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William J. Riggs
Director, Nuclear Assessment

May 12, 2003

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

Radioactive Effluent and Waste Disposal Report (2002)

LETTER NUMBER: 2.03.073

Dear Sir or Madam:

The enclosed 2002 annual "Radioactive Effluent and Waste Disposal Report" is submitted by Entergy Nuclear Operations, Inc. in accordance with Pilgrim Nuclear Power Station Technical Specification 5.6.3 and Regulatory Guide 1.21.

Sincerely,

A handwritten signature in black ink, appearing to read "W. Riggs".

for William J. Riggs

WGL/dd

Attachment: Radioactive Effluent and Waste Disposal Report (2002)

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PILGRIM NUCLEAR POWER STATION

Facility Operating License DPR-35

Radiological Effluent and Waste Disposal Report

January 1 through December 31, 2002





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

RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT

JANUARY 01 THROUGH DECEMBER 31, 2002

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Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
January-December 2002

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Pilgrim Nuclear Power Station
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EXECUTIVE SUMMARY

PILGRIM NUCLEAR POWER STATION RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT INCLUDING METEOROLOGICAL DATA JANUARY 01 THROUGH DECEMBER 31, 2002

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, 2002. 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 62 Curies. Releases of radioactive particulates and iodines totaled 0.023 Curies, and tritium releases totaled 691 Curies. No gross alpha radioactivity was detected in gaseous effluents.

Noble gases released in gaseous effluents resulted in a maximum total body dose of 0.016 mrem, with a corresponding skin dose of 0.25 mrem. The release of radioactivity in gaseous effluents from PNPS during 2002 resulted in a total body dose to the maximum-exposed hypothetical individual of about 2.6 mrem from radioactive particulates, iodines, and tritium. The maximum hypothetical dose to any organ from radioactive particulates, iodines, and tritium was about 3.0 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 3.0 mrem.

The maximum individual doses from gaseous radioactive effluents were compared to the applicable ODCM dose limits. Noble gas doses were less than 2% of the corresponding 10CFR50 dose objectives. Maximum doses resulting from releases of particulates, iodines, and tritium in gaseous effluents were less than 20% of corresponding 10CFR50 objectives.

In March 2003, it was discovered that a heating tape designed to keep the sample line at the main stack at an elevated temperature had failed in March 2002. Although this failure had the potential to affect sampling results, it was determined that the constant flow of air through the sample line would preclude condensation, and there would be no need for corrections to sample results collected between March and December of 2002.

LIQUID EFFLUENTS

Liquid radioactive releases for the reporting period are quantified in Tables 2.3-A and 2.3-B. Due to aggressive practices in reprocessing and reuse of water, liquid effluent releases were significantly lower than in past years. In fact, no discharges occurred during the months of March through December 2002. Liquid effluents released into the discharge canal contained 0.001 Curies of fission and activation products, and 0.29 Curies of tritium. No dissolved/entrained noble gases or gross alpha radioactivity were detected in liquid effluents.

The release of radioactivity in liquid effluents from PNPS during 2002 resulted in a total body dose of about 0.000042 mrem to the maximum-exposed hypothetical individual. The maximum hypothetical dose to any organ from liquid effluents was about 0.00022 mrem.

The maximum individual doses from liquid radioactive effluents were compared to the applicable ODCM dose limits. All doses from liquid effluents were less than 0.005% of their corresponding effluent control limit. In addition, all quarterly average concentrations of radioactivity in liquids released to Cape Cod Bay were less than 0.09% of the corresponding limits.

METEOROLOGICAL DATA

Meteorological joint frequency distributions are listed in Appendix A. During the course of 2002, numerous problems were encountered with meteorological sensors and translator card electronics. In October 2002, the hard disk on the computer containing the meteorological database failed, resulting in a loss of major portions of data for the months of August, September, and October. Data recovery for the entire annual period was about 77% for the 33-ft level, and 63% for the 220-ft level of the tower. The predominant wind direction was from the south-southwest, which occurred approximately 15% of the time during the reporting period. The predominant stability class was Class D, which occurred about 31% 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, was estimated as being about 11.5 mrem during 2002. There was no measurable increase during 2002 in ambient radiation measurements at the location of the nearest resident to PNPS.

The collective total body dose to a maximum-exposed hypothetical individual from radioactive gases, liquids, and ambient exposure resulting from PNPS operation during 2002 was calculated as being 5.7 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 waste shipped offsite for processing and disposal during the reporting period is described in Table 7.0. Approximately 250 cubic meters of solid waste, containing 170 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 2002, 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: 62.4 Ci, 1.98 μ Ci/sec
- Particulates and iodines with half-life greater than 8 days 0.023 Ci, 0.00073 μ Ci/sec
- Tritium: 691 Ci, 21.9 μ Ci/sec

Effluent releases from the main stack are detailed in Table 2.2-B. The main stack is an elevated release point with a 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.

In March 2003, it was discovered that a heating tape designed to keep the sample line at the main stack at an elevated temperature had failed in March 2002. The purpose of this heating tape is to prevent the formation of condensation in the sample line, which could affect sampling of radioactive particulates and iodines. An engineer with expertise in HVAC determined that the constant flow of air through the sample line would prevent condensation from occurring, and there would be no need for corrections to sample results collected between March and December of 2002. In addition, iodines were detected during this time period, indicating that the loss of heat trace did not adversely affect sampling.

Tritium samples were collected from the main stack and reactor building vent during the month of September 2002. Although the samples were analyzed, the records used to calculate tritium releases from the two release points could not be located, and total releases could not be calculated from the analytical results for the month. Tritium releases for the month of September were estimated based on the average of the releases for the months of August and October.

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.

Due to aggressive practices in reprocessing and reuse of water at Pilgrim Station during 2002, liquid effluent releases were significantly lower than in past years. In fact, no discharges occurred during the months of March through December 2002.

Liquid effluent releases are summarized in Table 2.3-A. Detailed breakdowns for individual radionuclides are listed in Table 2.3-B. No dissolved/entrained gases or gross alpha radioactivity were detected in liquid effluents released during the reporting period. Total releases for the various categories of radionuclides, as well as their corresponding mean concentrations, can be summarized as follows:

- Total Effluent Volume: 45,600 Liters
- Total Dilution Volume: 350,000,000 Liters
- Fission/Activation products: 0.0010 Ci, 0.0000000029 $\mu\text{Ci/mL}$
- Tritium: 0.29 Ci, 0.00000084 $\mu\text{Ci/mL}$
- Dissolved/entrained noble gases: Not Detected

Table 2.1
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Supplemental Information
January-June 2002

FACILITY: PILGRIM NUCLEAR POWER STATION

LICENSE: DPR-35

1. REGULATORY LIMITS

- | | |
|---|--|
| a. Fission and activation gases: | 500 mrem/yr total body and 3000 mrem/yr for skin at site boundary |
| b,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. EFFLUENT CONCENTRATION LIMITS

- | | |
|--|---|
| 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 μ Ci/mL for entrained noble gases; 10CFR20 Appendix B Table II values for all other radionuclides |

3. AVERAGE ENERGY

Not Applicable

4. MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

- | | |
|----------------------------------|--|
| 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. BATCH RELEASES

- a. Liquid Effluents
1. Total number of releases:
 2. Total time period (minutes):
 3. Maximum time period (minutes):
 4. Average time period (minutes):
 5. Minimum time period (minutes):
 6. Average stream flow (Liters/min):
during periods of release of effluents into a flowing stream

- b. Gaseous Effluents

Jan-Mar 2002	Apr-Jun 2002
6	-0-
2.98E+02	-0-
1.70E+02	-0-
4.97E+01	-0-
2.30E+01	-0-
1.17E+06	-0-
None	None
None	None
None	None

6. ABNORMAL RELEASES

- a. Liquid Effluents
- b. Gaseous Effluents

Table 2.1 (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Supplemental Information
July-December 2002

FACILITY: PILGRIM NUCLEAR POWER STATION

LICENSE: DPR-35

1. REGULATORY LIMITS

- | | |
|---|--|
| a. Fission and activation gases: | 500 mrem/yr total body and 3000 mrem/yr for skin at site boundary |
| b,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. EFFLUENT CONCENTRATION LIMITS

- | | |
|--|--|
| 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 μ Ci/mL for entrained noble gases;
10CFR20 Appendix B Table II values for all other radionuclides |

3. AVERAGE ENERGY

Not Applicable

4. MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

- | | |
|----------------------------------|--|
| 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. BATCH RELEASES

- a. Liquid Effluents
1. Total number of releases:
 2. Total time period (minutes):
 3. Maximum time period (minutes):
 4. Average time period (minutes):
 5. Minimum time period (minutes):
 6. Average stream flow (Liters/min):
during periods of release of effluents into a flowing stream

- b. Gaseous Effluents

Jul-Sep 2002	Oct-Dec 2002
-0-	-0-
-0-	-0-
-0-	-0-
-0-	-0-
-0-	-0-
-0-	-0-
None	None
None	None
None	None

6. ABNORMAL RELEASES

- a. Liquid Effluents
- b. Gaseous Effluents

Table 2.2-A
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Summation of All Releases
January-June 2002

Period: Jan-Mar 2002	Period: Apr-Jun 2002	Estimated Total Error
-------------------------	-------------------------	--------------------------

A. FISSION AND ACTIVATION GASES

Total Release: Ci	5.77E+00	3.24E+01	±22%
Average Release Rate During Period: $\mu\text{Ci/sec}$	7.31E-01	4.10E+00	
Percent of Effluent Control Limit	*	*	

B. IODINES

Total Iodine-131 Release: Ci	4.28E-04	4.67E-04	±20%
Average Release Rate During Period: $\mu\text{Ci/sec}$	5.43E-05	5.92E-05	
Percent of Effluent Control Limit	*	*	

C. PARTICULATES

Total Release: Ci	2.28E-04	1.12E-04	±21%
Average Release Rate During Period: $\mu\text{Ci/sec}$	2.89E-05	1.42E-05	
Percent of Effluent Control Limit	*	*	
Gross Alpha Radioactivity: Ci	NDA	NDA	

D. TRITIUM

Total Release: Ci	1.59E+02	1.25E+02	±20%
Average Release Rate During Period: $\mu\text{Ci/sec}$	2.02E+01	1.59E+01	
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 $1\text{E-}11 \mu\text{Ci/cc}$.

Table 2.2-A (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Summation of All Releases
July-December 2002

Period: Jul-Sep 2002	Period: Oct-Dec 2002	Estimated Total Error
-------------------------	-------------------------	--------------------------

A. FISSION AND ACTIVATION GASES

Total Release: Ci	1.91E+01	5.22E+00	±22%
Average Release Rate During Period: $\mu\text{Ci/sec}$	2.42E+00	6.62E-01	
Percent of Effluent Control Limit	*	*	

B. IODINES

Total Iodine-131 Release: Ci	8.57E-04	6.89E-04	±20%
Average Release Rate During Period: $\mu\text{Ci/sec}$	1.09E-04	8.73E-05	
Percent of Effluent Control Limit	*	*	

C. PARTICULATES

Total Release: Ci	3.70E-04	7.20E-04	±21%
Average Release Rate During Period: $\mu\text{Ci/sec}$	4.69E-05	9.12E-05	
Percent of Effluent Control Limit	*	*	
Gross Alpha Radioactivity: Ci	NDA	NDA	

D. TRITIUM

Total Release: Ci	1.57E+02	2.49E+02	±20%
Average Release Rate During Period: $\mu\text{Ci/sec}$	1.99E+01	3.16E+01	
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 $1\text{E-}11 \mu\text{Ci/cc}$.

