levels. At the nearest residence 0.80 kilometers (0.5 miles) southeast of the PNPS Reactor Building, the annual exposure was calculated as being 77.4 ± 15.5 mR (based on continuous occupancy at this location), which compares quite well to the Zone 4 annual average background radiation level of 73.1 ± 13.7 mR.

It must be emphasized that the projected ambient exposures discussed on the previous page are calculated to occur to a maximum-exposed hypothetical individual. Even though conservative assumptions are made in the projection of these dose consequences, all of the projected doses are well below the NRC dose limit of 100 mrem/yr specified in 10CFR20.1301, as well as the EPA dose limit of 25 mrem/yr specified in 40CFR190. Both of these limits are to be applied to real members of the general public, so the fact that the dose to the hypothetical maximum-exposed individual is within the limits ensures that any dose received by a real member of the public would be smaller and well within any applicable limit.

In 1994, Pilgrim Station opened the old training facility (I&S Building) overlooking the plant as a health club for its employees. This site is immediately adjacent to the protected area boundary near monitoring location OA and receives appreciable amounts of direct ambient and sky shine exposure from the turbine building. Although most personnel using this facility are employees of Entergy, they are considered to be members of the public. Due to their extended presence in the facility (500 hr/yr, assuming utilization of the facility for 2 hr/day, 5 days a week, for 50 weeks/yr), these personnel represent the most conservative case in regards to ambient radiation exposure to a member of the public within the PNPS owner controlled area. Their annual incremental radiation dose above background during 2004 is estimated as being about 9.3 mrem, based on the average exposure measured by three TLDs in the building.

The exposures measured by these three TLDs located in the health club would also include any increase in ambient radiation resulting from noble gases and/or particulate activity deposited on the ground from gaseous releases. However, they would not indicate any internal dose received by personnel in this facility from inhalation of small amounts of PNPS-related radioactivity contained in the air. An environmental air sampler located immediately adjacent to the health club did not indicate any PNPS-related activity during 2004. Dose calculations performed in the same manner as those outlined in Section 4.2 for airborne effluent releases yielded a projected total body dose to the maximum-exposed individual (500 hr/yr exposure) of about 0.0066 mrem, resulting from inhalation.

In response to the September 11, 2001 terrorism event, access to areas in the immediate vicinity of Pilgrim Station by members of the general public has been discontinued. A number of National Guard troops have been posted at Pilgrim Station to patrol the owner-controlled areas beyond the protected area. However, since these individuals are not employees of Pilgrim Station, they are considered to be members of the public for dose assessment purposes. Considering that their location is not fixed and they are patrolling areas within the site boundary, their annual exposure was estimated based on the average of those TLDs between the protected area fence and site boundary. The maximum dose received by a member of the National Guard is estimated to be about 20.9 mrem. Inhalation doses for National Guard troops, calculated in the same manner as that described above, were calculated at about 0.035 mrem.

Again, it must be emphasized that the above-described exposures were received by personnel who are employees or contractors of Entergy, accessing areas or facilities on property under the ownership and control of Entergy. Since this exposure was received within the owner-controlled area, it is not used for comparison to the annual dose limit of 25 mrem/yr specified in 40CFR190. This regulation expressly applies to areas at or beyond the owner-controlled property, and is not applicable in this situation. As stated earlier, TLDs at and beyond the site boundary do not indicate elevated ambient radiation levels resulting from the operation of Pilgrim Station.

Although some of the TLDs in close proximity to PNPS indicate increases in exposure levels from ambient radiation, such increases are localized to areas under Entergy control. For members of the general public who are not employed or contracted with Entergy and are accessing Entergy controlled areas (e.g., parking lots, etc.), such increases in dose from ambient radiation exposure are estimated as being less than 2.3 mrem/year.

Table 5.0

Average TLD Exposures By Distance Zone During 2004

Exposure Period	Average Exposure \pm Standard Deviation: mR/period			
	Zone 1* 0-3 km	Zone 2 3-8 km	Zone 3 8-15 km	Zone 4 >15 km
Jan-Mar	26.3 \pm 22.7	17.0 \pm 2.0	17.9 \pm 1.8	17.7 \pm 2.7
Apr-Jun	23.0 \pm 21.0	13.9 \pm 2.4	13.3 \pm 1.9	14.9 \pm 2.4
Jul-Sep	31.2 \pm 21.9	18.8 \pm 2.4	18.3 \pm 2.0	20.2 \pm 3.1
Oct-Dec	29.9 \pm 23.3	20.8 \pm 2.3	20.3 \pm 1.8	20.6 \pm 2.6
Jan-Dec	110.5 \pm 89.2**	70.8 \pm 13.6	70.3 \pm 12.4	73.1 \pm 13.7

* Zone 1 extends from the PNPS restricted/protected area boundary outward to 3 kilometers (2 miles), and includes several TLDs located within the site boundary.

** When corrected for TLDs located within the site boundary, the Zone 1 annual average is calculated to be 76.1 \pm 12.8 mR/yr.

6.0 PERCENT OF ODCM EFFLUENT CONTROL LIMITS

The PNPS ODCM contains dose and concentration limits for radioactive effluents. In addition, the effluent controls specified ensure that radioactive releases are maintained as low as reasonably achievable. The percentage of the PNPS ODCM Control limit values were determined from doses calculated in Section 4, the effluent releases summarized in Section 2, and the ODCM Control limits/objectives listed in Tables 6.1 and 6.2.

The percent of applicable control limit values are provided to supplement the information provided in the Section 2 of this report. The format for the percent of applicable limits is modified from that prescribed in Regulatory Guide 1.21 (Reference 1) to accommodate the Radioactive Effluents Technical Specifications (RETS) that became effective March 01, 1986. The percentages have been grouped according to whether the releases were via liquid or gaseous effluent pathways.

6.1 Gaseous Effluent Releases

Dose-based effluent controls related to exposures arising from gaseous effluent releases are presented in Table 6.1. The maximum quarterly air doses and annual whole body doses listed in Table 4.1 were used to calculate the percentage values shown in Table 6.1. All doses resulting from noble gas exposure were a small percentage of the applicable effluent control.

Organ dose limits for the maximum-exposed individual from radioactive particulates, iodines, and tritium from the PNPS ODCM are also shown in Table 6.1. The maximum quarterly and annual organ doses from Tables 4.2-A through 4.2-E were used to calculate the percentages shown in Table 6.1. The resulting organ doses from Pilgrim Station's gaseous releases during 2004 were a small percentage of the corresponding effluent control.