Table 2.2-B
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Elevated Release
January-June 2002

Nuclide Released	Continuous Mode		Batch Mode	
	Jan-Mar 2002	Apr-Jun 2002	Jan-Mar 2002	Apr-Jun 2002

1. FISSION AND ACTIVATION GASES - Ci

Ar-41	NDA	NDA	N/A	N/A
Kr-85m	NDA	NDA	N/A	N/A
Kr-87	NDA	NDA	N/A	N/A
Kr-88	NDA	NDA	N/A	N/A
Xe-133	NDA	NDA	N/A	N/A
Xe-133m	NDA	NDA	N/A	N/A
Xe-135	NDA	2.53E+01	N/A	N/A
Xe-135m	NDA	NDA	N/A	N/A
Total for period	NDA	2.53E+01	N/A	N/A

2. IODINES - Ci

I-131	1.90E-04	1.79E-04	N/A	N/A
I-133	1.16E-03	9.04E-04	N/A	N/A
Total for period	1.35E-03	1.08E-03	N/A	N/A

3. PARTICULATES - Ci

Mn-54	NDA	NDA	N/A	N/A
Co-60	6.03E-06	NDA	N/A	N/A
Sr-89	1.18E-05	1.69E-05	N/A	N/A
Sr-90	NDA	NDA	N/A	N/A
Cs-137	1.37E-06	NDA	N/A	N/A
Ba/La-140	1.69E-05	2.68E-05	N/A	N/A
Total for period	3.61E-05	4.37E-05	N/A	N/A

4. TRITIUM - Ci

H-3	3.03E+00	4.15E+00	N/A	N/A
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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 μ Ci/cc
 Iodines: 1E-12 μ Ci/cc
 Particulates: 1E-11 μ Ci/cc

Table 2.2-B (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Elevated Release
July-December 2002

Nuclide Released	Continuous Mode		Batch Mode	
	Jul-Sep 2002	Oct-Dec 2002	Jul-Sep 2002	Oct-Dec 2002

1. FISSION AND ACTIVATION GASES - Ci

Ar-41	NDA	NDA	N/A	N/A
Kr-85m	NDA	NDA	N/A	N/A
Kr-87	NDA	NDA	N/A	N/A
Kr-88	NDA	NDA	N/A	N/A
Xe-133	NDA	NDA	N/A	N/A
Xe-133m	NDA	NDA	N/A	N/A
Xe-135	1.42E+01	NDA	N/A	N/A
Xe-135m	NDA	NDA	N/A	N/A
Total for period	1.42E+01	NDA	N/A	N/A

2. IODINES – Ci

I-131	1.97E-04	1.30E-04	N/A	N/A
I-133	1.08E-03	7.44E-04	N/A	N/A
Total for period	1.28E-03	8.74E-04	N/A	N/A

3. PARTICULATES – Ci

Mn-54	NDA	NDA	N/A	N/A
Co-60	NDA	NDA	N/A	N/A
Sr-89	1.70E-05	7.32E-06	N/A	N/A
Sr-90	NDA	NDA	N/A	N/A
Cs-137	NDA	NDA	N/A	N/A
Ba/La-140	9.27E-05	NDA	N/A	N/A
Total for period	1.10E-04	7.32E-06	N/A	N/A

4. TRITIUM – Ci

H-3	4.90E+00	6.02E+00	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 μ Ci/cc
Iodines: 1E-12 μ Ci/cc
Particulates: 1E-11 μ Ci/cc

Table 2.2-C
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Ground Level Release
January-June 2002

Nuclide Released	Continuous	Mode	Batch	Mode
	Jan-Mar 2002	Apr-Jun 2002	Jan-Mar 2002	Apr-Jun 2002

1. FISSION AND ACTIVATION GASES - Ci

Ar-41	NDA	NDA	N/A	N/A
Kr-85m	NDA	NDA	N/A	N/A
Kr-87	NDA	NDA	N/A	N/A
Kr-88	NDA	NDA	N/A	N/A
Xe-133	NDA	NDA	N/A	N/A
Xe-133m	NDA	NDA	N/A	N/A
Xe-135	5.77E+00	7.02E+00	N/A	N/A
Xe-135m	NDA	NDA	N/A	N/A
Total for period	5.77E+00	7.02E+00	N/A	N/A

2. IODINES - Ci

I-131	2.38E-04	2.88E-04	N/A	N/A
I-133	2.53E-03	2.78E-03	N/A	N/A
Total for period	2.77E-03	3.07E-03	N/A	N/A

3. PARTICULATES - Ci

Mn-54	NDA	NDA	N/A	N/A
Co-60	NDA	NDA	N/A	N/A
Sr-89	1.11E-04	6.85E-05	N/A	N/A
Sr-90	NDA	NDA	N/A	N/A
Cs-137	3.19E-05	NDA	N/A	N/A
Ba/La-140	4.90E-05	NDA	N/A	N/A
Total for period	1.92E-04	6.85E-05	N/A	N/A

4. TRITIUM - Ci

H-3	1.56E+02	1.21E+02	N/A	N/A
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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 µCi/cc
 Iodines: 1E-12 µCi/cc
 Particulates: 1E-11 µCi/cc

Table 2.2-C (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Gaseous Effluents - Ground Level Release
July-December 2002

Nuclide Released	Continuous Mode		Batch Mode	
	Jul-Sep 2002	Oct-Dec 2002	Jul-Sep 2002	Oct-Dec 2002

1. FISSION AND ACTIVATION GASES - Ci

Ar-41	NDA	NDA	N/A	N/A
Kr-85m	NDA	NDA	N/A	N/A
Kr-87	NDA	NDA	N/A	N/A
Kr-88	NDA	NDA	N/A	N/A
Xe-133	NDA	NDA	N/A	N/A
Xe-133m	NDA	NDA	N/A	N/A
Xe-135	4.89E+00	5.22E+00	N/A	N/A
Xe-135m	NDA	NDA	N/A	N/A
Total for period	4.89E+00	5.22E+00	N/A	N/A

2. IODINES - Ci

I-131	6.59E-04	5.58E-04	N/A	N/A
I-133	5.20E-03	5.14E-03	N/A	N/A
Total for period	5.86E-03	5.70E-03	N/A	N/A

3. PARTICULATES - Ci

Mn-54	1.90E-06	NDA	N/A	N/A
Co-60	NDA	NDA	N/A	N/A
Sr-89	1.00E-04	9.73E-05	N/A	N/A
Sr-90	NDA	NDA	N/A	N/A
Cs-137	NDA	NDA	N/A	N/A
Ba/La-140	1.58E-04	6.15E-04	N/A	N/A
Total for period	2.60E-04	7.12E-04	N/A	N/A

4. TRITIUM - Ci

H-3	1.52E+02	2.43E+02	N/A	N/A
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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 μ Ci/cc
 Iodines: 1E-12 μ Ci/cc
 Particulates: 1E-11 μ Ci/cc

Table 2.3-A
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Liquid Effluents - Summation of All Releases
January-June 2002

Period: Jan-Mar 2002	Period: Apr-Jun 2002	Estimated Total Error
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A. FISSION AND ACTIVATION PRODUCTS

Total Release (not including H-3, noble gas, or alpha): Ci	1.00E-03	N/A	±12%
Average Diluted Concentration During Period: µCi/mL	2.86E-09	N/A	
Percent of Effluent Concentration Limit*	5.24E-02%	N/A	

B. TRITIUM

Total Release: Ci	2.93E-01	N/A	±9.4%
Average Diluted Concentration During Period: µCi/mL	8.39E-07	N/A	
Percent of Effluent Concentration Limit*	8.39E-02%	N/A	

C. DISSOLVED AND ENTRAINED GASES

Total Release: Ci	NDA	N/A	±16%
Average Diluted Concentration During Period: µCi/mL	NDA	N/A	
Percent of Effluent Concentration Limit*	NDA	N/A	

D. GROSS ALPHA RADIOACTIVITY

Total Release: Ci	NDA	N/A	±34%
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E. VOLUME OF WASTE RELEASED PRIOR TO DILUTION

Waste Volume: Liters	4.56E+04	N/A	±5.7%
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F. VOLUME OF DILUTION WATER USED DURING PERIOD

Dilution Volume: Liters	1.52E+11	N/A	±10%
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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 1E-05 µCi/mL.
4. LLD for liquid gross alpha activity listed as NDA is 1E-07 µCi/mL.

Table 2.3-A (continued)
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Liquid Effluents - Summation of All Releases
July-December 2002

Period: Jul-Sep 2002	Period: Oct-Dec 2002	Estimated Total Error
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A. FISSION AND ACTIVATION PRODUCTS

Total Release (not including H-3, noble gas, or alpha): Ci	N/A	N/A	±12%
Average Diluted Concentration During Period: $\mu\text{Ci/mL}$	N/A	N/A	
Percent of Effluent Concentration Limit*	N/A	N/A	

B. TRITIUM

Total Release: Ci	N/A	N/A	±9.4%
Average Diluted Concentration During Period: $\mu\text{Ci/mL}$	N/A	N/A	
Percent of Effluent Concentration Limit*	N/A	N/A	

C. DISSOLVED AND ENTRAINED GASES

Total Release: Ci	N/A	N/A	±16%
Average Diluted Concentration During Period: $\mu\text{Ci/mL}$	N/A	N/A	
Percent of Effluent Concentration Limit*	N/A	N/A	

D. GROSS ALPHA RADIOACTIVITY

Total Release: Ci	N/A	N/A	±34%
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E. VOLUME OF WASTE RELEASED PRIOR TO DILUTION

Waste Volume: Liters	N/A	N/A	±5.7%
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F. VOLUME OF DILUTION WATER USED DURING PERIOD

Dilution Volume: Liters	N/A	N/A	±10%
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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-June 2002

Nuclide Released	Continuous Mode		Batch Mode	
	Jan-Mar 2002	Apr-Jun 2002	Jan-Mar 2002	Apr-Jun 2002

1. FISSION AND ACTIVATION PRODUCTS - Ci

Cr-51	N/A	N/A	NDA	N/A
Mn-54	N/A	N/A	6.60E-05	N/A
Fe-55	N/A	N/A	7.06E-04	N/A
Fe-59	N/A	N/A	NDA	N/A
Co-58	N/A	N/A	NDA	N/A
Co-60	N/A	N/A	8.21E-05	N/A
Zn-65	N/A	N/A	2.26E-06	N/A
Sr-89	N/A	N/A	NDA	N/A
Sr-90	N/A	N/A	2.33E-06	N/A
Zr/Nb-95	N/A	N/A	NDA	N/A
Ag-110m	N/A	N/A	NDA	N/A
Sb-124	N/A	N/A	NDA	N/A
Cs-137	N/A	N/A	1.42E-04	N/A
Total for period	N/A	N/A	1.00E-03	N/A

2. DISSOLVED AND ENTRAINED GASES - Ci

Xe-133	N/A	N/A	NDA	N/A
Xe-135	N/A	N/A	NDA	N/A
Total for period	N/A	N/A	NDA	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
July-December 2002

Nuclide Released	Continuous Mode		Batch Mode	
	Jul-Sep 2002	Oct-Dec 2002	Jul-Sep 2002	Oct-Dec 2002

1. FISSION AND ACTIVATION PRODUCTS - Ci

Cr-51	N/A	N/A	N/A	N/A
Mn-54	N/A	N/A	N/A	N/A
Fe-55	N/A	N/A	N/A	N/A
Fe-59	N/A	N/A	N/A	N/A
Co-58	N/A	N/A	N/A	N/A
Co-60	N/A	N/A	N/A	N/A
Zn-65	N/A	N/A	N/A	N/A
Sr-89	N/A	N/A	N/A	N/A
Sr-90	N/A	N/A	N/A	N/A
Zr/Nb-95	N/A	N/A	N/A	N/A
Ag-110m	N/A	N/A	N/A	N/A
Sb-124	N/A	N/A	N/A	N/A
Cs-137	N/A	N/A	N/A	N/A
Total for period	N/A	N/A	N/A	N/A

2. DISSOLVED AND ENTRAINED GASES - Ci

Xe-133	N/A	N/A	N/A	N/A
Xe-135	N/A	N/A	N/A	N/A
Total for period	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, 31%
- Wind Direction (from): South-southwest, 15%
- 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 2002, numerous problems were encountered with meteorological sensors and translator card electronics. In October 2002, a failure of the hard disk on the computer containing the meteorological database failed, resulting in a loss of major portions of data for the months of August, September, and October. Data recovery for the entire annual period was about 77% for the 33-ft level, and 63% 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.