Table 6.1
Percent of ODCM Effluent Control Limits
for Gaseous Effluent Releases During 2004

A. Instantaneous Dose Rate Limit - Noble Gases PNPS ODCM Control 3.3.1.a Limit: 500 mrem/yr Total Body Dose		
<u>Period</u> Jan-Dec	<u>Value - mrem/yr</u> 1.99E-02	<u>Fraction of Limit</u> 3.98E-03%
B. Instantaneous Dose Rate Limit - Noble Gases PNPS ODCM Control 3.3.1.a Limit: 3000 mrem/yr Skin Dose		
<u>Period</u> Jan-Dec	<u>Value - mrem/yr</u> 2.68E-01	<u>Fraction of Limit</u> 8.94E-03%
C. Instantaneous Dose Rate Limit - Particulates, Iodines, & Tritium PNPS ODCM Control 3.3.1.b Limit: 1500 mrem/yr Organ Dose		
<u>Period</u> Jan-Dec	<u>Value - mrem/yr</u> 1.94E+00	<u>Fraction of Limit</u> 1.29E-01%
D. Quarterly Dose Objective - Noble Gas Gamma Air Dose PNPS ODCM Control 3.3.2.a Objective: 5 mrad Gamma Air Dose		
<u>Period</u> Jan-Mar	<u>Value - mrad</u> 1.54E-02	<u>Fraction of Limit</u> 3.08E-01%
Apr-Jun	4.71E-03	9.43E-02%
Jul-Sep	4.90E-03	9.79E-02%
Oct-Dec	5.23E-03	1.05E-01%
E. Annual Dose Objective - Noble Gas Gamma Air Dose PNPS ODCM Control 3.3.2.b Objective: 10 mrad Gamma Air Dose		
<u>Period</u> Jan-Dec	<u>Value - mrad/yr</u> 3.02E-02	<u>Fraction of Limit</u> 3.02E-01%

Table 6.1 (continued)

Percent of ODCM Effluent Control Limits
for Gaseous Effluent Releases During 2004

F. Quarterly Dose Objective - Noble Gas Beta Air Dose

PNPS ODCM Control 3.3.2.a

Objective: 10 mrad Beta Air Dose

<u>Period</u>	<u>Value - mrad</u>	<u>Fraction of Limit</u>
Jan-Mar	1.12E-01	1.12E+00%
Apr-Jun	6.69E-02	6.69E-01%
Jul-Sep	6.73E-02	6.73E-01%
Oct-Dec	7.19E-02	7.19E-01%

G. Annual Dose Objective - Noble Gas Beta Air Dose

PNPS ODCM Control 3.3.2.b

Objective: 20 mrad Beta Air Dose

<u>Period</u>	<u>Value - mrad/yr</u>	<u>Fraction of Limit</u>
Jan-Dec	3.19E-01	1.59E+00%

H. Quarterly Dose Objective - Particulates, Iodines, & Tritium

PNPS ODCM Control 3.3.3.a

Objective: 7.5 mrem Organ Dose

<u>Period</u>	<u>Value - mrem</u>	<u>Fraction of Limit</u>
Jan-Mar	7.12E-01	9.50E+00%
Apr-Jun	4.00E-01	5.34E+00%
Jul-Sep	4.45E-01	5.93E+00%
Oct-Dec	5.35E-01	7.13E+00%

I. Annual Dose Objective - Particulates, Iodines, & Tritium

PNPS ODCM Control 3.3.3.b

Objective: 15 mrem Organ Dose

<u>Period</u>	<u>Value - mrem/yr</u>	<u>Fraction of Limit</u>
Jan-Dec	1.94E+00	1.29E+01%

6.2 Liquid Effluent Releases

Liquid effluent concentration limits and dose objectives from the PNPS ODCM are shown in Table 6.2. The quarterly average concentrations from Table 2.3-A were used to calculate the percent concentration limits. The maximum quarterly and annual whole body and organ doses from Tables 4.3-A through 4.3-E were used to calculate the percentages shown in Table 6.2. Since no discharges of liquid effluent containing radioactivity occurred during 2004, all resulting concentrations, dose consequences, and fractional limits of NRC limits are zero.

Table 6.2

Percent of ODCM Effluent Control Limits
for Liquid Effluent Releases During 2004

- A. Fission and Activation Product Effluent Concentration Limit
PNPS ODCM Control 3.2.1
Limit: 10CFR20 Appendix B, Table 2, Column 2 Value

<u>Period</u>	<u>Value - $\mu\text{Ci/mL}$</u>	<u>Fraction of Limit</u>
Jan-Mar	0.00E+00	0.00E+00%
Apr-Jun	0.00E+00	0.00E+00%
Jul-Sep	0.00E+00	0.00E+00%
Oct-Dec	0.00E+00	0.00E+00%

- B. Tritium Average Concentration Limit
PNPS ODCM Control 3.2.1
Limit: 1.0E-03 $\mu\text{Ci/mL}$

<u>Period</u>	<u>Value - $\mu\text{Ci/mL}$</u>	<u>Fraction of Limit</u>
Jan-Mar	0.00E+00	0.00E+00%
Apr-Jun	0.00E+00	0.00E+00%
Jul-Sep	0.00E+00	0.00E+00%
Oct-Dec	0.00E+00	0.00E+00%

- C. Dissolved and Entrained Noble Gases Concentration Limit
PNPS ODCM Control 3.2.1
Limit: 2.0E-04 $\mu\text{Ci/mL}$

<u>Period</u>	<u>Value - $\mu\text{Ci/mL}$</u>	<u>Fraction of Limit</u>
Jan-Mar	0.00E+00	0.00E+00%
Apr-Jun	0.00E+00	0.00E+00%
Jul-Sep	0.00E+00	0.00E+00%
Oct-Dec	0.00E+00	0.00E+00%

Table 6.2 (continued)

Percent of ODCM Effluent Control Limits
for Liquid Effluent Releases During 2004

D. Quarterly Total Body Dose Objective

PNPS ODCM Control 3.2.2.a

Objective: 1.5 mrem Total Body Dose

<u>Period</u>	<u>Value - mrem</u>	<u>Fraction of Limit</u>
Jan-Mar	0.00E+00	0.00E+00%
Apr-Jun	0.00E+00	0.00E+00%
Jul-Sep	0.00E+00	0.00E+00%
Oct-Dec	0.00E+00	0.00E+00%

E. Annual Total Body Dose Objective

PNPS ODCM Control 3.2.2.b

Objective: 3 mrem Total Body Dose

<u>Period</u>	<u>Value - mrem</u>	<u>Fraction of Limit</u>
Jan-Dec	0.00E+00	0.00E+00%

F. Quarterly Organ Dose Objective

PNPS ODCM Control 3.2.2.a

Objective: 5 mrem Organ Dose

<u>Period</u>	<u>Value - mrem</u>	<u>Fraction of Limit</u>
Jan-Mar	0.00E+00	0.00E+00%
Apr-Jun	0.00E+00	0.00E+00%
Jul-Sep	0.00E+00	0.00E+00%
Oct-Dec	0.00E+00	0.00E+00%

G. Annual Organ Dose Objective

PNPS ODCM Control 3.2.2.b

Objective: 10 mrem Organ Dose

<u>Period</u>	<u>Value - mrem</u>	<u>Fraction of Limit</u>
Jan-Dec	0.00E+00	0.00E+00%

7.0 RADIOACTIVE WASTE DISPOSAL DATA

Radioactive wastes that were shipped offsite for processing and disposal during the reporting period are described in Table 7.0, in the standard NRC Regulatory Guide 1.21 format.

The total quantity of radioactivity in Curies and the total volume in cubic meters are summarized in Table 7.0 for the following waste categories:

- Spent resins, filter sludges, and evaporator bottoms;
- Dry activated wastes, contaminated equipment, etc.;
- Irradiated components, control rods, etc.; and,
- Other.

During the reporting period approximately 103 cubic meters of spent resins, filter sludges, etc., containing a total activity of about 1,762 Curies were shipped from PNPS for processing and disposal. Dry activated wastes and contaminated equipment shipped during the period totaled 435 cubic meters and contained 23.1 Curies of radioactivity. No irradiated components were shipped during the reporting period. No shipments of irradiated fuel were made during the reporting period.

Estimates of major radionuclides, those comprising greater than 1% of the total activity in each waste category shipped, are listed in Table 7.0. There was 1 shipment to Oak Ridge, TN (GTS Duratek); 11 shipments to Memphis, TN (RACE); and 22 shipments to Erwin, TN (Studsvik).

Table 7.0
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Solid Waste and Irradiated Fuel Shipments
January-December 2004

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Estimate of volume and activity content by type of waste

Type of waste	Jan-Dec 2004		
	Volume - m ³	Curies	Total Error
a. Spent resins, filters, filter sludge's, evaporator bottoms, etc.	1.03E+02	1.76E+03	± 25%
b. Dry activated waste, contaminated equipment, etc.	4.35E+02	2.31E+01	± 25%
c. Irradiated components, control rods, etc.	None	None	N/A
d. Other (describe)	None	None	N/A

2. Estimate of major nuclide composition by type of waste¹

Type of waste	Radionuclide	Abundance	Total Error
a. Spent resins, filters, filter sludge's, evaporator bottoms, etc.	Mn-54	2.29E+00%	± 25%
	Fe-55	7.99E+01%	± 25%
	Co-60	1.08E+01%	± 25%
	Cs-137	5.68E+00%	± 25%
b. Dry activated waste, contaminated equipment, etc.	Mn-54	3.82E+00%	± 25%
	Fe-55	5.94E+01%	± 25%
	Co-60	9.75E+00%	± 25%
	Ni-63	1.10E+00%	± 25%
	Cs-137	2.24E+01%	± 25%
	Ce-144	3.01E+00%	± 25%
c. Irradiated components, control rods, etc.	None	None	N/A
d. Other (describe)	None	None	N/A

¹ "Major" is defined as any radionuclide comprising >1% of the total activity in the waste category.

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
1	Tractor-trailer	GTS Duratek, ² Oak Ridge, TN
11	Tractor-trailer	RACE, ² Memphis, TN
22	Tractor-trailer	Studsvik, ² Erwin, TN

² This processor provides volume reduction services for dry compressible waste, contaminated equipment, etc. Remaining radioactive wastes will be shipped to Chem Nuclear Systems, Inc. in Barnwell, SC, or Envirocare, Inc. in Clive, UT for final disposal.

B. IRRADIATED FUEL SHIPMENTS & DISPOSITION

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

8.0 OFFSITE DOSE CALCULATION MANUAL REVISIONS

The PNPS Offsite Dose Calculation Manual (ODCM) was not revised during the calendar year of 2004. Information regarding revisions to the ODCM can be found attached as Appendix C of this report.

9.0 REFERENCES

1. U.S. Nuclear Regulatory Commission, "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", Regulatory Guide 1.21, Revision 1, June 1974.
2. "Pilgrim Nuclear Power Station Offsite Dose Calculation Manual", Revision 9, June 2003.
3. U.S. Nuclear Regulatory Commission, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50 Appendix I", Regulatory Guide 1.109, Revision 1, October 1977.
4. U.S. Nuclear Regulatory Commission, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors", Regulatory Guide 1.111, July 1977.
5. Boston Edison Company, "Pilgrim Station Unit 1 Appendix I Evaluation", April 1977.
6. Entech Engineering Inc., P100-R19, "AEOLUS-3 - A Computer Code for the Determination of Atmospheric Dispersion and Deposition of Nuclear Power Plant Effluents During Continuous, Intermittent and Accident Conditions in Open-Terrain Sites, Coastal Sites and Deep-River Valleys"

APPENDIX A

Meteorological Joint Frequency Distributions

TABLE	TABLE TITLE	PAGE
A-1	Joint Frequency Distribution of Wind Directions and Speeds for the 33-ft Level of the 220-ft Tower	48
A-2	Joint Frequency Distribution of Wind Directions and Speeds for the 220-ft Level of the 220-ft Tower	58

Table A-1
Joint Frequency Distribution of Wind Directions and Speeds
For the 33-ft level of the 220-ft Tower

Jan-Mar 2004

Class A Freq: 0.139

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	4
3.5-7.5	11	11	8	0	4	1	0	2	0	0	2	8	3	10	10	18	88
7.5-12.5	3	21	29	8	2	1	0	0	5	10	11	3	17	20	8	6	144
12.5-18.5	0	6	1	0	0	0	0	0	5	3	0	0	3	4	1	0	23
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	15	38	38	8	6	2	0	2	10	13	13	13	23	34	19	25	259

Class B Freq: 0.048

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	2	2	3	0	0	0	1	0	1	0	2	5	1	2	4	0	23
7.5-12.5	0	5	8	4	1	0	1	0	7	8	4	4	15	2	3	0	62
12.5-18.5	0	2	0	2	0	0	0	0	0	0	1	0	0	0	0	0	5
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	9	11	6	1	0	2	0	8	8	7	9	16	4	7	0	90

Class C Freq: 0.076

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	1	2	1	0	0	0	0	0	0	1	0	0	1	0	6
3.5-7.5	1	3	1	5	2	1	2	0	7	2	6	4	10	12	3	2	61
7.5-12.5	1	2	10	9	2	0	1	3	12	6	1	1	16	5	0	0	69
12.5-18.5	0	4	0	0	0	0	0	0	0	0	1	0	0	1	0	0	6
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	9	12	16	5	1	3	3	19	8	8	6	26	18	4	2	142

Class D Freq: 0.570

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	1	1	4	1	4	4	9	2	6	10	1	5	0	3	52
3.5-7.5	12	14	12	20	17	24	22	9	17	31	46	86	82	52	44	12	500
7.5-12.5	9	18	2	0	6	6	1	1	20	25	29	61	210	78	20	0	486
12.5-18.5	0	4	0	0	0	0	0	0	0	0	0	0	15	8	0	0	27
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	21	37	15	21	27	31	27	14	46	58	81	157	308	143	64	15	1065

Table A-1 (continued)

Jan-Mar 2004

Class E Freq: 0.153

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	2	5	2	6	11	9	3	7	9	7	5	2	1	69
3.5-7.5	0	1	0	13	1	0	2	6	9	16	32	33	44	23	3	2	185
7.5-12.5	2	0	0	0	0	0	0	0	2	1	5	5	7	4	4	2	32
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	1	0	15	6	2	8	17	20	20	44	47	58	32	9	5	286

Class F Freq: 0.014

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	1	0	0	0	0	1	2	1	0	0	0	0	5
3.5-7.5	0	0	0	1	0	0	0	0	0	3	11	1	2	0	0	0	18
7.5-12.5	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	1	1	0	0	0	0	5	15	2	2	0	0	0	26

Class G Freq: 0.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5-12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	1	2	5	11	3	10	15	18	6	15	23	8	10	3	5	136
3.5-7.5	26	31	24	39	24	26	27	17	34	52	99	137	142	99	64	34	875
7.5-12.5	15	46	49	21	11	7	3	4	46	51	52	74	265	109	35	8	796
12.5-18.5	0	16	1	2	0	0	0	0	5	3	2	0	18	13	1	0	61
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	42	94	76	67	46	36	40	36	103	112	168	234	433	231	103	47	1868

Table A-1 (continued)

Apr-Jun 2004

Class A Freq: 0.173

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	3
3.5-7.5	33	22	22	6	5	6	4	2	3	3	3	4	2	3	11	16	145
7.5-12.5	10	3	10	4	4	2	1	3	28	51	6	2	6	24	3	0	157
12.5-18.5	0	0	0	0	0	0	0	0	4	13	0	0	0	0	0	0	17
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	43	25	32	10	9	8	5	5	35	67	9	6	8	28	14	18	322

Class B Freq: 0.057

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	3	0	0	0	0	3	0	1	1	0	0	0	0	0	0	2	10
3.5-7.5	1	5	8	3	3	5	4	5	4	8	4	0	0	2	2	3	57
7.5-12.5	1	0	0	0	1	1	1	0	9	14	2	0	0	7	0	0	36
12.5-18.5	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5	5	8	3	4	9	5	6	15	23	6	0	0	9	2	5	105