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 2002 were also used as input to the "AEOLUS-3" computer program (Reference 7). 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 2002 resulted in a maximum total body dose of 0.016 mrem. The maximum skin dose was 0.25 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. Doses to more "realistic" individuals at offsite locations would be lower than doses for these hypothetical site boundary individuals.

Table 4.1

Maximum Doses From Noble Gas Releases During 2002^(a)

Release Period	Gamma Air Dose (location)	Beta Air Dose (location)	Total Body Dose (location)	Skin Dose (location)
Jan-Mar	5.89E-03 mrad (0.10 km NNE)	7.63E-02 mrad (0.10 km NNE)	3.89E-03 mrem (0.10 km NNE)	6.23E-02 mrem (0.10 km NNE)
Apr-Jun	7.50E-03 mrad (0.10 km NNE)	9.28E-02 mrad (0.10 km NNE)	4.95E-03 mrem (0.10 km NNE)	7.60E-02 mrem (0.10 km NNE)
Jul-Sep	5.18E-03 mrad (0.10 km NNE)	6.47E-02 mrad (0.10 km NNE)	3.42E-03 mrem (0.10 km NNE)	5.29E-02 mrem (0.10 km NNE)
Oct-Dec	5.33E-03 mrad (0.10 km NNE)	6.90E-02 mrad (0.10 km NNE)	3.52E-03 mrem (0.10 km NNE)	5.63E-02 mrem (0.10 km NNE)
Jan-Dec	2.39E-02 mrad (0.10 km NNE)	3.03E-01 mrad (0.10 km NNE)	1.58E-02 mrem (0.10 km NNE)	2.48E-01 mrem (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 doses 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 2002 were also used as input to the "AEOLUS-3" computer program (Reference 7). 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 2002 resulted in a maximum total body dose (teen age class) of 2.6 mrem. The maximum organ dose (teen age class, thyroid) was 3.0 mrem. Both of these doses occurred to hypothetical individuals at the shoreline 0.11 kilometers NE of the PNPS Reactor Building, an area under Entergy control. For the more "realistic" individuals at offsite locations, the maximum total body dose was 0.13 mrem (child age class at a location 0.9 kilometers SE from the Reactor Building), while the maximum organ dose was 0.25 mrem (child thyroid at a location 0.9 kilometers SE from the Reactor Building, yielding vegetables).

Table 4.2-A

Maximum Individual Organ Dose at Receptor Location -- mrem
From Gaseous Release Period: January-March 2002

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NE 0.10 km DI	Resident NW 0.74 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	7.17E-03	7.32E-05	4.84E-03	8.13E-05	2.12E-05	3.98E-05
GI-LLI	6.10E-01	5.53E-03	1.96E-02	2.68E-03	1.04E-03	1.16E-03
Kidney	6.10E-01	5.53E-03	1.94E-02	2.69E-03	1.04E-03	1.16E-03
Liver	6.10E-01	5.53E-03	1.99E-02	2.72E-03	1.04E-03	1.16E-03
Lung	6.10E-01	5.54E-03	1.91E-02	2.68E-03	1.03E-03	1.15E-03
Thyroid	6.53E-01	5.90E-03	3.23E-02	4.20E-03	1.17E-03	1.33E-03
Total Body	6.09E-01	5.53E-03	1.97E-02	2.70E-03	1.04E-03	1.16E-03
Age Class: Teen						
Bone	7.34E-03	7.46E-05	7.09E-03	1.35E-04	3.05E-05	5.66E-05
GI-LLI	6.15E-01	5.58E-03	2.19E-02	3.21E-03	1.13E-03	1.25E-03
Kidney	6.15E-01	5.59E-03	2.18E-02	3.24E-03	1.13E-03	1.25E-03
Liver	6.15E-01	5.58E-03	2.27E-02	3.28E-03	1.13E-03	1.26E-03
Lung	6.16E-01	5.59E-03	2.14E-02	3.21E-03	1.12E-03	1.25E-03
Thyroid	6.72E-01	6.07E-03	3.26E-02	5.54E-03	1.28E-03	1.40E-03
Total Body	6.15E-01	5.58E-03	2.19E-02	3.23E-03	1.13E-03	1.25E-03
Age Class: Child						
Bone	7.55E-03	7.64E-05	1.57E-02	3.16E-04	6.70E-05	1.24E-04
GI-LLI	5.44E-01	4.94E-03	3.03E-02	4.78E-03	1.59E-03	1.75E-03
Kidney	5.44E-01	4.94E-03	3.06E-02	4.84E-03	1.59E-03	1.76E-03
Liver	5.44E-01	4.94E-03	3.22E-02	4.92E-03	1.60E-03	1.77E-03
Lung	5.45E-01	4.95E-03	3.00E-02	4.78E-03	1.59E-03	1.75E-03
Thyroid	6.15E-01	5.55E-03	4.73E-02	9.39E-03	1.85E-03	1.98E-03
Total Body	5.44E-01	4.94E-03	3.05E-02	4.80E-03	1.59E-03	1.76E-03
Age Class: Infant						
Bone	7.31E-03	7.44E-05	8.54E-04	3.56E-04	9.78E-06	7.77E-06
GI-LLI	3.16E-01	2.87E-03	3.04E-03	3.67E-03	1.87E-04	1.35E-04
Kidney	3.16E-01	2.87E-03	3.05E-03	3.77E-03	1.89E-04	1.35E-04
Liver	3.16E-01	2.87E-03	3.05E-03	3.93E-03	1.91E-04	1.35E-04
Lung	3.17E-01	2.88E-03	3.05E-03	3.69E-03	1.88E-04	1.35E-04
Thyroid	3.82E-01	3.43E-03	3.49E-03	1.45E-02	5.60E-04	1.64E-04
Total Body	3.16E-01	2.87E-03	3.04E-03	3.70E-03	1.88E-04	1.35E-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: April-June 2002

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NE 0.10 km DI	Resident NW 0.74 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	5.09E-04	4.76E-06	2.10E-03	2.93E-05	9.56E-06	1.80E-05
GI-LLI	4.68E-01	4.24E-03	1.45E-02	2.08E-03	8.03E-04	8.97E-04
Kidney	4.68E-01	4.24E-03	1.42E-02	2.08E-03	8.02E-04	8.95E-04
Liver	4.68E-01	4.24E-03	1.42E-02	2.08E-03	8.02E-04	8.94E-04
Lung	4.68E-01	4.24E-03	1.41E-02	2.07E-03	8.01E-04	8.94E-04
Thyroid	5.17E-01	4.66E-03	3.00E-02	3.82E-03	9.59E-04	1.09E-03
Total Body	4.68E-01	4.24E-03	1.42E-02	2.08E-03	8.02E-04	8.94E-04
Age Class: Teen						
Bone	6.23E-04	5.73E-06	3.23E-03	4.89E-05	1.45E-05	2.71E-05
GI-LLI	4.72E-01	4.28E-03	1.62E-02	2.49E-03	8.73E-04	9.70E-04
Kidney	4.72E-01	4.28E-03	1.59E-02	2.50E-03	8.72E-04	9.68E-04
Liver	4.72E-01	4.28E-03	1.59E-02	2.49E-03	8.72E-04	9.68E-04
Lung	4.73E-01	4.28E-03	1.59E-02	2.48E-03	8.71E-04	9.67E-04
Thyroid	5.37E-01	4.83E-03	2.94E-02	5.14E-03	1.05E-03	1.14E-03
Total Body	4.72E-01	4.28E-03	1.60E-02	2.49E-03	8.72E-04	9.68E-04
Age Class: Child						
Bone	7.67E-04	6.95E-06	7.67E-03	1.18E-04	3.43E-05	6.40E-05
GI-LLI	4.17E-01	3.78E-03	2.28E-02	3.71E-03	1.23E-03	1.36E-03
Kidney	4.17E-01	3.78E-03	2.26E-02	3.73E-03	1.23E-03	1.36E-03
Liver	4.17E-01	3.78E-03	2.25E-02	3.72E-03	1.23E-03	1.36E-03
Lung	4.17E-01	3.78E-03	2.25E-02	3.71E-03	1.23E-03	1.36E-03
Thyroid	4.98E-01	4.47E-03	4.33E-02	8.94E-03	1.53E-03	1.62E-03
Total Body	4.17E-01	3.78E-03	2.27E-02	3.72E-03	1.23E-03	1.36E-03
Age Class: Infant						
Bone	6.30E-04	5.78E-06	3.21E-05	1.16E-04	2.84E-06	4.24E-07
GI-LLI	2.40E-01	2.17E-03	1.73E-03	2.85E-03	1.43E-04	9.97E-05
Kidney	2.40E-01	2.18E-03	1.73E-03	2.89E-03	1.44E-04	9.99E-05
Liver	2.40E-01	2.18E-03	1.73E-03	2.89E-03	1.44E-04	9.98E-05
Lung	2.40E-01	2.18E-03	1.74E-03	2.85E-03	1.43E-04	1.00E-04
Thyroid	3.14E-01	2.81E-03	2.23E-03	1.51E-02	5.61E-04	1.31E-04
Total Body	2.40E-01	2.17E-03	1.73E-03	2.87E-03	1.43E-04	9.97E-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: July-September 2002

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NE 0.10 km DI	Resident NW 0.74 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	1.06E-03	1.00E-05	3.14E-03	4.43E-05	1.39E-05	2.61E-05
GI-LLI	5.88E-01	5.33E-03	1.83E-02	2.61E-03	1.01E-03	1.13E-03
Kidney	5.89E-01	5.34E-03	1.80E-02	2.62E-03	1.01E-03	1.12E-03
Liver	5.88E-01	5.33E-03	1.79E-02	2.61E-03	1.01E-03	1.12E-03
Lung	5.89E-01	5.34E-03	1.78E-02	2.60E-03	1.01E-03	1.12E-03
Thyroid	6.88E-01	6.18E-03	5.32E-02	6.13E-03	1.32E-03	1.51E-03
Total Body	5.88E-01	5.33E-03	1.79E-02	2.61E-03	1.01E-03	1.12E-03
Age Class: Teen						
Bone	1.27E-03	1.18E-05	4.80E-03	7.39E-05	2.10E-05	3.90E-05
GI-LLI	5.93E-01	5.38E-03	2.06E-02	3.13E-03	1.10E-03	1.22E-03
Kidney	5.94E-01	5.39E-03	2.01E-02	3.15E-03	1.10E-03	1.22E-03
Liver	5.94E-01	5.38E-03	2.01E-02	3.14E-03	1.09E-03	1.22E-03
Lung	5.95E-01	5.39E-03	2.00E-02	3.12E-03	1.09E-03	1.21E-03
Thyroid	7.24E-01	6.49E-03	5.00E-02	8.50E-03	1.44E-03	1.55E-03
Total Body	5.93E-01	5.38E-03	2.01E-02	3.13E-03	1.09E-03	1.22E-03
Age Class: Child						
Bone	1.53E-03	1.40E-05	1.13E-02	1.78E-04	4.93E-05	9.15E-05
GI-LLI	5.24E-01	4.75E-03	2.87E-02	4.66E-03	1.55E-03	1.71E-03
Kidney	5.25E-01	4.76E-03	2.85E-02	4.71E-03	1.55E-03	1.71E-03
Liver	5.24E-01	4.75E-03	2.84E-02	4.69E-03	1.55E-03	1.71E-03
Lung	5.26E-01	4.76E-03	2.82E-02	4.65E-03	1.55E-03	1.71E-03
Thyroid	6.86E-01	6.12E-03	7.45E-02	1.52E-02	2.14E-03	2.21E-03
Total Body	5.24E-01	4.75E-03	2.86E-02	4.68E-03	1.55E-03	1.71E-03
Age Class: Infant						
Bone	1.29E-03	1.20E-05	7.57E-05	1.84E-04	4.79E-06	8.55E-07
GI-LLI	3.02E-01	2.73E-03	2.21E-03	3.58E-03	1.79E-04	1.25E-04
Kidney	3.02E-01	2.74E-03	2.21E-03	3.67E-03	1.82E-04	1.26E-04
Liver	3.02E-01	2.74E-03	2.21E-03	3.66E-03	1.82E-04	1.26E-04
Lung	3.03E-01	2.75E-03	2.22E-03	3.58E-03	1.80E-04	1.26E-04
Thyroid	4.50E-01	4.00E-03	3.20E-03	2.83E-02	1.01E-03	1.82E-04
Total Body	3.02E-01	2.74E-03	2.21E-03	3.61E-03	1.80E-04	1.25E-04