Class C Freq: 0.078

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	3	3	0	2	2	2	2	7	3	0	0	0	1	1	4	2	32
3.5-7.5	6	3	3	2	10	3	3	7	13	6	7	2	2	2	6	1	76
7.5-12.5	0	0	0	0	0	0	0	0	3	21	2	0	3	2	0	0	31
12.5-18.5	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	6
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9	6	3	4	12	5	5	14	22	30	9	2	6	5	10	3	145

Class D Freq: 0.300

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	7	5	9	7	5	5	14	9	4	1	1	9	6	9	8	4	103
3.5-7.5	3	8	9	10	30	16	16	13	30	61	22	27	19	6	12	3	285
7.5-12.5	3	1	0	0	0	1	0	0	18	84	16	3	9	17	4	5	161
12.5-18.5	0	0	0	0	0	0	0	0	2	6	0	0	0	0	0	0	8
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	13	14	18	17	35	22	30	22	54	152	39	39	34	32	24	12	557

Table A-1 (continued)

Apr-Jun 2004

Class E Freq: 0.276

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
0.95-3.5	5	3	5	9	5	6	6	13	6	5	8	10	9	14	6	7	117
3.5-7.5	10	4	8	30	33	13	3	3	21	31	43	54	35	10	13	5	316
7.5-12.5	3	1	0	0	1	0	0	0	3	37	15	6	6	1	3	2	78
12.5-18.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	18	8	13	40	39	19	9	16	30	74	66	70	50	25	22	14	513

Class F Freq: 0.093

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	1	0	1	0	2	1	1	3	9	7	6	4	1	0	36
3.5-7.5	1	1	1	8	1	0	0	0	0	17	47	9	4	4	5	1	99
7.5-12.5	0	0	0	0	0	0	0	0	0	10	27	0	0	0	0	0	37
12.5-18.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	1	2	8	2	0	2	1	1	31	83	16	10	8	6	1	173

Class G Freq: 0.023

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	1	2	5	3	0	0	0	0	11
3.5-7.5	0	0	0	0	0	0	0	0	0	2	17	4	1	0	0	0	24
7.5-12.5	0	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	7
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	1	6	27	7	1	0	0	0	42

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
0.95-3.5	18	11	15	18	13	16	24	31	16	11	23	29	22	29	19	17	312
3.5-7.5	54	43	51	59	82	43	30	30	71	128	143	100	63	27	49	29	1002
7.5-12.5	17	5	10	4	6	4	2	3	61	219	73	11	24	51	10	7	507
12.5-18.5	0	0	0	0	0	0	0	0	10	25	0	0	0	0	0	0	35
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	89	59	76	82	101	63	56	64	158	383	239	140	109	107	78	53	1857

Table A-1 (continued)

Jul-Sep 2004

Class A Freq: 0.173

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	2	4	0	1	0	1	1	0	1	0	0	0	0	1	0	2	13
3.5-7.5	13	17	7	6	4	4	0	5	17	27	11	3	2	2	3	12	133
7.5-12.5	5	5	0	0	0	0	0	0	18	24	3	0	0	0	0	3	58
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	20	26	7	7	4	5	1	5	36	51	14	3	2	3	3	17	204

Class B Freq: 0.062

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	1	0	1	0	0	0	2	2	0	0	1	0	2	2	12
3.5-7.5	1	2	1	3	3	0	0	2	13	9	2	1	0	3	3	4	47
7.5-12.5	0	0	0	0	0	0	0	0	8	4	1	0	0	0	0	1	14
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	3	2	3	4	0	0	2	23	15	3	1	1	3	5	7	73

Class C Freq: 0.091

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	1	0	0	0	0	1	0	0	3	1	0	2	1	2	0	12
3.5-7.5	2	3	3	4	2	2	0	5	21	26	6	1	0	1	3	1	80
7.5-12.5	0	0	0	0	0	1	0	0	9	4	1	0	0	0	0	1	16
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	4	3	4	2	3	1	5	30	33	8	1	2	2	5	2	108

Class D Freq: 0.297

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
0.95-3.5	6	2	9	2	7	5	9	6	10	5	2	5	4	2	4	2	80
3.5-7.5	7	3	6	11	7	16	7	9	56	42	19	17	5	6	4	5	220
7.5-12.5	3	1	0	0	0	1	0	0	10	28	6	0	0	0	0	0	49
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	16	6	15	13	14	22	16	16	76	75	27	22	9	8	9	7	351

Table A-1 (continued)

Jul-Sep 2004

Class E Freq: 0.275

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2
0.95-3.5	1	2	6	8	1	4	10	23	10	5	9	13	15	10	7	4	128
3.5-7.5	2	1	2	8	7	1	0	5	29	31	16	24	29	14	2	1	172
7.5-12.5	0	0	0	0	0	0	0	0	0	16	7	0	0	0	0	0	23
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	3	8	16	8	5	10	28	39	52	33	37	44	25	9	5	325

Class F Freq: 0.089

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	0	2	4	0	1	2	5	3	12	12	1	3	2	1	49
3.5-7.5	0	0	0	4	1	0	0	1	4	8	21	3	1	1	1	0	45
7.5-12.5	0	0	0	0	0	0	0	0	0	4	7	0	0	0	0	0	11
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	0	6	5	0	1	3	9	15	40	15	2	4	3	1	105

Class G Freq: 0.013

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	0	0	0	0	0	0	0	0	4	1	0	0	0	0	6
3.5-7.5	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	8
7.5-12.5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	0	0	0	0	0	0	0	0	13	1	0	0	0	0	15

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	4
0.95-3.5	10	12	16	13	13	10	22	31	28	18	28	31	23	17	17	11	300
3.5-7.5	25	26	19	36	24	23	7	27	140	143	83	49	37	27	16	23	705
7.5-12.5	8	6	0	0	0	2	0	0	45	80	26	0	0	0	0	5	172
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	43	44	35	49	37	35	29	59	213	241	138	80	60	45	34	39	1181

Table A-1 (continued)

Oct-Dec 2004

Class A Freq: 0.070

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
3.5-7.5	9	3	0	0	0	0	0	0	1	2	2	0	0	9	5	9	40
7.5-12.5	6	19	3	7	10	2	0	0	4	1	0	1	0	5	12	6	76
12.5-18.5	2	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	7
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	17	22	3	10	12	2	0	0	5	3	2	1	0	14	19	17	127

Class B Freq: 0.026

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.5-7.5	2	3	1	0	0	0	0	0	1	0	1	1	1	1	2	1	14
7.5-12.5	2	10	2	0	0	0	0	0	3	4	1	0	1	3	1	1	28
12.5-18.5	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
18.5-24	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	14	4	0	0	0	0	0	5	4	2	1	2	4	3	2	47

Class C Freq: 0.050

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	2	0	0	1	1	0	0	0	0	0	0	0	1	2	0	0	7
3.5-7.5	5	4	2	1	1	2	4	0	0	0	2	0	5	3	2	1	32
7.5-12.5	0	16	4	0	0	0	3	1	2	4	6	3	3	3	2	0	47
12.5-18.5	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	3
18.5-24	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	8	20	6	3	2	2	7	2	2	5	8	3	9	8	4	1	90

Class D Freq: 0.473

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	4	4	2	2	1	2	8	10	9	4	5	4	5	3	2	6	71
3.5-7.5	29	19	34	9	7	14	17	19	37	40	40	51	36	18	26	17	413
7.5-12.5	6	48	26	4	5	18	14	6	12	28	22	19	48	38	31	11	336
12.5-18.5	7	0	0	4	0	2	0	6	3	0	0	1	10	0	0	0	33
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	46	71	62	19	13	36	39	41	61	72	67	75	99	59	59	34	853