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: October-December 2002

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NE 0.10 km DI	Resident NW 0.74 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	1.09E-03	1.03E-05	3.13E-03	4.13E-05	1.33E-05	2.49E-05
GI-LLI	9.40E-01	8.52E-03	2.91E-02	4.16E-03	1.61E-03	1.79E-03
Kidney	9.40E-01	8.52E-03	2.85E-02	4.17E-03	1.61E-03	1.79E-03
Liver	9.40E-01	8.52E-03	2.84E-02	4.16E-03	1.61E-03	1.79E-03
Lung	9.42E-01	8.54E-03	2.83E-02	4.15E-03	1.61E-03	1.79E-03
Thyroid	1.03E+00	9.31E-03	5.89E-02	7.10E-03	1.87E-03	2.11E-03
Total Body	9.39E-01	8.52E-03	2.85E-02	4.16E-03	1.61E-03	1.79E-03
Age Class: Teen						
Bone	1.31E-03	1.21E-05	4.75E-03	6.86E-05	1.99E-05	3.69E-05
GI-LLI	9.48E-01	8.60E-03	3.26E-02	4.99E-03	1.75E-03	1.94E-03
Kidney	9.49E-01	8.60E-03	3.20E-02	5.00E-03	1.75E-03	1.94E-03
Liver	9.48E-01	8.60E-03	3.19E-02	4.99E-03	1.75E-03	1.93E-03
Lung	9.52E-01	8.63E-03	3.19E-02	4.98E-03	1.75E-03	1.94E-03
Thyroid	1.07E+00	9.63E-03	5.78E-02	9.47E-03	2.04E-03	2.22E-03
Total Body	9.48E-01	8.59E-03	3.20E-02	4.99E-03	1.75E-03	1.94E-03
Age Class: Child						
Bone	1.59E-03	1.45E-05	1.12E-02	1.65E-04	4.65E-05	8.64E-05
GI-LLI	8.37E-01	7.59E-03	4.56E-02	7.44E-03	2.47E-03	2.73E-03
Kidney	8.38E-01	7.60E-03	4.53E-02	7.47E-03	2.47E-03	2.72E-03
Liver	8.38E-01	7.59E-03	4.52E-02	7.45E-03	2.47E-03	2.72E-03
Lung	8.41E-01	7.62E-03	4.51E-02	7.43E-03	2.47E-03	2.72E-03
Thyroid	9.89E-01	8.88E-03	8.51E-02	1.63E-02	2.97E-03	3.14E-03
Total Body	8.37E-01	7.59E-03	4.55E-02	7.45E-03	2.47E-03	2.73E-03
Age Class: Infant						
Bone	1.33E-03	1.23E-05	7.64E-05	1.67E-04	4.37E-06	8.31E-07
GI-LLI	4.82E-01	4.37E-03	3.49E-03	5.71E-03	2.86E-04	1.99E-04
Kidney	4.82E-01	4.37E-03	3.49E-03	5.78E-03	2.88E-04	2.00E-04
Liver	4.82E-01	4.37E-03	3.49E-03	5.77E-03	2.88E-04	2.00E-04
Lung	4.85E-01	4.40E-03	3.51E-03	5.71E-03	2.87E-04	2.01E-04
Thyroid	6.22E-01	5.56E-03	4.42E-03	2.64E-02	9.77E-04	2.51E-04
Total Body	4.82E-01	4.37E-03	3.49E-03	5.74E-03	2.87E-04	1.99E-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: January-December 2002

Receptor: Direction: Distance ¹ : Pathway ² :	Bound NE 0.10 km DI	Resident NW 0.74 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	9.84E-03	9.83E-05	1.32E-02	1.96E-04	5.80E-05	1.09E-04
GI-LLI	2.61E+00	2.36E-02	8.14E-02	1.15E-02	4.46E-03	4.97E-03
Kidney	2.61E+00	2.36E-02	8.01E-02	1.16E-02	4.45E-03	4.96E-03
Liver	2.61E+00	2.36E-02	8.04E-02	1.16E-02	4.45E-03	4.97E-03
Lung	2.61E+00	2.37E-02	7.93E-02	1.15E-02	4.45E-03	4.96E-03
Thyroid	2.89E+00	2.61E-02	1.74E-01	2.12E-02	5.32E-03	6.03E-03
Total Body	2.60E+00	2.36E-02	8.03E-02	1.15E-02	4.45E-03	4.96E-03
Age Class: Teen						
Bone	1.05E-02	1.04E-04	1.99E-02	3.26E-04	8.60E-05	1.60E-04
GI-LLI	2.63E+00	2.38E-02	9.13E-02	1.38E-02	4.84E-03	5.38E-03
Kidney	2.63E+00	2.39E-02	8.99E-02	1.39E-02	4.84E-03	5.37E-03
Liver	2.63E+00	2.38E-02	9.06E-02	1.39E-02	4.84E-03	5.37E-03
Lung	2.64E+00	2.39E-02	8.91E-02	1.38E-02	4.84E-03	5.36E-03
Thyroid	3.00E+00	2.70E-02	1.70E-01	2.86E-02	5.81E-03	6.30E-03
Total Body	2.63E+00	2.38E-02	9.00E-02	1.38E-02	4.84E-03	5.37E-03
Age Class: Child						
Bone	1.14E-02	1.12E-04	4.59E-02	7.76E-04	1.97E-04	3.66E-04
GI-LLI	2.32E+00	2.11E-02	1.27E-01	2.06E-02	6.83E-03	7.56E-03
Kidney	2.32E+00	2.11E-02	1.27E-01	2.08E-02	6.84E-03	7.56E-03
Liver	2.32E+00	2.11E-02	1.28E-01	2.08E-02	6.84E-03	7.57E-03
Lung	2.33E+00	2.11E-02	1.26E-01	2.06E-02	6.83E-03	7.55E-03
Thyroid	2.79E+00	2.50E-02	2.50E-01	4.98E-02	8.49E-03	8.95E-03
Total Body	2.32E+00	2.11E-02	1.27E-01	2.06E-02	6.83E-03	7.56E-03
Age Class: Infant						
Bone	1.06E-02	1.04E-04	1.04E-03	8.22E-04	2.18E-05	9.88E-06
GI-LLI	1.34E+00	1.21E-02	1.05E-02	1.58E-02	7.95E-04	5.59E-04
Kidney	1.34E+00	1.22E-02	1.05E-02	1.61E-02	8.04E-04	5.60E-04
Liver	1.34E+00	1.22E-02	1.05E-02	1.62E-02	8.05E-04	5.60E-04
Lung	1.35E+00	1.22E-02	1.05E-02	1.58E-02	7.97E-04	5.62E-04
Thyroid	1.77E+00	1.58E-02	1.33E-02	8.42E-02	3.11E-03	7.28E-04
Total Body	1.34E+00	1.21E-02	1.05E-02	1.59E-02	7.98E-04	5.60E-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.

Radioactivity released in liquid effluents from PNPS during 2002 resulted in a maximum total body dose (child age class) of 0.000042 mrem. The maximum organ dose (child age class, bone) was 0.00022 mrem.

Table 4.3-A

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: January-March 2002

Organ	Age Class Organ Dose - mrem		
	Adult	Teen	Child*
Bone	1.64E-04	1.61E-04	2.26E-04
GI-LLI	8.33E-05	6.42E-05	2.73E-05
Kidney	7.29E-06	1.16E-05	6.16E-06
Liver	1.22E-04	1.23E-04	1.27E-04
Lung	6.18E-05	7.33E-05	6.68E-05
Thyroid	1.24E-06	6.12E-06	1.36E-06
Total Body	3.41E-05	3.64E-05	4.23E-05

* 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-B

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: April-June 2002

No Liquid Effluent Discharges Occurred During This Period

Table 4.3-C

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: July-September 2002

No Liquid Effluent Discharges Occurred During This Period

Table 4.3-D

Maximum Individual Organ Doses -- mrem
From Liquid Release Period: October-December 2002

No Liquid Effluent Discharges Occurred During This Period

Table 4.3-E

Maximum Individual Organ Doses -- mrem
 From Liquid Release Period: January-December 2002

Organ	Age Class Organ Dose - mrem		
	Adult	Teen	Child*
Bone	1.61E-04	1.58E-04	2.22E-04
GI-LLI	8.20E-05	6.32E-05	2.69E-05
Kidney	7.18E-06	1.14E-05	6.06E-06
Liver	1.20E-04	1.21E-04	1.25E-04
Lung	6.09E-05	7.22E-05	6.57E-05
Thyroid	1.22E-06	6.03E-06	1.34E-06
Total Body	3.36E-05	3.58E-05	4.16E-05

* 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 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 637 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 90.6 ± 92.1 mR/yr to 57.7 ± 7.0 mR/yr. Such a corrected dose is not statistically different from the Zone 4 average of 56.6 ± 8.2 mR/yr.

Although the annual exposure at TLD location OA was 580 mR above the average Zone 4 exposure rate, 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 2.7 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 55.3 ± 7.2 mR, which compares quite well to the Zone 4 annual average of 56.6 ± 8.2 mR based on continuous occupancy at this location.

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. Their annual incremental radiation dose above background during 2002 is estimated as being about 11.5 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 these contractor personnel 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 2002. Dose calculations performed in the same manner as those outlined in Section 4.2 yielded a projected total body dose to the maximum-exposed individual (500 hr/yr exposure) of about 0.008 mrem, resulting from inhalation.

Again, it must be emphasized that the above described exposures were received by personnel who are employees of Entergy, working in a facility 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.

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 11.5 mrem. Inhalation doses for National Guard troops, calculated in the same manner as that described above, were calculated at about 0.03 mrem.

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 12 mrem/year.

Table 5.0

Average TLD Exposures By Distance Zone During 2002

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	23.4 \pm 22.6	13.0 \pm 1.9	13.3 \pm 1.7	14.3 \pm 2.1
Apr-Jun	21.7 \pm 23.2	11.7 \pm 2.0	11.9 \pm 1.6	13.1 \pm 2.0
Jul-Sep	23.4 \pm 22.8	13.3 \pm 2.0	14.5 \pm 1.4	15.3 \pm 2.1
Oct-Dec	22.0 \pm 24.1	13.6 \pm 1.8	12.6 \pm 1.2	13.8 \pm 1.8
Jan-Dec	90.6 \pm 92.1**	51.6 \pm 8.1	52.2 \pm 6.8	56.6 \pm 8.2

* 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 57.7 \pm 7.0 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 2002 were a small percentage of the corresponding effluent control.