Table A-1 (continued)

Oct-Dec 2004

Class E Freq: 0.315

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	5	0	3	4	0	2	7	9	18	13	12	17	14	12	11	4	131
3.5-7.5	14	5	0	3	8	2	7	23	55	62	52	54	32	21	28	13	379
7.5-12.5	3	0	0	0	0	0	0	8	8	12	9	3	4	8	0	1	56
12.5-18.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	23	5	3	7	8	4	14	40	81	87	73	74	50	41	39	18	567

Class F Freq: 0.063

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	0	0	1	0	0	6	2	0	4	8	9	1	0	0	32
3.5-7.5	0	0	0	1	0	0	0	0	5	16	39	6	3	2	0	1	73
7.5-12.5	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	9
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	0	1	1	0	0	6	7	24	44	14	12	3	0	1	114

Class G Freq: 0.002

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
3.5-7.5	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
7.5-12.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	12	5	5	7	3	4	15	25	29	18	21	29	29	18	15	12	247
3.5-7.5	59	34	37	14	16	18	28	42	99	121	137	112	77	54	63	42	953
7.5-12.5	17	93	35	11	15	20	17	15	29	58	39	26	56	57	46	19	553
12.5-18.5	12	1	0	7	2	2	0	7	4	1	0	1	10	0	0	0	47
18.5-24	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	100	133	78	40	36	44	60	89	161	198	197	168	172	129	124	73	1802

Table A-1 (continued)

Jan-Dec 2004

Class A Freq: 0.136

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	3	4	0	1	0	1	1	0	1	0	0	2	0	2	2	7	24
3.5-7.5	66	53	37	12	13	11	4	9	21	32	18	15	7	24	29	55	406
7.5-12.5	24	48	42	19	16	5	1	3	55	86	20	6	23	49	23	15	435
12.5-18.5	2	6	1	3	2	0	0	0	9	16	0	0	3	4	1	0	47
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	95	111	80	35	31	17	6	12	86	134	38	23	33	79	55	77	912

Class B Freq: 0.047

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	4	1	1	0	1	3	0	1	3	2	0	0	1	0	2	4	23
3.5-7.5	6	12	13	6	6	5	5	7	19	17	9	7	2	8	11	8	141
7.5-12.5	3	15	10	4	2	1	2	0	27	30	8	4	16	12	4	2	140
12.5-18.5	1	3	0	2	0	0	0	0	2	1	1	0	0	0	0	0	10
18.5-24	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	14	31	25	12	9	9	7	8	51	50	18	11	19	20	17	14	315

Class C Freq: 0.072

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	6	4	1	5	4	2	3	7	3	3	1	1	4	4	7	2	57
3.5-7.5	14	13	9	12	15	8	9	12	41	34	21	7	17	18	14	5	249
7.5-12.5	1	18	14	9	2	1	4	4	26	35	10	4	22	10	2	1	163
12.5-18.5	1	4	0	0	0	0	0	1	3	4	1	0	0	1	0	0	15
18.5-24	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	22	39	24	27	21	11	16	24	73	76	33	12	43	33	23	8	485

Class D Freq: 0.421

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
0.95-3.5	17	12	21	12	17	13	35	29	32	12	14	28	16	19	14	15	306
3.5-7.5	51	44	61	50	61	70	62	50	140	174	127	181	142	82	86	37	1418
7.5-12.5	21	68	28	4	11	26	15	7	60	165	73	83	267	133	55	16	1032
12.5-18.5	7	4	0	4	0	2	0	6	5	6	0	1	25	8	0	0	68
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	96	128	110	70	89	111	112	93	237	357	214	293	450	242	156	68	2826

Table A-1 (continued)

Jan-Dec 2004

Class E Freq: 0.252

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	3
0.95-3.5	11	5	14	23	11	14	29	56	43	26	36	49	45	41	26	16	445
3.5-7.5	26	11	10	54	49	16	12	37	114	140	143	165	140	68	46	21	1052
7.5-12.5	8	1	0	0	1	0	0	8	13	66	36	14	17	13	7	5	189
12.5-18.5	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	46	17	24	78	61	30	41	101	170	233	216	228	202	123	79	42	1691

Class F Freq: 0.062

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	2	1	2	7	0	3	9	8	7	27	28	16	8	3	1	122
3.5-7.5	1	1	1	14	2	0	0	1	9	44	118	19	10	7	6	2	235
7.5-12.5	0	0	0	0	0	0	0	0	0	23	37	0	0	0	0	0	60
12.5-18.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	3	2	16	9	0	3	10	17	75	182	47	26	15	9	3	418

Class G Freq: 0.009

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	0	0	0	0	0	0	1	3	9	4	0	0	0	0	18
3.5-7.5	0	0	0	0	0	0	0	0	0	3	26	4	1	0	0	0	34
7.5-12.5	0	0	0	0	0	0	0	0	0	3	6	0	0	0	0	0	9
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	0	0	0	0	0	0	1	9	41	8	1	0	0	0	61

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	1	0	0	0	1	0	0	1	0	0	1	1	0	5
0.95-3.5	41	29	38	43	40	33	71	102	91	53	87	112	82	74	54	45	995
3.5-7.5	164	134	131	148	146	110	92	116	344	444	462	398	319	207	192	128	3535
7.5-12.5	57	150	94	36	32	33	22	22	181	408	190	111	345	217	91	39	2028
12.5-18.5	12	17	1	9	2	2	0	7	19	29	2	1	28	13	1	0	143
18.5-24	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	274	330	265	238	220	178	185	248	635	934	742	622	774	512	339	212	6708

Table A-2
Joint Frequency Distribution of Wind Directions and Speeds
For the 220-ft level of the 220-ft Tower

Jan-Mar 2004

Class A Freq: 0.137

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	4
7.5-12.5	2	5	8	0	0	0	0	1	0	0	1	0	1	2	4	3	27
12.5-18.5	6	4	22	2	4	1	1	1	2	2	6	8	9	9	9	7	93
18.5-24	0	1	16	6	2	0	0	0	1	9	7	1	7	15	6	6	77
>24	3	9	5	0	0	0	0	0	0	5	0	0	6	12	4	6	50
TOTAL	12	19	53	8	6	1	1	2	3	16	14	9	23	38	23	23	251

Class B Freq: 0.048

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	4
7.5-12.5	0	0	1	1	0	0	0	0	1	0	0	1	0	1	0	0	5
12.5-18.5	1	0	2	1	0	0	0	1	2	3	6	2	6	0	0	1	25
18.5-24	0	0	9	3	1	0	1	0	0	8	1	2	9	3	4	0	41
>24	1	1	1	3	0	0	0	0	0	0	1	1	3	1	1	0	13
TOTAL	3	2	14	8	1	0	1	1	3	11	8	6	18	5	6	1	88

Class C Freq: 0.076

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	0	2	0	3	0	0	0	0	0	1	0	0	0	1	0	7
7.5-12.5	0	1	1	0	2	0	1	0	1	2	4	2	1	2	2	0	19
12.5-18.5	3	0	5	2	3	0	1	3	11	7	0	1	14	6	1	2	59
18.5-24	0	0	4	6	3	0	0	1	1	4	2	0	8	6	0	0	35
>24	1	5	0	2	1	0	1	0	0	1	1	0	4	3	0	0	19
TOTAL	4	6	12	10	12	0	3	4	13	14	8	3	27	17	4	2	139