Table 6.1

Percent of ODCM Effluent Control Limits
for Gaseous Effluent Releases During 2002

A. Instantaneous Dose Rate Limit - Noble Gases

PNPS ODCM Control 3.3.1.a

Limit: 500 mrem/yr Total Body Dose

<u>Period</u>	<u>Value - mrem/yr</u>	<u>Fraction of Limit</u>
January-December	1.58E-02	3.16E-03%

B. Instantaneous Dose Rate Limit - Noble Gases

PNPS ODCM Control 3.3.1.a

Limit: 3000 mrem/yr Skin Dose

<u>Period</u>	<u>Value - mrem/yr</u>	<u>Fraction of Limit</u>
January-December	2.48E-01	8.27E-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>	<u>Value - mrem/yr</u>	<u>Fraction of Limit</u>
January-December	3.00E+00	2.00E-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>	<u>Value - mrad</u>	<u>Fraction of Limit</u>
January-March	5.89E-03	1.18E-01%
April-June	7.50E-03	1.50E-01%
July-September	5.18E-03	1.04E-01%
October-December	5.33E-03	1.07E-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>	<u>Value - mrad/yr</u>	<u>Fraction of Limit</u>
January-December	2.39E-02	2.39E-01%

Table 6.1 (continued)

Percent of ODCM Effluent Control Limits
for Gaseous Effluent Releases During 2002

- 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>
January-March	7.63E-02	7.63E-01%
April-June	9.28E-02	9.28E-01%
July-September	6.47E-02	6.47E-01%
October-December	6.90E-02	6.90E-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>
January-December	3.03E-01	1.52E+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>
January-March	6.72E-01	8.96E+00%
April-June	5.37E-01	7.16E+00%
July-September	7.24E-01	9.65E+00%
October-December	1.07E+00	1.43E+01%

- 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>
January-December	3.00E+00	2.00E+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. The resulting concentration and doses from Pilgrim Station's liquid releases during 2002 were a very small percentage of the corresponding effluent control.

Table 6.2

Percent of ODCM Effluent Control Limits
for Liquid Effluent Releases During 2002

- 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>
January-March	2.86E-09	5.24E-02%
April-June	0.00E+00	0.00E+00%
July-September	0.00E+00	0.00E+00%
October-December	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>
January-March	8.39E-07	8.39E-02%
April-June	0.00E+00	0.00E+00%
July-September	0.00E+00	0.00E+00%
October-December	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>
January-March	NDA	--
April-June	0.00E+00	0.00E+00%
July-September	0.00E+00	0.00E+00%
October-December	0.00E+00	0.00E+00%

Table 6.2 (continued)

Percent of ODCM Effluent Control Limits
for Liquid Effluent Releases During 2002

- 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>
January-March	4.23E-05	2.82E-03%
April-June	0.00E+00	0.00E+00%
July-September	0.00E+00	0.00E+00%
October-December	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>
January-December	4.16E-05	1.39E-03%

- 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>
January-March	2.26E-04	4.52E-03%
April-June	0.00E+00	0.00E+00%
July-September	0.00E+00	0.00E+00%
October-December	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>
January-December	2.22E-04	2.22E-03%

3. RADIOACTIVE WASTE DISPOSAL DATA

Radioactive wastes which were shipped offsite for processing and disposal during the reporting period are described in Table 3, 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 3 for the following waste categories:

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

During the reporting period approximately 27.8 cubic meters of spent resins, filter sludges, etc., containing a total activity of about 168 Curies were shipped from PNPS for processing and disposal. Dry compressible wastes and contaminated equipment shipped during the period totaled 222 cubic meters and contained 2.24 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 3. There were 4 shipments to Oak Ridge, TN (GTS Duratek,) and 5 shipments to Erwin, TN (Studsvik).

Table 3
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Solid Waste and Irradiated Fuel Shipments
January-June 2002

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-June 2002		
	Volume - m ³	Curies	Total Error
a. Spent resins, filters, filter sludges, evaporator bottoms, etc.	1.65E+01	1.28E+02	± 25%
b. Dry compressible waste, contaminated equipment, etc.	2.22E+02	2.24E+00	± 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 sludges, evaporator bottoms, etc.	Mn-54	9.00E+00%	± 25%
	Fe-55	1.40E+01%	± 25%
	Co-60	3.00E+01%	± 25%
	Cs-137	4.00E+01%	± 25%
b. Dry compressible waste, contaminated equipment, etc.	Mn-54	9.78E+00%	± 25%
	Fe-55	7.94E+01%	± 25%
	Co-60	6.30E+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
3	Tractor-trailer	Studsvik, ² Erwin, TN
4	Tractor-trailer	GTS Duratek, Oak Ridge, 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, for final disposal.

B. IRRADIATED FUEL SHIPMENTS & DISPOSITION

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

Table 3
Pilgrim Nuclear Power Station
Effluent and Waste Disposal Report
Solid Waste and Irradiated Fuel Shipments
July-December 2002

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	July-Dec. 2002		
	Volume - m ³	Curies	Total Error
a. Spent resins, filters, filter sludges, evaporator bottoms, etc.	1.12E+01	4.00E+1	± 25%
b. Dry compressible waste, contaminated equipment, etc.	None	None	N/A
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 sludges, evaporator bottoms, etc.	Mn-54	9.00E+00%	± 25%
	Fe-55	1.40E+01%	± 25%
	Co-60	3.00E+01%	± 25%
	Cs-137	4.00E+01%	± 25%
b. Dry compressible waste, contaminated equipment, etc.	None	None	N/A
	None	None	N/A
	None	None	N/A
	None	None	N/A
	None	None	N/A
c. Irradiated components, control rods, etc.			
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
2	Tractor-trailer	Studsвик, 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, 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 2002.

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 8, August 1999.
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	Distribution of Wind Directions and Speeds for the 33-ft Level of the 220-ft Tower	52
A-2	Distribution of Wind Directions and Speeds for the 220-ft Level of the 220-ft Tower	62

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

January-March 2002

Class A Freq: 0.114

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	3	0	0	0	0	0	0	0	0	0	0	2	1	7
3.5-7.5	16	17	10	3	3	6	1	1	2	4	1	3	25	13	4	8	117
7.5-12.5	6	8	1	0	0	1	0	1	13	8	8	5	30	22	0	2	105
12.5-18.5	6	0	0	0	0	0	0	0	2	0	1	0	1	4	0	0	14
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	29	25	11	6	3	7	1	2	17	12	10	8	56	39	6	11	243

Class B Freq: 0.036

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	5	3	0	1	2	2	4	2	1	8	11	2	3	0	44
7.5-12.5	5	4	0	0	0	0	0	0	7	3	5	3	3	0	1	0	31
12.5-18.5	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
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	4	5	3	0	1	2	2	12	7	6	11	14	2	4	0	78

Class C Freq: 0.045

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	7	0	0	1	0	2	7	2	6	5	2	0	0	34
7.5-12.5	9	1	1	0	1	0	1	5	8	8	8	3	12	2	2	0	61
12.5-18.5	0	0	0	0	0	0	0	0	0	2	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	11	1	1	7	1	0	2	5	10	17	10	9	17	4	2	0	97

Class D Freq: 0.383

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	1	3	6	2	4	7	2	3	0	4	6	3	5	7	3	61
3.5-7.5	19	10	16	18	36	17	16	13	40	38	26	40	31	15	24	13	372
7.5-12.5	12	10	5	17	33	6	12	11	31	48	17	26	40	32	25	3	328
12.5-18.5	9	0	0	0	1	0	0	2	18	8	1	0	14	3	1	0	57
18.5-24	0	0	0	0	0	0	0	0	1	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	45	21	24	41	72	27	35	28	93	94	48	72	88	55	57	19	819

Table A-1 (continued)

January-March 2002

Class E Freq: 0.318

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	1
0.95-3.5	0	1	2	5	6	8	8	11	6	13	11	9	10	8	1	2	101
3.5-7.5	3	1	3	2	7	10	13	16	30	89	75	98	45	24	12	2	430
7.5-12.5	0	1	0	0	7	2	2	12	12	24	21	33	10	3	7	2	136
12.5-18.5	0	0	0	0	0	0	0	1	6	0	0	0	4	1	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	3	3	5	7	20	20	23	40	54	126	107	140	69	36	20	6	680

Class F Freq: 0.087

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	4	0	0	2	4	6	8	7	8	2	4	5	2	0	52
3.5-7.5	0	0	0	1	0	2	1	4	5	29	58	5	0	2	0	0	107
7.5-12.5	0	0	0	0	0	0	0	0	1	17	9	0	0	0	1	0	28
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	4	1	0	4	5	10	14	53	75	7	4	7	3	0	187

Class G Freq: 0.016

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	3	0	0	0	0	0	0	1	0	1	1	0	8
3.5-7.5	0	1	0	0	0	0	0	0	0	3	11	1	0	0	0	0	16
7.5-12.5	0	1	0	0	0	0	0	0	0	6	3	0	0	0	0	1	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	2	0	2	3	0	0	0	0	9	14	2	0	1	1	1	35

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	1
0.95-3.5	6	2	9	16	11	14	19	19	17	20	23	18	17	19	13	6	229
3.5-7.5	40	29	34	34	46	36	34	36	83	172	174	161	117	58	43	23	1120
7.5-12.5	32	25	7	17	41	9	15	29	72	114	71	70	95	59	36	8	700
12.5-18.5	15	0	0	0	1	0	0	3	27	12	2	0	19	8	1	0	88
18.5-24	0	0	0	0	0	0	0	0	1	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	93	56	50	67	99	59	68	87	200	318	270	249	248	144	93	37	2139

Table A-1 (continued)

April-June 2002

Class A Freq: 0.312

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	1	4	1	0	0	1	0	0	2	0	1	13
3.5-7.5	28	34	26	43	33	11	10	3	12	20	13	10	24	25	23	38	353
7.5-12.5	14	23	24	11	10	6	4	2	57	65	17	8	17	5	4	6	273
12.5-18.5	0	3	3	1	0	0	0	0	2	13	0	0	9	0	1	1	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	43	61	54	55	43	18	18	6	71	98	31	18	50	32	28	46	672

Class B Freq: 0.065

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	1	3	1	0	0	1	0	0	0	0	0	0	3	0	3	14
3.5-7.5	3	8	3	13	17	4	2	0	3	6	3	5	0	1	2	8	78
7.5-12.5	0	3	0	3	0	1	0	1	5	17	3	1	6	1	0	1	42
12.5-18.5	0	0	0	0	0	0	0	0	1	5	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	5	12	6	17	17	5	3	1	9	28	6	6	6	5	2	12	140

Class C Freq: 0.046

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	0	2	2	0	1	0	0	1	0	0	0	0	1	1	4	16
3.5-7.5	3	4	2	5	4	5	2	1	7	4	1	5	2	2	4	4	55
7.5-12.5	0	2	1	1	1	0	1	0	6	10	3	0	2	0	0	0	27
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	1	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	7	6	5	8	5	6	3	1	14	14	4	5	5	3	5	8	99

Class D Freq: 0.265

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	6	4	3	6	6	11	5	10	10	4	2	1	2	3	10	88
3.5-7.5	7	14	14	24	15	16	16	7	53	38	13	13	12	15	14	6	277
7.5-12.5	4	0	1	9	2	7	4	1	64	66	6	9	8	2	6	5	194
12.5-18.5	0	0	0	0	0	0	0	0	4	5	0	0	3	0	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	16	20	19	36	23	29	31	13	131	119	23	24	24	19	23	21	571

Table A-1 (continued)

April-June 2002

Class E Freq: 0.234

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	2	7	7	10	15	7	8	7	8	2	5	3	2	3	92
3.5-7.5	4	7	15	14	4	4	7	15	32	21	23	44	31	15	10	10	256
7.5-12.5	0	0	1	0	0	0	0	0	5	95	12	12	23	2	1	0	151
12.5-18.5	0	0	0	0	0	0	0	0	0	6	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	7	10	18	21	11	14	22	22	45	129	43	58	59	20	13	13	505

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	0	1	3	3	1	3	1	5	3	7	9	3	2	0	2	43
3.5-7.5	0	0	0	6	0	0	1	1	5	17	30	8	2	4	4	0	78
7.5-12.5	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0	0	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	0	0	1	9	3	1	4	2	10	27	44	17	5	6	4	2	135

Class G Freq: 0.016

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	2	3	2	0	0	0	7
3.5-7.5	0	0	0	2	0	0	0	0	0	3	10	1	0	0	0	0	16
7.5-12.5	0	0	0	0	0	0	0	0	0	7	4	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	0	0	2	0	0	0	0	0	10	16	4	2	0	0	0	34