Class D Freq: 0.571

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	1	0	0	1	0	0	0	0	0	0	1	2	0	0	5
3.5-7.5	1	4	4	3	2	3	5	4	0	1	3	3	2	2	2	4	43
7.5-12.5	2	4	9	10	18	11	17	5	12	8	11	26	16	15	8	2	174
12.5-18.5	13	6	3	1	2	14	8	6	9	35	55	46	67	35	31	8	339
18.5-24	8	2	0	0	5	3	2	0	1	16	31	47	108	64	27	6	320
>24	14	4	0	0	2	0	0	0	0	1	0	2	81	60	2	0	166
TOTAL	38	20	17	14	29	32	32	15	22	61	100	124	275	178	70	20	1047

Table A-2 (continued)

Jan-Mar 2004

Class E Freq: 0.154

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	5
3.5-7.5	0	0	1	4	2	6	5	2	2	2	0	0	4	6	3	2	39
7.5-12.5	0	0	0	3	8	2	3	10	5	2	3	7	9	17	9	0	78
12.5-18.5	0	0	0	0	0	0	3	4	3	8	15	22	16	29	9	0	109
18.5-24	0	1	0	0	0	0	0	0	2	1	6	5	5	7	7	0	34
>24	2	0	0	0	0	0	0	0	0	0	0	0	1	6	6	2	17
TOTAL	3	1	1	8	10	8	11	16	13	13	25	34	35	66	34	4	282

Class F Freq: 0.014

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	0	0	0	1	0	0	0	1	0	0	0	2	0	0	0	4
7.5-12.5	0	0	0	0	0	0	0	1	1	1	1	2	1	3	0	0	10
12.5-18.5	0	0	0	0	0	0	0	0	0	0	9	1	0	2	0	0	12
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	1	0	0	1	2	1	10	3	3	5	0	0	26

Class G Freq: 0.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5-12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	0	1	1	0	1	0	0	1	0	1	0	1	3	0	0	10
3.5-7.5	3	5	10	7	8	9	10	6	3	3	4	3	8	8	7	7	101
7.5-12.5	4	10	19	14	28	13	21	17	20	13	20	38	28	40	23	5	313
12.5-18.5	23	10	32	6	9	15	13	15	27	55	91	80	112	81	50	18	637
18.5-24	8	4	29	15	11	3	3	1	5	38	47	55	137	95	44	12	507
>24	21	19	6	5	3	0	1	0	0	7	2	3	95	82	13	8	265
TOTAL	60	48	97	48	59	41	48	39	56	116	165	179	381	309	137	50	1833

Table A-2 (continued)

Apr-Jun 2004

Class A Freq: 0.173

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	2	4	1	1	0	1	0	0	0	0	0	0	0	0	2	0	11
7.5-12.5	3	3	13	2	0	1	0	0	3	3	2	1	0	0	1	4	36
12.5-18.5	15	10	19	6	2	5	7	2	8	29	5	9	3	3	2	11	136
18.5-24	12	1	2	4	4	0	0	1	5	42	3	0	0	15	8	11	108
>24	3	0	0	1	1	0	0	0	0	8	0	0	0	10	3	5	31
TOTAL	35	18	35	14	7	7	7	3	16	82	10	10	3	28	16	31	322

Class B Freq: 0.057

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	3	1	3	0	1	1	1	0	0	0	0	0	0	0	0	1	11
7.5-12.5	1	1	1	4	2	3	1	4	6	3	2	0	0	0	0	2	30
12.5-18.5	0	0	2	3	1	1	4	1	6	11	2	1	0	1	0	0	33
18.5-24	1	1	0	0	0	0	1	0	2	9	1	0	0	2	1	4	22
>24	1	0	0	0	0	0	0	0	0	2	1	0	0	4	1	0	9
TOTAL	6	3	6	7	4	5	7	5	14	25	6	1	0	7	2	7	105

Class C Freq: 0.078

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2
3.5-7.5	3	3	2	0	3	2	4	0	3	0	1	0	0	0	3	2	26
7.5-12.5	2	3	1	2	4	1	2	4	10	2	4	1	1	1	2	2	42
12.5-18.5	2	0	1	0	7	2	2	2	5	18	3	0	3	0	2	3	50
18.5-24	0	0	0	0	0	0	0	0	0	9	3	0	0	2	0	0	14
>24	1	0	0	0	0	0	0	0	2	5	0	0	0	3	0	0	11
TOTAL	8	6	4	2	14	5	8	6	21	34	11	1	4	6	8	7	145

Class D Freq: 0.300

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	3	2	1	1	1	0	1	1	2	0	1	1	0	1	3	18
3.5-7.5	5	6	14	5	5	5	9	2	1	2	2	4	5	1	6	2	74
7.5-12.5	1	0	10	9	11	12	9	14	16	18	12	10	5	4	3	2	136
12.5-18.5	2	2	0	2	11	9	8	8	14	57	25	1	27	5	1	1	173
18.5-24	1	2	0	0	0	0	1	2	1	46	21	1	2	10	10	2	99
>24	1	0	0	0	0	0	0	0	0	20	6	0	0	14	7	9	57
TOTAL	10	13	26	17	28	27	27	27	33	145	66	17	40	34	28	19	557

Table A-2 (continued)

Apr-Jun 2004

Class E Freq: 0.276

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	2	4	0	0	0	0	0	4	1	0	0	2	0	1	2	17
3.5-7.5	1	0	7	10	11	3	10	5	5	4	3	3	3	4	3	4	76
7.5-12.5	1	2	4	7	18	23	10	9	8	12	7	6	14	10	7	4	142
12.5-18.5	9	1	2	0	1	3	3	3	6	17	20	15	33	18	10	4	145
18.5-24	4	3	0	0	0	0	0	0	0	12	31	5	20	14	4	4	97
>24	5	0	0	0	0	0	0	0	0	10	4	0	0	6	7	4	36
TOTAL	21	8	17	17	30	29	23	17	23	56	65	29	72	52	32	22	513

Class F Freq: 0.093

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
3.5-7.5	1	0	3	1	5	3	0	2	1	4	0	3	0	1	1	0	25
7.5-12.5	1	0	0	1	1	3	0	0	1	2	1	6	2	7	5	1	31
12.5-18.5	0	0	0	0	0	0	0	1	3	1	10	23	13	3	6	2	62
18.5-24	1	0	0	0	0	0	0	0	0	2	30	6	2	0	4	2	47
>24	0	2	0	0	0	0	0	0	0	0	3	0	0	1	1	0	7
TOTAL	3	2	3	2	6	6	0	3	5	9	44	38	18	12	17	5	173

Class G Freq: 0.023

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	3
3.5-7.5	0	0	2	1	1	0	0	0	0	1	1	0	0	0	1	0	7
7.5-12.5	0	0	0	0	0	0	1	0	0	0	2	4	3	0	0	0	10
12.5-18.5	0	0	0	0	0	0	0	0	0	0	1	6	1	5	0	1	14
18.5-24	0	0	0	0	0	0	0	0	0	0	3	2	2	0	0	0	7
>24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	0	0	2	2	1	0	1	0	0	1	9	12	6	5	2	1	42

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	5	6	2	1	1	0	1	6	3	1	1	4	0	4	5	41
3.5-7.5	15	14	32	18	26	15	24	9	10	11	7	10	8	6	16	9	230
7.5-12.5	9	9	29	25	36	43	23	31	44	40	30	28	25	22	18	15	427
12.5-18.5	28	13	24	11	22	20	24	17	42	133	66	55	80	35	21	22	613
18.5-24	19	7	2	4	4	0	2	3	8	120	92	14	26	43	27	23	394
>24	11	2	0	1	1	0	0	0	2	45	15	0	0	38	19	18	152
TOTAL	83	50	93	61	90	79	73	61	112	352	211	108	143	144	105	92	1857

Table A-2 (continued)

Jul-Sep 2004

Class A Freq: 0.178

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	8	5	6	0	0	0	0	0	0	0	0	0	0	0	2	4	25
7.5-12.5	8	11	2	7	1	1	4	4	8	17	6	2	1	0	1	3	76
12.5-18.5	22	5	2	4	1	1	1	3	10	52	15	4	0	1	0	4	125
18.5-24	2	3	0	2	0	0	0	0	2	17	2	0	0	0	1	9	38
>24	3	6	0	0	0	0	0	0	0	0	0	0	0	0	1	4	14
TOTAL	43	30	10	13	2	2	5	7	20	86	23	6	1	1	5	24	278

Class B Freq: 0.077

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3
3.5-7.5	1	2	1	2	1	0	1	0	0	0	0	0	0	2	1	3	14
7.5-12.5	1	3	2	1	0	3	2	0	4	14	7	0	0	1	1	0	39
12.5-18.5	1	5	1	1	1	0	0	2	3	24	9	0	1	0	0	4	52
18.5-24	0	1	0	2	1	0	0	0	0	3	0	0	0	2	0	1	10
>24	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	3
TOTAL	3	12	4	6	3	3	4	2	8	41	16	0	1	5	2	11	121

Class C Freq: 0.104

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.5-7.5	2	2	1	4	1	0	0	0	0	0	0	0	0	0	2	0	12
7.5-12.5	0	2	1	4	1	2	2	1	4	19	10	2	0	0	0	4	52
12.5-18.5	2	3	1	1	1	0	0	4	7	42	9	2	0	0	2	1	75
18.5-24	4	0	0	1	3	0	0	0	1	6	1	1	0	0	0	1	18
>24	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	5
TOTAL	8	7	4	10	6	2	2	5	15	67	20	5	0	0	4	8	163

Class D Freq: 0.294

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	1	1	0	0	2	1	1	0	2	0	1	0	0	0	1	11
3.5-7.5	4	5	8	10	5	1	5	3	4	0	0	2	0	0	3	4	54
7.5-12.5	4	4	0	2	5	7	11	6	26	31	20	7	3	6	5	2	139
12.5-18.5	4	0	2	8	3	5	5	7	21	67	20	8	14	0	1	2	167
18.5-24	4	2	2	5	4	0	0	0	2	21	20	2	1	2	1	7	73
>24	5	0	0	2	4	0	0	0	2	2	0	0	0	0	0	0	15
TOTAL	22	12	13	27	21	15	22	17	55	123	60	20	18	8	10	16	459

Table A-2 (continued)

Jul-Sep 2004

Class E Freq: 0.254

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	1	4	3	0	2	0	0	1	0	1	0	0	0	1	1	15
3.5-7.5	2	5	12	6	6	6	5	3	4	1	1	2	0	5	2	8	68
7.5-12.5	2	2	0	0	4	15	8	6	12	7	2	4	9	18	2	7	98
12.5-18.5	2	0	1	0	0	0	6	15	12	23	16	14	17	18	23	4	151
18.5-24	3	0	0	3	0	0	0	0	1	16	33	1	0	1	2	2	62
>24	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	3
TOTAL	10	8	17	13	10	23	19	24	30	47	54	21	26	42	31	22	397

Class F Freq: 0.081

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	2	1	0	1	0	0	1	1	1	0	0	0	0	0	7
3.5-7.5	0	0	0	1	5	3	1	3	1	4	2	2	2	4	0	0	28
7.5-12.5	0	0	0	0	1	2	1	2	3	5	3	5	4	0	0	1	27
12.5-18.5	1	0	0	0	0	0	1	2	2	7	12	6	5	4	3	3	46
18.5-24	1	0	0	0	0	0	0	1	0	3	11	0	0	1	2	0	19
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	0	2	2	6	6	3	8	7	20	29	13	11	9	5	4	127

Class G Freq: 0.011

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
3.5-7.5	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	3
7.5-12.5	0	0	0	0	0	0	0	0	1	2	0	0	0	1	0	0	4
12.5-18.5	0	0	0	0	0	0	0	0	0	1	2	2	2	2	0	0	9
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	1	5	3	2	3	3	0	0	17

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	2	3	8	4	0	5	2	1	2	4	2	1	0	0	1	3	38
3.5-7.5	17	19	28	23	18	10	12	9	9	6	4	6	3	11	10	19	204
7.5-12.5	15	22	5	14	12	30	28	19	58	95	48	20	17	26	9	17	435
12.5-18.5	32	13	7	14	6	6	13	33	55	216	83	36	39	25	29	18	625
18.5-24	14	6	2	13	8	0	0	1	6	66	67	4	1	6	6	20	220
>24	8	6	0	3	4	0	0	0	6	2	1	0	0	0	2	8	40
TOTAL	88	69	50	71	48	51	55	63	136	389	205	67	60	68	57	85	1562

Table A-2 (continued)

Oct-Dec 2004

Class A Freq: 0.070

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
7.5-12.5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
12.5-18.5	3	0	0	0	0	0	0	0	0	4	1	2	1	3	9	7	30
18.5-24	5	2	10	0	0	0	0	0	1	2	0	0	0	1	7	8	36
>24	6	6	3	7	14	3	0	0	0	0	0	0	0	1	9	3	52
TOTAL	20	8	13	7	14	3	0	0	1	6	1	2	1	5	26	20	127

Class B Freq: 0.026

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
7.5-12.5	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3
12.5-18.5	0	0	0	0	0	0	0	0	1	2	2	0	1	1	2	1	10
18.5-24	0	5	6	0	0	0	0	0	1	3	0	1	0	0	2	1	19
>24	1	3	2	1	0	0	0	0	1	0	0	0	0	0	2	3	13
TOTAL	3	8	9	1	0	0	0	0	3	5	3	1	1	2	6	5	47

Class C Freq: 0.049

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	3
3.5-7.5	1	1	0	1	0	0	0	0	0	0	0	0	1	0	3	0	7
7.5-12.5	0	0	1	0	1	0	0	0	0	0	1	0	1	3	0	0	7
12.5-18.5	0	1	3	2	0	2	3	0	0	2	6	1	2	0	2	3	27
18.5-24	2	4	6	0	0	0	3	1	1	2	1	2	3	0	2	1	28
>24	2	5	3	1	0	0	0	2	0	1	0	0	0	1	3	0	18
TOTAL	5	11	14	5	1	2	6	3	1	5	8	3	7	4	11	4	90

Class D Freq: 0.468

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	2	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	5
3.5-7.5	2	9	7	3	1	5	5	2	4	2	3	4	1	2	1	3	54
7.5-12.5	3	2	15	8	5	6	9	17	18	16	20	6	12	14	2	3	156
12.5-18.5	5	2	19	9	1	4	14	9	10	36	37	35	37	14	16	8	256
18.5-24	21	6	19	6	4	5	12	6	4	15	11	8	16	18	43	14	208
>24	15	29	6	7	2	10	5	7	3	0	0	1	25	29	19	17	175
TOTAL	48	48	66	33	13	30	46	43	39	69	71	54	91	77	81	45	854

Table A-2 (continued)