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	15	11	13	16	16	19	34	14	24	20	22	16	11	13	6	23	273
3.5-7.5	45	67	60	107	73	40	38	27	112	109	93	86	71	62	57	66	1113
7.5-12.5	18	28	27	24	13	14	9	4	137	267	52	30	56	10	11	12	712
12.5-18.5	0	3	3	1	0	0	0	0	7	29	0	0	13	0	1	1	58
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	78	109	103	148	102	73	81	45	280	425	167	132	151	85	75	102	2156

Table A-1 (continued)

July-September 2002

Class A Freq: 0.224

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	3	1	2	0	3	1	0	0	0	1	0	0	2	2	9	30
3.5-7.5	12	34	30	18	13	7	1	1	13	23	17	8	8	5	9	12	211
7.5-12.5	0	0	4	2	0	0	0	0	14	39	7	1	0	0	0	0	67
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	18	37	35	22	13	10	2	1	27	62	25	9	8	7	11	21	308

Class B 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	2	4	1	3	4	0	1	0	0	0	0	0	0	1	1	0	17
3.5-7.5	3	4	7	3	7	0	0	2	12	6	3	2	1	1	1	2	54
7.5-12.5	0	0	0	0	0	0	0	0	0	16	0	0	0	1	0	0	17
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	5	8	8	6	11	0	1	2	12	22	3	2	1	3	2	2	88

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	4	4	1	2	2	2	3	2	0	1	2	0	6	2	0	31
3.5-7.5	2	1	5	1	2	4	1	0	18	15	5	5	3	0	1	0	63
7.5-12.5	0	0	3	0	0	0	0	0	3	7	0	0	0	0	0	0	13
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	5	12	2	4	6	3	3	23	22	6	7	3	6	3	0	107

Class D 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	11	6	6	7	4	2	3	3	8	5	5	8	4	6	4	2	84
3.5-7.5	3	13	17	6	26	5	0	5	44	52	12	9	10	6	8	2	218
7.5-12.5	0	4	0	0	0	0	0	0	9	49	2	0	1	3	0	0	68
12.5-18.5	0	0	0	0	0	0	0	0	0	1	0	0	1	6	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	14	23	23	13	30	7	3	8	61	107	19	17	16	21	12	4	378

Table A-1 (continued)

July-September 2002

Class E Freq: 0.222

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	2	7	5	2	2	2	8	6	8	5	8	8	3	3	6	77
3.5-7.5	9	11	10	2	5	3	0	0	6	41	23	28	8	14	9	5	174
7.5-12.5	1	1	0	0	0	0	0	0	0	28	16	1	2	4	0	0	53
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	12	14	17	7	7	5	2	8	12	77	44	37	18	21	12	11	304

Class F Freq: 0.092

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	1	1	3	6	6	16	6	2	2	2	45
3.5-7.5	0	0	0	0	0	0	0	0	5	12	31	5	3	1	1	0	58
7.5-12.5	0	0	0	0	0	0	0	0	0	8	15	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	0	0	0	0	0	0	1	1	8	26	52	21	9	3	3	2	126

Class G Freq: 0.044

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	2	3	3	0	0	0	0	8
3.5-7.5	0	0	0	0	0	0	0	0	0	2	33	5	0	0	0	0	40
7.5-12.5	0	0	0	0	0	0	0	0	0	5	8	0	0	0	0	0	13
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	9	44	8	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.95-3.5	21	19	19	18	12	9	10	15	19	21	21	37	18	20	14	19	292
3.5-7.5	29	63	69	30	53	19	2	8	98	151	124	62	33	27	29	21	818
7.5-12.5	1	5	7	2	0	0	0	0	26	152	48	2	3	8	0	0	254
12.5-18.5	0	0	0	0	0	0	0	0	0	1	0	0	1	6	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	51	87	95	50	65	28	12	23	143	325	193	101	55	61	43	40	1372

Table A-1 (continued)

October-December 2002

Class A Freq: 0.249

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	1	0	0	0	0	1	0	0	0	1	0	0	0	4	2	12
3.5-7.5	18	12	11	6	0	2	1	2	5	4	3	1	15	10	13	21	124
7.5-12.5	26	7	9	0	2	4	0	0	1	9	0	2	6	7	5	15	93
12.5-18.5	4	2	19	2	1	0	0	0	0	0	0	0	1	0	0	0	29
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	51	22	39	8	3	6	2	2	6	13	4	3	22	17	22	38	258

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	1	4	0	0	0	0	0	0	0	1	0	0	1	0	0	1	8
3.5-7.5	2	1	1	6	2	0	3	0	0	0	1	1	2	2	2	0	23
7.5-12.5	1	0	6	0	1	1	0	0	4	7	1	2	1	1	3	2	30
12.5-18.5	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	3
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	4	5	7	7	3	1	3	0	4	8	2	3	6	3	5	3	64

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	1	0	2	1	0	0	0	0	0	0	1	0	1	0	3	0	9
3.5-7.5	1	4	3	0	0	0	3	0	4	6	2	1	7	0	4	3	38
7.5-12.5	0	0	1	0	2	1	0	0	17	6	1	3	2	0	0	0	33
12.5-18.5	0	0	0	0	0	0	0	0	0	0	0	0	1	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	2	4	6	1	2	1	3	0	21	12	4	4	11	0	7	3	81

Class D Freq: 0.274

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	1	0	2	4	5	6	1	0	2	1	2	2	2	2	37
3.5-7.5	4	11	2	8	9	9	9	1	13	7	8	12	13	9	14	4	133
7.5-12.5	0	3	1	0	5	7	1	0	8	29	13	14	13	3	9	0	106
12.5-18.5	1	0	1	0	0	0	0	0	2	0	0	0	4	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	8	18	5	8	16	20	15	7	24	36	23	27	32	14	25	6	284

Table A-1 (continued)

October-December 2002

Class E Freq: 0.261

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	3	0	7	11	12	10	5	9	12	9	3	1	0	84
3.5-7.5	2	5	2	0	8	6	0	2	2	20	26	45	24	9	16	6	173
7.5-12.5	0	0	0	0	0	3	0	0	0	5	3	0	0	1	1	0	13
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	6	2	3	8	16	11	14	12	30	38	57	33	13	18	6	270

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	0	0	0	0	3	10	3	7	6	6	5	2	0	0	42
3.5-7.5	0	0	0	0	0	0	0	1	5	4	13	1	0	0	0	0	24
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	3	11	8	11	19	7	5	2	0	0	66

Class G Freq: 0.012

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	1	1	1	0	0	0	3
3.5-7.5	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0	0	9
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	2	8	1	1	0	0	0	12

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	9	10	3	4	2	11	20	28	14	13	20	20	19	7	10	5	195
3.5-7.5	27	33	19	20	19	17	16	6	29	43	60	61	61	30	49	34	524
7.5-12.5	27	10	17	0	10	16	1	0	30	56	18	21	22	12	18	17	275
12.5-18.5	5	2	20	3	1	0	0	0	2	0	0	0	8	0	0	0	41
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	68	55	59	27	32	44	37	34	75	112	98	102	110	49	77	56	1035

Table A-1 (continued)

January-December 2002

Class A Freq: 0.221

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	11	5	2	5	0	4	6	1	0	0	3	0	0	4	8	13	62
3.5-7.5	74	97	77	70	49	26	13	7	32	51	34	22	72	53	49	79	805
7.5-12.5	46	38	38	13	12	11	4	3	85	121	32	16	53	34	9	23	538
12.5-18.5	10	5	22	3	1	0	0	0	4	13	1	0	11	4	1	1	76
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	141	145	139	91	62	41	23	11	121	185	70	38	136	95	67	116	1481

Class B Freq: 0.055

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	9	4	4	4	0	2	0	0	1	0	0	1	4	1	4	39
3.5-7.5	8	13	16	25	26	5	7	4	19	14	8	16	14	6	8	10	199
7.5-12.5	6	7	6	3	1	2	0	1	16	43	9	6	10	3	4	3	120
12.5-18.5	0	0	0	1	0	0	0	0	2	7	0	0	2	0	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	19	29	26	33	31	7	9	5	37	65	17	22	27	13	13	17	370

Class C 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	5	4	8	4	2	3	2	3	3	0	2	2	1	7	6	4	56
3.5-7.5	8	9	10	13	6	9	7	1	31	32	10	17	17	4	9	7	190
7.5-12.5	9	3	6	1	4	1	2	5	34	31	12	6	16	2	2	0	134
12.5-18.5	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	4
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	22	16	24	18	12	13	11	9	68	65	24	25	36	13	17	11	384

Class D Freq: 0.306

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	24	17	14	16	14	16	26	16	22	15	15	17	10	15	16	17	270
3.5-7.5	33	48	49	56	86	47	41	26	150	135	59	74	66	45	60	25	1000
7.5-12.5	16	17	7	26	40	20	17	12	112	192	38	49	62	40	40	8	696
12.5-18.5	10	0	1	0	1	0	0	2	24	14	1	0	22	9	1	0	85
18.5-24	0	0	0	0	0	0	0	0	1	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	83	82	71	98	141	83	84	56	309	356	113	140	160	109	117	50	2052

Table A-1 (continued)

January-December 2002

Class E Freq: 0.262

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	1
0.95-3.5	6	7	11	20	15	27	36	38	30	33	33	31	32	17	7	11	354
3.5-7.5	18	24	30	18	24	23	20	33	70	171	147	215	108	62	47	23	1033
7.5-12.5	1	2	1	0	7	5	2	12	17	152	52	46	35	10	9	2	353
12.5-18.5	0	0	0	0	0	0	0	1	6	6	0	0	4	1	0	0	18
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	25	33	42	38	46	55	58	84	123	362	232	292	179	90	63	36	1759

Class F 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	0	5	3	3	3	11	18	19	23	27	33	18	11	4	4	182
3.5-7.5	0	0	0	7	0	2	2	6	20	62	132	19	5	7	5	0	267
7.5-12.5	0	0	0	0	0	0	0	0	1	32	31	0	0	0	1	0	65
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	5	10	3	5	13	24	40	117	190	52	23	18	10	4	514

Class G Freq: 0.021

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	3	0	0	0	0	2	6	8	3	1	1	0	26
3.5-7.5	0	1	0	2	0	0	0	0	0	10	61	7	0	0	0	0	81
7.5-12.5	0	1	0	0	0	0	0	0	0	18	15	0	0	0	0	1	35
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	2	0	4	3	0	0	0	0	30	82	15	3	1	1	1	142

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	1
0.95-3.5	51	42	44	54	41	53	83	76	74	74	86	91	65	59	43	53	989
3.5-7.5	141	192	182	191	191	112	90	77	322	475	451	370	282	177	178	144	3575
7.5-12.5	78	68	58	43	64	39	25	33	265	589	189	123	176	89	65	37	1941
12.5-18.5	20	5	23	4	2	0	0	3	36	42	2	0	41	14	2	1	195
18.5-24	0	0	0	0	0	0	0	0	1	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	290	307	307	292	298	204	198	189	698	1180	728	584	564	339	288	235	6702

Table A-2
Distributions of Wind Directions and Speeds
For the 220-ft level of the 220-ft Tower

January-March 2002

Class A Freq: 0.117

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	0	0	0	0	0	0	0	0	0	0	0	0	2
3.5-7.5	1	6	2	0	2	0	0	0	0	0	0	1	1	1	3	0	17
7.5-12.5	11	7	5	0	2	1	2	1	1	1	0	2	5	5	0	2	45
12.5-18.5	6	3	1	0	0	5	2	1	9	4	4	3	22	10	1	7	78
18.5-24	0	2	0	0	0	0	0	0	6	2	4	3	6	6	2	3	34
>24	13	1	0	0	0	0	0	0	1	0	1	0	9	13	0	1	39
TOTAL	31	19	8	2	4	6	4	2	17	7	9	9	43	35	6	13	215

Class B Freq: 0.038

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	1	1	0	0	0	0	0	0	0	0	0	0	3	0	0	5
7.5-12.5	0	1	1	1	2	0	0	3	1	0	0	3	6	1	0	0	19
12.5-18.5	0	0	1	0	0	1	1	1	5	2	3	5	5	1	0	0	25
18.5-24	1	1	0	0	0	0	0	0	0	0	3	0	2	1	1	0	9
>24	5	1	0	0	0	0	0	0	1	2	0	1	0	0	0	1	11
TOTAL	6	4	3	1	2	1	1	4	7	4	6	9	13	6	1	1	69

Class C 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	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
7.5-12.5	0	0	0	3	1	0	0	0	0	3	3	1	4	0	0	0	15
12.5-18.5	0	1	1	0	1	0	1	5	4	8	5	5	3	2	0	1	37
18.5-24	3	0	0	0	0	0	1	0	2	2	3	1	6	3	0	0	21
>24	5	0	0	0	1	0	0	0	0	2	0	0	2	0	2	1	13
TOTAL	8	1	1	4	4	0	2	5	6	15	11	7	15	5	2	2	88

Class D Freq: 0.390

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	1	2	0	1	1	0	0	0	1	6
3.5-7.5	1	2	7	6	3	4	5	4	1	2	0	1	1	0	3	3	43
7.5-12.5	1	3	8	10	16	7	7	6	13	21	11	11	10	4	4	2	134
12.5-18.5	7	8	3	8	20	11	9	2	20	40	21	32	13	13	11	6	224
18.5-24	4	1	0	4	15	1	12	9	14	26	14	21	20	7	17	8	173
>24	12	0	0	1	7	5	3	2	15	15	2	1	19	28	14	11	135
TOTAL	25	14	18	29	61	28	36	24	65	104	49	67	63	52	49	31	715

Table A-2 (continued)

January-March 2002

Class E Freq: 0.322

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	1	1	0	0	0	0	0	0	0	0	2
3.5-7.5	1	3	3	4	3	4	4	4	2	2	0	2	4	1	1	2	40
7.5-12.5	1	0	2	2	5	11	11	3	5	9	9	10	9	8	3	3	91
12.5-18.5	1	1	1	0	2	4	12	9	11	35	55	59	61	18	18	2	289
18.5-24	0	0	0	0	1	2	2	10	6	15	30	33	28	7	9	1	144
>24	0	0	0	0	0	0	0	2	7	1	0	0	4	4	5	2	25
TOTAL	3	4	6	6	11	21	30	29	31	62	94	104	106	38	36	10	591

Class F Freq: 0.075

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	2	0	2	0	0	0	2	0	0	0	7
3.5-7.5	3	3	0	1	1	0	3	3	2	1	0	2	3	0	2	0	24
7.5-12.5	2	0	0	4	1	0	4	4	3	5	9	2	5	1	2	1	43
12.5-18.5	0	0	0	0	1	1	1	4	2	4	22	13	4	1	0	0	53
18.5-24	0	0	0	0	0	0	0	0	0	2	4	1	0	0	2	0	9
>24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	5	3	0	5	4	1	10	11	9	12	36	18	14	2	6	1	137

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.5-7.5	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
7.5-12.5	0	0	1	0	0	0	0	0	0	0	2	1	3	1	0	0	8
12.5-18.5	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	4
18.5-24	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
TOTAL	2	2	1	0	0	0	0	0	0	0	7	2	4	1	0	1	20

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	0	2	1	0	3	2	4	0	1	1	2	0	0	1	18
3.5-7.5	6	16	13	12	10	8	12	11	5	5	1	6	9	5	9	5	133
7.5-12.5	15	11	17	20	27	19	24	17	23	39	34	30	42	20	9	8	355
12.5-18.5	14	14	7	8	24	22	26	22	51	93	111	118	109	45	30	16	710
18.5-24	9	4	0	4	16	3	15	19	28	47	61	59	62	24	31	12	394
>24	35	2	0	1	8	5	3	4	24	20	4	2	34	45	21	17	225
TOTAL	80	47	37	47	86	57	83	75	135	204	212	216	258	139	100	59	1835

Table A-2 (continued)

April-June 2002

Class A Freq: 0.312

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	0	1	2
3.5-7.5	6	9	6	3	1	4	1	0	1	0	0	1	3	2	3	5	45
7.5-12.5	8	10	16	29	24	7	5	6	8	5	5	8	12	4	16	15	178
12.5-18.5	9	2	6	3	4	3	5	40	48	26	13	9	15	11	25	15	234
18.5-24	10	5	5	4	4	4	0	12	26	7	2	14	8	5	9	13	128
>24	6	13	9	4	1	1	0	1	9	7	0	13	1	5	9	6	85
TOTAL	39	39	42	43	34	19	11	59	93	45	20	45	39	27	62	55	672

Class B Freq: 0.065

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	0	0	0	0	0	0	0	0	0	0	2
3.5-7.5	1	2	3	3	0	1	0	0	0	1	0	0	1	1	1	2	16
7.5-12.5	2	0	1	7	14	3	0	2	2	3	2	0	1	0	4	0	41
12.5-18.5	2	2	3	2	1	0	0	5	8	7	3	1	2	2	7	5	50
18.5-24	0	0	1	0	1	0	0	2	6	2	0	2	2	0	0	2	18
>24	0	0	2	0	0	0	0	0	2	5	0	2	0	0	1	1	13
TOTAL	6	5	10	12	16	4	0	9	18	18	5	5	6	3	13	10	140

Class C Freq: 0.046

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	1	0	0	0	0	1	0	0	0	0	0	0	0	4
3.5-7.5	0	1	0	0	1	2	0	1	0	0	0	1	0	0	1	2	9
7.5-12.5	1	0	0	2	4	1	1	1	2	1	2	0	1	0	3	2	21
12.5-18.5	2	2	2	2	1	3	0	6	9	5	2	1	0	4	5	1	45
18.5-24	0	0	1	1	0	1	0	1	6	1	0	1	1	0	1	1	15
>24	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	2	5
TOTAL	4	4	3	6	6	7	1	9	18	7	4	5	2	4	11	8	99

Class D Freq: 0.265

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	2	1	1	1	2	1	0	0	1	1	3	15
3.5-7.5	6	6	7	6	5	3	3	6	10	5	1	0	2	1	1	4	66
7.5-12.5	4	6	2	9	14	19	10	10	11	4	0	1	5	1	7	3	106
12.5-18.5	4	4	6	1	4	7	7	21	60	39	12	10	11	4	9	6	205
18.5-24	2	0	8	3	6	1	3	5	49	25	7	2	1	7	8	8	135
>24	0	0	0	0	0	0	1	1	17	6	0	6	6	1	4	2	44
TOTAL	18	16	23	19	29	32	25	44	148	81	21	19	25	15	30	26	571

Table A-2 (continued)

April-June 2002

Class E Freq: 0.234

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	2	3	1	0	1	0	0	0	0	8
3.5-7.5	1	2	6	8	5	9	2	4	2	3	0	0	1	3	1	0	47
7.5-12.5	5	2	4	2	6	10	10	9	10	4	3	3	1	6	2	3	80
12.5-18.5	3	5	4	0	2	3	16	17	21	10	13	28	9	13	5	2	151
18.5-24	0	0	2	0	0	0	0	3	49	13	17	19	10	8	5	1	127
>24	0	0	0	0	0	0	0	0	55	2	1	10	10	6	7	1	92
TOTAL	9	9	16	11	13	22	28	35	140	33	34	61	31	36	20	7	505

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	0	0	0	0	0	2	0	0	1	2	0	3	0	0	1	9
3.5-7.5	0	0	0	2	3	5	2	3	1	2	1	2	1	0	1	1	24
7.5-12.5	0	0	2	0	0	0	5	1	3	2	2	7	3	2	2	1	30
12.5-18.5	1	0	0	0	0	1	2	1	3	5	10	10	5	4	0	0	42
18.5-24	0	0	0	0	0	0	0	0	7	7	4	1	0	3	0	0	22
>24	0	0	0	0	0	0	0	0	0	2	1	0	0	3	2	0	8
TOTAL	1	0	2	2	3	6	11	5	14	19	20	20	12	12	5	3	135

Class G Freq: 0.016

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	1	0	0	0	2	0	0	0	0	0	0	4
3.5-7.5	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	4
7.5-12.5	0	0	0	0	0	0	0	0	1	0	2	0	3	0	0	0	6
12.5-18.5	0	0	0	0	0	0	0	0	0	6	2	4	0	3	0	0	15
18.5-24	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	4
>24	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTAL	1	0	0	0	1	1	0	1	3	9	6	5	3	3	0	1	34

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	4	2	0	2	1	3	3	3	6	6	3	1	3	1	1	5	44
3.5-7.5	15	20	22	22	15	24	8	15	14	11	2	5	8	7	8	15	211
7.5-12.5	20	18	25	49	62	40	31	29	37	19	16	19	26	13	34	24	462
12.5-18.5	21	15	21	8	12	17	30	90	149	98	55	63	42	41	51	29	742
18.5-24	12	5	17	8	11	6	3	23	144	56	32	39	22	23	23	25	449
>24	6	13	11	4	1	1	1	2	84	22	2	33	17	15	24	12	248
TOTAL	78	73	96	93	102	91	76	162	434	212	110	160	118	100	141	110	2156

Table A-2 (continued)

July-September 2002

Class A Freq: 0.261

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	5	1	1	3	1	1	0	0	0	1	3	0	1	0	2	21
7.5-12.5	4	6	4	1	4	3	1	3	2	10	1	5	1	3	1	1	50
12.5-18.5	5	6	0	2	5	2	1	2	16	18	4	6	0	0	2	5	74
18.5-24	1	0	1	0	0	0	0	0	3	11	2	1	0	1	3	6	29
>24	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
TOTAL	12	17	6	4	12	6	3	5	21	41	8	15	1	5	6	14	176

Class B 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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	1	2	0	0	0	1	0	1	0	0	1	0	0	0	0	6
7.5-12.5	0	0	0	0	1	1	2	1	2	0	1	1	0	0	0	0	9
12.5-18.5	0	0	0	1	1	0	0	1	2	2	1	1	0	1	0	0	10
18.5-24	0	0	0	0	0	0	0	0	3	2	0	0	0	0	1	0	6
>24	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2
TOTAL	0	1	2	1	2	1	3	2	8	5	2	3	0	1	1	1	33

Class C 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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5-7.5	0	1	1	0	0	2	0	1	2	1	1	0	0	0	0	0	9
7.5-12.5	0	0	0	2	0	0	1	0	3	3	2	1	1	0	0	0	13
12.5-18.5	0	0	0	0	0	0	0	0	1	1	4	0	1	0	0	0	7
18.5-24	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	1	2	0	2	1	1	7	7	7	1	2	0	0	0	32

Class D Freq: 0.241

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	1	0	0	0	1	0	0	0	0	0	2
3.5-7.5	0	3	0	1	3	0	4	1	0	5	0	5	3	0	0	1	26
7.5-12.5	4	0	0	1	1	3	2	1	2	6	3	5	3	2	1	2	36
12.5-18.5	1	2	0	0	4	1	0	1	6	23	3	3	2	5	2	1	54
18.5-24	0	4	2	0	0	0	0	0	3	24	1	0	0	0	3	0	37
>24	0	1	0	0	0	0	0	0	0	5	0	0	2	0	0	0	8
TOTAL	5	10	2	2	8	4	7	3	11	63	8	13	10	7	6	4	163

Table A-2 (continued)

July-September 2002

Class E Freq: 0.261

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	0	2
3.5-7.5	2	1	1	1	0	1	0	0	0	2	1	0	2	1	1	0	13
7.5-12.5	3	2	0	2	3	0	4	0	0	4	6	2	2	7	0	1	36
12.5-18.5	4	2	2	1	4	1	0	0	4	6	14	12	6	11	4	3	74
18.5-24	2	1	0	0	0	0	0	0	1	25	6	2	1	3	0	3	44
>24	1	0	0	0	0	0	0	0	0	0	0	0	1	3	0	2	7
TOTAL	12	6	3	4	7	2	4	0	5	37	27	16	12	25	7	9	176