Oct-Dec 2004

Class E Freq: 0.315

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	1	0	3	2	1	1	0	0	0	1	0	0	1	1	0	0	11
3.5-7.5	1	2	1	3	3	4	2	3	4	4	2	3	4	3	5	5	49
7.5-12.5	10	0	1	0	4	6	12	11	6	19	12	1	10	20	20	10	142
12.5-18.5	12	1	0	0	0	0	6	24	17	31	62	21	37	19	26	13	269
18.5-24	3	0	0	0	0	0	1	8	6	13	11	11	7	10	10	7	87
>24	4	0	0	0	0	0	0	0	0	0	0	1	0	4	6	2	17
TOTAL	31	3	5	5	8	11	21	46	33	68	87	37	59	57	67	37	575

Class F Freq: 0.070

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	3
3.5-7.5	3	0	0	0	1	1	0	1	0	2	1	2	0	1	1	2	15
7.5-12.5	0	0	0	0	0	1	2	1	1	1	3	10	7	7	6	2	41
12.5-18.5	0	0	0	0	0	0	0	2	2	11	6	18	5	4	2	0	50
18.5-24	0	0	0	0	0	0	0	0	0	3	8	1	3	1	1	2	19
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	0	1	0	1	2	2	4	3	17	18	32	15	13	10	7	128

Class G Freq: 0.002

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.5-12.5	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
12.5-18.5	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
18.5-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	4

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	3	0	5	3	1	1	1	2	0	1	0	1	1	1	1	1	22
3.5-7.5	10	12	8	7	5	10	7	6	8	8	7	9	6	6	11	11	131
7.5-12.5	18	2	18	8	10	13	23	29	26	37	36	17	30	45	28	16	356
12.5-18.5	20	4	22	11	1	6	23	35	30	86	116	77	83	41	57	32	644
18.5-24	31	17	41	6	4	5	16	15	13	38	31	23	29	30	65	33	397
>24	28	43	14	16	16	13	5	9	4	1	0	2	25	35	39	25	275
TOTAL	110	78	108	51	37	48	75	96	81	171	190	129	174	158	201	118	1825

Table A-2 (continued)

Jan-Dec 2004

Class A Freq: 0.138

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	13	9	9	1	0	1	0	0	0	0	0	0	0	0	5	6	44
7.5-12.5	17	19	23	9	1	2	4	5	11	20	9	3	2	2	6	11	144
12.5-18.5	46	19	43	12	7	7	9	6	20	87	27	23	13	16	20	29	384
18.5-24	19	7	28	12	6	0	0	1	9	70	12	1	7	31	22	34	259
>24	15	21	8	8	15	3	0	0	0	13	0	0	6	23	17	18	147
TOTAL	110	75	111	42	29	13	13	12	40	190	48	27	28	72	70	98	978

Class B Freq: 0.051

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3
3.5-7.5	6	4	5	2	2	1	2	0	0	0	1	0	0	2	2	4	31
7.5-12.5	3	4	5	6	2	6	3	4	11	17	9	1	0	3	1	2	77
12.5-18.5	2	5	5	5	2	1	4	4	12	40	19	3	8	2	2	6	120
18.5-24	1	7	15	5	2	0	2	0	3	23	2	3	9	7	7	6	92
>24	3	4	3	4	0	0	0	0	2	2	2	1	3	5	4	5	38
TOTAL	15	25	33	22	8	8	12	8	28	82	33	8	20	19	16	24	361

Class C Freq: 0.076

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	2	1	0	0	0	0	1	0	0	0	0	0	2	0	6
3.5-7.5	6	6	5	5	7	2	4	0	3	0	2	0	1	0	9	2	52
7.5-12.5	2	6	4	6	8	3	5	5	15	23	19	5	3	6	4	6	120
12.5-18.5	7	4	10	5	11	4	6	9	23	69	18	4	19	6	7	9	211
18.5-24	6	4	10	7	6	0	3	2	3	21	7	3	11	8	2	2	95
>24	4	10	3	3	1	0	1	2	5	7	1	0	4	7	3	2	53
TOTAL	25	30	34	27	33	9	19	18	50	120	47	12	38	27	27	21	537

Class D Freq: 0.412

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	3	4	4	1	1	4	2	4	1	4	0	2	2	2	1	4	39
3.5-7.5	12	24	33	21	13	14	24	11	9	5	8	13	8	5	12	13	225
7.5-12.5	10	10	34	29	39	36	46	42	72	73	63	49	36	39	18	9	605
12.5-18.5	24	10	24	20	17	32	35	30	54	195	137	90	145	54	49	19	935
18.5-24	34	12	21	11	13	8	15	8	8	98	83	58	127	94	81	29	700
>24	35	33	6	9	8	10	5	7	5	23	6	3	106	103	28	26	413
TOTAL	118	93	122	91	91	104	127	102	149	398	297	215	424	297	189	100	2917

Table A-2 (continued)

Jan-Dec 2004

Class E Freq: 0.250

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	4	3	11	6	1	3	0	0	6	2	2	0	3	2	2	3	48
3.5-7.5	4	7	21	23	22	19	22	13	15	11	6	8	11	18	13	19	232
7.5-12.5	13	4	5	10	34	46	33	36	31	40	24	18	42	65	38	21	460
12.5-18.5	23	2	3	0	1	3	18	46	38	79	113	72	103	84	68	21	674
18.5-24	10	4	0	3	0	0	1	8	9	42	81	22	32	32	23	13	280
>24	11	0	0	1	0	0	0	0	0	10	5	1	1	16	20	8	73
TOTAL	65	20	40	43	58	71	74	103	99	184	231	121	192	217	164	85	1767

Class F Freq: 0.064

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	3	1	0	1	0	0	1	1	1	1	1	0	0	1	11
3.5-7.5	4	0	3	2	12	7	1	6	3	10	3	7	4	6	2	2	72
7.5-12.5	1	0	0	1	2	6	3	4	6	9	8	23	14	17	11	4	109
12.5-18.5	1	0	0	0	0	0	1	5	7	19	37	48	23	13	11	5	170
18.5-24	2	0	0	0	0	0	0	1	0	8	49	7	5	2	7	4	85
>24	0	2	0	0	0	0	0	0	0	0	3	0	0	1	1	0	7
TOTAL	8	2	6	4	14	14	5	16	17	47	101	86	47	39	32	16	454

Class G Freq: 0.009

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	4
3.5-7.5	0	0	2	1	1	0	0	0	0	2	2	0	1	0	1	0	10
7.5-12.5	0	0	0	0	0	0	1	0	2	3	2	4	3	1	0	0	16
12.5-18.5	0	0	0	0	0	0	0	0	0	1	5	8	3	7	0	1	25
18.5-24	0	0	0	0	0	0	0	0	0	0	3	2	2	0	0	0	7
>24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	0	0	2	2	1	0	1	0	2	7	14	14	9	8	2	1	63

Class All Freq: 1.000

mph	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Calm-0.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	7	8	20	10	2	8	3	4	9	8	4	3	6	4	6	9	111
3.5-7.5	45	50	78	55	57	44	53	30	30	28	22	28	25	31	44	46	666
7.5-12.5	46	43	71	61	86	99	95	96	148	185	134	103	100	133	78	53	1531
12.5-18.5	103	40	85	42	38	47	73	100	154	490	356	248	314	182	157	90	2519
18.5-24	72	34	74	38	27	8	21	20	32	262	237	96	193	174	142	88	1518
>24	68	70	20	25	24	13	6	9	12	55	18	5	120	155	73	59	732
TOTAL	341	245	348	231	234	219	251	259	385	1028	771	483	758	679	500	345	7077

APPENDIX C

PILGRIM NUCLEAR POWER STATION OFFSITE DOSE CALCULATION MANUAL

No revisions were made to the PNPS Offsite Dose Calculation Manual (ODCM) during calendar year 2004.