Class F Freq: 0.092

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	1	0	0	0	2
3.5-7.5	0	0	0	0	0	1	0	1	0	0	1	0	1	1	0	0	5
7.5-12.5	0	0	0	0	2	1	0	0	0	0	0	0	1	7	2	0	13
12.5-18.5	0	0	0	0	0	0	0	0	0	4	11	5	0	10	3	0	33
18.5-24	0	0	0	0	0	0	0	0	0	1	6	0	0	1	1	0	9
>24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	0	0	0	2	2	0	1	0	5	18	5	3	19	6	0	62

Class G 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	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	1	0	0	0	1
7.5-12.5	0	0	0	0	0	0	0	0	0	1	7	5	3	2	0	0	18
12.5-18.5	0	0	0	0	0	0	0	0	0	4	3	2	4	1	0	0	14
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	5	10	7	8	3	0	0	33

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	0	0	0	0	1	0	0	0	1	0	1	0	2	0	6
3.5-7.5	4	11	5	3	6	5	6	3	3	8	4	9	7	3	1	3	81
7.5-12.5	11	8	4	6	11	8	10	5	9	24	20	19	11	21	4	4	175
12.5-18.5	10	10	2	4	14	4	1	4	29	58	40	29	13	28	11	9	266
18.5-24	3	5	3	0	0	0	0	0	11	65	15	3	1	5	8	9	128
>24	1	1	0	0	0	0	0	0	0	8	0	0	3	3	0	3	19
TOTAL	30	35	14	13	31	17	18	12	52	163	80	60	36	60	26	28	675

Table A-2 (continued)

October-December 2002

Class A Freq: 0.262

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	1	0	0	0	0	0	2
3.5-7.5	1	0	0	0	0	0	0	1	1	2	1	1	2	0	0	0	9
7.5-12.5	8	1	0	0	0	0	0	1	3	1	0	0	0	2	0	5	21
12.5-18.5	4	0	3	0	0	1	2	0	0	6	1	1	4	13	8	16	59
18.5-24	1	2	1	0	0	0	0	0	0	3	1	1	8	3	4	3	27
>24	9	9	24	6	6	2	0	0	0	2	1	1	2	1	13	26	102
TOTAL	23	12	28	6	6	3	2	2	5	14	5	4	16	19	25	50	220

Class B 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	0	0	0	0	1	0	0	0	0	0	0	0	2
3.5-7.5	0	1	0	0	0	0	2	0	1	1	1	0	0	0	0	0	6
7.5-12.5	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
12.5-18.5	1	0	0	0	0	0	0	0	1	2	1	1	0	1	0	1	8
18.5-24	0	2	1	0	0	0	0	0	0	6	1	0	2	0	3	0	15
>24	2	0	4	1	2	0	1	0	2	0	0	2	1	1	2	1	19
TOTAL	3	4	5	1	2	0	3	3	5	9	3	3	3	2	5	2	53

Class C Freq: 0.084

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	1	0	0	0	0	0	0	0	0	0	1
3.5-7.5	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
7.5-12.5	0	2	0	0	0	0	0	1	3	2	1	0	1	0	0	1	11
12.5-18.5	1	1	2	0	0	0	1	1	2	4	2	0	1	2	2	0	19
18.5-24	0	0	0	0	0	0	0	0	12	7	2	1	0	3	4	0	29
>24	0	0	1	0	2	1	0	0	0	1	0	2	2	0	0	0	9
TOTAL	1	3	3	0	2	1	3	2	17	15	5	3	4	5	6	1	71

Class D Freq: 0.285

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	1	1	0	0	0	0	0	0	0	0	0	2
3.5-7.5	1	0	2	1	0	0	1	3	2	0	0	0	0	1	0	0	11
7.5-12.5	1	2	4	0	1	4	1	8	8	1	0	3	1	0	4	0	38
12.5-18.5	3	7	1	0	0	3	0	7	1	9	5	4	8	12	6	1	67
18.5-24	0	2	0	0	0	3	0	0	4	17	17	7	2	4	7	4	67
>24	1	0	1	0	1	3	3	0	1	11	4	13	7	1	9	0	55
TOTAL	6	11	8	1	2	14	6	18	16	38	26	27	18	18	26	5	240

Table A-2 (continued)

October-December 2002

Class E Freq: 0.239

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	0	0	1
3.5-7.5	0	0	1	1	0	0	0	2	3	2	0	1	0	1	0	0	11
7.5-12.5	0	0	1	1	2	5	0	4	6	5	5	5	7	14	3	1	59
12.5-18.5	1	0	0	0	1	0	0	3	3	6	13	8	22	23	5	3	88
18.5-24	1	0	0	0	0	2	0	0	0	15	8	1	3	3	1	5	39
>24	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3
TOTAL	2	0	2	2	3	9	1	9	13	28	26	15	32	41	9	9	201

Class F Freq: 0.056

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	1	1	0	0	0	0	0	0	4
3.5-7.5	0	0	0	0	0	0	0	1	3	3	0	0	0	1	0	0	8
7.5-12.5	0	0	0	0	0	3	0	1	3	1	2	1	2	3	1	0	17
12.5-18.5	0	0	0	0	0	0	0	0	5	3	1	1	7	1	0	0	18
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	3	1	2	12	8	3	2	9	5	1	0	47

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	0	0	0	0	0	0	0	0
3.5-7.5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
7.5-12.5	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	4
12.5-18.5	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	4
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	2	0	4	3	0	0	0	9

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	0	2	0	0	0	1	3	0	4	1	1	0	0	0	0	0	12
3.5-7.5	2	1	3	2	0	0	4	7	10	9	2	2	3	3	0	0	48
7.5-12.5	9	5	5	1	3	12	1	18	23	11	8	11	12	19	8	7	153
12.5-18.5	10	8	6	0	1	4	3	11	12	31	23	17	43	52	21	21	263
18.5-24	2	6	2	0	0	5	0	0	16	48	29	10	15	13	19	12	177
>24	12	9	30	7	11	8	5	0	3	14	5	18	12	3	24	27	188
TOTAL	35	31	46	10	15	30	16	36	68	114	68	58	85	90	72	67	841

Table A-2 (continued)

January-December 2002

Class A Freq: 0.233

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	0	0	0	0	2	0	1	0	0	0	0	1	6
3.5-7.5	10	20	9	4	6	5	2	1	2	2	2	6	6	4	6	7	92
7.5-12.5	31	24	25	30	30	11	8	11	14	17	6	15	18	14	17	23	294
12.5-18.5	24	11	10	5	9	11	10	43	73	54	22	19	41	34	36	43	445
18.5-24	12	9	7	4	4	4	0	12	35	23	9	19	22	15	18	25	218
>24	28	23	33	10	7	3	0	1	10	11	2	14	12	19	22	33	228
TOTAL	105	87	84	55	56	34	20	68	136	107	42	73	99	86	99	132	1283

Class B Freq: 0.054

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	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
3.5-7.5	1	5	6	3	0	1	3	0	2	2	1	1	1	4	1	2	33
7.5-12.5	2	1	2	8	17	4	2	9	5	3	3	4	7	1	4	0	72
12.5-18.5	3	2	4	3	2	1	1	7	16	13	8	8	7	5	7	6	93
18.5-24	1	3	2	0	1	0	0	2	9	10	4	2	6	1	5	2	48
>24	7	1	6	1	2	0	1	0	5	8	0	5	1	1	3	4	45
TOTAL	15	14	20	15	22	6	7	18	38	36	16	20	22	12	20	14	295

Class C Freq: 0.053

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	1	0	0	1	0	1	0	0	0	0	0	0	0	5
3.5-7.5	0	2	1	1	2	4	1	2	2	2	1	1	0	0	1	2	22
7.5-12.5	1	2	0	7	5	1	2	2	8	9	8	2	7	0	3	3	60
12.5-18.5	3	4	5	2	2	3	2	12	16	18	13	6	5	8	7	2	108
18.5-24	3	0	1	1	0	1	1	1	21	12	5	3	7	6	5	1	68
>24	5	0	1	0	3	1	0	0	0	3	0	4	4	0	3	3	27
TOTAL	13	9	8	12	12	10	7	17	48	44	27	16	23	14	19	11	290

Class D Freq: 0.307

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	3	3	2	3	2	3	1	0	1	1	4	25
3.5-7.5	8	11	16	14	11	7	13	14	13	12	1	6	6	2	4	8	146
7.5-12.5	10	11	14	20	32	33	20	25	34	32	14	20	19	7	16	7	314
12.5-18.5	15	21	10	9	28	22	16	31	87	111	41	49	34	34	28	14	550
18.5-24	6	7	10	7	21	5	15	14	70	92	39	30	23	18	35	20	412
>24	13	1	1	1	8	8	7	3	33	37	6	20	34	30	27	13	242
TOTAL	54	51	51	51	100	78	74	89	240	286	104	126	116	92	111	66	1689

Table A-2 (continued)

January-December 2002

Class E Freq: 0.267

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	1	3	4	1	0	1	0	0	2	0	13
3.5-7.5	4	6	11	14	8	14	6	10	7	9	1	3	7	6	3	2	111
7.5-12.5	9	4	7	7	16	26	25	16	21	22	23	20	19	35	8	8	266
12.5-18.5	9	8	7	1	9	8	28	29	39	57	95	107	98	65	32	10	602
18.5-24	3	1	2	0	1	4	2	13	56	68	61	55	42	21	15	10	354
>24	1	0	0	0	0	2	1	2	62	3	1	10	15	13	12	5	127
TOTAL	26	19	27	23	34	54	63	73	189	160	181	196	181	140	72	35	1473

Class F Freq: 0.069

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	1	0	5	0	3	2	2	0	6	0	0	1	22
3.5-7.5	3	3	0	3	4	6	5	8	6	6	2	4	5	2	3	1	61
7.5-12.5	2	0	2	4	3	4	9	6	9	8	13	10	11	13	7	2	103
12.5-18.5	1	0	0	0	1	2	3	5	10	16	44	29	16	16	3	0	146
18.5-24	0	0	0	0	0	0	0	0	7	10	14	2	0	4	3	0	40
>24	0	0	0	0	0	0	0	0	0	2	2	0	0	3	2	0	9
TOTAL	7	4	2	7	9	12	22	19	35	44	77	45	38	38	18	4	381

Class G Freq: 0.017

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	1	1	0	0	0	2	0	0	0	0	0	0	5
3.5-7.5	1	1	0	0	0	0	0	1	0	0	1	1	2	0	0	1	8
7.5-12.5	0	0	1	0	0	0	0	0	1	2	11	8	10	3	0	0	36
12.5-18.5	0	1	0	0	0	0	0	0	0	11	6	9	6	4	0	0	37
18.5-24	1	0	0	0	0	0	0	0	1	1	5	0	0	0	0	0	8
>24	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2
TOTAL	3	2	1	0	1	1	0	1	3	16	23	18	18	7	0	2	96

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	6	4	0	4	2	4	10	5	14	7	6	2	6	1	3	6	80
3.5-7.5	27	48	43	39	31	37	30	36	32	33	9	22	27	18	18	23	473
7.5-12.5	55	42	51	76	103	79	66	69	92	93	78	79	91	73	55	43	1145
12.5-18.5	55	47	36	20	51	47	60	127	241	280	229	227	207	166	113	75	1981
18.5-24	26	20	22	12	27	14	18	42	199	216	137	111	100	65	81	58	1148
>24	54	25	41	12	20	14	9	6	111	64	11	53	66	66	69	59	680
TOTAL	223	186	193	163	234	195	193	285	689	693	470	494	497	389	339	264	5507

APPENDIX C

PILGRIM NUCLEAR POWER STATION OFFSITE DOSE CALCULATION MANUAL

The PNPS Offsite Dose Calculation Manual (ODCM) was not revised during calendar year 2002.